

Journey of Arid Horticulture Research

(1993-2015) ICAR-CIAH



Edited by: Shравan M Haldhar and Satish K Sharma



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Preface

During workshop of nodal officers of 'ICAR Research Data Repository for Knowledge Management' from august 04-05, 2014, I met Dr. Sumant Vyas, Principal Scientist of NRC on camel. His advice to make your institute published research work as online book. His words kept on disturbing me because it is true that unless the research findings are available to other researchers they cannot be put on trial for their repetitive value, an essential criterion for the research findings to be declared useful for end user (in our case the farmer). The lack of widespread dissemination of research findings can also hamper the due recognition for novelty of the research results. This was the genesis for preparing the present book of abstracts of research papers published (from 1993 to 2015) out of work done on arid horticulture at ICAR-Central Institute for Arid Horticulture, Bikaner, an institute under aegis of Indian Council of Agricultural Research. Majority of the work was done on arid fruits (ber, datepalm, aonla, bael, jamun, karonda, phalsa, pilu, lasora, pomegranate, kinnow and citrus) and vegetables (snapmelon, kachari, watermelon, long melon, muskmelon, bottle gourd, moringa, khejri, ridge gourd and sponge gourd).

Apart from Central Library, the libraries of CIAH, Bikaner, SKRAU, Bikaner, IIHR, Bengaluru and IARI, New Delhi were consulted. It took almost two months to complete this book. A total number of 280 abstracts are presented in chronological order. A list of research papers (81) published without summary or abstracts have been placed in the end. Apart from limited print copies, the book will also be made available on internet. This will save the cost of printing of many copies for distribution and will aid to conserve the environment by saving paper. The page setting has been done in the manner to enable it to be searched easily by popular search engines like Google scholar. I am hopeful that this book will become important reference book for the arid horticulture researchers and students globally.

We express my warm regards and sincere thanks to Dr. N. K. Krishnan Kumar, Deputy Director General (HS), Indian Council of Agricultural Research for his constant motivation and encouragement. We express my gratitude to Dr S. K. Sharma, Director, ICAR-Central Institute for Arid Horticulture, Bikaner for providing necessary infrastructure and resources to complete this book. This work would not have been possible without his sagacious guidance, immense help and care. I also thank the help by Head, CHES, Godhara, Head, Crop Improvement and Crop Production, ICAR-CIAH, Bikaner.

Editors



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Abstract of Research Papers

Current Agriculture, 20(1-2): 83-86, 1996

Variability of *Boradi* in Western Rajasthan

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ABSTRACT

Boradi (*Z. mauritiana* var. *rotundifolia*) is a hardy fruit tree found in many parts of India. In spite of hostile environmental conditions in arid regions *boradi* trees are extensively grown along with arable crops for fruit, fodder, fuel and minor timber. In the farming system of the region, a perennial woody component of *boradi* tree plays a major role in increasing productivity and providing sustainability. Some high yielding *boradi* trees have been identified.



Current Agriculture, 21(1-21): 17-118, 1997

Note on effect of intercropping on growth and yield of ber (*Z. Mauritiana* Lamk.) in semi-arid region

R.S. Singh

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ABSTRACT

To increase output of per unit area and proper utilization of interspaces in ber orchards during initial stage of establishment, an experiment on intercropping with various agronomical crops during kharif was carried out at Pali. The initial fruit yield in intercropped orchard increased three folds (14.8 kg/tree) than non-cropped (control) orchard (5.2 kg/tree). It has also been observed that intercropping in newly planted ber orchard has no adverse effect on plant growth up to 5 years. The inter crops also yielded better under ber orchard than sole crops under rain fed conditions. The detailed plant growth, yield and effect of intercrops have been discussed.



Current Agriculture, 122(1-2): 115-116, 1998

Note on patch and 'T' budding of ber (*Ziziphus mauritiana* Lamk.) on *Boradi* (*Z. mauritiana* var. *rotundifolia*) rootstock

Vishal Nath, R.S. Singh, R. Bhargava and O.P. Pareek

National Research Centre for Arid Horticulture, Bikaner

ABSTRACT

Ber is an important fruit crop of arid and semi region. Owing to extreme aridity in this region, nursery raised saplings have been found to give poor orchard establishment. To avoid this problem, budding of suitable cultivars on in situ has been found better. Present study was aimed at evaluating the comparative performance of the patch and 'T' budding on one year old water raised rootstocks of bready under hot arid environment. The data on sprouting percentage, length of sprouts and number of secondary branches revealed that patch method outshines the other in establishment of orchard.



Journal of Applied Horticulture, 3(1): 32-36, 2001

Heterosis studies in bottlegourd [*Lagenaria siceraria* (Mol.) Standi.]

D.K. Samadia and R.C. Khandelwal

NRC for Arid Horticulture, Bikaner

ABSTRACT

Experiment on heterosis in bottle gourd was conducted involving 9 parents, their 36 F₁ hybrids and one standard check. The crop was raised in RBD with three replications under four environments. The analysis of variance indicated presence of significant genetic variability in the experimental material. Mean squares due to genotypes as well as parents and hybrids, environments and their interaction effects were significant. Hybrids, Banswara Local-1 x IC 92374, Banswara Local-1 x Pusa Naveen and IC 92374 x PSPL were superior and exhibited significant economic heterosis for fruit yield per plant, number of fruits per plant and its contributing traits in all the environments. Most of the heterotic crosses were also heterobeltiotic.



Indian Horticulture, 20-21, 2001

AHW 19 and AHW 65: new mateera varieties

D.K. Samadia and O.P. Pareek

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ABSTRACT

High temperature, low and erratic rainfall in Indian arid zone limits the choice and productivity of vegetable crops. Mateera is an indigenous type of watermelon (*Citrullus lanatus*) extensively grown in western India particularly in Rajasthan. Its ripe fruits have sweet, juicy, refreshing and cooling pulp. Its immature, green and tender fruits (loiya), rich in protein, carbohydrates, fat, crude fibre, calcium and phosphorus, are used as a vegetable. Seeds are roasted and eaten. The seeds also yield very nutritive oil (30-40%). Kernels are extracted by decorticating the seeds on a large scale and are extensively used in sweets, bakery and ice-creams. Since it is a potential nutritive vegetable, development of AHW 19 and AHW 65 was the long-felt need of the arid region, say the authors.



Combining ability in bottle gourd

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ABSTRACT

Analysis of variance for combining ability revealed that mean squares due to GCA and SCA effects were significant for all the characters. This indicated that both additive and non additive genes played significant role in the inheritance of these characters. The GCA: SCA ratio was more than one for different the traits. This indicated that additive components played relatively greater role in the inheritance of these traits. Mean squares due to interaction, *i.e.* GCA x environment and SCA x environment were significant for all the traits. This indicated that both GCA and SCA were significantly influenced by the environments. The higher magnitude of GCA x environment than the SCA x environment variance was indicative of the fact that additive components were influenced more by the environments. In present study under E₁, E₂ and pooled environment, four cultivars viz. Banswara Local-1, Pusa Naveen, IC 92374 and PSPL were good general combiner for fruit yield per plant. These cultivars were also good general combiner in their respective environment for days to opening of first female flower, node number to first female flower appearance, number of female flower plant and days to first harvest. In addition to above cultivars, the parental line Udaipur Local-1 was also good general combiner for fruit yield per plant in E₃ and E₄ environments. Most of the parents which were good general combiner for fruit yield per plant in E₁ E₂, E₃, E₄ and pooled environment were also good general combiner for yield contributing traits like number of fruits per plant, fruit length and fruit girth. However, four cultivars viz., Banswara Local-1, Pusa Naveen, IC 92374 and PSPL were good general combiners for fruit yield per plant in all the environments. Since the GCA effects are attributed to fixable components, *i.e.* additive and additive x additive gene effects, the above mentioned parents can be used in hybridization programme. Estimates of specific combining ability effects are attributed to role of dominance and its interaction. Out of thirty-six crosses, only nine crosses exhibited significant positive SCA effects for fruit yield per plant in E₁, E₂, E₃, E₄ and pooled environment. Most of these crosses exhibited significant



desired sea effects for yield contributing traits like number of fruits per plant, number of female flowers per plant, days to first harvest, fruit length, number of branches per plant, main vine length, days to opening of first female flower and days to opening of first male flower. However, the cross Banswara Local-1 x Pusa Naveen, Banswara Local-1 x IC 92374 and IC 92374 x PSPL depicted significant economic heterosis in all the environments for total yield per plant and contributing traits. The response to selection is expected to be best in crosses involving parents having high GCA effects. The crosses that showed high specific combining ability could be best utilized in heterosis breeding.



Indian Journal of Plant Genetic Resources, 15 (3): 197-202, 2002

Genetic resources of Tamarind

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ABSTRACT

The tamarind tree has gained great socio-economic significance in a large part of the globe. It yields a large number of economic products from the fruit pulp and the seed, besides the usage of almost all its plant parts either as timber, fuel, vegetable or medicine. Introduced into the Indian sub-continent during pre-historic days, a wide genetic diversity of tamarind is found in India. The paper provides information on the diversity regions, extent of variability with respect to growth and fruit characters, germplasm holdings, evaluation and selection of genotypes, etc. A scheme of classification of tamarind types based on fruit characters and ideotype description to aim at genetic improvement for commercial exploitation have been suggested.



Genetic diversity in vegetable type *Khejri*

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ABSTRACT

Eighteen *Khejri* genotypes bearing sweet (not acrid) pods were identified from a natural population of 600 trees in the vicinity of Bikaner. Observations were made on pod characters such as length (5.34-27.43cm), diameter (0.33-0.62cm), weight (0.52-5.36g), seeds per pod (6.81-27.40), yield (0.12-1.62 kg m⁻³ tree canopy) and quality rating on 5-point scale. Significant differences in these characters showed the presence of sufficient variability in test trees. On the basis of overall performance, seven trees, *i.e.* K1, K2, K4, K9, K11, K16 and K17 were found to be promising.



Storage behavior of Indian goose berry (*Emblica officinalis*) cultivars under semi-arid ecosystem of Gujarat

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ABSTRACT

An experiment was conducted during 2001 and 2002 to study physico-chemical changes and economic life of 'Banarasi', 'NA 7', 'Chakaiya' and 'Francis' cultivars of Indian goose berry or aonla (*Emblica officinalis* L.) during storage at ambient temperature under semi-arid conditions of Gujarat. Increase in physiological loss in weight, spoilage percentage, total soluble solids, total sugar and reducing sugar and decrease in acidity, ascorbic acid with advancement of storage period were general phenomena in all the cultivars. 'Chakaiya' and 'NA 7' recorded the least physiological loss in weight (3.42-17.20% and 3.92-8.23%) and spoilage loss (6.36-16.00% and 7.30-17.00%) and also exhibited 7 days storage life. The lowest rate of respiration was noted in 'Chakaiya' (70.20-85.00 mg CO₂/kg/hr), followed by 'NA 7' (71.00-86.00 mg CO₂/kg/hr). However, 'Banarasi' showed highest respiratory activity (73.10-88.13 mg CO₂/kg/hr) till the last day of storage. 'Francis' and 'Banarasi' could be stored up to 5 days at ambient temperature.



Constraints in fruit production in tribal area of Gujarat

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ABSTRACT

Lack of technical guidance and lack of information about IPM were perceived as main technical constraints by 82.00 and 86.00 percent of the respondents respectively. Traditional methods of cultivation were commonly practiced. This was followed by local market facilities faced by nearly two third of the respondent. As there are no co-operative or established markets for selling fruits in this district, naturally tribal farmers were facing this problem. Amongst resource constraints, high cost of pesticide, and propagating material and lack of irrigation facilities were major constraints, which more than 80.00 percent of the respondents expressed as problem, Only 8 percent expressed the problem of cold storage facilities, since fruits are not grown in large quantity this problem was not even considered by many other constraints were occurrence or periodic drought (82%), lack of government subsidy (76%) and high wages of laborers (70%) faced by the respondents in fruit cultivation.



Studies on growth enhancement of *Khejri* (*Prosopis cineraria* (L.) Druce) seedlings and in situ budded plants

A. K. Purohit, D. K. Samadia and O. P. Pareek

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ABSTRACT

Studies were conducted on the growth vigor of khejri seedlings as affected by environment (in open and under shade net), irrigation method (rose can and mini-sprinkler), growth regulator treatment (50 ppm GA, 50 ppm GA + 2% urea, 1000 ppm MH and 8-9) and on the growth of the in situ budded plants as affected by black polyethylene mulch and application of 1 L urea (2%) per plant under irrigated and rainfed conditions. Seedling height after 6 months was 34.33 cm in plants treated with 50 ppm GA when planted under open with rose can irrigation compared to 29.6 cm in the control. Linear growth of budded plants was 138.31 cm under rain fed conditions when mulched with black polyethylene compared to 76.98 cm in the control.



Variability and character association in chilli landraces and genotypes under arid environment

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ABSTRACT

The extent of genetic variability, heritability, genetic advance as per cent of mean and correlation coefficients in respect of 17 quantitative characters in 30 chilli genotypes were studied under hot arid environment. There was high phenotypic and genotypic coefficient of variations for red ripe fruit yield per plant (44.20 and 42.91), followed by green fruit yield per plant, weight of seeds per fruit, fruit weight and number of fruits per plant. High heritability and genetic advance as per cent of mean was observed for fruit yield per plant, number of fruits per plant, fruit weight, and number of seeds per fruit, which could be improved by simple selection. A significant positive correlation of economic traits like green fruit yield per plant, fruit weight, fruit diameter, number of seeds per fruit and weight of seeds per fruit with red ripe fruit yield was recorded suggesting that selection for these characters could lead to improvement in yield. Path analysis revealed that red ripe fruit weight followed by green fruit yield per plant, weight of seeds per fruit and number of branches per plant had maximum direct effects on red ripe fruit yield. Thus emphasis should be given on these characters to improve yield potential. The traits such as green and red ripe fruit yield per plant, number of fruits per plant, green and red ripe fruit weight and number of seeds per fruit are important yield contributing characters and deserve due weightage, while formulating selection strategies for improvement of chilli under arid conditions.



Effect of GA₃ and sucrose on seed germination and seedling growth in ber under semi arid conditions

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ABSTRACT

An experiment of the effect of GA₃ and sucrose of seed germination and seedling growth in ber under semi-arid conditions was conducted in the experimental orchard of CHES (CIAH), Vejalpur, Panchmahals (Gujarat) during the year 2000-2001 under JVG-NATP-HFNS. The seed treatment with GA₃ 600 ppm + sucrose 6% promoted germination, seedling height, stem diameter and length of the roots in ber and the seedlings attained appropriate height and diameter for budding operation after 90 days of sowing.



Current Agriculture, 29(1-2): 65-70, 2005

Effect of size, age and planting methods of cladodes on growth behavior in cactus pear (*Opuntia ficus- indica* (L.) Mill)

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ABSTRACT

A propagational experiment was conducted to study the effect of size, age of cladode and methods of planting on growth behavior in cactus pear (*Opuntia ficus-indica* (L.) Mill). The upright planting of 12 months old full size cladode (8 to 15 cm width) in flat bed was found to be the best for better survival, growth and production of cladodes in cactus pear clone-1271 under semi arid sub-tropical conditions of Agra, India. Spring season planting gave better establishment and plant growth in Cactus pear. However, in case of unavailability of planting material, two pieces of 6 to 8 cm width size of a cladode can also be used for planting.



Indian Journal of Agricultural Sciences, 75 (8): 519-523, 2005

Genetic diversity in mahua (*Bassia latifolia*) under semi-arid ecosystem of Gujarat

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ABSTRACT

In a survey carried out during 2003 and 2004 in the district Panchmahals and adjoining areas to identify the elite genotypes of mahua (*Bassta latifolia* Roxb.) among its population, revealed that there was a wide variation among the mahua (*Bassia liatifolia* Roxb.) genotypes. Early flowering was observed in the first week of March in 'MH-1', 'MH-4', 'MH-5' while late (second week of April) in 'MH-6'. Flowers (45) and fruits (8)/fascicle were noted highest in MH-2'. Dry flower yield varied from 30 to 46 kg/plant, being highest in 'MH 2'. Fruit yield among the genotypes ranged from 35 kg to 82 kg/plant, with maximum in 'MH 2'.The highest total soluble solids (27.80%), total sugar (24.24%) and vitamin C content (64.00 mg/100g) was recorded in flowers of 'MH-4'. Maximum fruit weight (34.50), seed weight (14.50 g), kernel oil (46.50%), minerals (4.90%) and protein content (24%) were found in 'MH-2'. These genotypes would be exploited as potential parents to develop high yielding stable genotypes having positive horticultural traits.



Indian Journal of Agricultural Sciences, 75 (10): 647-50, October 2005

Prolonging storability of Indian gooseberry (*Emblica officinalis*) under semi-arid ecosystem of Gujarat

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ABSTRACT

An experiment was conducted during 2001-2002 to see the effect of different post-harvest treatments on storability of Indian gooseberry (*Emblica officinallis* Gaertn) during storage at ambient temperature. Increase in physiological loss in weight, spoilage percentage, total soluble solids, total sugar and reducing sugar and decrease in acidity, ascorbic acid with advancement of storage period were general phenomena in all the treatments. Fruits treated with calcium nitrate 1.5 % + perforated polyethylene bag and GA₃100 ppm + perforated polyethylene bag recorded the least physiological loss in weight (2.12-16.00 and 2.15-16.34%) and spoilage loss (2.40-15.00% and 2.50-15.60 %) and exhibited 11 days of storage life. The same treatments also showed lowest respiratory activity (72.10-82.00 mg CO₂/kg/hr and 72.00-82.10 mg CO₂kg/hr), on the last day of storage (day 13).



Indian Journal of Plant Genetic Resources, 18(3), 2005

Genetic Variability Studies in *Lasora* (*Cordia myxa* *Roxb.*)

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ABSTRACT

Lasora is an under-exploited fruit and an important herbal tree in rural India. Two extensive explorations were made during 2000 and 2001 for the surveys and collections of *lasora* variability in Rajasthan. The germplasm was collected from 95 sites having varied agro-climatic conditions. The analysis of variance revealed that there were high and significant differences among the thirty groups of *lasora* population. A wide range of variation was observed for important characters on plant growth, leaf size, and fruit size and fruit quality and yield components. The estimation of GCV and PCV for fruit weight and leaf size was high and therefore, good scope for improvement through selection. Genotypes with large sized leaves are potential source of bigger sized fruits and vice-versa.



Genetic Divergence in Mahua (*Bassia latifolia*) under Semi-Arid Ecosystem of Gujarat

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ABSTRACT

The study revealed that there was a wide variation among the genotypes. Peak period of flowering was earliest (1st week of March) in MH 25, while it was delayed in MH 26, MH 29, MH 31 and MH 32 (1st week of April), MH 32 recorded maximum number of flowers and fruits per fascicle. Early ripening i.e. 4th week of May was recorded in MH 21, MH 22, MH 27, MH 31, MH 32, and MH 33, while it was noted late (3rd week of June) in MH 23, MH 28, MH 34 and MH 35. Dry flower yield ranged from 27-48 kg/plant being highest in MH 32. Fruit yield was found to be highest in MH 32 (98.00 kg /plant). The flower Juice was found to be highest (67.00 %) in MH 32. Total soluble solids, total sugar, reducing sugar and vitamin C content of flowers were the highest in MH 32. Weight of mahua fruit was found to be maximum in MH 34. The seed per cent was found to be maximum in MH 35 (42.91). The total soluble solids, total sugar and vitamin C contents of the fruits were maximum in MH 32. The kernel per cent varied from 74.13-82.68 with highest in MH 24. The highest protein and mineral contents were recorded in MH 34. Fruit yield was found to be positively and significantly associated with flowers and fruits per fascicle, flower weight and flower yield per plant. With respect to all traits studied in these genotypes, MH 32, MH 34, MH 35, MH 26, MH 27, MH 23 and MH 33 were found to be promising and would be exploited as potential parents to develop high yielding stable genotypes.



Genetic resources of Aonla (*Emblica officinalis* Gaertn.)-a review

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ABSTRACT

Aonla tree has gained great socio-economic impact in large part of the country. It has significant contribution to improvement of economic status of farming communities through commercial orcharding, nursery production and processing of herbal respect of fruit size, maturity period and yield per plant. Due to predominance of seedling propagation India holds rich genetic diversity in cultivated and their wild relatives of aonla. Genetic erosion status of these resources is constantly high due to severe deforestation, natural calamities and adoption of a few popular cultivars in the selected pockets. However, enormous variability in aonla still remains unexploited and awaits proper attention on exploration; collection and maintenance to conserve genetic diversity available in the nature. Besides cultivated species of (*Emblica helianthus*), some other available species can be utilized in aonla breeding programme to infuse hardiness into the offspring for adverse habitat. This paper discusses the diversity region, extent of variability with respect to quality, fruit character, germplasm holdings, evaluation and selection of genotypes, *etc.*



Performance of Date Palm Introductions under Hot Arid Environment

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ABSTRACT

The vigorous plant growth was observed in cultivars Chip chap in comparison to Braim plant in respect of palm height, spread, leaf size, pinnae, and suckering also. Plant growth pattern in both the cultivars were at par to other genoplasm planted in the same year at same site. It seems that the growth performance of both the cultivars is satisfactory under hot arid environment. However, plant growth depends upon genetic character of the genotype besides environmental conditions of growing sites. In the first year of fruiting, 6.000 kg doka fruits/ plant was harvested from Braim plant after five years of planting. However, Chipchap cultivar started flowering and fruiting in the year 2002 after four years of planting but the yield was very less. Only one bunch of 500g weight was obtained in the year 2002. During the year 2003, fruit yield (1.000 kg/plant) was obtained from Chip chap plant. In both the cultivar, fruit colour was yellow and sweet in taste with average berry weight 7.74g and 8.32g for Braim and Chip chap, respectively. Bigger berry size was recorded in Chip chap than that of Braim cultivar, which possibly be due to genetic feature of the genotype in addition to environmental conditions. Doka (Khalal) stage was early in Chip chap cultivar. Bunch size was also bigger in Braim in respect of number of strands per bunch, number of fruits per strands. Fruit set also depends on the time of spathe opening, pollination, viability of pollens and receptivity of stigma besides climatic conditions. However, good percentage of fruit set (70-80 %) was also recorded in both the cultivars under arid conditions. The percent acidity was 0.17 and 0.22 in Braim and Chip chap, respectively. There was no much more difference in both the cultivars with respect to acidity (%), ascorbic acid and sugars contents. The seed size and pulp stone ratio was higher in case of Chip chap which might be due to genetic features of the variety. The seeds of seven varieties viz., Khastavi, Sayer, Braim, Chip chap, Barhee, Khadrawy and Zahidi (EC 454540- 46) were procured from Iraq in the month of May, 2000.



Indian Horticulture, 10-11, 2005

AHS 10 and AHS 82: new snap melons

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ABSTRACT

Snapmelon is a popular cucurbit vegetable cultivated in arid and semiarid regions of western India. So far, there is no commercial variety of this drought hardy crop that could give good quality fruits and higher returns. AHS 10 and AHS 82 snapmelons have been developed at CIAH, Bikaner, which could give sustained yield of superior quality produce.



Collection and Conservation of Some Gourd Landraces of Tribal Areas of Rajasthan

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ABSTRACT

A rich genetic diversity of bottle gourd was observed in tribal dominating parts of Rajasthan and Gujarat. The maximum variability exhibiting areas were in the districts of Chittorgarh, Banswara, Dungarpur, Udaipur, Dahod and Panchmahal. A total of 18 population samples were made which includes landraces, primitive selections and local cultivars. A wide range of variation was recorded for plant growth and fruit shape, size, colour tenderness. Variation in mature fruit and seed characters was also recorded. Farmers of tribal and *mali* community were very conscious for the preservation of desirable types of landraces by timely seed storage, regeneration and continuity in production. The accession DKSI AHLS 23 which produced only bitter fruits was being maintained by a tribal family for over more than 70 years (to measure and serve the Tadi liquor). On evaluation, AHLS 23, AHLS 24, AHLS 27 and AHLS 28 were found to be potential germplasm material for multiple characters. During the surveys, it was noticed that the tribal dominating adjoining areas of south Rajasthan, north Gujarat and western Madhya Pradesh are important regions for *Luffa* gourds where wide range of variability existing in the form of wild species, primitive landraces and domesticated local cultivars. In these areas, several landraces and natural selections were in cultivation and preserved by the tribal families. The maximum variability exhibiting areas were in the districts of Ajmer, Bhilwara, Chittorgarh, Banswara, Dungarpur, Udaipur, Dahod and Panchmahal. In ridge gourd (kali tori, aara tori) the tender fruits were of 9 to 90 cm in length. The wild forms were extremely bitter but the domesticated types were less or rarely bitter. The hermaphrodite type "Satputia" bears perfect flowers in clusters. The fruits were small in size (5-7 cm) and in clusters (4-7). Tender fruits of



spongegourd (smooth gourd, chikni tori, ghiya tori, gulki) were much variable in sizes. In *Luffa* gourds, maximum variability was recorded for fruit characters in respect of size, shape, and tenderness and seed characters. Nineteen population samples of ridged gourd and 15 of sponge gourd were collected. On evaluation, a wide spectrum of variation were observed and recorded for plant phenological characters, flowering and fruiting behavior, fruit characters and biotic and abiotic stresses. The genotypes AHRG 1, AHRG 4, AHRG 8 and AHRG 15 in ridge gourd and AHSG 4, AHSG 5 and AHSG 13 of sponge gourd were found to be particularly under arid conditions. In tribal dominated areas of South Rajasthan and north Gujarat, *M. dioica* (spine gourd, kakoda) occurs in semi wild form. It is perennial and dioecious, *M. charantia* (bittergourd, karela) is annual and monoecious tender fruits of both the species have been used as curries and pickled. In bittergourd, the availability of local cultivars and landraces was very low where as a high range in adoption of cultivars was observed. Four bittergourd land races were evaluated for growth, flowering, fruiting, maturity, fruit yield and quality and seed and reaction to biotic and abiotic stresses under hot arid environment.



Effect of mulch material on soil-hydrothermal regimes, growth and fruit yield of brinjal under arid conditions

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ABSTRACT

Among vegetable crops, brinjal occupies an important place in Western Rajasthan and is commonly grown as a rainfed crop. In areas where irrigation facilities are available it is also grown as a ratoon crop. Mulching has been found to increase the availability of water and its retention in soil by decreasing evaporative losses to alleviate harmful effects of drought. An experiment was conducted with local brinjal grown under semi-irrigated condition in newly established aonla orchard spaced at 8 x 8 m during September 2002 - March 2003 at Central Institute for Arid Horticulture, Bikaner. The experiment was conducted in a randomized block design with three replications consisting of treatments (i) 200 μ thick black polyethylene film, (ii) 200 μ thick white polyethylene film, (iii) lasoda (*Cordia myxa*) leaf mulch, (iv) neem (*Azadirachta indica*) leaf mulch (v) grass clippings of sewan (*Lasiurus indicus*), (vi) kheep (*Leptodania pyrotechnica*) and (vii) control (no mulch). The crop was grown between two aonla plants at a spacing of 60 x 40 cm leaving 1 m away from the main stem thus occupying 75 per cent area. Mulching treatments were imposed in 6 m² area. The black and white polyethylene films were spread in 6 m² area, while leaves of lasora and neem were applied @ 2 t/ ha, grass and kheep clippings were applied @ 1 t/ha. Soil temperature was measured by the use of stainless steel, fisher band bimetal dial thermometer and soil moisture by Neutron Probe. Fruit yield was pooled at the end of experiment. Soil mulched with organic mulches showed beneficial effect in lowering the soil temperature at 20 cm depth during summer months (1.1-5.6°C), while increase in soil temperature was recorded during the peak winter months *i.e.* December January (0.6-3.2°C). Significant increase in soil temperature was recorded in black and white polyethylene during the winter months December-January (2.7-5.1°C) over control.



Impact of hybridity on flavonoid spectrum of ber (*Ziziphus mauritiana Lamk.*)

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ABSTRACT

Ber (*Ziziphus mauritiana Lamk.*) demonstrates a rich biodiversity with respect to morphometric and fruit characters. Much of this has been generated on account of natural cross pollination. In depth studies have been conducted in different crops to evaluate the impact of hybridity on plant morphometric and yield parameters but very few studies were undertaken to evaluate the impact on metabolite constitution. Accordingly, the present study was aimed at evaluating the foliar flavonoid spectrum of two hybrids developed at CIAH, Bikaner viz-a-viz their parents. The results demonstrated that some compounds encountered in parents were present in profiles of hybrids also. Similarly, some novel compounds were also found which might have produced as a result of new gene combinations in hybrid. Likewise some compounds present in parents were not found in hybrids. These could be explained on the basis of epistatic phenomenon.



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Genetic variability in jamun (*Syzygium cumini* Skeels) in Gujarat

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ABSTRACT

Jumun is found scattered throughout Gujarat. A survey was carried out in the districts of Gujarat to identify the elite genotypes among its population. Flowering, fruiting and physico-chemical attributes of ripe fruits from seven selected genotypes were studied. The study revealed that there was a wide variation among the genotypes. Earliest flowering (Mid February) took place in GJ-24, and latest (Last March) in GJ -23, GJ-30, GJ-31, GJ-32 and GJ-33. Maximum panicle length (15.24 cm) and number of fruits per panicle (26.00) were found in GJ-19. Collection numbers GJ-19, GJ-21, GJ-22 and GJ-25 have been found earliest (First week of May) in ripening period, while GJ -17, GJ-28 and GJ-32 ripened at the last (Last June). Maximum yield per plant was recorded in GJ-19 (175.00 kg) followed by (GJ-23 (170.00 kg), GJ-22 (160.00 kg) and (GJ-18 (150.00 kg). Individual fruit weight ranged from 10.10 to 22.50g, length from 1.99 to 3.24 cm and pulp percentage from 73.66 to 85.68. There was a wide variation in chemical characters also; total soluble solids varied from 10.30 to 12.34% total sugar 8.58 to 9.13% and vitamin C 32.12 to 46.37 mg/100g. On the basis of overall performance GJ-18, GJ-19, GJ-23, GJ-24 and GJ-25 were found to be promising among the genotypes studied based on its yield and physio-chemical characters.



Change in cropping pattern subsequent to farm mechanization

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ABSTRACT

This study was conducted in Haryana and Rajasthan states to know the change in cropping pattern subsequent to farm mechanization, It was found that in the study area of Haryana the crops under which the area decreased after farm mechanization are, cotton (82.35%), green manuring sunn-hemp (70.58%), pigeon pea (63.63%), chillies (51.85%), green gram (42.00%), cowpea (40.00%) and sorghum (36.00%) followed by others. The crops under which the area increased are, onion (666.66%), vegetables (457.14%), wheat (94.67%) and rapeseed/mustard (73.58%) followed by green fodder and pea. In case of study area of Rajasthan, the highest area decreased under groundnut (57.14%), green manuring sunn-hemp (56.76%), pigeon pea (54.00%), green gram (36.11%), pearl millet (24.13%) and sorghum (20.27%) followed by others, while the crops under which the area increased subsequent to farm mechanization are, rapeseed/ mustard (135.71 %), wheat (74.69%) and green fodder (40.90%) during rabi season.



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Prolonging storability of Indian goose berry (*Emblica officinalis*) under semi-arid ecosystem of Gujarat

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ABSTRACT

An experiment was conducted during 2001-2002 to see the effect of different post-harvest treatments on storability of Indian gooseberry (*Emblica officinallis* Gaertn) during storage at ambient temperature. Increase in physiological loss in weight, spoilage percentage, total soluble solids, total sugar and reducing sugar and decrease in acidity, ascorbic acid with advancement of storage period were general phenomena in all the treatments. Fruits treated with calcium nitrate 1.5% + perforated polyethylene bag and GA, 100 ppm + perforated polyethylene bag recorded the least physiological loss in weight (2.12-16.00 and 2.15-16.34%) and spoilage loss (2.40-15.00% and 2.50-15.60 %) and exhibited 11 days of storage life. The same treatments also showed lowest respiratory activity (72.10-82.00 mg CO₂/kg/hr and 72.00-82.10 mg C₀₂/ kg/hr), on the last day of storage (day 13).



Genetic Resources of Aonla (*Emblica officinalis* Gaertn.)

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ABSTRACT

Aonla tree has gained great socio-economic impact in large part of the country. It has significant contribution to improvement of economic status of farming communities through commercial orcharding, nursery production and processing of herbal respect of fruit size, maturity period and yield per plant. Due to predominance of seedling propagation India holds rich genetic diversity in cultivated and their wild relatives of aonla. Genetic erosion status of these resources is constantly high due to severe deforestation, natural calamities and adoption of a few popular cultivars in the selected pockets. However, enormous variability in aonla still remains unexploited and awaits proper attention on exploration, collection and maintenance to conserve genetic diversity available in the nature. Besides cultivated species of *Emblica* (*Phyllanthus*), some other available species can be utilized in aonla breeding programmc to infuse hardiness into the offspring for adverse habitat. This paper discusses the diversity region, extent of variability with respect to quality, fruit character, germplasm holdings, evaluation and selection of genotypes, etc.



Studies on variability in tamarind (*Tamarindus indica* L.) from Gujarat

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ABSTRACT

Tamarind is found scattered throughout Gujarat. A survey was carried out in the district Panchmahals and adjoining areas to identify the elite genotypes among its population. Flowering fruiting and fruit quality attributes of 15 genotypes were studied in the year 2001-02 and 2002-03. The study revealed that there was a wide variation among the genotypes. Earliest flowering took place in T1 (2nd week July). Maximum panicle length (15.12 cm) and number of fruits per panicle (15.00) were found in T13 T1, T2, T6, T7 and T12 have been found earliest (4th week March) in maturity period, while T4 and T15 matured at the last (2nd week May). Maximum yield per plant was recorded in T13 (175.00 kg). The highest pulp percent (53.87) was recorded in T10. TSS and total sugars were found to be maximum in T13, however vitamin C content was found at the top in T12, On the basis of overall performance, T10, T11, T3, and T13 were found to be promising among all genotypes studied based on desirable horticultural traits. These genotypes would be exploited as potential parents to develop high yielding stable genotypes.



Performance of tamarind (*Tamarindus indica L.*) under semi arid conditions of Gujarat

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ABSTRACT

Tamarind is found scattered throughout Gujarat. A survey was carried out in the district Panchmahals and adjoining areas to identify the elite genotypes among its population. Flowering, fruiting and fruit quality attributes of 15 genotypes were studied during the year 2002 -04. The study revealed that there was a wide variation among the genotypes. Earliest flowering (4th week of June) was recorded in CPT-17, while CPT-24, CPT-25 and CPT-20 were last to flower (2nd Week of August). Maximum panicle length (15.30 cm) and number of fruits per panicle (13.50) were recorded in CPT-19. Collection number CPT-21, CPT- 27 and CPT-17 ripened at the earliest (4th week of March), while CPT-24, CPT-25 and CPT-20 ripened at the last (2nd Week of May). Maximum yield per plant was recorded in CPT-20 (190.00 kg) followed by CPT-18 (170.00 kg) and CPT-19 (160.00 kg). Individual pod weight ranged from 12.00-26.00 g, length from 10.50-18.00 cm and pulp percentage from 32.00-48.00. There were wide variations in chemical characters also. Total soluble solids varied from 52.00-71.50 % total sugars from 44.00-53.00 % and vitamin C 9.50-23.00 mg/100g. Protein content, of the seed varied from 12.50-24.40 % in different genotypes. On the basis of overall performance, CPT-18, CPT-19, CPT-2(CPT-25 and CPT-26 were found to be promising among all genotypes studied based on desirable horticultural traits. These genotypes would be exploited as potential parents to develop high yielding stable genotypes.



Effect of size grading on quality and shelf life of aonla (*Emblica officinalis* Gaertn.)

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ABSTRACT

The fruits were harvested from experimental orchard and graded on the weight basis (A grade=50±5g, B grade=40±5g and C grade =30±5g) during the year 2001-2004. Physiological loss in weight was lower in A grade than Band C grade fruits during storage. The spoilage loss in NA 7 amounted to 14.00, 17.00 and 21.00 per cent in A, Band C grade fruits respectively on 7th day of storage; however, it was recorded 7.20, 13.00 and 14.00 per cent in Chakaiya. Pathogens of three genera viz., *Aspergillus Niger*, *Rhizopus sp.* and *Penicillium oxalicum* were detected from the rotted fruits. A grade fruits had higher per cent of total soluble solids, vitamin C and total sugar in comparison to Band C grade fruits. The lowest respiratory activity (NA 7, 86.13 mg CO₂/kg/h and Chakaiya, 85.10 mg CO₂/kg/h) was noted in A grade fruits on 13th day of storage. On the basis of experimental findings, it may be concluded that grading is one of the important practices and may be followed by aonla growers to fetch better price in the market.



Efficiency of planting systems on productivity and economics of anola cv. NA-7 under rainfed condition

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ABSTRACT

An experiment on high-density planting system was conducted on aonla Cv.NA-7 at the experimental field of Central Horticultural Experiment (CIAH-ICAR), Vejalpur, Panchmahals, Gujarat, India during the year 2004 to 2005 with objective to maximize its productivity under rain fed condition. Five planting systems, viz (i) square (9 plants/plot) (ii) hedgerow (15 plants/plot) (iii) double hedgerow (20 plants/plot) (iv) cluster (16 plants/plot) and (V) paired (12 plants/plot) having 100, 166, 222, 177 and 133 plants per ha respectively, were studied. Plot size was maintained 30x30 m for each treatment, which was replicated four times in randomized block design. Plant height was recorded significantly highest in double hedgerow system with highest number of plants per unit area. However, maximum values of tree spread, rootstock and scion girth were recorded in square system of planting. Yield per tree was not significantly affected by different planting systems. Maximum yield per ha was recorded in double hedgerow system, which was narrowly followed by cluster and hedgerow planting system. Among the various planting systems evaluated, yield and economic returns were almost doubled in hedgerow planting system over square system during 4th year of planting. The physio-chemical attributes of aonla fruits were not influenced significantly by the different planting systems. Based on the initial trends, double hedgerow planting system can be adopted by aonla growers for gaining better productivity per unit area even in early stage of bearing.



Standardization of maturity indices in Indian gooseberry (*Emblica officinalis*) under semi-arid conditions of Gujarat

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ABSTRACT

An investigation was carried out during 2003 and 2004 to study the fruit developmental stages pertaining to quality characteristics for fixation of maturity standards in Indian gooseberry (*Emblica officinalis* Gaertn.) at Central Horticultural Experiment Station, Vejalpur. It was observed that the fruit growth was faster initially and slowed down between last week of September to first week of October and increased slightly thereafter and followed double sigmoid growth pattern in almost all the cultivars. The specific gravity showed increasing trend (1.00-1.08) in all the cultivars during development. Total soluble solids; total and reducing sugar contents increased as the fruits reached towards maturity. Titratable acidity increased during initial period of fruit development then declined. In all the cultivars, vitamin C increased during development and they came constant till the fruits attained physiological maturity. Increment in specific gravity (> 1), appearance of fiber on seed cover and change of seed colour from creamy-white to brown was the general phenomena in all the cultivars at maturity, TSS: acid ratio was 4.53, 4.54, 5.02, 4.41 and 4.64 in 'Anand 1', 'Anand 2', 'Agra Bold', 'Francis' and 'Banarsi' respectively at maturity.



DRIS norms for sapota in western plains of India

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ABSTRACT

A leaf sampling survey was conducted in existing orchards of sapota in Valsad, Navsari, and Junagarh and Bhavnagar districts of Gujarat during 1999 and 2000 to develop DRIS norms. The optimum nitrogen concentration in the index leaf ranged from 1.25-2.38%, whereas phosphorus, potassium, calcium, magnesium, sulphur, iron, manganese, zinc and copper, ranged from 0.05-0.17%, 0.36-0.77%, 1.01-2.04%, 0.48 - 0.92% and 0.38-0.82% and 18.9-147.43 ppm, 18.12-36.97 ppm, 7.89-16.57 ppm and 3.92-5.66 ppm respectively. These findings may be used for diagnosis of nutrient requirements of sapota orchards in Gujarat.



Arid horticulture: an overview

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ABSTRACT

The arid region is spread over 38.7 million hectare mainly in states of Rajasthan, Gujarat, Haryana, Punjab and Andhra Pradesh. The area is marked by extreme climatic conditions due to which the cultivation of traditional crops is non-economical. In a situation such as this, arid horticulture has ample scope to develop the arid regions. The present communication attempts to perform an overview of the technologies developed which can be used to make arid ecosystem a horticultural bowl and provide income and nutritional security to the inhabitants.



Review on ber (*Ziziphus mauritiana* Lamk) diseases and their management

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ABSTRACT

Ber (*Ziziphus mauritiana* Lamk) is an ancient and poor man fruit crop grown in semiarid and arid regions of India and other few countries. Ber fruits from commercial varieties like Gola, Umran, Seb, Mundia, and Chomu local are considered as supplementary source of nutrition to the poor people of arid region. However, the yield and quality of ber fruits are adversely affected by various abiotic and biotic factors. Out of different biotic factors, fruit fly infestation and powdery mildew incidence pose many problems in attaining economic yield and consumer's preference of these commercial varieties. Being an underutilized fruit crop, much attention has not been given on documentation of the production constraints mainly the biotic factors. Unless there is comprehensive information available about the symptoms, life cycle and epidemiology of particular disease, suitable management practices cannot be worked out. In this review, all possible efforts have been critically evaluated and only the relevant information from different sources, the working experience and publications available with the authors are presented. Emphasis was given on almost all the diseases based on the economical significance of particular disease in ber growing areas of the country preferably Western parts of Gujarat and Rajasthan. Disease like powdery mildew, fruit rots and post harvest diseases are elaborated with suitable literatures and management practices including some of the resistant varieties. This review could be more useful to formulate integrated management strategies for managing ber diseases at present and in future.



Direct organogenesis in single bud explant of lasoda (*Cordia myxa Roxb.*)

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ABSTRACT

Organogenesis of shoot and root in single bud explant taken from mature tree of Lasoda (*Cordia myxa Roxb*) has been achieved. Organogenesis was obtained by placing nodal explant on shoot induction medium and subsequently on rooting medium. More than 90% culture was responsive for *in-vitro* axillary shoot proliferation on MS media supplemented with BA 2.0 mg and NAA 0.1 mg per litre. After culture period of 6-8 week, the nodal explants with microshoot were rooted on the MS media supplemented with 3g activated charcoal and different level of NAA (0, 1, 3 and 6 mg/ litre). The season and position of explant on the mother plant was also shown to influence *in-vitro* performance of the regeneration in terms of establishment of aseptic culture, percentage of responsive explants and intensity of leaching of growth inhibitory phenolics.



Variation in physiological parameters of some ber (*Ziziphus mauritiana* var. *rotundifolia*) cultivars

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ABSTRACT

The gene pool of the ber (*Ziziphus mauritiana*) cultivars available in the National repository at Central Institute for Arid Horticulture, Bikaner was evaluated for the variation in the photosynthetic rate and associated parameters. It was observed that the ber cultivars showed a marked variation on the basis of photosynthetic rate and can be grouped into two groups viz. i) showing mid day depression and ii) those which do not show mid day depression. The results on relative water content leaves demonstrated that leaves of group (i) maintain high RWC as compared to that in group (ii).



Role of information and communication technologies for improving input efficiency of horticultural crop production

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ABSTRACT

Indian farming community is passing through a phase of reducing incomes, uncertain and unpredictable markets and weather conditions. They need advance information and intelligence on agricultural commodities and their supply/demand position in the local as well as global markets. They also need advises on the impending climate/weather parameters so as to regulate their choice of crops and farm management and operations. They have to be enabled to face the global competition. For that Information and communication Technologies (ICT) are very use full. The use of ICT in agriculture in general and rural livelihood security in particular remains restricted in India. Effective utilization of ICT has the potential to make the rural communities in India prosperous. Failure to exploit the benefits of ICT would make them isolated, victims of the vicious cycle of poverty and widen the gap between rich and poor people, thereby affecting social equality and livelihood security. The use of ICT should not be restricted to simply establishing information flow channels; rather we should find a way to integrate it with the various livelihood needs (natural, social, human, physical and financial) of the rural community. The narrow ICT coverage is found to be financially non-viable. Further, no single agency can effectively deliver this critical input. Besides the public sector, the need for a proactive participation by the private sector, NGOs and other civil society organisations is being increasingly felt. For ICT initiatives to be successful and sustainable in the longrun, collaborative efforts are indispensable. This digital development in rural areas of India facilitates rural prosperity, rural empowerment, and a warehousing of data for development, increasing input efficiency and productivity, reducing cost of service delivery etc. a step towards digital inclusions to foster rural enterprise in India.



Graft compatibility among the Asian and Algarobia *Prosopis* species

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ABSTRACT

Graft inter-relationships have been studied among four *Prosopis* species, viz. the Asian *P cineraria* and *P juliflora*, *P Alba* and *P nigra* of section *Algarobia*. Reciprocal stock-scion combinations were attempted by bud grafting using each species as stock as well as scion. The autografts in all the four species were successful. In *P cineraria*, *P juliflora*, *P Alba* and *P nigra* respectively 88.9, 88.9, 72.2 and 11.1 per cent successful grafts were obtained. The graft combinations between the species within section *Algarobia* were also successful. Patch budding *P nigra* scion on *P juliflora* rootstock gave 83.3 % successful grafts. Thus true-to-type plantations of these species could be raised by patch budding on their own roots. The combinations of *P cineraria* with any of the other three species of section *Algarobia* were incompatible.



Managing scarce water resources in hot arid regions: a review

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ABSTRACT

The arid region of India is spread over 38.7 m ha area, of which 31.7 m ha is hot arid. About 90% of hot arid zone is spread over western part of Rajasthan (19.6 m ha). The conditions of low and erratic rainfall, extreme temperature variation, high evapo-transpiration, scarce water resources, low and saline ground water table with ill defined profile development threaten sustainable agriculture. As the scope of expanding irrigation potential is limited, effective water harvesting and its management is essential to increase the share of water to agriculture, which is likely to reduce by 10 to 15 per cent in the next two decades. The gap between water supply and demand necessitates harnessing of available water resources with efficient in-situ and ex-situ water conservation and proper recycling at appropriate stages of crop growth. The traditional water harvesting structures are of immense use however, blending it with modern technology can make it more effective. Reducing water demand by changing water delivery scheme from supply-to demand-driven basis, improving the efficiency of water use through advanced irrigation technologies, improved soil and water management practices can play a great role in alleviating the adverse effects of water scarcity. In this paper traditional and advance method of managing water resources is discussed.



Diversity of leaf proteins in ber genotypes differ in powdery mildew reaction

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ABSTRACT

Ber (*Ziziphus mauritiana Lamk*) is a major fruit crop cultivated in water deficit areas, arid and semi-arid regions of India. Powdery mildew, an economically important disease causes great loss in production of ber fruits. To understand the genetic variability of ber genotypes differ in powdery mildew reactions, total leaf protein of 17 genotypes were subjected to SDS-PAGE (Sodium Disulphide-Polyacrylamide Gel Electrophoresis). The overall results revealed the presence of 68 bands at different relative mobility (Rm) having molecular weight ranging from 97-20 kDa. Majority of the bands migrated towards cathode (-) with slow running rate. Analysis of zymogram of banding pattern showed similarities and differences among ber genotypes. Molecular weight of 46kDa band was observed in most of the genotypes irrespective of mildew reactions. However, the resistant genotypes viz., Kathapal and Kishmis were having additional bands at Rm 0.65 with molecular weight of 34 kDa. Similarly, cv. Illaichi which is also reported to be resistant to the test disease showed two prominent bands at Rm 0.67 (Mwt. 22.50 kDa) and 0.68 (Mwt. 21.00 kDa). Presently, the results on electrophoretic banding pattern of total protein profile of ber genotypes is presented for the first time and this finding could be useful in demarcation of ber germplasm against powdery mildew resistance.



Survey and collection of aonla germplasm from eastern Uttar Pradesh

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ABSTRACT

As a result of survey of eastern part of Uttar Pradesh, seven genotypes were identified *i.e.* three from Vindhyan hills (AKS/CIAHIEO-27, 28 and 29) one from Allahabad (AKS/CIAHIEO-30) and three from Pratapgarh (AKS/ CIAH/EO-31, 32, 33). Based on observation it was noted that AKS/CIAH/EO-28 and 29 were red coloured, profuse and cluster bearing with small-fruited type. There was wide range of variability with regards to physico-chemical properties of fruit samples collected during identification of aonla genotypes. Variability with respect to various physical parameter exhibited marked variation with respect to plant height, size of determinate shoot and No. of fruit per shoot. The maximum plant height 9.0m was observed with AKS/CIAH/EO-30 where as the dwarfing height *i.e.*, 3.5m was recorded with AKS/CIAH/EO- 29 with canopy spread of 2.5m (E-W) and 2.3m (N-S). This difference is highly correlated with important character of fruit weight and size. Size of determinate shoot, which is an important character of aonla is basically responsible for bearing of flowers and fruit. A remarkable difference was also observed for this character in different genotypes. The maximum length (1.4cm) of determinate shoot was found in AKSI CIAH E032 where as the shortest size (4.5cm) recorded with AKS/CIAH E027 genotype. The maximum number (9) of fruit per shoot was with AKS/CIAH E027 as compared to minimum number (5) of fruits with AKS/CIAH E031. The colour of fruit differed with respect to genotypes and an excellent red coloured fruit were observed with AKSI CIAH E029. Thus this genotype revealed two distinguishing characteristics of dwarfing nature and red colour of fruit that may be considered elite genotype in stone measured from 1.12cm to 1.74cm and width 1.10 to 1.54cm. These measurements clearly indicate the variability of fruit quality in terms of pulp 1st one ratio indirectly. Total soluble solids (TSS) which



generally determine the quality of fruits for nutritive and shelf life of produce also differed with respect to genotypes and maximum TSS (25%) was recorded in AKS/CIAH E027 followed by AKS/CIAH E029 (23%) as compared to minimum with AKS/CIAH E031 (13%). The final economic part of the fruit is the pulp quantity and this character was measured in different genotypes and a high pulp weight (42.95g) with AKS/CIAH E032 where as minimum pulp weight (5.10g) with AKS/CIAH E027 was recorded. The percentage of pulp content was found highest (95.91) with AKS/CIAHE032 as compared to minimum (84.01 %) with AKS/CIAH E027. The per centage of stone content was measured and the minimum (4.09%) was observed with AKS/CIAH E032 as compared to maximum (16.21 %) with AKS/CIAHE029. It is evident from the data given in table-I and 2 that genotype AKSI CIAH E032 seems to be superior with respect to several physical and quality parameters for crop improvement programmes.



An evaluation ber based farming system in hot arid ecosystem of western Rajasthan

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ABSTRACT

That more than one third population of the farmers of Bikaner district (Rajasthan) grew country type and improved varieties of ber. The majority of ber growers grew various crops like mateera, snapmelon, kachari, brinjal, bottle gourd, ridge gourd, round melon, Indian aloe, spinach, carrot, radish, green onion, fenugreek, cauliflower, chilli, cluster bean, pearl millet, cowpea, groundnut, mustard, gram, wheat, coriander, cumin, etc. as inter-crops in ber orchards during different seasons of the year. It was also observed that most of the ber growers reared various farm animals for different purposes. The major farm animals reared by ber growers were cows, buffaloes, sheep, goats and camels. These animals were reared for various purposes viz, milk, wool, meat, FYM, hair, skin production, draft purposes, for extra income and employment generation. Therefore, ber growers adopted mixed farming system to reduce risk and uncertainty in their farming system to sustain their livelihood especially during drought and famine conditions.



Dehydration methods and their impact on microbial contamination in Kachari (*Cucumis callosus*) products

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ABSTRACT

The overall results presented in Table 1 revealed that the kachari products were associated with different genera of saprophytic fungal and bacterial populations. However the intensity or the level of contamination varied among the dehydration methods. Out of twelve different treatments, kachari without peels subjected to tray drying did not have any microbial colonization even after two and half year of storage under ambient conditions. Perhaps due to the treatment effect in addition to the nature of the samples which did not contain the surface tissues (peeled) which may normally act as carrier of the contaminants at storage stage. Conversely, the same product stored under refrigerator conditions was infected (20%) by *Rhizopus* sp. Maximum colonization of *Rhizopus* sp ranging from 30-00% was noticed in kachari slices dried under shade and direct sun light. Powder form of kachari fruits contained more bacterial population. Shade dried (16 months old) product showed 60% *Rhizopus* sp, 10% *Penicillium* sp and 10% bacteria. The post harvest products colonized by the toxigenic fungi like *Penicillium* spp as evidenced from the present investigation is important concern in terms of health point of view. However, most of the other toxigenic fungi did not contaminate rest of the samples. This is the first kind of investigation revealing the importance of dehydration methods on quality of kachari products. Although no works have been carried out so far in this crop, few reports on mycoflora of other arid vegetables like Khejri are available. The results showed in *Ecineraria*, 23 out of 54 isolates of *A. flavus* produced aflatoxins. In present study, kachari fruits under shade dry contained the toxin producing fungal genera like *Aspergillus* and *Penicillium* spp. Of the toxigenic isolates, 21 produced B 1 aflatoxin, whereas 2 produced both Band B2 aflatoxins.



Bacterial leaf and fruit spot: A major constraint in pomegranate orchards

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ABSTRACT

In present investigations, different types of symptoms were observed in most of the commercial cultivars like Ganesh, Mirdula and Bhagava. In leaves, almost similar kind of symptoms were seen except in case of cv. Mirdula, dark spots surrounded by yellowish green halo and in other cases the spots are surrounded with yellow halo. The bacteria could migrate from the spots to stems through leaf petioles to central veins and slowly enters in to stem forming dark lesions. Bark tissues are severely distorted by bacterium in advanced stage of infection. In cv. Ganesh, water soaked lesions were prominent and subsequently appeared as necrotic spots without much halos on young fruits. In severe cases, many spots coalesced to form necrotic lesions and progress to the extent of epidermal cells of rind. When the infection occurs on matured fruits, the rinds are cracked easily and such fruits are congenial for colonization of saprophytic fungi and insect's damage. In flower buds also, deep-seated necrotic lesions were seen. In contrast to necrotic and water soaked spots on rind, initially dark brown spots with sunken lesions appeared on cv. Mirdula. In advanced stages, fruits cracking were severe as compared to other varieties. Systemic migration of the pathogen was seen as symptoms expressed by the bacterium in vascular tissues. The bacteria colonized in the inter-cellular spaces in mesophyll cells before moving to the petiole and finally down to the node. Invaded cells were killed resulting in blight and therefore, it is also known as nodal blight disease of pomegranate which is very common in Bangalore area.



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Studies on genetic variability and varietal performance in pomegranate under hot arid environment

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ABSTRACT

The extent of genetic variability, heritability and genetic advance with respect to growth, fruit yield and quality traits in 38 genotypes have been studied. Considerable variability was observed in these characters. Number of fruits and fruit yield per plant and fruit weight were observed to highly heritable traits which also showed large magnitude of genetic advance. Thus these characters should respond favourably to simple selection procedures in cultivar improvement attempts. Out of nine popular pomegranate varieties, Jalore Seedless, G-137 and Ganesh were: observed to be superior with regards to fruit yield and Mridula excelled in fruit quality indicates promise for cultivation under hot arid conditions. It is disappointing that all the nine commercial types were prone to fruit cracking (30-90%). This study suggest for systematic in provement in pomegranate not only for high quality fruit yield but also free from fruit cracking under hot arid environment.



Fruit quality improvement in pomegranate under hot arid environment

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ABSTRACT

The extent of genetic variability, heritability and genetic advance with respect to growth, fruit yield and quality traits in 25 pomegranate hybrids/open-pollinated progenies were studied. Fruit yield per plant, number of fruits per plant, fruit weight and weight of 100 arils were recorded high heritability parameters along with large amount of genetic advance. Thus, selection of progenies based on performance would be effective for these characters. The number of fruit per plant, fruit weight, diameter and length were positively and significantly correlated with fruit Yield per plant both at phenotypic and genotypic levels. Fruit weight had highly significant and positive correlation with fruit delimitation, fruit length and weight of 100 arils. Therefore, emphasis should be given to these characters while selecting a genotype for enhancing yield and fruit size in pomegranate. On the basis of desirable parameters, best individuals were identified from the heterozygous progenies and compared for fruit quality and yield components in respect of popular cultivar Jalore Seedless for further testing under hot arid agro-climate after clonal propagation.



Genetic analysis for yield components in tomato land races

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ABSTRACT

The PCV and GCV were high for fruit weight, number of fruits per plant, fruit yield per plant, number of fruits per cluster and number of seeds per fruits. High estimates of heritability along with genetic advance as percentage of mean for fruit weight followed by number of fruits per plant: fruit yield per plant, number of fruits per cluster and seeds per fruits indicated that the role of additive gene action for these traits. Correlation studies revealed significant positive correlations between fruit yield and fruit weight and that of fruit weight with fruit diameter and length at phenotypic level indicating mutual association of these traits. The genotypic evocation coefficients for all the combinations of the traits were higher or quite close to respective phenotypic values, this indicated strong inherent potential as well, therefore, selection on the basis of phenotypic could be quite effective for getting the desired combination of traits.



Identification of yield attributes in bottle gourd for rainfed condition

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ABSTRACT

The results of path analysis revealed the highly significant direct positive direct effect of no. of primary branches per plant, node of first female flower appeared, no. of fruits per plant and 100 seed weight on yield at genotypic level. Days to first female flower appeared, internode length and main vine length had also showed higher magnitude of direct positive effect on yield. This result is consonance with findings of Sex ratio, fruit weight, fruit girth and days to fruit harvest exhibited negative direct effect on yield as their negative correlation coefficient indicates their strong dependency for higher yield. Ahmed et al. (2005) also reported direct negative effect of fruit diameter and days to fruit harvest. The action of the traits such as fruit set per cent and days to first female flower anthesis are not in agreement with correlation studies, they showed contradictory effect with yield. On the other hand it contributed indirectly via no. of primary branches per plant, no. of offruits per plant. This suggests that selection for no. of primary branches per plant, no. of fruits per plant would ultimately improve the yield. No. of offruits per plant and fruit weight are considered important economical characters. The former attributes exhibited the strong positive direct effect on yield at both studies indicates its strong trustability. This is in agreement with Ahemed at al. (2005). Fruit weight and fruit girth exhibited positive association with negative direct effect on yield indicating these two characters are contributing through fruit set per cent and no. of primary branches per plant. It was very interesting to note that the residual effect was 0.0862. This infers the total genotypic variability in yield has been explained by the characters associated in the study.



Genetic diversity in chironji (*Buchanania lanzan*) under semi-arid ecosystem of Gujarat

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ABSTRACT

Chironji (*Buchanania lanzan* Spreng) of family anacardiaceae shows wide genetic variation owing to its heterozygous nature. An extensive survey and exploration was carried out during the year 2004 and 2005. Earliest flowering (first week of February) took place in 'CPT 1', 'CPT 5', 'CPT 10', 'CPT 15', 'CPT 17', 'CPT 19' and 'CPT 22', while the latest (4th week of February) occurred in 'CPT 13'. Maximum panicle length (35.11 cm) was found in 'CPT 1', while 'CPT 18' recorded least panicle length (14.20 cm). Highest percentage of perfect flowers (13.10) and fruits/panicle (37.50) was recorded in 'CPT 12' while, it was found least in 'CPT 18'. Ripening time varied from third week of April to second week of May indifferent genotypes. The highest fruit yield/plant was found in 'CPT 7' (28.00 kg/plant). Kernel weight was highest in 'CPT 1' (0.14 g). The highest protein content was found in 'CPT 2' (30.70%). With respect to all horticultural traits studied the genotypes 'CPT 1', 'CPT 2', 'CPT 5', 'CPT 6', 'CPT 7', 'CPT 8', 'CPT 12' and 'CPT 30' were found to be promising. Vegetatively propagated promising genotypes have been planted in the field for their further evaluation.



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Standardization of method and time of propagation in jamun (*Syzygium cuminii*) under semi arid environment of western India

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ABSTRACT

The experiment was conducted during consecutive years of 2002-2003 and 2003-2004 at Central Horticultural Experiment Station, Vejalpur (Godhra), Panchmahal, Gujarat to standardize method and time of propagation in jamun (*Syzygium cuminii* Skeels) under semiarid environment of western India. Patch budding and soft wood grafting were carried out at monthly interval commencing from September 2002 to August 2004. Patch budded plants sprouted earliest in July (16 days). Higher percentage of graft success was noted in March (40 %) in patch budded plants, whereas it was recorded to be highest in soft wood grafted plants in August (36 %). Soft wood grafted plants had also higher number of leaves than patch budded plants. Irrespective of scion and rootstock, maximum accumulation of nitrogen and carbohydrate content was recorded in March while it was found in lower concentration during September, October, November, December and January. Patch budding in March and soft wood grafting in July- August may be followed for multiplication of elite jamun plants.



Electrical conductivity and accelerated ageing techniques for evaluating deterioration in cucurbitaceous vegetables

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ABSTRACT

Three promising varieties of Bottle, gourd, Sponge gourd and Round melon of cucurbitaceous vegetables were artificially aged at 45⁰C and 100 per cent relative humidity for 9 days. The experimental results revealed that accelerated ageing showed significant effect on loss of germination per cent, seedling growth, dry weight and other vigour parameters in all the varieties. However, ageing was more pronounced in sponge gourd seeds, twice as that of non-aged seeds. The decline in germination during accelerated ageing was related to the initial degree of deterioration of the seed lot. Percentage of electrolyte leakage, increased steadily during the course of ageing and irrespective of the varieties. The EC values of the sponge gourd were high as compared with those of bottle, gourd and round melon seeds after 24 hours of soaking which confirms the changes in the membrane permeability.



Performance of muskmelon genotypes under arid conditions

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ABSTRACT

Thirteen indigenous and six exotic muskmelon genotypes were evaluated for yield and quality component characters at CIAH, Bikaner, and The results revealed that the number of fruits set per plant varied from 5.13 to 14.14 and marketable fruits per plant were from 3.10 to 7.13. The highest significant number of fruits per plant was recorded in CHES-238 (7.13) followed by CHES-268 (5.97) in comparison to mean of genotypes (4.4). All the genotypes were prone to extremes of aridity and high temperature conditions resulted in sunburn and cracking of fruits. Among the indigenous genotypes, the CHES-238 was found to be the most potential for high quality early fruit yield under extremes of hot arid environment. The evaluated Iranian cultigens failed to prove their superiority because of susceptibility to high temperature and extremes of environmental conditions prevailing from February to October in the arid region.



Effect of mulch on soil-hydrothermal regimes, growth and fruit yield of brinjal under arid conditions

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ABSTRACT

Different synthetic and organic mulches in brinjal grown as ground storey crop with aonla were studied with respect to soil-hydrothermal regimes, growth, fruit yield and quality parameters. In general, organic mulches at 20 cm depth curtailed soil temperature by 1.1–5.6°C during warmer months, while an increase in temperature by 0.6–3.2°C was recorded during the winter months of December-January. A significant variation in soil moisture percentage (30 cm below the mulch) in September–November was recorded under black polyethylene and conserved 46–50% more moisture. Fruit yield/plant was 84 and 77% more under black and white polyethylene mulches. Among the organic mulches, fruit yield/plant as compared to control was 66 and 58% more under mulches of lasoda leaf and kheep clippings respectively. Fruit quality parameters were significantly influenced by mulch treatments. Fruit size and moisture content was maximum under black and white polyethylene mulches. Ascorbic acid, acidity, β -carotene and vitamin-content were higher under lasoda leaf mulch.



Constraints in adoption of Ber production technologies

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ABSTRACT

This study was conducted in Bikaner district of western Rajasthan during 2002-2003 to assess the socio-psycho and economic hindrances in adoption of ber production technologies. A total of 120 farmers were interviewed to collect the information. The study reveals that attachment with traditional cropping systems and cultural practices, lack of knowledge of new technologies, fear of crop failure, fear of attack of diseases, distress sale and poor bargaining, low demand and consumption in local markets, monopoly of private brokers in purchasing of ber fruits, non availability of inputs on reliable costs in the locality are the major socio-psycho and economic hindrances in adoption of innovative ber production technologies.



Influence of mulch on soil hydrothermal regimes, leaf and soil nutrient concentrations, growth and fruit yield of brinjal grown under arid ecosystem

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ABSTRACT

An experiment was conducted during 2002-2003 and 2003-2004 to study the effect of black and white polyethylene mulches and two organic mulches namely *Cordia* leaf and *Leptodenia clippings* on soil hydrothermal regimes, macro and micronutrient concentrations in leaf and soil, growth and fruit yield of brinjal. The mulch treatments retained more soil moisture at all the depths as compared to control. The synthetic and organic mulches conserved 55 and 36 per cent more moisture per 0.15 cm soil depth respectively as compared to control. Soil temperature was favourably moderated in mulch materials as compared to unmulched treatment. Leaf tissue-N and K were higher under *Cordia* leaf mulch and P was highest under black polyethylene mulch but micronutrient concentrations were variable. Plant height, stem girth, plant spread, no. of fruits/plant and fruit yields increased with mulch application.



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***Studies on genetic variability and varietal performance
in pomegranate under hot arid environment***

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ABSTRACT

The extent of genetic variability, heritability and genetic advance with respect to growth, fruit yield and quality traits in 38 genotypes have been studied. Considerable variability was observed in these characters. Number of fruits and fruit yield per plant and fruit weight were observed to be highly heritable traits which also showed large magnitude of genetic advance. Thus these characters should respond favourably to simple selection procedures in cultivar improvement attempts. Out of nine popular pomegranate varieties, Jalore Seedless, G 137 and Ganesh were observed to be superior with regards to fruit yield and Mridula excelled in fruit quality, indicates promise for cultivation under hot arid conditions. It is disappointing that all the nine commercial types were prone to fruit cracking (30-90%). This study suggest for systematic improvement in pomegranate not only for high quality fruit yield but also free from fruit cracking under hot arid environment.



Evaluation of date palm germplasm under hot arid ecosystem

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ABSTRACT

The introduction of date palm germplasm in the arid region is essential to enrich genetic resources for crop improvement. A rich genetic diversity in date palm is available in Kachchh region of Gujarat and its exploitation is essential. The performance evaluation study indicates that cultivar Halawy is the most suitable with respect to growth, early maturing, regular bearing and fruit quality for cultivation under Indian arid ecosystem. However, the initial performance also showed that cultivars Khadrawy, Zahidi, Khuneizi, Dayari and Sabiah are better with respect to fruiting. The study reveals that introduction of date palm offshoots from warm arid and semi-arid parts of the world are useful for better establishment, growth and production.



Evaluation of pomegranate germplasm under arid conditions

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ABSTRACT

Thirty-eight pomegranate genotypes were evaluated to assess the components of genetic variability with respect to growth, fruit yield and quality traits. Considerable variability was observed in these characters. Number of fruits and fruit yield per plant and fruit weight were observed to be highly heritable traits which also showed large magnitude of genetic advance. Thus these characters should respond favorably to simple selection procedures in cultivar improvement attempts. Out of nine popular pomegranate varieties, Jalore Seedless, G 137 and Ganesh were observed to be superior with regards to fruit yield and Mridula excelled in fruit quality, indicates promise for cultivation. However, all the nine commercial types were prone to fruit cracking (30 - 90 %). This study suggest for systematic improvement in pomegranate not only for high quality fruit yield but also free from fruit cracking under hot arid environment.



Stability parameters in bottle gourd

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ABSTRACT

The investigation was carried out to study the stability parameters for fruit yield and associated characters in bottle gourd. The material comprised of nine parents, 36 F₁ hybrids and one standard check. The environments were created by sowing the crop on the different dates at two different locations. The study revealed the presence of genotypes x environment interactions. The variation due to G x E (linear) was significant for all the traits indicating that major portion of G x E interaction were linear in nature and prediction of these traits was still possible. Based on the individual genotypes of adaptability, it is evident that three parental line and twelve hybrids recorded high mean performance along with non-significant deviation from regression. The hybrid Banswara Local x PSPL recorded below average regression coefficient ($b_i=1$) while hybrid Long C-92374 and Udaipur Local-I x IC-92374 recorded above average coefficient indicating their better performance in poor and better environments, respectively. While, the parental line Banswara Local-I, Pusa Naveen and PSPL and nine regression coefficient around unity ($b_i=1$) indicating their stability in varying environments.



Variation in carbon fixation and water use efficiency among date palm cultivars grown in arid zone

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ABSTRACT

Seven commercial cultivars of date palm (Halawy, Khadrawy, Shamran, Zahidi, Medjool, Khuneizi and Khalas) were evaluated on the basis of physiological parameters. The net photosynthetic rate, transpiration, stomatal conductance and internal CO₂ concentration were estimated using LI-6200 Infra Red Gas Analyzer. The values of carboxylation efficiency and water use efficiency were computed. The results demonstrate that in date palm maximum rate of photosynthesis occurs during spathe emergence stage, which shows that probably this stage has a high sink demand. It was further noticed that higher rate of photosynthesis in date palm is on account of higher stomatal conductance. Inter-cultivars comparison revealed that cv. Halawy might have advantage over others in hot arid ecosystem, as this cultivar possesses high rate of photosynthesis, water use efficiency and carboxylation efficiency.



Genetic variability studies in bitter melon for zero irrigated condition of semi-arid ecosystem

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ABSTRACT

The study was undertaken with forty-six genotypes of bitter melon collected from diversified areas of the country assessed under zero irrigation condition for mean, genetic variability, heritability and genetic advance in respect of fourteen quantitative characters. The genotype MCC-23 recorded the highest number of primary branches per plant, fruit yield per plot and fruit weight. The genotypic and phenotypic coefficient of variation for different characters ranged from 6.375 to 37.251 and 8.373 to 38.630 respectively. The highest PCV and GCV were observed for number of female flowers per plant followed by fruit weight and number of primary branches per plant indicating the extent of variability based in these characters. High heritability coupled with greater genetic gain was observed for number of female flowers per plant followed by fruit weight, number of primary branches per plant and yield per plot indicating the additive gene action. Fruit girth showed moderate heritability with low genetic gain.



Standardization of method and time of vegetative propagation in tamarind under semi-arid environment of western India

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ABSTRACT

An experiment was conducted to standardize method and time of propagation in tamarind. Patch budding and soft-wood grafting (cleft method) were carried out at monthly interval. Patch budded plants sprouted earliest during August (22 days) followed by July (23 Days) and June (24.25 days). The maximum time was taken in the February (32 days). Higher percentage of graft success was noted in August in patch budded plants, whereas it was recorded to be highest in soft wood grafted plants in May, closely followed by April. Soft-wood grafted plants had the higher number of leaves than patch budded plants. Irrespective of scion and rootstock, maximum accumulation of nitrogen and carbohydrate content was recorded during May, June, July and August, while it was found lower during September, October, November, December, January and February. It was concluded that patch budding in July-August and soft wood grafting in April-May may be adopted in the region for multiplication of elite tamarind genotypes.



Studies on physico mechanical properties of ber cultivars

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ABSTRACT

Ber is an important fruit crop in the arid regions of Asia and Africa. Some physical and mechanical properties of six ber cultivars namely Umran, Ilaichi, Gola, Mundia, Goma kirthi and Banarasi karka were determined. The geometrical mean diameter of fruits varied from 2.65 to 4.85 cm. The sphericity varied from 0.73 to 0.88 among cultivars and the fruits of Gola were more spherical than the fruits of other cultivars. The surface area, volume, average weight and firmness of Umran fruits were significantly higher, 74.04 cm², 89.90 cm³, 56.66 g and 6.80 N, respectively than the other fruits. The cutting strength of Goma kirti fruits was found to be better than the fruits of other cultivars.



Prolonging shelf life of ber under semi-arid environment

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ABSTRACT

An experiment was conducted during the year 2005 and 2006 to study the effect of CaCl_2 , Til oil 2.0% emulsion, potassium permanganate coated silica gel @ 10g per bag, potassium sulphate 2.0% and mustard oil 2.0% emulsion on shelf life and fruit quality attributes of ber (*Zizyphus mauritiana Lam.*) cv. Gola during storage at ambient temperature under semi-arid environment of western India. Different post harvest treatments were imposed to the fruits after harvest. Increase in physiological loss in weight (PLW), spoilage percentage, total soluble solids, total sugar and reducing sugar and decrease in acidity, ascorbic acid with advancement of storage period were general phenomena in all the treatments. Fruits treated with calcium chloride 1.5% recorded the least physiological loss in weight (17.45%) and spoilage loss (25.20 %) and exhibited 5 days of shelflife, while untreated control had 3 days shelflife under ambient conditions. The same treatment also showed lowest respiratory activity ($0.22 \text{ mg CO}_2 \text{ kg}^{-1} \text{ hr}^{-1}$), however, it was recorded highest in the control ($0.43 \text{ mg CO}_2 \text{ kg}^{-1} \text{ hr}^{-1}$) on the last day of storage (day 9). It was closely followed by calcium chloride 2.0%. It may be concluded that the fruits treated with calcium chloride (1.5%) was found most efficient to retain the fruit quality attributes till the last day of storage under ambient conditions of western India.



Variability in pomegranate fruit spot pathogen

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ABSTRACT

Pathogenic isolates of *A. alternata* causing fruit spots in pomegranate from Anantapur (Andhra Pradesh), Bikaner (Rajasthan) and Rahuri (Maharashtra) locations were collected and pure culture was made on potato dextrose agar medium. Pathogenic isolates were tested for pathogenicity and maintained for different studies. The results reveal the existence of morphological variation of three *A. alternata* isolates. Mycelial growth and conidiogenesis were fast in Anantapur and Bikaner isolates as compared to isolate from Rahuri (Maharashtra). Initially olive green and later brown mycelia colonies were noticed in Bikaner isolate while brown colonies from rest of the isolates chains of conidia were observed irrespective of isolates. However, size and shape were dissimilar. Chain of conidia measuring 24.12-33.43 x 7.6-11.53 μ m with more number was seen in Anantapur isolate. Isolate from Anantapur showed high (1.386 μ g 100 mg) total protein followed by isolate of Rahuri (1.295 μ g 100 mg) whereas, soluble protein was more (0.824 μ g 100 mg) in Bikaner isolate followed by 0.64 μ g 100 mg in Rahuri isolate. Isolate from Anantapur recorded maximum of 0.16% total amino acids followed by 0.1% in Rahuri and 0.096% in Bikaner isolate. Similarly, variation on percentage of synthesized amino acids in liquid medium showed that maximum of 0.032% from Anantapur isolate followed by 0.024% in Rahuri and 0.02% in Bikaner isolate.



Variability and scope of improvement in Lasora (*Cordia myxa*)

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ABSTRACT

A rich reserve of genetic variability in hardy fruit species such as khejri, lasora, jharber, bordi, ker, pilu, etc. in the traditional arid farming system has sustained substantial nutritional needs and livelihood of the desert dwellers. Lasora is an important fruit species and is considered as a herbal tree in rural India. Two explorations were made during 2000 and 2001 for the surveys and collections of lasora variability in the state of Rajasthan. The germplasm was collected from 95 sites with varied agro-climatic conditions. A wide range of variations was observed for the important characters on plant growth, leaf size, fruit size, and fruit quality and yield components. The analysis of variance revealed that there were high and significant differences among the thirty groups of lasora population. The estimation of GCV and PCV for fruit weight and leaf size was high and therefore, good scope for improvement through selection. High estimate of heritability along with high genetic advance as per cent of mean was estimated for fruit weight (79.95), leaf size (89.72) and leaf width (53.73). Positive and highly significant correlations were observed between fruit weight and fruit length and diameter. On the basis of correlation studies, it could be suggested that plants with large sized leaves would give bigger sized fruits and vice-versa.



Studies on genetic variability and scope of improvement in round melon under hot arid conditions

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ABSTRACT

Genetic variability, heritability, genetic advance and correlation coefficients components in round melon using eighteen land races/genotypes under hot arid environment were studied in order to identify desirable genotypes for crop improvement programme. On the basis of fruit quality characters along with more number of fruits and early yield per plant, the genotype AHRM-1 (1.91 kg), KPT-3, Arka Tinda and KCM/BKP 01 were observed to be most potential. The estimates of GCV were high for fruit yield and number of fruits/ plant and moderate for node to female flower appearance, fruit weight, number of seeds/fruit, plant height and number of branches/plant indicated better scope of improvement through selection. The genetic advance as percentage of mean ranged from 10.62 to 91.17. High estimates of heritability values accompanied with high genetic gain were observed for fruit yield/plant, number of fruit/plant, node to first female flower appearance, and number of seeds per fruit. A very strong positive and significant correlation was recorded between fruit yield per plant with number of fruits per plant (0.921) and vine length (0.808) indicating that effective improvement through these characters could be achieved in round melon. Negative and significant association of days to appearance of female flower and days to first harvest with number of fruits per plant which indicated that early genotypes bear more number of fruits per plant.



Genetic variability studies in chilli germplasm under hot arid eco-system

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ABSTRACT

Two crop specific explorations were conducted in arid, semi-arid and sub-humid areas of Rajasthan and Gujarat resulting in 182 collections from target variability pockets and areas of commercial chili cultivation. Besides, 18 landraces collected from 10 districts of Gujarat by GAU, Vejalpur and 10 lines of Guntur type chilies from Lam (Andhra Pradesh) were also assembled. Thus, total 210 chili genotypes were evaluated from 1999 to 2002 under hot arid agro climatic conditions at CIAH, Bikaner for agro morphological growth, flowering and fruiting behavior, fruit yield and quality contributing characters, and also to screen the material against biotic and biotic stresses. The survey studies revealed that a large number of varieties and types of chilies are under cultivation and perhaps these have been developed by natural selection, long period of cultivation under varying climatic conditions and hybridization. Based on fruit size and shape, seed content and pungency, some popular types and selections are well known, e.g., Mathania, Haripur-Raipur, Mehsana, Nikhari, Patodl, Tonk Local, Mahaveerji Local and some *desi* types. In the past few years, however, due to several factors such as high incidence of viral diseases and unavailability of good quality and pure seeds of desired types, there is drastic reduction in yield potential even in some popular types like Mathania Local. One of the approaches is phenotypic selection from the available variability. The Success of phenotypic selection in a breeding programme, however, depends upon the range of genetic diversity available in the population and also on its information on the heritability of plant characters and association among yield and its component characters. The results of evaluation and categorization of the collected germplasm revealed that, in general, there are well known pockets/areas where some typical



types of land races or local cultivars of chili are still being cultivated on large scale and maintained by the growers owing to its peculiar quality and market demand. Due to one or more production factors, the yield potential of these landraces is low and even then its Cultivation is continuing. These are Mathania type chili in Jodhpur, Nagour and Jalore; Mahaveerji Local in Karoli and Swaimadhampur; Patodi and Nihari in Tejara (Alwar) and Tonk Local in Tonk districts of Rajasthan. Besides, there are very peculiar types or landraces locally known as desi of the particular areas have distinct quality components and liked by a group of community. In tribal areas, still farmers are being maintaining the local land races for their domestic purposes possessing unique fruit quality, small size and high in pungency. By and large, on the basis of fruit quality and market demand, the local land races/ types of Mathania, Mahaveerji, Tejara (Alwar) and Tonk could be further exploited to develop uniform fruit producing genotypes with consistence yield potential. The chili genotypes were characterized for more than 45 traits. However, the studies on analysis of variance for nine important quantitative characters revealed that the mean squares were highly significant for all the nine characters indicating considerable variability in the genotypes. The range, mean and genetic variability components are presentation Table 2. The estimates of PCV and GCV exhibited almost similar trend of variability. The extent of coefficient of variation indicates that fruit yield per plant, number of fruits/plant, fruit weight, number of seeds/fruit, fruit length and fruit diameter had maximum PCV indicating better scope of phenotypic selection to enhance the fruit yield in chili. Genetic advance as percentage of mean ranged from 13.47 to 185.64 per cent. Thus, there is a tremendous scope to isolate superior genotypes for improving yield through simple selection procedures.



Genetic variability and correlation studies in brinjal

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ABSTRACT

The extent of genetic variability, heritability, genetic advance and correlations in respect of eight economic characters in 30 genotypes of brinjal were studied under hot arid environment. The phenotypic and genotypic coefficients of variation were high for number of fruits and fruit yield per plant and fruit weight. High heritability estimates along with high genetic advance for number of fruits and fruit yield per plant and fruit weight indicated the role of additive gene action. Correlation studies revealed that fruit yield per plant was significantly and positively associated with number of fruits per plant and fruit weight. The genotype AHB 02, KSB 73, KSB 33, KSB 39 and F₂ (AHB 04 x PPC) showed high mean performance for fruit yield per plant along with earliness trait which can be further tested for direct use as variety or may be used in breeding programme for improving fruit yield.



Strategies for enhancing water productivity in horticultural crops

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ABSTRACT

Water is the most critical input for horticultural productivity, and efficient use of water is critical for the development of horticulture, the efficiency of irrigation water use continues to be low with adverse environmental repercussion. Increasing water-use efficiency through improved irrigation systems as an alternative or a complement to physically enhanced water supplies is an important issue in water resource management. Micro-irrigation has emerged as an appropriate water saving techniques for all wide spaced high value crops in water scarce, undulated and sandy areas of hot arid ecosystem. This paper deals with the present status of micro-irrigation research, economics of different micro-irrigation systems and the need for affordable and low cost micro-irrigation systems. Future research on micro-irrigation is needed (i) to improve the performance of drip system, and (ii) to include fertigation study. The various studies revealed that the productivity of horticultural crops can be enhanced to the tune of about 60-70 percent by adopting micro-irrigation.



Impact of polyploidy on morphological and physiological parameters in ber

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ABSTRACT

Polyploidy has played a pivotal role in the evolution of plants and production of genetic variability. Although, the impact of polyploidy on plant vegetative, floral and fruit characters have been documented in depth, but impact on physiological efficiency has been studied rarely. The present attempt was to screen the polyploid taxa on the basis of physiological parameters in a polyploid sense of ber (*Ziziphus mauritiana* Lam.). Our results demonstrated that in this species, the polyploidy has shown variable effect in different cultivars. In cv. Illaichi it reduced the physiological efficiency but in cv. Gola it maintained at par.



Storage behavior of ber cultivars under semi-arid environment

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ABSTRACT

Physico-chemical changes and economic shelf life of ber fruits cvs. Gola, Goma Kirti, Umran, Seb and Mundia were studied during storage at ambient temperature under semi-arid environment of Gujarat during the year 2001 and 2002. Increase in physiological loss in weight (PLW), spoilage percentage, total soluble solids, total sugar and reducing sugar and decrease in acidity and ascorbic acid with advancement of storage period were the general trends in all the cultivars. In the present study, Umran recorded the least physiological loss in weight (23.10%) and spoilage loss (20.10%) and exhibited 7 days economic shelf life. Goma Kirti could also be stored up to 7 days during storage. However, Gola recorded maximum physiological loss in weight and spoilage loss and showed only 3 days economic shelf life. In respect of storability, Seb proved to be better than Gola and could be stored up to 6 days at ambient temperature. The lowest rate of respiration rate (0.37 mg CO₂/kg/h) was noted in Umran closely followed by Goma Kirti (0.41 mg CO₂/kg/h) however, Gola showed highest respiratory activity (0.56 mg CO₂/kg/h) on the last day of storage.



Use pattern of agro-chemicals in ber based cropping system: ber grower's perceptions

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ABSTRACT

The present study was conducted in Bikaner district of western Rajasthan. A total of 108 ber growers were selected for the study using purposive-cum-random sampling method. It was found that during kharif season, 8-36% ber growers grow various vegetables as intercrops in ber orchards on area ranging from 0.1-1.2 ha. During rabi season, 9-32% ber growers grow several Rabi vegetables/wheat/mustard/gram/green fodders/cumin/fenugreek (seeds) as intercrop in ber orchards on area ranging from 0.1-1.1 ha. Some of the ber growers grow some vegetables as intercrops in ber orchards during the summer season also. It was also observed that 37-86%, 48-89% and 17-29% ber growers use various fungicides, insecticides and nematicides, respectively to control the insect pests and diseases in ber and vegetable intercrops grown in ber orchards. The chemical fertilizers (Urea, DAP, SSP) is used by 32-98% ber growers in ber based cropping system. However the ber growers are unhappy with use of agro-chemical (Fungicides, insecticides, fertilizers, etc.) in their crop production. They perceive that the use of agro-chemicals in crop production leads to "poisoning and degradation of the soil quality/properties, degradation in quality and tests of the crop produces, crop produces become unhealthy and poisonous, induce the diseases and disorders in human being and animals body, reduce biodiversity, contaminate the ecological food chain, pollute the irrigation water, decrease the soil fertility, dangerous to crops and other economic plants, induce paralytic effect on human and animals limbs, increase soil drought and pollute the air, water bodies and ground water.



Biological control of arid fruit diseases

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ABSTRACT

Area of plantation of arid fruits is increasing every year under arid and semi-arid regions of the country. Fruit crops like ber, pomegranate, aonla, date palm and other minor fruits are mostly grown in water deficit areas. Among different production constraints in these crops, diseases are also concerned with yield and quality of fruits. For example, powdery mildew of ber can devastate whole orchards and fruit rots can trim down yield and quality of fruits. Leaf and fruit spots in pomegranate affect the foreign trade; rust in aonla results in poor quality of fruits in the absence of proper management practices in these crops. Low establishment of new plantation in date palm is mainly because of sucker rot in addition to fruit rot incited by common saprophytes. Despite, advancements in plant pathology and molecular plant pathology, many attempts have not been focused on etiology and management of arid zone fruits and therefore, presently comprehensive information on biological control is discussed herewith.



In vitro propagation of cactus pear

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ABSTRACT

In this investigation an elite genotype of spineless cactus pear was selected for in vitro propagation. The effect of different levels of BA (0, 3.0, 6.0 and 9.0 mg I⁻¹) and NAA (0, 0.1 and 1.0 mg I⁻¹) alone and in combination were evaluated for in vitro culture establishment, axillary bud breaking, micro-shoot formation and root initiation. Early axillary bud breaking in cladode explant was induced with 9.0 mg BA I⁻¹ + 0.1 mg NAA I⁻¹ in 19.47 days, whereas all NAA concentrations failed to induce bud breaking in the explants. However, root initiation was noticed with NAA concentrations of 0.1 and 1.0 mg I⁻¹. Culture establishment in terms of percentage of explant with microshoot was maximum (80%) with 6.0 mg BA I⁻¹ + 0.1 mg NAA I⁻¹ as compared to minimum (26.67%) with 3.0 mg BA I⁻¹ and 1.0 mg NAA I⁻¹ treatment. All treatments of BA alone and in combination with NAA found to induce micro-shoots in single bud/areole of cladode explant. The proliferated micro-shoots were subjected for elongation treatment in order to obtain rootable length of micro-shoots. The elongated micro-shoots were further subjected to root formation under in vitro condition with different concentrations of NAA (0, 2.0, 4.0 and 6.0 mg I⁻¹) and IBA (2.0, 4.0 and 6.0 mg I⁻¹). Maximum number of roots was recorded with 6.0 mg IBA I⁻¹. Further the length of roots was also maximum (3.80 cm) with 6.0 mg IBA I⁻¹. The rooted plantlets were successfully acclimatized and approximately 92 per cent success obtained in potting mixture of vermiculite and cocopeat 3: 1 (v/v)



Comparative feeding behavior of coccinellid beetles

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Feeding propensity of different grub instars and adults of *C. septempunctata* and *M. sexmaculatus* revealed that 24 hours starved adult of *C. septempunctata* consumed maximum individuals of aphid (75.00 aphids in 24 hours). The IV instar grubs (64.66 aphids in 24 hours) and unstarved adult (55.33 aphids in 24 hours) of *C. septempunctata* were also consumed higher number of aphids. The I, II and III instar grubs were found to be devouring less number of aphids *i.e.* 18.66, 24.00 and 44.33, respectively. Whereas, the adult of *M. sexmaculatus* were consumed 52.23 individuals of aphid in 24 hours.



Biological studies on the surface grasshopper, *Chrotogonus trachypterus* (Blanchard) at Udaipur

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ABSTRACT

Studies on the biology of the surface grasshopper, *C. trachypterus* were carried out under laboratory conditions for two successive rabi seasons (Nov. 2005 – March 2006 and Nov. 2006 – March 2007) at the Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur. The females laid eggs in moist soil at a depth of 3-6 cm. Egg pods were hard, elongated and cylindrical with a slight bend at the middle. The average eggs laid per female were 65.500 ± 4.365 . The average incubation period was 22.975 ± 1.015 days under laboratory conditions. The total nymphal period ranged from 43.50 to 53.50 (48.513 ± 0.496) days; with the first, second, third, fourth, fifth and sixth instars taking an average of 9.900 ± 0.238 , 8.613 ± 0.302 , 8.300 ± 0.173 , 7.186 ± 0.191 , 6.625 ± 0.146 and 7.913 ± 0.232 days, respectively. The pre-oviposition, oviposition and post-oviposition periods were 18.000 ± 0.793 , 36.150 ± 2.075 and 12.250 ± 1.039 days, respectively. Adult longevity of male and female was observed as 54.350 ± 3.005 and 66.400 ± 3.210 days, respectively under laboratory conditions. The average linear biometrical data of egg pods, eggs, six nymphal instars and the adults (male and female) have also been presented.



Morphometric Variations in the Local Populations of *Chrotogonus trachypterus* (Blanchard)

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ABSTRACT

The observed linear morphometric variations within the local species of the surface grasshopper, *Chrotogonus trachypterus* (Blanchard) was evident as per mean values for the different traits measured. The lengths of antennae, tegmina, hind wing, body up to genitalia/ wing tip, pronotum, and the sternal region were relatively more for the females than the males; similarly the width of tegmina, body, pronotum, and the sternal region were also relatively more for the females. Variations in the linear measurements of the mouthparts and the legs of the grasshopper evinced that the females had relatively more length and width than that of the males for the different parameters observed; however, the maximum coefficient of variation was noted for the length of the galea (21.45 %) and for the tarsal region of the fore legs in either sex of the grasshopper. Comparison of the compounded ratios for some of the morphological traits showed that the ratio between length of hind femur and width of vertex (F/v) was the maximum (7.335 ± 0.132 and 7.151 ± 0.124 for the males and females, respectively). The lowest ratio happened to be for the ratio between the length and width of the pronotum (P/p) for both the males as well as the females (0.686 ± 0.014 and 0.624 ± 0.009).



Evaluation of ber (*Ziziphus mauritiana* L.) cultivars under hot arid ecosystem of Rajasthan

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ABSTRACT

Ber (*Ziziphus mauritiana* L.) is an economically important tropical fruit tree which is grown all over the drier parts of the Indian subcontinent for its fresh fruits. There are many cultivars of ber, which have been selected for a number of characters. Cultivars may be known as early, mid or late maturing, depending on whether they produce their fruit early, mid or late in the growing year. This may be an important consideration when selecting which cultivar to grow. The environmental requirements may also differ depending on the cultivar. Based on the observation recorded with respect to plant growth characteristics it was observed that the highest plant height was reported in cultivar Thornless (6.25 m), Gola and Chhuhara. Maximum pruned wood weight was recorded in Gola (34 Kg). It was observed that the maximum fruit weight was in Umran (50g) followed by Seb (42g) and Gola (35g). The TSS was maximum in Reshmi (28%) and minimum in Thornless (17%). Further, the maximum fruit yield was recorded in cultivars Umran (42kg) followed by Seb (32kg) and minimum in Aliganj (9kg). Based on the performance of the varieties, it was observed that cultivar Gola, Seb, Umran, Banarsi Pewandi, Sanour-5, Rashmi, Mundia and Illaichi were found more promising under hot arid ecosystem.



Effect of severity and time of pruning on canopy growth and yield of ber (*Ziziphus mauritiana* Lamk) under hot arid ecosystem

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ABSTRACT

Pruning is essential operation for the production of quality and quantity fruits. From the finding, it is found that the number of secondary and tertiary shoots was maximum with 50% intensity and 20th April timing which gave maximum fruit yield. However, plant height and canopy spread were not much affected by the time and severity of pruning. The stem diameter was recorded maximum with 25% intensity and 20th April timing. Similarly, 25% intensity took less time for sprouting than the 50% and 75% pruning intensity. Further, April pruning took less time in sprouting than the May pruning.



Preliminary studies on high density planting system in NA-7 aonla (*Emblica officinalis* Gaertn)

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ABSTRACT

A field experiment was conducted during 2000-2004 to study the influence of different planting densities on growth, yield and quality attributes on NA-7 aonla. Five planting system *i.e.* square, hedgerow, double hedgerow, paired and cluster planting system having a population of 100, 166, 222, 133 and 177 per ha, respectively, were studied in Randomized Block Design with four replication. The results revealed that the maximum plant height was attained in double hedgerow system, while stem girth and plant spread recorded highest in square system of planting. There was no significant effect of different planting systems on fruit quality attributes. The result reported upon the initial data recorded from quite young plants has opened the vistas for further detailed investigation.



Influence of organic on soil and nutrient concentration of aonla shoots cv. NA - 7 under semi - arid ecosystem

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ABSTRACT

Effect on soil properties and nutrient concentration of NA-7 aonla shoots as influenced by different organic mulches was studied at Central Horticultural Experiment Station (CIAH), Vejalpur. Panchamahals, Gujarat during 2002-2005. Different organic mulches viz. paddy straw, maize straw, subabool lopping and grasses had given favorable results with regards to physio-chemical properties of soil. All the mulching treatments showed positive response for most of the macronutrients in aonla shoots, whereas the influence of mulching on nutrient concentration of aonla shoots was recorded highest in paddy straw among the organic mulches evaluated. Subabool lopping, maize straw and grass mulch were found to be intermediate for soil properties as well as nutrient content in aonla shoots, but superior to control (no mulch). Among the organic mulches evaluated, paddy straw showed better response in respect to physio-chemical properties of soil and nutrient concentration in aonla shoots. Therefore, the use of paddy straw as mulch needs to be popularized for sustainable production of aonla under semi-arid ecosystem.



Extent of use of Agro-chemicals in ber based cropping systems in hot arid environment of western Rajasthan

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ABSTRACT

The conclusion of this study was that about 1/3 population of ber growers grew various vegetables as intercrops in ber orchards during kharif, rabi and zaid (summer) season of the year. Majority of ber growers used several agro-chemicals (fungicides, insecticides, nematicides, rodenticides and chemical fertilizers) in their ber based cropping system. However, they were not happy with use of agro-chemicals in their crop production system. They apprehended that this agro-chemical had bad poisoned/degraded the soil quality/ properties. They degraded the quality and test of the crop produces. They induced the disease and disorders in plant, animals and human being. They had ill effect on biodiversity, ecological food chain, soil fertility and soil micro- organism. They polluted the air, ground water and irrigation water. Hence, the farmers should be trained and guided for scientific and environmental safe use of agro-chemicals in their crop production. They should be motivated for adoption of organic farming system in horticultural crop production. The organic farming system, integrated nutrient management, integrated pests and diseases management, bio-pesticides, organic manures etc. should be popularized among the farmers/ber growers of arid region so that they may adopt these practices for better horticultural crop production with minimum environmental risk.



Influence of organic mulches on soil temperature, moisture and growth of aonla NA-7 under rainfed condition

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ABSTRACT

An experiment on the effect of various organic mulches (paddy straw, maize straw, grasses, subabool lopping and rice husk) on soil temperature, moisture and growth of aonla was studied at Central Horticultural Experiment Station (CIAH), Vejalpur, Panchmahals (Godhra), Gujarat during 2003-05. Significant differences in soil temperature and soil moisture content were recorded at different period. All mulching treatments encouraged plant growth than control. Paddy straw mulch not only reduced the soil temperature but also conserved maximum moisture in the soil significantly. Maximum plant height, rootstock girth, scion girth, and plant spread were also recorded in plants mulched with paddy straw followed by maize straw. Maize straw, grasses, subabool-looped mulch showed parity with each other for these parameters. Yield per plant was also recorded significantly highest in the plants treated with paddy straw, while minimum was recorded in control. Among the organic mulches evaluated, paddy straw needs to be popularized for better growth and production of aonla under rain fed condition.



Reproductive biology of jamun (*Syzygium cuminii* Skeels) under semi- arid tropics of western India

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ABSTRACT

An experiment was conducted to study the reproductive biology of ten elite genotypes of jamun during the year 2004 and 2005. Peak period of panicle emergence was recorded in the month of February. Peak period of flowering and fruit set was recorded in the month of May all genotypes. Highest panicle length (16.24cm) and fruit set per panicle (25.00) were recorded in GJ-19. Time taken for complete development of flower bud ranged from 20-26 days being highest in GJ-26. Variable percentage of anthesis/dehiscence was registering different genotypes. Peak period of anthesis was recorded between 8.00 AM-1.00 PM in all genotypes. None of the genotypes showed anthesis before 7.00AM and after 3.00 PM. Another dehiscence commenced after opening of flowers i.e. at 7.00AM and continued till 4.00 PM. period of dehiscence was recorded between 9.00 AM -2.00 PM in all genotypes. The flower length varied from 9.25-13.21 mm, maximum in GJ-25. The stamen and style length varied from 5.20-9.00 mm and 7.25-8.90 mm respectively being at the top in GJ-21, viability ranged from 90.20-98.50 % being highest in GJ-24. Pollen germination and pollen length ranged from 24.110-37.50 % and, 48.90 micron respectively. On the basis of different reproductive attributes studied, fruit set per panicle is considered as one of the positive while screening the elite genotypes of *jamun*. These genotypes would be further exploited as potential parents to develop high yield stable genotypes having horticultural traits.



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Development of contamination free culture in bael (*Aegle marmelos* Correa)

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ABSTRACT

The efficacy of sterilizing agent mercuric chloride (HgCl_2) and sodium hypochlorite (NaOCl) with different exposure time was assessed in terms of maximum aseptic explants produced, which responded to sprouting. In case of Mercuric chloride @ 0.1 per cent, the maximum 80 per cent contamination free explants were recorded when exposed to 7 minute. In case of different time exposers of NaOCl (0.75 per cent) the maximum 60 per cent contamination free culture was recorded at 5 and 7 minute. Thus, the present investigation revealed that application of HgCl_2 , is better agent for surface sterilization. In the present study, the data on number of shoot and length of shoot were also recorded on 30th day after inoculation. The results revealed that among mercuric chloride treatments, the maximum number of shoot (2.80), length of shoot (3.42 cm) was recorded at 5 minute after treatment. Although further increasing the time of exposure reduces number and length of shoot. However, the length of shoot and number of shoots produced at 5 and 7 minute exposures were statistically non significant. At the end of 30 day maximum number of shoot (2.90) and length of shoot (3.71 cm) were recorded at 6 minute treatment of sodium hypochlorite (0.75 per cent) which declined on increasing the duration of exposure. The data on time required for bud break reveal that when the explants were treated with HgCl_2 the minimum time required for bud break (6.20 days) was with 5 minute exposure which increased with increase in duration of exposure but was statistically non-significant. Similarly, in case of explants treated with sodium hypochlorite, the minimum time required for bud break was 6.50 days which increased with increase in duration of exposure. Thus, based on all the four parameters studied, it was concluded that surface sterilization with Mercuric chloride was better with respect to production of aseptic culture and reducing time to bud break. The further increase in duration of exposure to either of sterilizing agents decreased the number and length of shoot, which may be because of toxic effect of these chemicals.



Genetic variability for floral traits and yield attributes in tamarind

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ABSTRACT

There was marked variation in average panicle length in most of the genotypes and CPT 13 and CPT 19 revealed the maximum panicle length followed by CPT 8, CPT 15, CPT 21 and CPT 20, while least was found in CPT 27. The pedicel length and thickness varied from 7.12-12.50 mm and 1.00-1.03 mm respectively in different genotypes. Maximum pedicel length was recorded in CPT 13 closely followed by CPT 18, CPT 19 and CPT 20. Number of perfect flowers per panicle varied from 9.50-19.50 being highest in CPT 13 closely followed by CPT 8, CPT 19 and CPT 20. The flower length varied from 17.94-22.1 mm being maximum in CPT 6. Similarly, flower breadth also varied from 18.49-22.80 mm being highest in CPT 6. Petal length varied from 13.14-16.14 mm with highest in CPT 5. Petal breadth ranged from 6.12-8.69 mm being at the top in CPT 26 closely followed by CPT 21, CPT 22 and CPT 23. There was variation in filament length in most of the genotypes and CPT 13 recorded the maximum filament length followed by CPT 18, CPT 11 and CPT 3. The length of sepal varied with maximum in CPT 18 closely followed by CPT 13, CPT 3 and CPT 11. The breadth of sepal varied being highest in CPT 26 closely followed by CPT 15, CPT 13, CPT 10 and CPT 11. Studies indicate that the number of sepals and petals in all genotypes were found to be four and three respectively. The total number of anthers in each flower was three. The anther length and breadth varied from 2.14-2.71 mm and 1.0-1.03 mm respectively but differences among the genotypes did not reach the level of significance. Marked differences in various floral traits might be due to inherent genetic variations among the genotypes (Singh et al., 8). Usha and Singh (10), Pareek and Awasthi (5), and Singh and Mishra (9) recorded similar results in tamarind and bael. Stamen length varied from



14.11-18.39 mm in different genotypes being at the top in CPT 10. The range of variation in pistil length was 14.19-16.45 mm. Ovary length varied from 6.34 -8.45 mm in different genotypes and it was noted to be maximum in CPT 18. The diameter of stigma, breadth of ovary and size of style did not differ significantly among the genotypes. Bud length and bud breadth at flower opening varied in different genotypes. The highest fruit yield per plant was recorded in CPT 20 followed by CPT 13, CPT 18, CPT 19, and CPT 22, while least fruit yield per plant was found in CPT 1.



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Evaluation of bael genotypes for growth behavior and floral traits under semi-arid ecosystem of western India

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ABSTRACT

Bael (*Aegle marmelos Correa*) occupies important place among the indigenous fruit of India not only because of its religious significance but also owing to its high medicinal and nutritive values. In western India, a wide range of naturally grown tree is available providing diversity in the morphology and fruit quality and identification of suitable genotypes has become necessary for promoting its productivity, production and quality of the produce under semiarid tropics of western India in order to initiate any crop improvement programme, It is essential to generate information regarding the growth and reproductive behavior including floral traits of the crop. Keeping these points in background, the present study was undertaken to evaluate the bael genotypes for their growth and flowering under semi-arid ecosystem of western India.



Vegetative propagation of wood apple (*Feronia limonia* Correa)

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ABSTRACT

Wood apple is one of the under utilized fruits, indigenous to our country. It is one of the most hardy fruit tree and can be cultivated under harsh soil and climatic conditions in rainfed areas. There are no regular plantations but stray seedling trees are found growing all over India. Lot of variability exists in the species and there is a possibility to identify the elite types which can be multiplied vegetatively true to type on large scale. Therefore studies were carried out to identify best method and time suitable for large-scale multiplication of wood apple. The results clearly indicated that softwood grafting was the best method when one-year-old desi rootstock was used for propagation. Maximum success was obtained when grafting was done in the month of February. Comparative performance of in-situ soft wood grafting and grafting in nursery and then transplanting in the field indicated that on the basis of growth parameters in-situ soft wood grafting was more vigorous as compared to nursery grafting.



Workload of Tribal Farmwomen of Gujrat

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ABSTRACT

This study reports the workload of tribal farmwomen in terms of nature of work, and time consumption. Fifty tribal farmwomen, randomly selected from Panchmahals district of Gujrat State, were the respondents. Data were collected through participatory Rural Appraisal tool namely Daily Routine Schedule. Tribal farmwomen spent 14 hours, 42 minutes on daily routine activities. Farm and animal management was the major consumer of their time (5Hours and 31 minutes); followed by home management (4hours and 42 minutes) and self care (2hours, 44 minutes). Cleaning utensils, cooking and serving food, cleaning home, washing clothes, fetching water were the major household activities.



Variability, inter-relationship among characters and path coefficient studies in annual moringa

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ABSTRACT

The variance analysis for seventeen quantitative characters were studied in annual moringa showed that genotypes differ significantly among themselves for all the characters under study indicating great wealth of variability existence among the genotypes selected for all the economic traits. Studies on correlation and path coefficient analysis indicated that the genotypic correlations were higher than phenotypic level in general. The yield per plant had positive and significant correlation with percent fruit set, fruit length, fruit pulp weight, fruit weight, number of primary branches and number fruits per plant at both genotypic and phenotypic levels. The path coefficient analysis revealed that the days to 50% flowering, number of flowers per panicle, height at first branch, percent fruit set, number of fruits per plant, plant height, fruit length and fruit girth had the highest positive direct effect on yield per plant. Number of fruits per plant, number of primary branches, number of flowers per panicle, percent fruit set had the highest indirect positive effect on yield per plant through no of fruits per plant. Hence, the selection based on these characters will be effective in formulating selection indices for improvement of high yielding genotypes in annual moringa.



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Storability of ber (*Zizyphus mauritiana Lamk*) fruit in semi arid environment

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340

ABSTRACT

Effect of calcium nitrate and perforated polyethylene (PPE) bag on shelf-life and quality attributes of ber fruit cv Gola and goma Kirti was studied during storage at ambient conditions (12-28⁰C. 65±3% RH) under semi arid environment of Gujarat. Different post-harvest treatments were applied 1.0 the fruits after harvest. Increase in physiological loss in weight (PLW), spoilage percentage, total soluble solids, total sugars and reducing sugar and decrease in acidity and ascorbic acid during storage were observed. The treatment with calcium nitrate (1.5%) and kept in the PPE bag was most efficient to retain fruit quality. This treatment recorded 21.3 and 10.8% PLW in Gola and Goma Kirti, respectively. Calcium nitrate (1.5%) + PPE bag also recorded least spoilage loss in both the cultivars. The cultivars had 5 and 9 days while untreated control had 3 and 5 days economic life for Gola and Goma Kirti, respectively under ambient conditions.



Performance of bael (*Aegle marmelos*) cultivars under hot arid ecosystem of Rajasthan

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ABSTRACT

The study was conducted during 1998-2004 to assess performance of bael (*Aegle marmelos* Correa) cultivars under hot arid ecosystem of north-western Rajasthan. The budded plants of 07 bael cultivars, viz 'NB 5', 'NB 7', 'NB 9', 'Pant Aparna', 'Pant Urvashi', 'Pant Shivani' and 'Pant Sujata' were planted in low fertile sandy soil at 6 m apart. The observations on growth parameters revealed that the cultivars 'Pant Apama', 'NB 5', 'NB 9' and 'Pant Sujata' can be categorized as dwarf type, whereas cultivars 'Pant Urvashi', 'NB 7' and 'Pant Shivani' as vigorous types. Among different cultivars, big fruit size (> 1.45 kg) was obtained in 'NB 7', 'NB 9' and 'Pant Shivani', while in cultivars 'NB 5', 'Pant Urvashi', 'Pant Sujata' and 'Pant Aparna' medium size (< 1.0 kg) fruits were obtained. The highest yield/plant was recorded in 'NB 5' (25.50 kg), followed by 'NB 9' (22.94 kg) and 'Pant Urvashi' (19.38 kg). Variable quality attributes were recorded among different cultivars but in general, better quality fruits with respect to high TSS and low acidity were obtained. There were also heavy fruit drop in all the cultivars and <4% fruits were retained up to maturity. Fruit cracking which ranged from 15.63 to 44.47 % emerged as serious problem of bael cultivation in this region. The cultivars 'NB 5', 'NB 9', 'Pant Urvashi' and 'Pant Shivani' can be recommended for cultivation in hot arid ecosystem but with proper management of moisture, nutrient and problem of fruit cracking.



Standardization of maturity indices in anola (*Emblica officinalis* Gaertn.) under semi-arid environment of western India

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ABSTRACT

The fruit growth was faster initially and slowed down between last week of September and first week of October and completed almost 70% growth during this period and increased slightly thereafter and followed double sigmoid growth pattern in all the cultivars. The average weight of fruits recorded was maximum in Krishna (42.13 g) followed by NA-7 (38.14 g), Chakaiya (33.72 g) and Kanchan (31.74 g) at the time of last sampling date. The maximum fruit growth (on weight basis) was recorded on 215 days after fruit set in NA-7, 225 days after fruit set in Krishna and Kanchan, 245 days after fruit set in Chakaiya. Initial fast growth might be due to increased levels of auxin, gibberellins and cytokinins during the first rapid growth phase of anola fruit. Fruit skin color at maturity was yellowish green in NA-7 and apricot yellow in Krishna however, Kanchan and Chakaiya remained light green at this stage. Specific gravity of fruits remained almost constant up to 185 days after fruit set, thereafter it increased in all the culti vars. It was 1.03 in NA-7, Krishna and Kanchan at the last sampling date, while Chakaiya recorded 1.02 specific gravity at maturity. The fiber content exhibited significant variation during development of anola cultivars, 211 and was highest in Kanchan (2.64 g/ 100 g) followed by Chakaiya and NA-7 at the last date of sampling and it was lowest (0.87 g/100 g) in Krishna. The total soluble solid (TSS) of the fruit increased with the advancement of fruit growth in all the cultivars. The increase was much faster between 30th August to 19th October in NA-7, 4th September to 24th October in Krishna, 9th September to 8th November in Kanchan and 15th September to 11th October in



Chakuiya. It was found to be highest in NA-7 (11.00%) at the last date of sampling, closely followed by Kanchan (10.50%) and Krishna (10.14%). Titratable acidity of fruit increased up to ISS days after fruit set; thereafter it declined in all the cultivars. Minimum titratable acidity was recorded in Chakaiya (1.91 %) at the last date of sampling followed by Kanchan, and NA-7, however it was maximum in Krishna. An increase in TSS/acid ratio one of the parameters used for assessing maturity was noted towards latter stages of development and this could be marked as one of the criteria for fixing maturity standard in all the cultivars. Highest TSS/acid ratio (5.00) was noted in Kanchan closely followed by NA-7 and Chakaiya, while it was least in Krishna (4.37) at maturity. Increase in specific gravity (more than one), appearance of fiber on seed cover and change of seed color from creamy white to brown during maturity was common in all cultivars. It may be concluded that fruits of NA-7 and Krishna matured by last week of October (215 days after fruit set) and second week of November (225 days after fruit set), respectively, Kanchan matured by last week of November (225 days after fruit set) and that of Chakaiya by first week of December (245 days after fruit set), under semi-arid ecosystem of Gujarat.



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Planning, designing and construction of series of check dams for soil and water conservation in micro-watershed

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ABSTRACT

Planning, design and construction parameters of series of water harvesting structures were presented for 66.75 hectares in micro-watershed. Thematic maps were prepared for planning, design of various types) of water harvesting structures in 1:5,000 scale on land use/land cover, soil with drainage status. The slope of the land varies from 0-5 per cent and slight, moderate and serve erosion, classes were observed. The total volume of water storage is 61,200 m³ at cost of 6.75/1000 liters, which also be estimated to protect 160.7 m³ of productive soil from flowing out of the area. The series of check dam is found suitable for retaining productive soil and also to help in conservation of moisture for horticulture land.



Effect of mulching on soil properties, growth and yield of 'NA 7' aonla (*Emblica officinalis*) in semi-arid ecosystem

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ABSTRACT

An experiment was conducted during 2001- 2005 to assess the effect of different mulches (maize straw, paddy straw, rice husk, grasses, subabool lopping and black polyethylene) on soil properties, growth, yield and fruit quality attributes in aonla (*Emblica officinalis Gaertn*). Different organic and inorganic mulches significantly increased the soil moisture status at various soil depths. Black polyethylene and paddy straw mulches were regards to soil moisture and physio-chemical attributes of the soil. The black polyethylene and paddy straw, mulches were found to be more effective in producing maximum growth extension than rest of the, treatment, although the differences were non-significant among the treatments. Plants treated with black polyethylene mulch recorded highest yield (337 kg/ha), followed by paddy straw (315 kg/ha) while minimum in control plant (270 kg/ha). The poor aeration, non-decomposable nature and high cost are the constraints of using black polyethylene as mulch material. Fruit yield/plant and fruit size and total soluble solids were recorded highest with black polyethylene mulch, followed by paddy straw, Among the organic mulches evaluated, paddy straw showed better response, followed by maize straw.



Prolong storability of ber (*Zizyphus mauritiana* Lamk) under semi arid environment of western India

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ABSTRACT

An experiment was conducted during the year 2003 and 2004 to study the effect of GA₃ calcium nitrate, silver nitrate, postassium sulphate and bavistin on shelf life and fruit quality of ber (*Zizyphus mauritiana* Lamk) during storage at ambient temperature under semi-arid ecosystem of Gujarat. Increase in physiological loss in weight (PLW), spoilage percentage, increase in total soluble solids, total sugar and reducing sugar and decrease in acidity, ascorbic acid with advancement of storage period were the general phenomena in all the fruits during storage. Different pre harvest treatments were imposed to the fruits 20 days before harvest. Fruits treated with calcium nitrate 1.5% recorded the least physiological loss in weight (17.34%) and spoilage loss (22.00%) and exhibited 5 days of economic storage life, while untreated control had 3 days economic life under ambient conditions. It was followed by calcium nitrate 2.00%, GA₃ 50 ppm 100 ppm, bavistin 0.1% and silver nitrate 40 ppm. The same treatments also showed lowest respiratory activity, however, it was recorded highest in the control (0.31 mg CO₂/kg/hr) on the last day of storage (day 9). The study revealed that the fruits treated with calcium nitrate (1.5%) and GA₃ (50 ppm) could efficient retain the fruit quality till the last day of storage (9th day) under ambient conditions.



Evaluation of packages for transportation and storability of ber (*Zizyphus mauritiana* Lamk.) under semi- arid tropics of Western India

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ABSTRACT

Experiment was conducted during the year 2004-05 to study the effect of different packaging materials like gunny bag, corrugated fiberboard box (CFB), pigeon pea basket, wooden crate and bamboo basket with polythene liner (PL) or newspaper liner (NPL) and control (gunny bag without any liner) for transportation and storability of ber at ambient temperature under semi- and conditions. Increase in physiological loss in weight (PLW), spoilage percentage, total soluble solids (TSS), total and reducing sugars and decrease in acidity, ascorbic acid were general phenomena with advancement of storage period in all the treatments. Minimum spoilage loss was in fruits kept in CFB with NPL closely followed by CFB with PL. Same treatment also showed lowest respiratory activity (0.37 mg CO₂ /kg/h.) and exhibited 4 days of shelf-life, while control had 2 days economic life under ambient conditions. Highest respiration rate was in control (0.60 mg CO₂ /kg/h.) on the last day of storage (day 7). CFB provides appropriate atmosphere and ventilation inside the box and was also found strong enough to stand heavy stack loads and can be recycled as pulp or paper. It may be concluded that CFB with NPL was most suitable and economically viable packing container during transportation of ber fruits under ambient conditions.



Effect of various post harvest treatments on shelf life of aonla (*Emblica officinalis* Gaertn) Cv. Chakaiya

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ABSTRACT

An Experiment was conducted during the year 2001-2002 to see the effect of GA₃, calcium nitrate and perforated polyethylene bag on shelf life and fruit quality of Indian gooseberry or aonla (*Emblica officinallis* Gaertn) cv. Chakaiya during storage at ambient temperature under semi-arid ecosystem of Gujeret. Increase in physiological loss in weight (PLW), spoilage percentage, changes in total soluble solids, total sugar, reducing sugar, acidity and ascorbic acid with advancement of storage period are general phenomena in all fruits during storage. Fruits treatment with calcium nitrate 1.5% + perforated polyethylene bag and GA₃ 100 ppm + Perforated Polyethylene bag could be stored up to 11 days with minimum spoilage loss, while untreated control had 7 days economic self life under ambient conditions. The same treatments (calcium nitrate 1.5% + perforated polyethylene bag and GA₃ 100 ppm + Perforated Polyethylene bag) were also found most effective in minimizing physiological loss in weight during storage. The lowest rate of respiration was noted in calcium nitrate 1.5% + Perforated Polvethylene bag (78.14.00 mg CO₂/kg/hr), however, the same was highest under control (87.20 mg CO₂/kg/hr) on the last day of storage (day 13), It could be concluded that the fruits treated with GA₃ 100 ppm or calcium nitrate 1.5% and kept in perforated polyethylene bag could efficiently retain the fruit quality till the last day of storage (13th day) under ambient conditions.



Evaluation of Indian bean genotypes under hot arid environment

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ABSTRACT

Horticultural and morphological studies among twelve genotypes of Indian bean were made for growth, pod quality and yield contributing characters under arid environment to select desirable types for commercial exploitation. Significant variation in all the important characters was observed in the genotypes especially for days to first picking, pods per plant, pod yield per plant, fresh weight, length and width of pod and these characters are of great significance in redesigning the plant architecture of the genotype having higher early yield with better quality pods. The genotypes AH DB-16 (8180 g) AHDB- 15 (707.1 g), AHDB- 3 (698.3 g) and AHDB-7 (147.7 g) were found to be promising on the basis of important traits like plant type, fruiting, quality of pod and yield under arid conditions.



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New bottle gourd: Thar Samridhi

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ABSTRACT

Thar Samridhi is a new bottle gourd variety. It is better in yield and allied characters than the hitherto-grown popular bottle gourds. Bottle gourd is popularly grown vegetable from March to December by adjusting planting schedule under arid conditions. The fruit yield and quality of available varieties, however, are very low under high day temperature (38-40°C from March to October), high vapour pressure deficit (25-30 mm), and low and erratic rainfall (250-500 mm) which usually remains confined in 9-21 days during July-September. Thar Samridhi (AHLS Round 1) has, therefore, been developed and recommended for commercial cultivation.



Genetic Diversity and Status of *Ziziphus* in India

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ABSTRACT

Indian jujube known as ber (*Ziziphus mauritiana* Lam.) is an extremely drought hardy and native fruit of India. It is a dominant component of the natural vegetation in the Indian “Thar desert”. It can be successfully cultivated even in the most marginal ecosystem of the tropics and subtropics. There are 90,000 ha plantation of improved ber trees. The average productivity is 8.34 tons ha⁻¹. Genetic diversity of *Ziziphus* is high in India and about 20 species are found between 8.5- 32.5°N and 69-84°E. Economically important species are *Z. nummularia*, *Z. oenoplia*, *Z. rugosa*, *Z. sativa*, *Z. vulgaris* and *Z. xylopyrus*. The ability of *Ziziphus* species and different varieties/types within mauritiana to cross freely has allowed the build up of rich gene pool which depicts heterozygosity in their adaptability to soil and climate; morphological, physiological and phenological traits; chromosome number; tolerance/resistance to biotic and abiotic stresses and genomic DNA. The germplasm holding of ber at Central Institute for Arid horticulture (CIAH), the largest in India, consist of total 333 accessions, comprising cultivars, indigenous and exotic selections and rootstocks. From the diverse germplasm at CIAH and All India Coordinating Centres working under the aegis of CIAH, considerable basic information on growth and development, floral biology and cytology of a good number of ber cultivars has been generated. Besides, promising germplasms with distinctive traits such as desired adaptation (Gola, Umran, Thar Bhubhraj, Thar Sevika), diverse quality traits (Banarasi Karaka, Illaichi), high and stable yield (Seb, Ponda), tolerance to biotic and abiotic stress (Tikadi, Katha, Bawal-Sel-1, Sanaur-2) have been identified which have comparative advantages to improve the productivity of this important arid fruit crop. Genetic Status of *Ziziphus* in India along with future line of work is discussed in this paper.



Standardization of pomegranate propagation by cutting under mist system in hot arid region

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ABSTRACT

The treatments comprised of two types of cutting, i.e. hardwood and semi-hardwood; five concentrations of IBA, i.e. 50, 100, 200 as prolonged dip and 2,500 and 5,000 ppm as quick dip (5 min.) as well as water dip planted at monthly intervals from January to December. Pomegranate cultivar Jalore Seedless can be propagated both by hardwood and semi-hardwood cuttings under mist system though the better success was obtained with semi hardwood cutting. Among various concentrations of IBA, 2,500 ppm has given best response in term of rooting and number of roots/shoot in semi-hardwood cutting but the same treatment did not make any impact with hardwood cutting regarding percentage rooting. Appreciable response with respect to rooting was also recorded in control during July in both types of cutting indicating that microclimatic conditions have marked influence on rooting than exogenous application of IBA. The number of roots/shoot was maximum at 2500 ppm in both type of cutting but length of roots reduced with increasing concentrations of IBA. July followed by August and September was the best months for planting of cutting. From this investigation, it is concluded that July is the best time for planting of cutting under mist system by using both semi-hardwood and hardwood cuttings after treating with 2,500 ppm IBA. This treatment (IBA 2,500 ppm) also induces fibrous root system, which is essential for better establishment of plants under field conditions.



Allelopathic influence of aqueous leaf extract of drumstick (*Moringa oleifera*) on germination and seedling growth of ground storey crops

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ABSTRACT

The seedling growth parameters like shoot length, root length, number of roots/plant, number of leaves/plant were also affected by the leaf extract as compared to control. Significant reduction in root and shoot length under the influence of leaf extract was recorded in all the test crops. The results show that the influence of drumstick leaf extract on different component was more on root growth compared to shoot growth. More than 25% reduction in root growth was observed in wheat. In mustard and gram it was reduced by 25.79 and 17.85% respectively. Reduction in shoot and root growth may be attributed to the presence of water soluble allelo chemicals in drumstick. Significant reduction trend was recorded with respect to root length in all the test crops. Aqueous drumstick leaf extract played significant role in reducing shoot growth in all the annual crops except gram. Maximum reduction in shoot growth over control was recorded in wheat followed by mustard. The number of leaves/plant was at par with control in test crops mustard and wheat. However, the same was found to be significantly reduced in gram recording an average reduction of 18.18%. The root: shoot ratio was observed to be lower in wheat, while reverse trend was recorded in mustard and gram. The vigour index was also calculated and it was less under treated crops as compared to control particularly mustard and wheat. Based on growth parameters, wheat was found to be most sensitive crop, while gram and mustard were tolerant to water-soluble allelo-chemicals of drumstick leaf extract. Fresh and dry weight of annual crops was not influenced significantly by drumstick leaf extract except gram where significant reduction in seedling phytomass was recorded. Significant reduction in fresh and dry weight of gram might be due to reduction in biosynthesis of photosynthates required for growth.



Efficient use of drumstick in multitier cropping system under semi-arid ecosystem

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ABSTRACT

To achieve the projected target of 220 MT of vegetable production by 2020, augmentation in vegetable production needs to be formulated for different cropping system to fully exploit the natural resources. Number of cropping systems have been developed for different ecosystems, however, a suitable vegetable based cropping system is lacking for semi-arid and arid ecosystem. Considering the nature of growth pattern of the component crops and their yield potential, drumstick (base crop) and cucurbits (climbers) have been chosen in the cropping system. An experiment comprising eleven treatments with three replications in randomized block design was conducted at Central Horticultural Experiment station, Vejalpur from 2004-05 and 2005-06. The results revealed that the interaction of component crops did not significantly reduce the growth parameters of base crop (drumstick) over sole crop. Higher the cropping index (200%), drumstick equivalent yield (28.65 kg/ ha) and land equivalent ratio (2.39) has been observed in the treatment combining drumstick and ridge gourd. This multitier system reduced the cost of input by 70.1 and 64.0 per cent comparing bower system and local system respectively.



Micropropagation and in-vitro conservation of elite genotype of cactus pear (*Opuntia ficus indica* Mill.)

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ABSTRACT

Micropropagation techniques of cactus pear for a thorn-less, vegetable type elite genotype, which was collected under germplasm collection programmes, was developed successfully through single bud explant. Physiologically mature buds on cladodes were collected and single bud segment was used for culture initiation. Maximum multiple shoots (8 shoots/ explant) formation was achieved on MS medium supplemented with 30 g sucrose, 8 g agar and 2 mg 6- benzylaminopurine (8A) + 0.1 mg alpha-Naphthalene acetic acid (NAA) per liter. Multiple shoot clump were further subjected to culture for shoot elongation medium devoid of plant growth regulators. The elongated shoots were rooted cent per cent under in vitro conditions. The rooted plantlets were successfully acclimatized under three step hardening procedure. Under in vitro conservation study, in vitro rooted plantlets were used for further conservation by reducing growth of the plantlets and by minimizing sub-culturing process. The rooted plantlets were transferred on agar solidified MS medium supplemented with activated charcoal 3 gm and different combinations of 8A (0, 0.5, 1.0 mg/l) and NAA (0, 0.5, 1.0 mg/l), The higher concentration of 8A (1.0 mg/l) was found to increase shoot proliferation and was detrimental to root growth of the in vitro plantlets whereas higher concentration of NAA (1.0 mg/l) was found to influence both shoot and root growth positively. This technique of in vitro conservation was found effective in maintaining cultures continue for more than six years. Further, proliferated growth of in vitro maintained plantlets were harvested and transferred to new containers for increasing number of stock materials.



Influence of soil moisture conservation practices on soil properties under arid conditions of Rajasthan

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ABSTRACT

A field experiment was conducted during 2004-09 to study the effect of soil water conservation practices viz., FYM mulch (@30t/ha), cluster bean (*Cyamopsis tetragonoloba*) straw mulch (@ 8 t/ha), bui (*Aerva pseudotomentosa*) grass straw mulch (@ 8 t/ha), sub-surface application of FYM (@ 12 t/ha) on soil properties. The soil samples were collected after the harvest of brinjal crop in January each year. The pooled data of five years were analysed for various soil physicochemical properties. Among various soil moisture conservation practices application of FYM mulch was found superior than others. It improved soil hydraulic conductivity from 29.35 in control to 27.12 cm h⁻¹, soil moisture content at field capacity from 3.30 to 3.88% w/w, wilting point from 1.20 to 1.54% w/w, organic carbon from 0.38 to 2.41 g kg⁻¹, available N from 78 to 120 kg ha⁻¹, I, P from 8.16 to 13.74 kg ha⁻¹, K from 430 to 621 kg ha⁻¹, available Fe from 4.1 to 7.1 mg kg⁻¹, Mn from 4.5 to 6.5 mg kg⁻¹, Cu from 0.13 to 0.34 mg kg⁻¹, and Zn from 0.08 to 0.30 mg kg⁻¹.



Low cost earthen dam for maximization of fruit crops production in semi-arid region

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ABSTRACT

Study was conducted on low cost earthen dam during 2003-2005 at the Central Horticultural Experiment Station, Vejalpur. The study indicated that, runoff water, harvested can be recycled which forms an integral part of successful horticulture fruit crops during lean period. Dam was constructed across small gully of 3 m depth for this study and its location, design and specifications were taken as per recommendations. The structure resulted that, an appreciable amount of water or moisture storage remains in the buffer area. Storage capacity of structure decreased enormously due to silt load, debris and seepage losses.



Arid vegetable production potential and income generation

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ABSTRACT

The present study was conducted in Bikaner district of western Rajasthan. A total of 81 (total sample size) farmers selected for the study using purposive-cum-random methods of sampling. The results of the present study revealed that 37.75 per cent farmers grew different kind of vegetables in hot arid eco-system of Bikaner district during Kharif and Rabi season. Sixty to seventy per cent farmers of the district grew mateera, kachari and snap melon during Kharif season as rainfed crops. At present, the major arid vegetables being grown by the farmers on small scale (0.10 ha) to large scale (2.50 ha) in different cropping systems during Karif and Rabi seasons are mateera (*Citrullus lanatus*), snapmelon, kachari (*cucumis callosus*), brinjal, bottle gourd, ridge gourds, clusterbean, round melon, Indian aloe, okra, tomato, chilli, cauliflowers, cabbage, spinach, fenugreek (leaves), coriander (green), carrot, radish, pea, green onion, mustard leaves, sangari (pods) of khejri (*Prosopis cineraria*), moringa pods, etc. The major vegetable cropping system practiced by the vegetable growers (farmers) in Bikaner district are sole, inter, mixed cropping system and perennial plantation. Mixed cropping is the most prominent system of vegetable growing in arid environment which is practiced by majority (58.25 % of the farmers covering highest area (0.6-2.5 ha). During Rabi season and irrigated conditions, brinjal, cauliflower/cabbage, spinach, fenugreek (leaves), coriander (leaves), carrot, radish, pea, green onion, etc are grown by 33.45 per cent farmers (out of total vegetable growers) on a small scale (0.2-0.3 ha) as sole crops during Rabi season and bottle gourds, mustard leaves, cauliflowers/ cabbage, chilli, fenugreek, etc. are grown as inter-crops in ber, aonla, citrus/kinnow orchards by only 15.20 per cent farmers on a small scale (0.1-0.2 ha). During the Kharif season, the farmers grow Mateera, snapmelon Kachari bottlegourd, cluster bean, brinjal and Indian aloe on their fields and earn net income from them ranging Rs. 26162 to 41117, per hectare. In case of Rabi season's arid vegetables, the farmers are getting net income ranging Rs. 33302 to 47380 per hectare.



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Vegetable based farming system in hot arid eco-system of Western Rajasthan

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ABSTRACT

The present study was conducted in Bikaner District, Rajasthan, India to evaluate the vegetable-based farming systems practiced by the farmers in arid environments. A total of 120 vegetable growers (farmers) were selected from two Tehsils of Bikaner District (Bikaner Tehsil and Nokha Tehsil). Results showed that one-third of the farmers of Bikaner District grow various vegetables with livestock production. The major vegetables grown by the farmers are mateera (*Citrullus lanatus*), snapmelon (*Cucumis melo* var. *momordica*), kachari (*Cucumis callosus*), aubergine (*Solanum melongena*), bottle gourd (*Lagenaria siceraria*), ridge gourd (*Luffa acutangula*), round melon (*Cucumis melo*), Indian aloe (Aloe sp.), spinach (*Spinacia oleracea*), fenugreek (*Trigonella foenum-graecum*), cauliflower (*Brassica oleracea* var. *botrytis*), clusterbean (*Cyamopsis tetragonoloba*) and chilli (*Capsicum annuum*) in different seasons as sole crops, intercrops or mixed crops. The major farm animals reared by majority of the vegetable growers are cows, buffaloes, sheep, goats and camels. These animals are reared for various purposes, i.e. milk, wool, meat, farmyard manure, hair, skin production and for extra income and employment generation.



Performance of intercrops during establishment phase of aonla (*Emblica officinalis*) orchard

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ABSTRACT

A study was conducted during 2004–06 on intercropping under arid conditions of Bikaner in newly established ‘NA7’ aonla (*Emblica officinalis* Gaertn). Mothbean (*Vigna acontifolia* (Jacq.) Marechal) grown during rainy (kharif) season was a common crop in rotation with winter (rabi) crops, i.e. fenugreek (*Trigonella foenum-graceum* Linn.), chickpea (*Cicer arietinum* L.), mustard [*Brassica juncea* (L) Czernj. & Cosson] and cumin (*Cuminum cyminum* L). Growth parameters in terms of plant height, stem girth, canopy spread and canopy volume of aonla was recorded to be significantly more with intercrops compared with its sole plantation. Higher grain and straw yield were recorded in mothbean–chickpea (497, 1 250 kg/ha) and mothbean–fenugreek (465, 1 161 kg/ha) crop sequence. Amongst the winter (rabi) crops, grain yield of fenugreek, chickpea, mustard and cumin were higher by 28.05, 38.11, 19.96 and 36.50%, respectively, when grown in association with aonla compared to its sole crops. The highest net profit (Rs 28 260/ha) was obtained from mothbean–cumin cropping system, followed by mothbean–chickpea (Rs 25 024/ha) cropping system. Mothbean–chickpea intercropping with aonla supplemented 22.01, 5.00 and 27.90 kg/ha nitrogen, phosphorus and potassium through crop residues, followed by mothbean– fenugreek crop sequence.



Attitude of vegetable growers towards organic farming practices

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ABSTRACT

The study was undertaken in Thiruvananthapuram district. One hundred vegetable growers were selected by using the proportionate random sampling technique. Sixteen independent variables were selected based on judges' relevancy rating and were quantified using measurement devices. The data were collected using a pretest structured interview schedule and suitable statistical tools were used to analyze the data. Majority of the respondents (64%) had a favourable attitude. Seven variables, namely, mass media exposure, innovativeness, market perception, self confidence, environmental orientation, awareness and knowledge showed a significant and positive relationship with attitude towards organic farming practices. Attitude is very important for success organic farming practices.



Response of integrated nutrient management on yield, quality and physico-chemical characteristics of okra cv.

Arka Anamika

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ABSTRACT

Okra produced highest number of fruits (18.36), fruit yield (182.50 g plant⁻¹ and 135.18 q ha⁻¹), fruit weight (17.65 g), length of fruits (12.26 cm) and thickness of fruits (1.898 cm) with the application of neem cake 6 q ha⁻¹ + vermicompost 10 q ha⁻¹ + Azotobacter + PSB + 60% recommended dose of NPK through inorganic fertilizers. The fruit yield was increased 29.30 per cent over control along with highest benefit cost ratio (3.19) in this treatment. Similarly, total chlorophyll content of leaves at 30 and 60 DAS (0.311 and 0.390 mg g⁻¹ fresh weight) respectively, nitrogen (2.275%), phosphorus (1.060%) and potassium contents of leaves (1.443%) and protein content of fruit (1.86 g 100 g⁻¹) were also highest with the same integrated nutrient management treatment. Integrated nutrient management emerged as the best over the nutrient management through both sole inorganic and organic sources.



Performance of Indian gooseberry (*Emblica officinalis*) cultivars under arid region of India

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ABSTRACT

An experiment was conducted during 2001-05 to evaluate the performance of different cultivars of gooseberry *Emblica officinalis* Gaertn, viz 'Krishna' 'Kanchan' 'Chakaiya' 'NA 6' 'NA 7' 'NA 10' 'Anand 1' and 'Anand 2' under arid ecosystem. Observations on growth parameters, time of fruit set and maturity, fruit drop, yield-attributing traits, quality parameters were recorded. The plant height was varied from 2.10 to 3.45 m. Canopy spread in east-west and north-south directions varied from 2.75 m to 4.0 m and 3.0 m to 4.20 m respectively. Fruit length was maximum in 'Krishna' (4.30 cm), followed by 'NA 6' (3.85 cm) and 'Chakaiya' (3.73 cm) minimum was found in 'Anand 2' (2.97 cm). Fruit set was recorded maximum in 'NA 7' (49.2%) with minimum in 'Anand 1' (25.9%) and fruit retention was varied from 6.00 to 11.4% with maximum in 'NA 7' (11.4%) and minimum in 'Anand 2' (6.00%). The maximum fruit breadth was observed in 'Krishna' (4.26 cm) and minimum in 'Anand 2' (3.00 cm). Fruit weight was maximum in 'Krishna' (49.3 g) and minimum in 'Anand 2' (28.66 g). The fruit yield/tree was recorded maximum in 'NA 7' (105 kg) and minimum in 'Anand 1' (25.3 kg). Vitamin C was varied from 433.9 to 678.2 mg/100 g fruit pulp and TSS varied from 14.9 to 19.3%.



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Woes and throes of horticultural crop growers in hot arid regions: A critical analysis

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ABSTRACT

The farmers want to adopt the improved technologies on their fields in hot arid zone but they face so many ecological, technological, economical, sociological and psychological problems, woes and throes which make them unable to adopt the innovative technologies of the arid horticulture. However, the woes and throes of the arid farmers in adoption of the arid horticultural technologies as mentioned above can be reduced to a great extent by initiating some programmes/activities, which can enrich the socio-psychological and economic status of the farmers. The programmes/activities for the farmers like better education; motivation and inspirations; active and regular interactions; improvement in farm management skills and quality of work; scientific vision and attitude; creating awareness and interest; technical training programmes; felt need based guidance; farmer's participation in research and developmental programmes of arid horticulture; economic support; timely supply of required inputs at local level with reasonable cost; individual crop based fund aided schemes/projects; suitable horticultural cropping system; value addition techniques for fruit and vegetable products; arid horticultural crop based extra employment and income generating enterprises; marketing facilities; provision of minimum/procurement prices for crop products; initiation of some common programmes to improve the socio-economic condition of the farmers; etc. are of great importance in encouraging and motivating the adoption of arid horticultural technologies. While the research programme for improved technologies formulated, the adverse climatic factors of the hot arid zones must be kept. The potential characters and quality of the technologies should be strong and capable to grow in hard climatic conditions of the hot arid environment of the zones, Only technologies which can suitably address location specific problems and existing conditions of the arid farmers should be developed.



Micropropagation of vegetable type aloe vera (*Aloe barbadensis* Mill.)

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ABSTRACT

Micropropagation protocol for vegetable type Aloe vera (*Aloe barbadensis* Mill.) has been developed using shoot tip explants. The protocol standardized for multiple micro-sucker proliferation, induction of in vitro adventitious roots and acclimatization of rooted micro-sucker from in vitro environment to greenhouse condition. Maximum proliferation of micro-suckers was obtained with combined supplementation of Benzyl adenine (BA) 2 mg + Thidiazuran (TDZ) 0.5 mg + 0.1 mg Naphthalene acetic acid (NAA) to per liter basal Murashige & Skoog (MS) medium containing 0.8% agar and 3 % sucrose. The maximum rootable micro-sucker (- 2 m) long were achieved after transfer of culture to hormone free medium for two weeks. The elongated micro-suckers were rooted successfully under in vitro condition. The better quality adventitious roots formation observed with NAA 0.5 mg/l supplemented to Y, MS medium. The regenerated plants were successfully acclimatized under Hi- Tech greenhouse and maintained in protrays for further growth and development.



Evaluation of packages for transportation and storability of aonla (*Emblica officinalis*) under semi-arid environment of Western India

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ABSTRACT

Effect of gunny bag (control), corrugated fiberboard box (CFB), pigeon pea basket, wooden crate and bamboo basket with polythene liner (PL) or newspaper liner (NPL) as packaging materials was studied for transportation and storability of aonla (Indian gooseberry) cv. NA-7 at ambient temperature of $21\pm 2^{\circ}\text{C}$ (minimum) and $33\pm 2^{\circ}\text{C}$ (maximum) with a relative humidity of $65\pm 3\%$ (at 8 am) under semi-arid conditions of Western India. Increase in physiological loss in weight, spoilage, total soluble solids, total sugars and reducing sugar and decrease in titratable acidity, and ascorbic acid during storage were general phenomena in all the treatments. Minimum spoilage loss was in fruits kept in CFB with NPL closely followed by CFH with PL. Same treatment also showed lowest respiratory activity (81.1 mg CO/kg/h) and exhibited II days of economic shelf-life, while control had 7 days economic life under ambient conditions. Highest respiration rate was in control (90.0 mg CO/kg/h) on 13th day of storage. CFB provides appropriate atmosphere and ventilation inside the box and also strength to withstand heavy stack loads and can be recycled as pulp or paper. It may be concluded that CFB with NPL was most suitable and economically viable packing container for transportation of aonla fruits under ambient conditions.



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Cyber Extension in Transfer of Technology to Farmers

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ABSTRACT

At present days the conventional extension system has been facing several challenges in delivering information to farmers as farmers need is much more diversified and more knowledge driven to address them is beyond the level of grass root extension functionaries (Dhanka). It is possible to deliver information timely by computer based technologies and Information communication Technologies (ICT), which are interlink among extension, research, marketing network and farm communities to provide information at the arid region, Central Institute for Arid Horticulture, Bikaner has been launched a Web-site during August 2006. This website includes facility to access the information from databases and to give feed back to the research institute. The website is mostly being utilized by farmers, followed by others to obtain information on the cultivation details, processing technologies, planting material details and the Institute programmes. This web site was found to be more useful to the farmers in the arid region of India.



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AHSB-1 for protein-rich diet in arid region

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ABSTRACT

Sword bean is an under-exploited leguminous vegetable. Its green, tender and non-fibrous pods are used for vegetable purposes. In north-western parts of India, short perennial and races having low harvest Index, are available meagerly with the tribal farmers. It has potential for diversified vegetable production under resource constraints arid agroclimate, but so far there is no improved variety and production technology available for its commercialization.



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New Indian beans for more protein-rich foods

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ABSTRACT

Of the Indian bean genotypes evaluated and purified during 2001-2008 at CIAH, Bikaner, two landraces showing a wide variation for growth, flowering and fruiting behaviour, pod quality and yield-contributing traits have been selected. Both are high-yielding with better quality characters under arid conditions. They are known as AHOB 1 and AHOB 16.



Enjoy new mouth-watering ber

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ABSTRACT

Thar Sevika and Thar Bhubhraj were released in 2007 at the Central Institute for Arid Horticulture, Bikaner. Thar Sevika yields 65-70q/ha, Thar bhubhraj a selection from local material of bhusavar area of Bharatpur district of Rajasthan yields 70-75 q/ha. These varieties have the ability to tolerate extreme of temperatures (2.5-48°C). Both are early-maturing, suitable for staggered harvesting and practically free from powdery mildew under arid conditions.



Motivational factors and constraint analysis regarding commercial production of Mateera (*Citrulus lanatus*) in hot arid ecosystem

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ABSTRACT

The present study was conducted in Bikaner district of western Rajasthan and motivational factors and constraints being faced by the farmers in growing Mateera (*Citrulus lanatus*) crop in hot arid ecosystem of Rajasthan were analyzed. The major motivational factors of farmers behind mateera production at commercial scale as observed during the survey were: substantial income from mateera seeds, good earning from fresh mateera fruits, very low water requirement of the crop, high seed germination capacity, high consumption of mature mateera as a dessert fruits, immature Mateera fruits (Loiya) a very good source of vegetable, long storage life of the mateera fruit, high demand of mateeraeds in the markets, mateera juice protects the body from hot winds (Loo) during summer season, mateera juice helps in removing kidney stones, mateera is a very important component of traditional mixed cropping system of the arid regions, mateera is most suited crop in arid environment, etc. Amongst the major constraints being faced by the farmers in mateera production at large scale were: scarcity of water, very low and erratic rainfall and occurrence of drought very frequently, lack of viable schemes and support system for Mateera growers, no standardized technique is available for value addition of mateera fruits, very deep and salty ground water, inadequate supply of electricity, poor marketing system and market intelligence, lack of knowledge and awareness amongst the farmers about improved technologies of mateera cultivation, etc.



Phylogenetic relationship among Indian jujube cultivars based on flavonoid spectrum

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ABSTRACT

Indian jujube (ber) cultivation has been in vogue in India since Vedic age. It is adapted to the extreme agroclimatic conditions of the arid ecosystem and is, therefore, a popular fruit crop in this region. Genetically, the crop is highly heterozygous and, therefore, a wide genetic variability exists in nature. Apart from this, polyploidy and hybridity has further enriched in the gene pool of this crop species. As a result of systematic evaluation of the gene pool a large number of cultivars have been identified. The classification of these cultivars rests mostly on floral and fruit characteristics which presently becomes overlapping and hence renders the identification difficult. Apart from this, the migration of varieties from one location to other and often with different names has led to greater confusion in identification of varieties. In a pursuit to develop National Gene Bank of ber, a total of 318 cultivars has been collected and maintained at CIAH, Bikaner farm. The cultivars are being evaluated and attempts are underway to develop phyto-chemical markers for their identification and assess the phylogenetic relationships between them. Among the various phyto-chemical markers in recent past, flavonoids have gained importance in varietal identification and assessment of phylogeny. This is on account of the fact that flavonoids are secondary metabolites, species specific and remains unchanged even under environmental fluctuations. Therefore, in the present study an attempt has been made to use flavonoid pulp of eight ber cultivars and assess the inter-relationships between them. Eight genotypes of ber (*Ziziphus mauritiana* var. *rotundifolia*), Illaichi, Bagwadi, Banarsi Karaka, Seb, Gola, Umran, Reshmi and Mundia constituted the material for the present investigation. The leaf samples, for the extraction of flavonoid 2 g of leaf sample was fixed in 10 ml of methanol containing 1% HCl. The fixed samples were stored at room temperature and were macerated in mortar and pestle



before analysis. The whole content was centrifuged at 10,000 rpm for 20 min. at room temperature. The clear fluid was taken and evaporated to dryness in an oven maintained at 60o C. Finally, the sample was taken in 1 ml methanol. The flavonoids were separated on thin layer chromatography (TLC) plates coated with 0.6 mm thick layer of cellulose. An aliquot of 10 µl of sample as prepared above was loaded on one corner of the plate. The plate was first developed with 2% formic acid and later, after rotating at 90o , in solvent containing amyl alcohol : acetic acid and water in the ratio of 10: 6: 5. The plates after air drying were viewed for flavonoid spots as: (i) without any spray, (ii) spray with 1% methanolic AlCl₃ under UV and (iii) spray with 1% methanolic NaOH under UV. The spots were marked and pooled chromatogram of each cultivar was prepared. They were then numbered and master chromatogram was prepared for comparison of cultivars. The phylogenetic relationship was ascertained by using NTSYS 2.0 computer software.



Effect of ber and pomegranate plantation on soil nutrient status of typic orripsamments

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ABSTRACT

A study was conducted in arid region of western Rajasthan to determine the cumulative effect of leaf litter of ber (*Ziziphus mauritiana*) and pomegranate (*Punica granatum*) plantations on the changes of soil nutrients below the tree canopy and their interspaces at surface (0–15 cm) and sub-surface (15–60 cm) depth. The results of the study showed that both the fruit species exerted gain in the nutrient contents in the soil below the canopy area and their interspaces. The beneficial effect of *Ziziphus mauritiana* in improving the soil nutrient status was however, more pronounced. Ten year after plantation of ber and pomegranate, organic carbon below the canopy increased from 0.03 to 0.39% and 0.03 to 0.25% in ber and pomegranate, respectively. Available P increased from 9.16 to 12.35; 9.16 to 10.67 kg ha⁻¹ and exchangeable cations [cmol (p+)/kg] (Ca²⁺ 5.1 to 8.0; 5.1 to 6.8, Mg²⁺ 1.2 to 2.0; 1.2 to 2.0 and K⁺ 0.3 to 2.3; 0.3 to 1.9) under the canopy area of ber and pomegranate which entails the benefits of plantations in the development of dune soils. Gain in nutrient content between the inter space although was lower than the canopy area but was higher than control. Nutrient returns through litter fall followed the order N > K > Ca > P.



Breeding of F₁ hybrids in muskmelon: accomplishment and prospects

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ABSTRACT

Heterosis breeding has been extensively explored and utilized in muskmelon. Being cross pollinated crop and its ability to produce plenty of seeds per fruit facilitates heterosis breeding and make it economically viable. Presence of different pollination mechanisms like monoecy, gynoecy and genetic male sterility could be effectively explored for economic production of F₁ hybrids. A large number of varieties have been developed through continuous inbreeding and selection without losing vigour, which is unexpected in cross pollinated crops. Now there is need to give the attention to develop high quality (TSS) and disease resistant hybrids utilizing economic tools.



Studies on physicochemical characters of fruits of Date palm genotypes

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ABSTRACT

In Kachchh region of Gujarat, variability with respect to berry colour, weight, pulp content, fruit size, taste, bunch size and yield potential were observed in date palm orchards. A survey was carried out to identify suitable genotypes of date palm (*Phoenix dactylifera L.*) based on the fruit quality and yield attributing characters. Fruits of ten elite types were collected and physicochemical characters were studied. The genotypes showed considerable variation in morphological and physicochemical characters of fruits. The colour of berry at doka stage was yellow, red to dark red. Variation in fruit weight from 7.71 to 17.4g, stone weight 0.81-1.50g., TSS 19.8 -36.2 brix and acidity 0.18-0.40 % was recorded. The suckers of identified genotypes DP-01 and DP -03 would be procured for multiplication and evaluation under hot arid region and it can be further utilized for improvement programme.



Reproductive biology of tamarind (*Tamarindus indica* L.) under semi-arid tropics of western India

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ABSTRACT

Reproductive biology of fifteen elite genotypes of tamarind was studied during the year 2004 and 2005. Peak period of panicle emergence and flowering was recorded in the month of July and August, respectively in majority of genotypes. It was found to be earliest in CPT 1 closely followed by CPT 2, CPT 3, CPT 11 and CPT 13. Variable percentage of anthesis dehiscence was registered in different genotypes. Peak period of anthesis was recorded between 7-9 AM in all the genotypes during both the years. None of the genotypes showed anthesis before 5 A M and after 11 AM. Another dehiscence commenced after opening of flowers, i.e., at 8AM and continued till 12 noon. Peak period of dehiscence was recorded between 9-11 AM in all genotypes. None of the genotypes showed anther dehiscence before 8 AM and after 12 noon. Time taken for complete development of flower ranged from 18-26 days, pollen viability ranged from 80.10-94.13 per cent being highest in CPT 3. Pollen germination ranged from 10.11-18.13 per cent being at the top in CPT 3 (18.13 per cent). Pollen diameter ranged from 34.12- 42.14 micron. Pollen grain was spherical in shape having light yellow colour in all genotypes. CPT 13 recorded maximum panicle length (15.20 cm) and fruit set per panicle (16.80). The peak period of fruit set was recorded in the month of September in majority of genotypes. These genotypes are being further evaluated.



Floral biology studies in *Bhuchanania* under semi-arid ecosystem of western India

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ABSTRACT

An experiment was conducted to study the floral biology of 15 elite genotypes of chironji (*Bhuchanania lanzan* Spreng.) during 2004 and 2005. Peak period of panicle emergence and flowering were recorded in January-February. Highest panicle length (35.11 cm) was noted in CPT 1. Peak period of anthesis and dehiscence was recorded between 6-11 AM and 8 AM to 12 noon respectively in all the genotypes. The stamen and pistil length varied from 1.97-2.12 mm and 1.22-1.38 mm respectively being at the top in CPT 13. Pollen viability ranged from 54.55-70.38% being highest in CPT 5. Pollen germination and pollen diameter ranged from 20.00 to 35.00 % and 49.10 to 63.1811, respectively. Maximum stigma receptivity was recorded in CPT 5 (35.00 %) on the day of anthesis. The peak period of fruit set was recorded in February in majority of genotypes and it was noted maximum in CPT 12 (37.50). Fruit set/ panicle was found to be positively and significantly associated with panicle length and it may be observed while selecting elite genotypes. Vegetatively propagated genotypes have been planted in the field for their further evaluation.



Efficacy of organic mulches on soil properties, earthworm population, growth and yield of aonla cv. NA7 in semi- arid ecosystem

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ABSTRACT

The influence of different organic mulches viz, paddy straw, maize straw, rice husk, grasses, *subabul* lopping on soil properties, earthworm population, growth, yield and fruit quality-attributes was studied. Various organic mulches significantly increased the soil moisture status at various soil depths. Paddy straw mulch recorded the maximum soil moisture content followed by maize straw and grasses, among the different evaluated organic mulches. The findings of the study indicated that paddy straw mulch followed by maize straw and grasses had given favourable results with regards to soil moisture and physico-chemical attributes of soil and earthworm population in basin soil. Paddy straw mulches were found to be more effective in producing maximum growth than rest of the mulching treatments. Plants treated with paddy straw mulch recorded highest yield 09.00 kg/plant and 42.15 kg/plant during 2005 and 2006. T55, total sugar, total phenols and vitamin C were observed maximum with paddy straw followed by maize straw mulch. Among the evaluated organic mulches, paddy straw had showed better response followed by maize straw. In view of the superiority over other organic mulches, use of paddy straw as mulch material over long period needs to be popularized for increasing the productivity of aonla orchards in rainfed condition under semi-arid ecosystem.



Effect of zero energy cool chamber and post-harvest treatments on shelf-life of fruits under semi-arid environment of Western India. Part 2. Ber fruits

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ABSTRACT

Effect of zero energy cool chamber (ZECC) along with post-harvest treatments (including CaCl_2 , mustard oil and K_2SO_4 separately) on shelf-life and fruit quality attributes of bel (*Zizyphus mauritiana* Lamk.) cv Gola during storage under semi-arid ecosystem of Gujarat was studied. Increase in physiological loss in weight (PLW), spoilage loss, total soluble solids, total sugars, reducing sugar and reduction in titratable acidity, and ascorbic acid during storage were observed in all treatments. Fruits treated with CaCl_2 1.5% and stored in ZECC recorded least PLW (17.1 %), spoilage loss (20%), respiratory activity (0.25 mg $\text{CO}_2/\text{kg/h}$) and exhibited 7 days of shelf-life, followed by CaCl_2 , 1 % + ZECC, while untreated fruits had 3 days of economic shelf-life. Fruits stored in ZECC recorded 6 days shelf-life. Highest respiration rate was in control (0.45 mg $\text{CO}_2/\text{kg/h}$) on 9th day of storage. Data on fruit quality attributes indicated that ZECC + CaCl 1.5% or ZECC alone might be an ideal on-farm storage facility for maintaining the quality of bel fruits under semi-arid environment of Western India.



Effect of zero energy cool chamber and post-harvest treatments on shelf-life of fruits under semi-arid environment of Western India. Part 2. Indian gooseberry fruits

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ABSTRACT

Effect of zero energy cool chamber (ZECC) along with post-harvest treatments including CaCl_2 , mustard oil and $\text{K}_2\text{S}_2\text{O}_8$ separately on shelf-life and fruit quality attributes of Indian gooseberry or aonla (*Emblica officinalis Gaertn*) during storage under semi-arid ecosystem of Gujarat was studied. Increase in physiological loss in weight (PLW), spoilage loss, total soluble solids, total sugar and reducing sugars, reduction in titratable acidity and ascorbic acid were observed during storage period in all the treatments. Fruits treated with 1.5% CaCl_2 , and stored in ZECC recorded least PLW (16%), spoilage loss (16.5%), respiratory activity (83 mg CO_2 /kg/h) and exhibited 11 days of shelf-life, while untreated control had 6 days economic life. It was closely followed by 1 % CaCl_2 , + ZECC treatment. Fruits stored in ZECC recorded 9 days shelf-life. Highest respiration rate was in control (88.1 mg CO_2 /kg/h) on 13th day of storage. It may be concluded that 1.5% CaCl_2 and storage in ZECC treatment was found most efficient to retain the fruit quality attributes till 13th day of storage under semi-arid environment of western India.



Genetic variability studies and scope of improvement in sponge gourd under hot arid agro-climate

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ABSTRACT

Fifteen landraces of sponge gourd were evaluated for 19 quantitative characters to study the genetic variability and association of the traits. The analysis of variance revealed considerable genetic variability in the evaluated germplasm. The GCV and PCV estimates were high for fruit yield/plant, number of fruits/plant and number of seeds/fruit indicating better scope for improvement through simple selection. These characters also depicted high estimates for heritability and genetic gain indicating additive type of gene action. Fruit yield/plant showed positive and significant association with number of fruits/plant and fruit weight. Among the genotypes tested for performance studies, AHS-4 and AHS-5 recorded the highest fruit yield potential under arid conditions. The genotype AHS-4 exhibited earliness (53.84 days) for first marketable harvest.



Survey, distribution patterns and abundance of Pyrgomorphid fauna (Orthoptera: Pyrgomorphidae) in agro-ecosystems of south western Rajasthan

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ABSTRACT

Survey conducted in the five districts of Rajasthan viz., Banswara, Dungarpur, Rajsamand, Sirohi and Udaipur during 2005-06 and 2006-07 under the present investigation indicated that five species of short homed grasshoppers belonging to the family Pyrgomorphidae were regularly abundant in the agro-ecosystems. The diversity comprised four genera (*Chrotogonus*, *Atractomorpha*, *Pyrgomorpha* and *Poekilocerus*) and five species i.e. *Chrotogonus trachypterus* (Blanchard), *Chrotogonus oxypterus* (Blanchard), *Atractomorpha crenulata* Fabricius, *Pyrgomorpha bispinosa* Walker and *Poekilocerus pictus* Fabricius. The genus *Chrotogonus*, represented by *C. trachypterus* (33.34 ± 7.63) and *C. oxypterus* (29.45 ± 6.93), were relatively more abundant in Udaipur district than in the other four districts surveyed. The species *A. crenulata* (07.09 ± 1.66) and *P. bispinosa* (06.35 ± 1.54) had a relatively equal representation in all the districts, but their numerical abundance was a little more in the district Banswara as compared to the other four districts surveyed. The species *P. pictus* (07.00 ± 2.82) was relatively more in district Rajsamand and was not recorded from the district Banswara. The mean hopper population of the surface grasshopper species *C. trachypterus* and *C. oxypterus* was



relatively more in Udaipur district with a respective mean population of 6.50 and 5.58 per 25 stops followed by that in Sirohi (5.17 & 4.80/ 25 stops). They were least abundant in Banswara (4.10 & 3.73 25 stops) district during both the years. The hoppers of the genus *Atractomorpha* was almost equally represented in all the five districts surveyed. However, their population was relatively more in Banswara district (3.83/ 25 stops). The genus *Pyrgomorpha* also had a similar representation from all the five districts surveyed, though the hopper population was relatively more at Banswara with a mean population of (3.42 hoppers/ 25 stops). The hopper population of *Poekilocerus* was relatively more in district Rajsamand with 2.43 hoppers per 25 stops.



Population dynamics of lemon butterfly (*Papilio demoleus*) in *bael* (*Aegle marmelos*) as influenced by abiotic factors in arid region of Rajasthan

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ABSTRACT

It was observed that population and infestation of *P. demoleus* appeared from August to February. The highest egg, larval population and plant infestation were observed 12.75, 6.15/ 10 branches and 65.0 %, respectively. The relationship between lemon butterfly egg, larval population and maximum temperature was (-0.53 & -0.55) negatively correlated whereas the maximum relative humidity was (0.44 & 0.53) positively correlated. Then, the egg and larval population gradually increased and reached to its peak, when the temperature decreased and humidity increased. The rainfall was also negatively correlated (-0.51) with egg population of lemon butterfly in arid region.



Influence of tree plantation on soil physico-chemical properties in arid region

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ABSTRACT

The effect of ber (*Ziziphus mauritiana* Lamk), drumstick (*Moringa olerifera* Lam), karonda (*Carissa congesta* WI.) and khejri (*Prosopis cineraria* L. Druce) on the physical and chemical properties of soil at different depths (0-15, 15-30, 30-45 and 45-60 cm) were studied. The increase in the porosity and water holding capacity and decrease in the bulk density (of subsurface soils) in the sites under plantations were marginal, when compared to open sites. There was slight decrease in the pH of soil under *vegetated* area, whereas no appreciable change in EC was observed. There was an appreciable increase in the organic carbon (0.04 to 0.13%) and available nitrogen content (69 to 100 kg ha⁻¹) in the sites under vegetation. Fruit plants particularly ber and drumstick growing in the arid region indicated the process of deposition of bases such as Ca and Mg in the surface layers from lower strata. Overall results showed that exchangeable cations such as Ca, Mg, and Na and available P and K *have* depicted a poor potential *activity* in the maintenance offertility which is affected by the young nature of plantation. The increase/decrease of soil properties due to the influence of plantation was more in surface (0-15 cm) and subsurface (15-30 cm) than in the lowermost soil (30-45 and 45-60 cm) layers. Among the four different fruit plantations, ber recorded substantial *improvement* and maintenance in soil fertility followed by drumstick. The nutrient return through litter fall followed the order K > N > Ca in *Z. mauritiana* and *M. olerifera* and N > Ca > K, Ca > N > K in *C. congesta* and *P. cineraria*, respectively. The soils belong to the order Entisol and the calcareous pH is well adopted for the plantation of these fruit trees.



Molecular diversity of the DNA-b satellites associated with tomato leaf curl disease in India

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ABSTRACT

DNA-b satellites, referred to here as betasatellites, were found associated with tomato leaf curl disease (ToLCD) in India. The size of eight betasatellites isolated from different geographical locations in India varied from 1353 to 1424 nt; these molecules had an ORF bC1, an adenine-rich region, and a satellite conserved region. Their nucleotide sequence identity varied from 45 to 93%. In phylogenetic analysis, these betasatellites grouped according to their geographic locations rather than the host species. Two new betasatellites, tomato leaf curl Bangalore betasatellite and tomato leaf curl Maharashtra betasatellite, were identified.



Effect of nutrient replenishment through organic fertilizers in sapota cv. Kalipatti

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ABSTRACT

The results of the study revealed that application of different fertilizer treatments had non-significant effect on growth parameter of sapota cv. Kalipatti. Leaf nutrient composition in respect of Nitrogen and Potassium were influenced significantly. However, Phosphorus content of the leaf was non-significantly influenced. Maximum N content was recorded in 50:50 application of castor cake and recommended dose of fertilizer (T2). Whereas, maximum potash content was observed in T3 (100 % FYM). Application of organic manure found to have significant influence on soil moisture content after two and five months of cessation of monsoon and it was maximum in 50:50 application of FYM and recommended dose of fertilizer (T4), closely followed by 100 percent castor cake application (T1) as compared to chemical fertilizer application, indicating that application of organic fertilizer helped in higher retention of soil moisture for longer period. (Kale and Jagtap, 6) also reported increased RWC in sapota Kalipatti with application 2.0 percent power oil. Data on soil health parameters like pH, EC and percent organic carbon content indicated that the pH of the soil was reduced after application of organic fertilizers as compared with initial soil pH. The soil PH was maximum in T1 but was on par with RDF, which was least. The electrical conductivity of the soil was maximum in T3. Organic carbon content of the soil was maximum where organic fertilizers were applied compared to where chemical fertilizers were applied. Number of fruit set per shoot and yield per plant indicated that there were significant differences amongst the treatments. It was maximum in T4 (Table 3). Kale and Jagtap (6) also revealed that increased dose of nitrogen resulted in increased productivity of sapota Kalipatti.



Species richness, density and diversity indices of grasshoppers fauna (Orthoptera: Pyrgomorphidae) in maize-wheat cropping system of south-western Rajasthan (India)

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ABSTRACT

Survey conducted in the five districts of Rajasthan viz., Banswara, Dungarpur, Rajsamand, Sirohi and Udaipur during 2005-06 and 2006-07 yielded four different species *Chrotogonus trachypterus* (Blanchard), *Chrotogonus oxypterus* (Blanchard), *Atractomorpha crenulata* Fabricius and *Pyrgomorpha bispinosa* Walker. Based on the mean density data recorded during the investigation, the two species of *Chrotogonus* (*C. trachypterus* and *C. oxypterus*) had the highest mean density in the month of February with (12.88 & 12.13/ 180 ff) at Udaipur and lowest mean density in the month of October with (2.30 & 1.88/ ft²) at Rajsamand, respectively. In the south-western regions of Rajasthan, the maximum mean density was during February in maize-wheat cropping system. The relative density of *C. trachypterus* and *C. oxypterus* was the maximum during the month of May (50.56 & 48.41 % respectively) at Dungarpur district. Due to sparse vegetation during May in most parts of Rajasthan the geophilus species, *Chrotogonus* had relatively the highest relative density as compared to the other pyrgomorphids. The mean density for *Atractomorpha crenulata* happened to be the maximum during the month of August with 4.38 per ft² and relative density was the highest in September (31.10 %) at Banswara. The grasshopper, *Pyrgomorpha bispinosa* had the maximum mean density (3.881 ft²) during the month of August at Banswara. The relative density (28.39 %) was the highest during September at Banswara. The Simpson Diversity Index and Shannon Weiner Diversity Index values were the maximum in August during both



the years. This conspicuously indicates the fact that the monsoon season (August-September) happened to comprise greater diversity of the Pyrgomorphids than the spring season (February-March). Based on the habitat preference and their behaviour, the Pyrgomorphids could be grouped as the geophilus and arboreal types. A comparison within the geophilus species showed that the relative density was nearly equal depicting a 1: 1 ratio at all districts and the diversity indices were 1.915 to 2.00 during both the year. Similarly, comparison between the arboria species indicated that their relative density was also nearly equal depicting a similar 1: 1 ratio and the diversity indices were 1.00 to 1.997 during both years.



Status of *Alternaria* blight of watermelon under Rajasthan conditions

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ABSTRACT

The incidence and severity of *Alternaria* blight of watermelon recorded during survey programme is presented in Table 1. The data revealed that *Alternaria* blight of watermelon was present to the varying extents in watermelon fields of above four districts of Rajasthan in which two localities such as Pakka Saharana (Hanumangarh) and Piperan (Sriganganagar) were found free from the incidence of the disease. The disease incidence and disease severity ranged from 13.50-26.50% and 3.0 to 18.50%, respectively. Highest disease incidence (26.50%) and disease severity (18.50%) were observed at Pathology Block (Beechwal, Bikaner) followed Khejroli (Chomu, jaipur), 25.50% and 12.0%, respectively. The disease incidence (13.50%) and disease severity (3.0%) were found lowest at locality Khara Bikaner. The district wise average disease was observed highest (10.92%) in Bikaner district, while minimum disease severity (5.58%) was found in Hanumangarh followed by Sriganganagar (5.67%).



Genetic variability studies and scope of improvement in sponge gourd under hot arid agro-climate

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ABSTRACT

Fifteen landraces of sponge gourd were evaluated for 19 quantitative characters to study the genetic variability and association of the traits. The analysis of variance revealed considerable genetic variability in the evaluated germplasm. The GCV and PCV estimates were high for fruit yield/plant, number of fruits/plant and number of seeds/fruit indicating better scope for improvement through simple selection. These characters also depicted high estimates for heritability and genetic gain indicating additive type of gene action. Fruit yield/plant showed positive and significant association with number of fruits/plant and fruit weight. Among the genotypes tested for performance studies, AHS-4 and AHS-5 recorded the highest fruit yield potential under arid conditions. The genotype AHS-4 exhibited earliness (53.84 days) for first marketable harvest.



In- vitro propagation studies of virus tolerant citrus rootstock Cleopatra Mandarin (*Citrus reshnii* Tanaka)

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ABSTRACT

Studies on virus tolerant, citrus rootstock Cleopatra (*Citrus reshnii* Tanaka) were carried out by using nodal segments of seedlings as explants. The maximum survival of explants (90 per cent) and minimum time required to bud breaking (19.50 days) was recorded on BAP 0.5mg^{-1} + kinetin 0.5mg^{-1} . However, maximum number of shoot (7.30) was there on BAP 2.0mg^{-1} + kinetin 1.0mg^{-1} and maximum length shoot (2.40 cm) on BAP 0.5mg^{-1} + kinetin 2.0mg^{-1} . The maximum (90 per cent) survival of micro shoot for rooting and length of root (6.28 cm) were recorded on M S medium modified with NAA 0.5mg^{-1} + IEA 0.5mg^{-1} . The minimum time taken to root induction (22.00 days) was on NAA 0.5mg^{-1} + IEA 0.1mg^{-1} . and maximum number of root (5.60) was on NAA 0.5mg^{-1} + IEA 1.0mg . In-vitro propagated plantlets were successfully acclimatized by transferring them in pots containing a potting mixture of soil: perlite: vermiculite in equal proportion. Plantlets survival of 90 per cent was observed in this mixture.



Marketing practices of acid lime (*Citrus aurantifolia* Swingle) in panchmahals district of Gujarat

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ABSTRACT

Review of the study on marketing practices of Acid lime (*Citrus aurantifolia* Swingle) in Panchmahals District of Gujarat revealed that the acid lime is grown as main cash crop in several parts viz. Halol and Jambugoda of the district and in some places as a source of additional income. The maximum farmers belong to age group of 30-40 years (58.30 per cent), marginal (61.57%), illiterate (55.0 per cent) and living in joint family (68.33 per cent). The increasing age of farmers decrease the per cent of selling produced to contractor and middle man and increases the self marketing. The marginal farmers sold their produced to middle man followed by self marketing (21.62 per cent) and on contract (5.40 per cent). In general, small farmers sold their produced to middle man. Whole progressive farmers sold their produce contractor followed by middle man. The literacy and type of family of farmers were also affecting the mode of acid lime marketing. For providing better price to farmers development of regulated mandies and market is required. There is need to trained the farmers regarding the package and practices, grading and create awareness regarding the marketing system among the farmers of Panchmahals district of Gujarat.



Socio Economic status of the beneficiaries of JFMP in the Rajpipla and Valsad Forest Divisions of South Gujarat”

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ABSTRACT

The present investigation was carried out in Rajpipla and Valsad Forest Division, which is situated in Southern part of the Gujarat having 12 Forest Divisions of Forest Department where the JFM Programme was introduced. ‘Ex-post facto’ research design was used for the study. According to Kerlinger (1976) ex-post facto research design is worth to apply when the independent variable have already acted upon. The study is concerned to identify the characteristics of beneficiaries who have certain influenced on JFM Programme’s activities. The results of study indicate that the majority of the beneficiaries belonged to middle age group, had middle level of education, had medium size of family, membership with a position in social organization and had medium level of value orientation. More than one third of them had low level of progressivism and two fifth had medium level of economic motivation.



Flavonoids as an aid in cultivar identification and assessing phylogenetic kinship among some cultivars of pomegranate (*Punica granatum*)

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ABSTRACT

Secondary metabolites, foliar flavonoids have gained reputation as being excellent phyto-chemical markers for cultivar identification. These markers come handy at places where the morphological parameters become limiting and hence recourse to such phyto-chemical markers is taken to delimit the taxon. Pomegranate is represented by a large number of cultivars which have been identified/developed for specific purposes. The genetic variability once generated has been fixed on account of vegetative propagation which is commonly practiced in this taxon. Varietal identification of these cultivars is based mostly on fruit characters. These at times become highly overlapping and hence pose a problem in varietal delimitation and assessing the phylogenetic kinship between the cultivars which is essential for a pre-breeding program. Accordingly, the present investigation was undertaken using nine cultivars of pomegranate to develop phyto-chemical markers for them using foliar flavonoid. The data thus generated have shown that distribution of flavonoid spots or spot combination is specific for each cultivar which can be used not only for varietal identification but also for assessing the phylogenetic kinship among pomegranate cultivars. Thus, pomegranate cultivar 'Kabul' could be identified by spot no. 9 whereas cultivars which could be identified by unique spot combination were 'Mridula' (18, 20 and 24), 'Jodhpur Red' (4, 14 and 18), 'P-23' (4, 14, 15 and 24) and 'Ganesh' (1, 3, 18 and 19).



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Effect of size grading and packaging along with transportation during storage on quality of Jamun (*Syzygium cuminii* Skeels) fruits

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ABSTRACT

The experiment was conducted in the month of June, 2009 at Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand to justify the effect of size grading and packaging along with transportation on quality of Jamun fruits during storage. The graded fruits (grade A and B) were packed in different containers (Bamboo basket, CFB box and Wooden crates) with and without lining (Newspaper, Polyethylene and Jamun leaves) and transported for 200 km and then kept in room at ambient temperature for four days. The fruits were examined on daily basis for physiological loss in weight and spoilage loss. While, chemical parameters viz., TSS, pH, acidity, ascorbic acid, reducing sugar and non reducing sugar were examined on 1st and 4th day of storage. The result revealed that grade A (16.00 to 22.00 g) fruits packed in CFB box having newspaper lining proved to be the best treatment than grade B (12.00 to 15.99 g) fruits as well as rest of the containers. The treatment effectively reduced physiological loss in weight and spoilage loss with minimum changes in chemical constituents than the rest of the treatments and hence can be used for post harvest management of Jamun fruits.



Detection of multiple virus infection with severe mosaic affected watermelon from Bikaner (India)

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ABSTRACT

A disease of watermelon (*Citrullus lanatus* (Thunb.) Matsumura and Nakai) characterised by severe mosaic, leaf reduction and shoe-stringing, upright branches, shortening of internodal length, and bud necrosis was observed during 2008 at the Central Institute for Arid Horticulture experimental farm near Bikaner, India, with disease incidence of more than 80%. Symptomatic watermelon plants were tested for the presence of virus by electron microscopy (EM) and direct antigen coated –ELISA (DAC-ELISA) using polyclonal antiserum to Tobacco streak virus (TSV), Watermelon bud necrosis virus (WBNV), Cucumber mosaic virus (CMV) and Papaya ringspot virus (PRSV). Flexuous and isometric particles were seen under EM. In DAC-ELISA, symptomatic watermelon samples reacted strongly with WBNV, CMV and PRSV antisera. Asymptomatic samples of other cucurbitaceous crops such as *Citrullus colocynthis* (Tumba), *Cucumis melo* (kachri) and *Lagenaria siceraria* (bottle gourd) were also showed the presence of flexuous and isometric particles under EM and were ELISA positive for WBNV, CMV and PRSV. The preliminary results suggested co-infection of Tospo-, Cucumo- and Poty-viruses with watermelon and *C. colocynthis*, *C. melo* and *L. siceraria* may serve as alternative hosts for these viruses.



Effect of post harvest treatments on quality of Jamun (*Syzygium cuminii* Skeels) fruits during storage

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ABSTRACT

An investigation was carried out at Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand during month of June, 2009 to see the effect of post harvest treatments on quality of Jamun fruits. The Jamun fruits were treated with growth regulators GA3 (50 and 100 ppm), chemical CaCl₂ (1.0 and 1.5%) and Paraffin wax along with control and kept in with or without perforated polyethylene bag. The experiment was carried out in Completely Randomized Block Design (Factorial) with twelve treatments and replicated thrice. Among these, treatment of CaCl 2 1.5 per cent with perforated polyethylene bag proved to be the best post harvest treatment than the rest of the treatments. The treatment effectively reduced the physiological loss in weight as well as spoilage loss and thereby useful in maintaining good balance between ascorbic acid and sugar content of fruits during storage. The treatment also showed little change in TSS, pH and acidity content and hence, it can be useful in post harvest management of Jamun fruits.



Morphological variability of bael varieties under rainfed conditions of hot semi-arid environment of western India

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ABSTRACT

Bael is an indigenous hardy fruit tree; its fruits are very rich source of riboflavin (Vitamin B₂) with high nutraceutical and medicinal value. Every part of bael tree is used in one way or the other. During recent years, its importance has been highlighted in north India but, adequate attempts have not been made for its exploitation in Western India. A study keeping this fact in view was carried out to evaluate the bael genotypes for their growth behaviour and floral traits at Experimental Farm of Central Horticultural Experiment Station (CIAH), Vejalpur, Panchmahals, Gujarat during the years 2008 and 2010. Among the varieties evaluated for growth characters, plant height was recorded in CISH B-1, while plant spread, root stock and stem girth were recorded maximum in the variety NB-7. All the varieties exhibited significant difference with respect to for most of the growth characters. Studies on floral biology revealed that the flower bud emergence started from 20th April and continued up to 23rd June, while anthesis initiated from 12th May and completed by last week of June. Bud length and width varied from 10.00 to 13.00 mm and 7.00 to 9.50 mm while length and width of flower size ranged between 12.00 to 19.00 mm and 24.00 to 35.00 mm, respectively among the evaluated varieties. Number of petals in different varieties varied from 4 to 6 but majority of flowers showed only four petals. Stamen length varied from 7.00 mm (NB-7) to 9.00 mm (CISH B-2), whereas ovary length was recorded maximum in the genotype Pant Aparna (8.00 mm). Stigma length was recorded highest (3.50 mm) in the four varieties namely CISH B-2, PantAparna, NB-7 and NB-16, among the evaluated genotypes of bael. Pollen viability was observed more than 94 per cent in almost all the varieties.



Screening of Amaranths genotypes for yield and quality under hot climatic condition of semiarid ecosystem of western India

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ABSTRACT

An experiment on the screening of *Amaranthus* genotypes for yield and quality under semiarid condition of western India was conducted using twenty eight accessions including released varieties were collected from diversified areas. The experiment was laid out in a randomized complete block design with three replications. The experiment results revealed that the significant differences among the genotypes for all the characters under study indicating the wide variability present in the germplasm. Among the genotypes studied in the present experiment, the highest plant height was recorded in IC-4469674 followed by IC-469676. The leaf size is considered an important character which decided by the length and breadth of the leaf. Arka Suguna, IC-469646, IC-469620, IC-469601 and IC-46452I recorded the lengthiest leaves over 10.0cm against IC-469645 (5.0cm). Arka Suguna, IC-469646, IC-469620 recorded the higher leaf breadth over 7.0cm against IC-469624 (2.6cm). The highest total leaf yield per plot was recorded in Arka Suguna (5.66 Kg) followed by Arka Arunima and IC-469646. This result indicate that the Arka Suguna, IC-469646, IC-469620 are broader leafy type and would be preferred by consumers. Study on quality parameters indicated that the highest protein (3.8g) and Fe 0.521mg) per 100 g has been recorded in IC-469646. Hence, Arka Suguna (Green type) and Arka Arunima (purple type) are exhibited a high yielding genotypes and IC-469646 (Green type) has registered high yield coupled with high protein and high Fe content under semiarid condition.



Evaluation of mango genotypes for morpho-physiological attributes under hot arid zone of Rajasthan

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ABSTRACT

Ten mango cultivars namely 'Amrapali', 'Kesar', 'Rajapuri', 'Langra', 'Alphanso', 'Dashehari', 'Chausa', 'CISH-M-1', 'DC-1' and 'Mallika' were evaluated during 2008–'09 and 2009–'10 for morphological and physiological parameters at Bikaner, Rajasthan. 'Kesar' had least field mortality (9.0%) and better growth performance, followed by 'Amrapali'. Under the adverse environmental conditions of the site, 'Langra' and 'Dashehari' had the two highest specific leaf areas (SLA), while 'Kesar' registered the maximum chlorophyll content (a, b, and total), highest net photosynthesis (Pn; 5.38 $\mu\text{mole m}^{-2} \text{s}^{-1}$), and transpiration rate (E; 2.27 mmole m^{-2}). Overall, 'Kesar', 'Amrapali', and 'Rajapuri' were better performing genotypes under the hot arid environment in the initial year of establishment.



Introduction and evaluation of Anardana type pomegranate under hot arid conditions

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ABSTRACT

Pomegranate (*Punica granatum* L.) is one of the important fruit plants of the semi-arid and arid region of the country. It is used for fresh consumption and processing. The sour type pomegranate is also in demand for garnishing many dishes. Seventeen germplasms were collected from foot hills of Himachal Pradesh, were evaluated for growth, flowering, fruiting, yield and quality of fruits at CIAH, Bikaner. Three plants of each germplasm were planted at 4×6 m distance. Out of collections, 14 germplasms adopted well to hot arid conditions. The maximum plant height 2.70 m and canopy 2.5×2.6 m was recorded in Collection No. 17 after the sixth year of planting. Flowering and fruiting in all types started after 3-4 years of planting. The flowering during the month of August-September was found better for fruiting and yield. Pests and disease pressure was low under arid environment. At initial stage, fruiting in germplasm varied from 10 to 40 fruits/plant with a fruit weight of less than 100 g. The quality parameters of fruits also varied among collections. In the present paper, performance of anardana type pomegranate under arid conditions has been discussed.



Genetic analysis in ridge gourd [*Luffa acutangula* (*Roxb.*) L.] under hot arid conditions

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ABSTRACT

The present investigation was conducted to determine variability, heritability, genetic advance and correlation of different yield and yield contributing characters of ridge gourd. The range of variation was higher in fruit length (3.66-6.93cm). The highest GCV (29.40) and PCV (32.29) was recorded in node at which first female flower appeared. The heritability estimate values in broad sense were higher for all the traits except number of branches/ plant, days to first female flower and days to first fruit harvest. The marketable fruit yield per plant had positive and significant correlation with fruit weight (0.786) and fruit length (0.448) at phenotypic level.



Studies on utilization of small size kinnow fruits for preparation of squash

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ABSTRACT

Kinnow mandarin is an important fruit crop of sub-tropical and hot arid region. It is being grown in about 6500 ha in western parts of Rajasthan where irrigation facilities are available. It is sour- sweet in taste and fruits are available during November to January months. The fruit is generally used for fresh consumption and juice preparation. The post harvest losses in kinnow fruits has been faced by growers because of improper marketing and processing. The under size fruits are not suitable as such for fresh consumption because of small size and low percentage of juice recovery. The selling price of such fruits is also low in the markets. Therefore, the under sized kinnow fruits can be properly utilized for value addition purpose. The small sized unmarketable kinnow fruits can be used for making juice and ready-to- serve drinks. The physio-chemical characters of under size and normal fruits and its post harvest utilization studies were carried out at CIAH, Bikaner during 2010-11. The fruits were cut down in halve and juice was extracted by juicer. The recovery of juice was 35-40 per cent. To the filtered juice, sugar @ 700 g per litre of juice was added to prepare the delicious drink. The squash was stored in bottle at ambient temperature for a period of 45 days with and without mixing of KMS as preservative. Organoleptic testing was done at 15 days interval with a panel of ten people on score basis. The squash was mixed with water in ratio of 30:70 for sensory evaluation of product. The sensory evaluation revealed that squash mixed with 30:70 ratio of water was acceptable by the panel of judges. In this paper, post harvest utilization of undersized kinnow mandarin fruits for value addition has been discussed.



Application of rock phosphate in composting improving the quality of compost

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ABSTRACT

A steady decrease of substrate total biomass subjected to composting was noted with the progress of incubation days irrespective of phosphorus enrichment. The phosphorus enrichment up to 4 % pps as phosphate rock with the substituted biomass significantly increased the rate of decomposition and lead to a faster loss of total substrate biomass. However at 8 % pps enrichment the total biomass loss was less compared to phosphorus enrichment at 4 % P205 and recorded at par to 1 % enrichment. A steady increase in total N % of decomposable substrate biomass was recorded with the progress of composing. The phosphorus enrichment @ 1 % PPs was more effective in increasing total N percentage of decomposable biomass as compared to 4 and 8 % enrichment. The enrichment of the compost with rock phosphate not only enhanced the availability of phosphorus from the insoluble source by its dissolution but also composting also increased the calcium and magnesium improved the quality of the final product. After 120 days of incubation the release of citrate soluble phosphorus was higher compared to water-soluble phosphorus after 90 days of incubation. In all the stages of composting citrate soluble phosphorus was higher compared to water-soluble phosphorus in the compost mixture irrespective of level of enrichment with MPR compared to control. Compost charged with either 1 % or 4% P205 and 8% P20, attained the highest level of citrate soluble phosphorus with the progress of composting at 120 DAI. Release of water-soluble phosphorus followed similar trend as citrate soluble phosphorus. The only difference was being lesser amount of phosphorus in water-soluble form than in citrate soluble form organic carbon content in the raw material was as high as 40 per cent in the beginning of incubation, which considerably reduced after 30 days, and steadily decreased with time till reached a minimum value of 6.3 percent after 120 days.



Field evaluation of bottle gourd genotypes for resistance against *Alternaria* leaf blight in Western Rajasthan

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ABSTRACT

The results presented in Table 1 reveal that there was significant variation in all the genotypes evaluated against *Alternaria* leaf blight of bottle gourd. Out of seventeen genotypes, none was found immune, while six varieties such as Pusa Naveen, Pusa Samridhi, Pusa Santushti, Pusa Sandesh, PSPL and Arka Bahar were resistant having 5.25-8.75% disease intensity. Five genotypes viz., PN-22, DBG-6, DBG-5, Azad Harit and IC-567538 were moderately resistant (11.5 to 21.25% disease severity) against this disease and remaining six genotypes such as Panchmahal Local, Sriganganagar Local, Jodhpur Local, Udaipur Local, Chomu Local and Thar Samridhi proved moderately susceptible with disease severity ranging from 25.50- 28.75%. Carmody et al. (1985) screened the muskmelon cultivars and found that three cultivars (TAM-Uvalde, TAM-Mayan Sweet and Greenflesh Honeydew) were resistant against *Alternaria* leaf blight of muskmelon. Kumar and Rani (2010) noted that three entries viz., RAUP-32, RAUP-34 and Pusa (B)-35 were found to be resistant and twelve entries showed moderately resistant against *Alternaria* blight in pignonpea.



Insect pest management in aonla (*Emblica officinalis Gaertn.*) by farmers of Gujarat

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ABSTRACT

A survey was carried out in the panchmahals and Vadodara districts of Gujarat. Sixty aonla growers were randomly selected and interviewed at their farms. The survey was done during June August, 2005. The data were collected in a structured interview schedule. Majority of the aonla farmers (54%) reported the infestation of shoot-gall maker. Forty nine per cent aonla farmers reported the infestation of bark-eating caterpillar. Thirty per cent farmers adopted the practice of dipping monocrotophos in cotton and kept inside the hole and plugged the hole with cow dung. Even though monocrotophos was effective in controlling the pest, its usage had been banned in fruit crops. Nineteen per cent farmers did not take up any control measures. The larvae bore usually at the joints between twig and main stem and tunneled straight downward; presence of silken webs comprising of excreta of larvae indicated the damage. The silken galleries might be removed and chlorpyrifos (0.07%) or carbaryl (0.1 %) might be sprayed on tree trunk. Dichlorvos (0.1 %) might be injected into bored holes. Nineteen per cent aonla farmers reported the incidence of aphid and they sprayed monocrotophos. Both nymphs and adults sucked the cell sap from tender shoots, leaves and devitalized the plants. They exuded honeydew on which sooty mould developed. Dimethoate (0.03%) or phosalone (0.05%) might be sprayed to manage the pest. Fourteen per cent aonla farmers reported the incidence of mealy bug. Both nymphs and adults sucked the cell sap from tender shoots, leaves and devitalized the plants. Few farmers (11 %) reported the incidence offruit borer in aonla. They sprayed dimethoate (0.2%) thrice at tri-weekly interval. Aonla cultivars NA-7, Krishna, Chakaiya, Banarasi, Kanchan,



Francis, Anand-I and Anand-2 were susceptible to borer. The caterpillar bore into the fruits and fed within causing premature drop of fruits during monsoon season, maximum damage during July and August. Nine per cent aonla farmers reported the incidence of hairy caterpillar. They sprayed dimethoate. The caterpillar on hatching fed voraciously and gregariously on tender leaves and defoliated the plants. The larvae later on migrated to entire plant and fed on leaves leading to defoliation was 30% in NA-7 (CIAH, 4). The caterpillar bore into the fruits and fed within causing premature drop of fruits during monsoon season, maximum damage during July and August. Nine per cent aonla farmers reported the incidence of hairy caterpillar. They sprayed dimethoate. The caterpillar on hatching fed voraciously and gregariously on tender leaves and defoliated the plants. The larvae later on migrated to entire plant and fed on leaves leading to defoliation.



Standardization of micro-propagation technique for acid lime (*Citrus aurantifolia* Swingle)

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ABSTRACT

In an endeavour to standardize the protocol for micro-propagation of acid lime maximum survival of explants was found when the explants were grown on media comprising of BAP (0.5 mg l^{-1} and 1.0 mg l^{-1}), Kinetin (0.5 mg l^{-1}), BAP (0.5 mg l^{-1}) + NAA (0.5 mg l^{-1}) Minimum time required to bud break (27.45 days), maximum shoot (8.40) and maximum length of shoot (2.65) were recorded BAP (0.5 mg l^{-1}) + NAA (0.5 mg l^{-1}). As regard to rooting parameters, the maximum (100 per cent) survival of micro shoot for rooting, minimum time required to sprout the bud (18.50 days) and maximum roots (4.80) were recorded in medium supplemented with IBA (0.5 mg l^{-1}). Maximum length of root (5.80) was observed on MS medium supplemented with NAA (0.5 mg l^{-1}) + IBA (0.5 mg l^{-1}). The In-vitro propagated plantlets got acclimatized successfully by transferring them in small pots containing a potting mixture of soil: perlite: vermiculite in equal proportion. Following it 90 per cent survival of plantlets was observed.



Effect of high density planting systems on the productivity of NA-7 aonla under rainfed conditions

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ABSTRACT

An investigation on high density planting systems was carried out on young trees of aonla (*Emblica officinalis Gaertn*), planted in 2001, to study the influence of different planting systems and densities on production and productivity of aonla under rainfed condition in the semi-arid ecosystem of western India. Plant height was recorded significantly highest in double hedgerow system having maximum number of plants per unit area, among the different planting systems. However, maximum values of root-stock girth, scion girth and plant spread were recorded in the square system of planting, but the differences among the treatments were non significant. Individual plant gave high yield in square system, but on per unit area basis, double hedgerow system exhibited almost double the crop over square system of planting. Planting systems and plant densities had considerable influence on TSS, vitamin C and sugar contents. Other physico-chemical characters of fruits were not affected significantly by the different planting systems. Based on the overall evaluation data, it can be concluded that by adopting double hedgerow system of planting in aonla the productivity per unit area can be enhanced to nearly double over conventional square system of planting under the rainfed condition in semi-arid ecosystem.



Characterization of *Prosopis cineraria* (L.) Druce germplasm with suitable horticultural traits from the hot arid region of Rajasthan, India

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ABSTRACT

Sixteen germplasm accessions of *Prosopis cineraria* with suitable horticultural traits were identified from north-western Rajasthan, India, propagated clonally by budding on seedling rootstock and maintained in the field gene bank. Morphological characterization of seven-year-old trees of these accessions by 21 traits indicated a lot of variation among the accessions tested. Higher number of flowers per raceme was found in accession CIAH/K2, higher width of ripened pod in CIAH/K5, higher number of seeds per pod in CIAH/K12 and a higher weight of seed per pod in CIAH/K6. Overall, CIAH/K16 was found to be a superior genotype for most of the useful traits. High significant positive correlation was obtained with traits useful for horticultural values. Out of 62 random decamer primers for random amplification (RAPD) reaction, and four minisatellite core sequence for direct amplification of minisatellite DNA (DAMD) screened with these accessions, 12 RAPD and 2 DAMD primers were found polymorphic. Average polymorphism resolved by these markers among the accessions was 93.2%. Genetic diversity revealed by Jaccard's co-efficient was between 0.11 and 0.77, and four major clusters were identified among these accessions by phylogenetic analysis using NTSYSpc-2.02e software.



Determination of root distribution in ber (*Ziziphus mauritiana*) by root excavation

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ABSTRACT

The rooting pattern studies on nine years old trees of “Gola” *ber* were carried out during post-rainy season (October 2007) and spring season (March 2008). It was observed that root density was found maximum at nearest radial distance from tree trunk, i.e. 0-80 cm (71.20 and 86.72% during post-rainy and spring season, respectively) and an increase in distance from the tree trunk resulted in reduction of root density considerably. It was also observed that maximum root density was found at deeper soil layers i.e. at 25 - 50 cm soil depth during post rainy and at 50 - 75 cm soil depth during spring season. Thick (> 1.5 cm in diameter) and medium (> 0.5-1.5 cm in diameter) comprised major amount of roots during both seasons. The amount of thick type of roots was more during spring season as compared to post rainy season. Distribution of feeder roots (0.2 cm in diameter) revealed that these were maximum at 0-80 cm distance from tree trunk during post rainy and spring season. Thus, it emphasizes need to maintain adequate moisture in *ber* orchard during spring and summer months. The fertilizer application should be done during post-rainy season for efficient use of nutrients.



Genetic variability studies in ridge gourd under arid environment

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ABSTRACT

Ridge gourd (*Luffa acutangula* L.) is an important cucurbit native to India. Despite economic and nutritive importance, not much attempts have been made on its genetic improvement for cultivation under stressed arid environment. Considering the available genetic variability with respects to yield and other desirable characters, the study was carried out with a view to assess the scope of improvement in ridge gourd through selecting promising genotype: The experimental material for the present investigation consisted of 20 genotypes collected from the tribal areas of Rajasthan and northern Gujarat. These were evaluated at the experimental farm of Central Institute for Arid Horticulture, Bikaner under arid agro-climatic conditions. The experiment was conducted in randomized block design with three replications during the rainy seasons of 2003-04 & 2004-05. Research findings have been presented on 18 quantitative characters, viz., days to appearance of first male flower (DFMF), days to appearance of first female flower (DFFF) and days to first harvest (DFH) after sowing; node to first fruit set (NFF); fruit length (FL), fruit diameter (FD), fruit weight (FW), number of fruits/ plant (NF/P), fruit yield/plant (FY/P), vine length (VL), leaf length (LL), leaf width (LW), leaf size (LS), mature fruit length (MFL), number of seeds/fruit (NS/F), seed length (SL), seed width (SW) and seed test weighted (STW). The collected data were subjected to statistical analysis adopting standard procedures with computer based INDOSTAT package. The analysis of variance revealed highly significant mean square estimates for all the 18 characters indicating sufficient variability in the germplasm. The extent of variability



in ridge gourd genotypes was measured in terms of mean, range, genotypic and phenotypic coefficient of variation. The genotypes depicted considerable diversity in fruit yield and quality attributes when grown under arid environment and thus showed great potential for selection of promising types. The days to appearance of first male and female flower ranged between 32.26 - 45.03 and 40.66 - 57.23 days from sowing, respectively. The days taken for first marketable harvesting varied from 50.70 to 67.00 with a population mean of 58.02 days after crop sowing. The maximum fruit length of 38.36 cm was recorded in the genotype AHRG-20 and the minimum of 7.60 cm in AHRG-15. The number of fruits per plant ranged from 6.70 to 12.60 with a population mean of 9.08. The genotypes AHRG-1, AHRG-4 and AHRG-15 recorded more than 12 fruits per plant. The marketable fruit yield/plant ranged from 0.356 to 1.963 kg with a mean of 0.935 kg. The maximum fruit yield 1.963 kg/plant was obtained in AHRG-1. On the basis of fruit quality, earliness and yield, the genotypes AHRG-1, AHRG-3 and AHRG-4 were found to be the most promising for growing under hot arid environment. In general, the estimates of PCV were higher than GCV for all the characters. Differences between phenotypic and genotypic coefficient of variations were low. This indicates the low impact of environment on the expression of characters. Fruit yield/plant, fruit weight and fruit length exhibited the highest PCV and GCV estimates. High values of GCV are an indication of high genetic variability among the genotypes and thus the scope for improvement of these characters through simple selection would be better.



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Thar Manak to quench thirst in desert

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ABSTRACT

The Thar Manak is a new variety of mateera. It is improved potential variety for the desert region, providing 50-80 tonnes/ha of fruits. The formers are getting more return by cultivating this variety.



**Leaf curl disease of tomato in Haldwani
(Uttarakhand), India region is caused by a
begomovirus with satellite molecule DNA b**

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ABSTRACT

The leaf curl disease of tomato was observed in the Haldwani region of Uttarakhand, India during 2004–2007 with an average disease incidence of 49.8 and 73.7% during the month of October and February, respectively. The virus isolate from the infected tomato plants was transmissible to healthy tomato plants by whiteflies (*Bemisia tabaci*), and the inoculated plants showed typical leaf curl symptoms with a latent period of 16–18 days. The total DNA was extracted from the infected plants and subjected to polymerase chain reaction to amplify the genomic components. The coat protein (CP) gene of *750 nt was amplified using a set of CP gene specific primer and sequenced (EU847240). Sequence analysis of 701 nt from the N0 terminal region revealed that it had a sequence identity of more than 90% with other isolates/strains of Tomato leaf curl New Delhi virus. A satellite molecule, DNA b of *1.4 kb was also amplified using universal DNA b-specific primers, cloned and sequenced (EU847239). The isolated DNA b was 1370 nt in length and had a nucleotide sequence identity of 91–93% with DNA b associated with cowpea severe leaf curl and tomato leaf curl disease (TomLCD) reported from India and



Pakistan, respectively, and followed by 79% with DNA b associated with TomLCDs reported from Rajasthan. This result showed that the satellite DNA b was associated with TomLCD in Haldwani.



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Complete genome sequence of an isolate of Clerodendron yellow mosaic virus – a new begomovirus from India

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ABSTRACT

Clerodendron inerme, a common hedge plant grown in India, is affected by a yellow mosaic disease caused by a begomovirus. In the present study, the complete genome (DNA A) of this virus was cloned and sequenced. The total size of DNA A is 2760 nucleotides. The genome of this virus contains six open reading frames and a non-coding intergenic region of 293 nucleotides. Nucleotide sequence comparison analysis revealed maximum sequence identity with Papaya leaf curl virus-Pakistan [Pakistan: Cotton: 2002] (73.9%). As this virus had less than 89% identity with other begomoviruses, it was identified as a new begomovirus species and tentatively, named as Clerodendron yellow mosaic virus-[India:New Delhi:2007] (CIYMV-[IN:ND:07]).



Polymerase chain reaction and nucleic acid spot hybridisation detection of begomovirus (es) associated with apical leaf curl disease of potato

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ABSTRACT

Apical leaf curl disease of potato (PALCD) is most likely to be caused by begomovirus (es) and it is very important to produce disease-free potato seed tuber as these viruses are transmitted through seed tuber from one generation to the next. In the present investigation, 27 potato leaf samples were tested by polymerase chain reaction (PCR) using coat protein gene of Tomato leaf curl New Delhi virus - [Potato] (ToLCNDV-[Pot]) specific primers and nucleic acid spot hybridisation (NASH) using DNA A, DNA B and DNA b components of ToLCNDV-[Pot] associated with PALCD as probe. Out of 27 samples tested by these two techniques; PCR could detect the presence of DNA A of ToLCNDV in 19 samples and only two samples were found positive for DNA A and DNA B of ToLCNDV by NASH. These results suggest that the utility and sensitivity of the PCR technique in large scale screening for the production of disease-free potato seed tubers.



Indian Council of Agricultural Research, 81(8): 760-763, 2011

Soil properties, root growth, water-use efficiency in brinjal (*Solanum melongena*) production and economics as affected by soil water conservation practices

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ABSTRACT

A field experiment was conducted during 2004-2009 to study the effect of soil water conservation practices on soil properties, root growth, water-use efficiency, production, and economics of brinjal (*Solanum melongena* L.) under irrigated condition in loamy sand soil of hot arid environment. Application of mulch treatments was found superior with respect to moderation of hydrothermal regimes of soil. The moisture retention capacity and hydraulic conductivity of soil were enhanced by 7.6 to 28% due to FYM mulch as compared to control. FYM mulch, generally, increased the soil chemical fertility status (available N, P and K, exchangeable Ca, and K) by 39 to 87%. The root length density, root mass density and root volume were higher by 370, 392 and 198%, respectively under FYM mulch treatment as compared to the control. These treatments also increased water use efficiency and fruit yield by 24.16 to 34.79 kg/ha and 15 to 19 tonnes/ha, respectively over control. Results indicated that application of soil water conservation practices in arid tropical soils improved soil properties, root growth, water use efficiency and crop yield of brinjal.



Physiological disorders in fruits in arid region- A review

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ABSTRACT

Physiological disorder are distinguished from other disorders in that they are not caused by living organisms, but are caused by non-living, abiotic situations and cause a deviation from normal growth. Most of them are not reversible once they have occurred. The present review attempts to address this issue taking into account the fruit in general and fruits of arid region in particular.



Genetic divergence in hermaphrodite ridge gourd (*Luffa acutangula*)

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ABSTRACT

The present investigations were carried out on 35 genotypes collected from different locations of India and evaluated for 8 quantitative traits. A wide range of variability in shape (long, round, oblong) and colour (green, light green, dark green) of hermaphrodite ridge gourd [*Luffa acutangula* (Roxb.) L.] fruits exist in India. The studied genotypes were grouped in to four clusters irrespective of geographic divergence, indicating no parallelism between geographic and genetic diversity. Cluster IV was very large containing 16 genotypes, while cluster III was represented by three genotypes. The maximum inter-cluster distance was recorded between cluster II and IV, while minimum distance was between cluster I and II. Cluster IV showed superiority for fruit yield per plant which indicates the potentiality of these genotypes, providing basic material for future improvement breeding programmes of hermaphrodite ridge gourd.



Efficacy of urea and zinc on sweet orange cv. Sathgudi under hot semi-arid environment of west em India

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ABSTRACT

An experiment was conducted on sweet orange cv. Sathgudi to study the effect of urea and zinc, alone and in different combinations, on growth, yield and quality of Sathagudi sweet orange during the year 2002 and 2004 under semi-arid conditions of Panchmahals district of Gujarat. Treatments comprised of zinc as foliar spray (0.5%) alone and in combination with different nitrogen doses in the form of urea in soil as well as foliar spray. Soil application of urea was given in the last week of June and first week of September during both the years of experimentation. Results of the experiments revealed that the growth of plants in terms of plant height, stem girth and plant spread, yield in terms of weight of fruits, fruit size, and quality with respect of juice content, TSS, total sugar and vitamin C increased with the soil application of urea 350 g per tree over control. The parameters further showed an increasing trend when urea was sprayed in addition to soil application. An increase in the percentage of urea in solutions for spray from 0.5 to 1.5 % increased the growth, yield and quality of sweet orange fruits. Among the various treatment combinations evaluated, urea in soil (350 g) + zinc (0.5%) + Urea as foliar spray (1.5%) was found to be the best to increase the growth and yield of quality fruits under semi-arid ecosystem of western India.



Pest management in mango by farmers of Central Gujarat

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ABSTRACT

Mango (*Mangifera indica* L.) nicknamed as king of fruits in India is the major fruit crop. It tops the list of preference of farming community for cultivation due to endless demand in domestic as well as international market. Mango cultivar 'Kesar' is one of the finest delicacies from Gujarat exported to Europe. In the package of practices of cultivation of mango to be followed by the farmers plant protection occupies a significant role. Negligence of this aspect brings about considerable loss of yield and quality. Mango malformation is still an unsolved mystery. Many insects and fungal pathogens attack mango. Keeping this in view, a survey was conducted to assess the adoption level of pest management in mango by the farmers of Central Gujarat. A survey was conducted in Panchmahals and Vadodara districts. Sixty mango farmers were randomly selected. These farmers were interviewed at their farms during June August, 2005. Information regarding pest management measures practised in these orchards was collected in a structured interview schedule which encompassed the questions pertaining to the status of a pest disease, its salient cause, symptoms, extent of damage, major management strategies, reasons for non-adoption of the recommended practices etc.



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Influence of organic and inorganic nutrient sources on soil properties and quality of aonla in hot semi-arid ecosystem

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ABSTRACT

An experiment was conducted on young of NA-7 aonla trees to evaluate the influence of various levels of organic and inorganic nutrient sources on morphomatrix, productivity and quality attributes and soil quality during 2007 and 2008 under hot semi-arid ecosystem. Significant improvement was recorded in soil quality by application of different combinations of cakes, FYM and CPP. The vegetative growth, yield and quality of aonla were influenced significantly by different sources of nutrients. Vegetative growth was recorded significantly highest in the plants treated with farm yard manure coupled with standard dose of NPK. Various treatment combinations of organic nutrient sources increased the fruit yield and quality. Maximum yield per plant (32.15 kg) was recorded with the plants, which were treated With FYM plus standard does of NPK. Quality parameters like TSS, total sugars, vitamin C and total phenols were influenced considerably by the application different organic sources of nutrients. The soil parameters in terms of pH, EC, bulk density, hydraulic conductivity and organic carbon were also improved significantly by different sources of organic nutrients. Considerable improvements in the soil physical and chemical properties were observed by the use of different sources of organic nutrients.



Morphological diversity analysis among watermelon (*Citrullus lanatus* (Thunb) Mansf.) genotypes

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ABSTRACT

A study was carried out during summer season of 2009 and 2010 to determine variability, heritability, genetic advance, correlation, path analysis and genetic divergence in watermelon for eleven quantitative characters. The TSS (89.5%) had maximum heritability followed by rind thickness (81.7%), days to first fruit harvest (81.2%), number of primary branches per plant (80.7%), fruit yield per plant (79.7%), node at which first female flower appeared (79.3%) and main vine length (79.0%) which provides ample scope for varietal improvement through selection. Significant positive correlation was found between fruit yield per plant and node at which first female flower appeared (0.440), number of primary branches per plant (0.342), fruit weight (0.339) and number of fruits per plant (0.077). The maximum direct effect on fruit yield per plant was exerted by fruit weight had maximum positive direct effect (1.023) at phenotypic level followed by number of fruits per plant (0.862). Therefore, selection should be practices on these characters these characters in breeding programme of watermelon.



Preliminary evaluation of bael varieties under rainfed conditions of hot semi-arid ecosystem of western India

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ABSTRACT

Evaluation of bael varieties under rain-fed, hot semi-arid ecosystem of western India was conducted. Nine bael varieties, viz., NB-5, NB-7, NB-9, CISH-B-1, CISH-B-2, Pant Shivani, Pant Urvashi, Pant Aparna and Pant Sujata (10-year-old) were evaluated for growth, yield and quality parameters. Maximum yield per tree was recorded in NB-9 (25.00 kg) followed by CISHB-2 (22.74 kg), NB-5 (20.00 kg). Fruit weight was recorded maximum in NB-7 (3.15 kg) followed by Pant Shivani (2.20 kg) and Pant Urvashi (2.00 kg). Pulp TSS was found highest in NB-9 (38°B) followed by Pant Aparna (37°B) and Pant Shivani (36°B). The other parameters varied considerably. NB-9 and CISHB-2, NB-5 and CISHB-1 could be recommended for commercial cultivation.



Pods of khejri (*Prosopis cineraria*) consumed as a vegetable showed functional food properties

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ABSTRACT

The arid plant *Prosopis cineraria* (Fabaceae) is known as Khejri in India or the golden tree of Indian deserts. The dried pods are consumed as a vegetable and leaves as traditional medicine to cure a wide range of diseases in the state of Rajasthan, India. The pods of this plant have not been investigated for their bioactive components; hence we have done so in this study. The dried pods were boiled with water to afford the aqueous extract. Extraction of the residue gave methanolic extract. The lipid peroxidation (LPO) and cyclooxygenase enzymes (COX-1 and -2) inhibitory activities of extracts and major compounds present in the bioactive extracts were then determined. Purification of bioactive extracts yielded compounds 1–7. The absorbance of 1–7 at 570 nm ranged between 0.15 and 0.45 at 50 lg/mL whereas vitamin C and tert-butylhydroquinone (TBHQ) at 25 lg/mL gave an absorbance of 0.5 in the MTT [3-(4,5-dimethylthiazole-2-yl)-2,5-diphenyltetrazolium bromide] assay. At 25 lg/mL concentration, compounds 1–7 inhibited LPO, COX-1 and -2 enzymes between the ranges of 15–87%, 21–67% and 16–59%, respectively. This is the first report of the chemical and biological activities of the edible part of this plant.



The Asian Journal of Horticulture, 7(1): 186-189, 2012

Studies on variability in jamun (*Syzygium cuminii* Skeels) from Gujarat

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ABSTRACT

Jamun is found scattered throughout Gujarat. A survey was carried out to identify the elite genotypes. Flowering, fruiting and fruit quality attributes of sixteen genotypes were studied. The study revealed that there was a wide variation among the genotypes. Earliest flowering (Mid February) took place in GJ-1, GJ-2, GJ-3 and GJ-10. Maximum panicle length (15.50 cm) and number of fruits per panicle (28.00) were found in GJ-2. Collection number GJ-3, GJ-2, GJ-10 and GJ-14 have been found earliest (First Week May) in ripening period, while GJ-16 and GJ-13 ripened at the last (Last June). Maximum yield per plant was recorded in GJ-2 (152.00 kg). Individual fruit weight ranged from 9.80 to 21.50 g, length from 1.98 to 3.20 cm and pulp percentage from 79.67 to 86.37. There was a wide variation in chemical characters also. T.S.S. per cent varied from 9.60 to 12.30, total sugar 7.40 to 9.14% and vitamin C 33.00 to 43.00 mg/100g. On the basis of overall performance GJ-2, GJ-3 and GJ-8 were found to be promising among all the genotypes.



**Pupal parasitization of *Anaphaeis aurota* Fabricius
(*Lepidoptera: Pieridae*) infesting *Capparis decidua*
(Forsk.) by *Brachymeria albicrus* (Klug)
(*Hymenoptera: Chalcididae*)**

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ABSTRACT

During the surveys conducted in CIAH Farm and in Desnok, Bikaner in the month of November and December, 2010, *Capparis decidua* (Forsk.) commonly known as kair was found to be heavily infested with *Anaphaeis aurota* Fabricius commonly known as Pioneer or Caper white. *C. decidua* is a bushy shrub used in landscape gardening, afforestation and reforestation in semi desert and desert areas and it provides assistance against soil erosion. The grown caterpillars of *A. aurota* easily strip off the branches, devouring leaf after leaf causing great damage. The pupae of *A. aurota* were found to be parasitized with *Brachymeria albicrus* (Klug). *B. albicrus* has been earlier reported from southern India, Orissa and from Haryana as *Brachymeria kurukshetraensis* Farooqi, Husain & Ghai. *B. kurukshetraensis* Farooqi is a junior synonym of *B. albicrus*. The mean per cent parasitization of Pioneer butterfly by *B. albicrus* at CIAH farm and at Desnok, Bikaner was 49.5 and 47.5 respectively and the mean per cent emergence of the mature adult parasitoids from the parasitized pupae was 15.5 and 14.0 respectively.



Influence of food plants on growth and development of *Chrotogonus trachypterus* Blanchard

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RCA, MPUAT, Udaipur (Rajasthan) – 313001

ABSTRACT

Laboratory experiments were conducted with the surface grasshopper, *Chrotogonus trachypterus*, to evaluate the effect of food plants on its growth and development. As indicated by a growth index for hoppers, in descending order of effectiveness were; lucerne, wheat, barley, mixed food, oats, chickpea, Bermuda grass, spinach, nut grass and pigweed. On lucerne, hoppers took the shortest period (17.40 days) to develop into fledglings, while on pigweed; development took the longest (25.25 days). Hoppers had 100 per cent survival on lucerne, wheat and barley; survival was lowest when reared on pigweed: 82.50, 72.50 and 67.50 per cent for hopper survival of the IVth, Vth and VIth instars respectively). However, irrespective of the food plant, the sixth instar hoppers developed into fledglings, showing acent (emergence the 100 per cent adult) per cent survival. The effect of different food plants on food utilization indices evinced that efficiency of conversion of ingested food (ECI) was high when the hoppers were reared either on wheat (36.53%) or mixed food (35.20%), but pigweed (16.21%) followed by nut grass (19.28) had lowest ECI. The approximate digestibility (AD) was high when the hoppers were reared on lucerne (45.20%) and significantly low in gram (38.39%). The efficacy of conversion of digested food (ECD) into body substances was significantly the maximum for hoppers raised on wheat (89.50%) and was significantly the lowest for hoppers on pigweed (42.14%).



Changes in soil properties under tree species

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ABSTRACT

A study was conducted to study the effects of ber (*Ziziphus mauritiana* Lamk), drumstick (*Moringa olerifera* Lam), karonda (*Carissa congesta* Wt.) and khejri (*Prosopis cineraria* L. Druce) on the physical and chemical properties of soil at different depths (0–15, 15–30, 30–45 and 45–60 cm). The increase in the porosity and water-holding capacity and decrease in the bulk density (of subsurface soils) in the sites under plantations were marginal, when compared to open sites. There was slight decrease in the pH of soil under vegetated area, whereas no appreciable change in EC was observed. There was an appreciable increase in the organic carbon (0.04 to 0.13%) and available nitrogen content (69 to 100 kg/ha) in the sites under vegetation. Fruit plants, particularly ber and drumstick growing in the arid region indicated the process of deposition of bases such as Ca and Mg in the surface layers from lower strata. Overall results showed that exchangeable cations such as Ca, Mg, and Na and available P and K have depicted a poor potential activity in the maintenance of fertility which is affected by the young nature of plantation. The increase/decrease of soil properties due to the influence of plantation was more in surface (0–15 cm) and subsurface (15–30 cm) than in the sub-surface layers of 30–45 and 45–60 cm. The results obtained from the physical and chemical analyses indicated that among the four different fruit plantations, ber recorded substantial improvement and maintenance in soil fertility followed by drumstick. The nutrient return through litter fall followed the order $K > N > Ca$ in *Z. mauritiana* and *M. olerifera* and $N > Ca > K$, $Ca > N > K$ in *C. congesta* and *P. cineraria* respectively. The soils belong to the order Entisol and the calcareous pH is well adopted for the plantation of these fruit trees.



Florida Entomologist, 95(4): 848-853, 2012

Report of *Homoeocerus variabilis* (Hemiptera: Coreidae) on khejri (*Prosopis cineraria*) in Rajasthan, India: incidence and morphometric analysis

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ABSTRACT

An infestation of *Homoeocerus variabilis* Dallas (Hemiptera: Coreidae) on khejri, *Prosopis cineraria*, was first noticed in 2010 at the Experimental Farm of Central Institute for Arid Horticulture and other fields of Bikaner district, Rajasthan, India. The maximum incidence was observed in December (66.7%) and minimum in June (16.7%). The number of this bug ranged between 27.3 and 222.9 adults per plant. This species is characterized by an ochraceous body with a broad red basal fascia on the pronotum between the humeral angles, small pale scutellum, antennae 4-segmented, the basal part of second and third segment is pale yellow, third segment flattened at the tip and fourth segment is the shortest. The mean body lengths of the male and female adult vary and were recorded as 12.2 mm and 15.5 mm, respectively.



Conservation and management of plant genetic resources of arid fruits: A review

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ABSTRACT

Arid climate is characterized by harsh environmental conditions such as low rainfall, high evapo-transpiration and high temperature. The arid zone soils are very poor in fertility, organic matter and water holding capacity. The soils of the north-western arid region described as “desert soils” and order of Aridisols are light in texture. The ground water resources is not only limited but is also of saline quality. The average annual rainfall is very low and varies from 100 mm in north-western sector of Jaisalmer to 450 mm in the eastern boundary or arid zone of Rajasthan. The rich genetic diversity is available in arid fruit crops such as ber (*Ziziphus mauritiana*); boradi (*Ziziphus rotundifolia*), Lasoda (*Cardia myxa*), Ker (*Capparis decidua*), Phalsa (*Grewia subinaequalis*), Pomegranate (*Punica granatum*), Date palm (*Phoenix dactylifera*), Bael (*Aegle marmelos*), Pilu (*Salvadora spp.*), Karonda (*Carissa carandus*), Fig (*Ficus carica*), Wood apple (*Feronia limonia*), Mulberry (*Morus spp.*), Manila (*Morus spp.*), Manila tamarind (*Pithecellobium dulce*), etc. and it should be conserved for crop improvement programme. Due to hardy plant types, these fruit plants can thrive well under drought situations, which is a common feature in arid regions. The fruit crops which have the potential for commercial exploitation are yet to be fully exploited to their potential for providing food and livelihood security in semi-arid parts of the country. These fruit plant species produce edible nutritious fruits and other products of economic importance. In this paper, the genetic variability, conservation and utilization in arid fruits have been discussed for genetic improvement and sustainable production in arid regions.



Indian Journal of Arid Horticulture, 7 (1-2):12-15, 2012

Genetic variability and heritability for quality characters in bottle gourd (*Lagenaria siceraria* Stand.) for rainfed system

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ABSTRACT

The study was carried out on twenty genotypes of bottle gourd collected from diversified areas of the country assessed under rainfed condition for genetic variability, heritability and genetic advance in respect of characters. The genotype LS-6 recorded the highest fruit yield per plant, highest no of fruits per plant, highest fruit set percent, followed by LS-20. The phenotypic and genotypic coefficient of variation for different characters ranged from 6.270-34.045 and 3.749-30.732 respectively. The highest PCV and GCV were observed: plant, fruit length, no. of fruits per plant and sex ratio indicating the extent of variability based in these characters. High heritability coupled with higher genetic gain was observed for no. of seed per fruit, fruit length, no. of yield per plant indicating the additive gene action. Days to first fruit harvest showed moderate to low when genetic gain expressed non-additive gene action governing these characters.



Impact of climate change on population dynamics of insect pests

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ABSTRACT

The occurrence of climate changes is evident from increase in global average temperature, changes in the rainfall pattern and extreme climatic events. These seasonal and long term changes would affect the fauna, flora and population dynamics of insect pests. The abiotic parameters are known to have direct impact on insect population dynamics through modulation of developmental rates, survival, fecundity, voltinism and dispersal. Among the climatic factors, temperature is an important factor. The studies showed that, declined survival rate of brown plant hopper *Nilaparvatha lugens* (Stal) and rice leaf folder, *Cnaphalocrocis medinalis* (Guen) at higher temperature indicates the impacts of rising temperature could do the changes in the pest population dynamics of rice ecosystem. The alteration in the voltinism also could be the results of warming and it is more profit to multivoltine species and voltinism could be reflected in changes in the geographical distribution. Beside these, elevated CO₂ also showed some impact on pest's population abundance, the crop grown under 2 the elevated CO₂ could alter the nutritional value of plants; it may alter the insect abundance and increase the 2 consumption rate of herbivores. Therefore climate change would result in changes in the population dynamics of insect pests. Thus temperature rise plays a pivotal role in insect population dynamics.



Inspirational factors in adoption and production of Kachri (*Cucumis callosus*) on large scale in hot arid parts of western Rajasthan: An assessment

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ABSTRACT

The study was conducted in Bikaner district of western Rajasthan and inspirational factors, which encourage the farmers to adopt and produce the kachri (*Cucumis callosus*) in hot arid eco-system, were assessed. The major inspirational factors which motivate the farmers for the adoption and production of kachri on large scale in hot arid eco-system were "substantial income from fresh fruits of kachri, substantial income from dried (dehydrated) kachri, low cost of cultivation, minimum loss due to the attack of insects and diseases, very low water requirement of the crop, high seed germination capacity of the crop, accessibility of drought hardy local varieties, the vegetables of mature kachri fruits is most favorite, kachri vegetable has a special test and flavour, its preserved items are most liked and acceptable in the society, high demand of kachri fruits in localities/ local markets/villages, high demand of value added products of kachri in the markets, very good storage life of the fruit. Among the major factors which restrain the adoption and production of Kachri at large scale in hot arid eco-system, were; scarcity of water, very low and erratic rainfall and occurrence of drought very frequently, lack of viable schemes and support system for kachri growers, no standardized technique is available for value addition of kachri, very deep and salty ground water, inadequate supply of electricity, poor marketing system and market intelligence, lack of knowledge and awareness among the farmers about improved technologies of kachri cultivation.



Prediction of biophysical attributes for high yielding genotypes of bitter gourd (*Momordica charantia L.*) for rainfed condition

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ABSTRACT

An investigation on prediction model to identify suitable genotype by character association and path analysis was undertaken with forty-six genotypes of bitter gourd. The results revealed that in general, the genotypic correlation coefficients were higher than the corresponding phenotypic correlation coefficient level. The fruit yield per plot had a strong positive and significant association with number of female flowers per plot, number of fruits per plot, fruit girth, fruit length, number of primary branches and main vine length. Node of first female flower appeared and days to first fruit harvest showed negative association with yield. The path analysis revealed that fruit length, 100 seed weight, no. of female flower per plot, no. of fruits per plot, no. of primary branches per plant and main vine length exhibited strong positive direct effect on yield per plot. Days to first fruit harvest, no. of seeds per fruit, fruit girth had direct negative effect on yield. Hence the selection based on these characters will be effective in formulating selection indices for improvement of high yielding genotypes in bitter gourd for zero irrigation system.



Inspirational factors in adoption and production of Kachri (*Cucumis callosus*) on large scale in hot arid parts of western Rajasthan: An assessment

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ABSTRACT

The study was conducted in Bikaner district of western Rajasthan and inspirational factors, which encourage the farmers to adopt and produce the kachri (*Cucumis callosus*) in hot arid eco-system, were assessed. The major inspirational factors which motivate the farmers for the adoption and production of kachri on large scale in hot arid eco-system were "substantial income from fresh fruits of kachri, substantial income from dried (dehydrated) kachri, low cost of cultivation, minimum loss due to the attack of insects and diseases, very low water requirement of the crop, high seed germination capacity of the crop, accessibility of drought hardy local varieties, the vegetables of mature kachri fruits is most favorite, kachri vegetable has a special test and flavour, its preserved items are most liked and acceptable in the society, high demand of kachri fruits in localities/local markets/villages, high demand of value added products of kachri in the markets, very good storage life of the fruit. Among the major factors which restrain the adoption and production of Kachri at large scale in hot arid eco-system, were; scarcity of water, very low and erratic rainfall and occurrence of drought very frequently, lack of viable schemes and support system for kachri growers, no standardized technique is available for value addition of kachri, very deep and salty ground water, inadequate supply of electricity, poor marketing system and market intelligence, lack of knowledge and awareness among the farmers about improved technologies of Kachri cultivation.



New Agriculturist, 23 (2): 205-208, 2012

Response of different date palm cultivars to varying concentration of ethephon on yields and yield attributing characters

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ABSTRACT

The study revealed that the maximum fruit size (length, breadth and volume) was observed in variety Halawy. The highest number of fruits per strand, number of bunches per tree and bunch weights were recorded highest under variety Zahidi. But yield was observed maximum in variety Halawy (per tree). The number of days in attaining fruit colour after colour breaking stage was counted minimum in Zahidi and maturity in Halawy. The fruit length, breadth and volume were found maximum under the treatment of ethephon at 1000 ppm when it was applied after colour breaking stage. The application of ethephon also produced more bunch weight and yield per tree. The less number of days in attaining fruit colour and maturity were counted minimum under the concentration of 1000 ppm than the control and other concentrations employed.



Effect of organic manure and biofertilizers on soil properties and growth of aonla under rainfed conditions of hot semi-arid environment

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ABSTRACT

The experiment was conducted on seven and eight years old trees of NA-7 aonla to evaluate the influence of various levels of organic (FYM, biofertilizers) and inorganic (NPK) sources of nutrients on morphometrix, productivity and quality attributes of aonla and soil quality during 2009-10 and 2010-11 under hot semi-arid ecosystem. Significant improvement was recorded in soil quality by application of different combinations of N P K, FYM and biofertilizers. The vegetative growth and soil quality were influenced significantly by different sources of nutrients. Maximum vegetative growth was recorded in the plants which were applied with standard doses of N P K which was closely followed by Farm Yard manure plus 50% of the standard dose NPK. The soil properties in terms of pH, EC showed declining trend whereas level of hydraulic conductivity, organic carbon increased with the application of various combinations of FYM and biofertilizers, whereas pH, EC, hydraulic conductivity, bulk density and organic carbon of the basin soil applied with standard dose of NPK were not improved considerably.



Response of plant density on growth, yield and quality of Pomegranate cv. Ganesh

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ABSTRACT

An experiment on response of planting density on growth, yield and quality of pomegranate cv. Ganesh was conducted during 2001 to 2004 in the Experimental field of Central Horticultural Experiment Station, Vejalpur, Panchmahals, and Gujarat under NG-NATP-HFNS project. Pomegranate variety cv. Ganesh was planted at four different spacing levels *i.e.* 5m x 5m (T1), 5m x3m (T2), 4m x2m (T3) and 2.5m x 2.5m (T4) having density of 400, 666,1250 and 1600 plants per ha, respectively in randomized block design with five replications purely under rainfed conditions of hot semi-arid ecosystem. Maximum plant height was recorded with planting density 2.5 m x 2.5m, while plant spread and stem girth was observed with 5m x 5m spacing during 3rd year. With regard to spacing, yield (3680 kg) per ha was recorded the maximum with plant density 2.5m x 2.5m, whereas size (6.50 cm x 6.90cm) of the fruit and quality characters were recorded the maximum in the planting density 5m x 5m under rainfed conditions of semi-arid ecosystem of western India.



Protocol standardization for micropropagation of *Citrus jambhiri* Lush using nodal segments of nucellar seedlings

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ABSTRACT

The present study was conducted during 2008-09 to standardized micropropagation protocol for rough lemon (*Citrus jambhiri* Lush: Rutaceae) using nodal segment of nucellar seedlings. The maximum survival of explants (100 per cent) and minimum time required to bud breaking (17.00 days) were observed with BAP 1.0 mg l⁻¹ + kinetin 1.0 mg l⁻¹ and BAP 0.5 mg l⁻¹ + kinetin 1.0 mg l⁻¹ respectively whereas maximum number of shoot (8.30) and length (2.60 cm) were recorded with BAP 2.0 mg l⁻¹ + kinetin 1.0 mg l⁻¹ and BAP 1.0 mg l⁻¹ + kinetin 1.0 mg l⁻¹ respectively. The plain MS medium unable to initiate rooting process but slight adding of hormone either NAA or IBA enhanced the process. The maximum (90 per cent) survival of microshoot for rooting on NAA (0.5 mg l⁻¹) + IBA (0.5 mg l⁻¹), minimum time taken to root induction (19.30 days) on NAA (0.1 mg l⁻¹) + IBA (1.0 mg l⁻¹) maximum number of root (5.90) on NAA (0.1 mg l⁻¹) + IBA (0.5 mg l⁻¹) and maximum length of root (6.60 cm) on NAA (0.5 mg l⁻¹) + IBA (0.5 mg l⁻¹) were recorded. The rooted plantlets were successfully acclimatized in green house, in pot containing sterile soil, perlite and vermiculite in equal proportion and found 85.00 per cent success after 60 days of transfer in glass house.



Role of betasatellite in the pathogenesis of a bipartite begomovirus affecting tomato in India

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ABSTRACT

Betasatellites are commonly associated with tomato leaf curl disease caused by begomoviruses in India. This study demonstrates the role of a betasatellite in the pathogenesis of tomato leaf curl New Delhi virus (ToLCNDV), a bipartite begomovirus affecting tomato in India. For infection, accumulation, systemic movement and disease induction by ToLCNDV, co-infection by the associated betasatellite was not essential, as the DNA A alone of ToLCNDV could infect tomato and *Nicotiana benthamiana* and induce mild symptoms, but DNA B or Cotton leaf curl Multan betasatellite (CLCuMB) was required for development of typical leaf curl symptoms. The symptoms were most severe in plants infected with all three components, indicating a role of the betasatellite in the pathogenesis of ToLCNDV. The plants infected with ToLCNDV DNA A alone had limited accumulation of viral DNA, which increased by many times in plants co-infected with DNA B or/and betasatellite. However, the plants infected with all three components accumulated 20 times less betasatellite DNA than the plants infected with DNA A and betasatellite. The increase in the amount of viral DNAs was also reflected in the commensurate increase in symptom severity and transmissibility by whitefly, *Bemisia tabaci*.



Journal of Insect Science, 25 (2): 164-176, 2012

A key and systematic account of the short horned grasshopper (Orthoptera: Pyrgomorphidae) in South Western Rajasthan

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ABSTRACT

A dichotomous color key made for the easy identification of the species of short horned grasshopper family Pyrgomorphidae in south western Rajasthan is provided. The systematic account of genera of pyrgomorphidae is also given.



Morphological and molecular diversity of an underutilized fruit crop - *Cordia myxa* L. germplasm from the arid region of Rajasthan, India

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ABSTRACT

Twenty two germplasm accessions of *Cordia myxa* were collected from Rajasthan and established at the field gene bank for conservation and evaluation. Morphological characterization of 10 year-old trees for 17 traits indicated wide variations among the accessions tested. Higher number of flowers per cyme was found in accession ACHM11 and higher pulp:stone ratio in AHCM25. Overall, AHCM22 was found to be a superior germplasm line for most of the horticulturally useful traits among the accessions tested as it had higher percent of fruit set, pulp:stone ratio and fruit weight. High significant positive correlation was obtained between leaf, fruit characters and pulp: stone ratio. However, these characters were found to be negatively correlated with number of flowers per cyme. Out of 50 random decamer primers used for random amplification (RAPD), 25 were polymorphic. Average polymorphism resolved by these markers among these accessions was 69.8% with an average polymorphic information content of 0.43. Genetic diversity revealed by Jaccard's co-efficient was between 0.44 and 0.94, and three major clusters were identified among these accessions by phylogenetic analysis using NTSYSpc-2.02e software. RAPD markers associated with leaf size and pulp:stone ratio were also identified. This study shows the existence of high genetic diversity among these accessions.



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Screening of bottle gourd germplasms for resistance against powdery mildew under hot arid region of Rajasthan

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ABSTRACT

Bottle gourd [*Lagenaria siceraria* (Mol.) Stand.] is a commonly grown vegetable throughout India. It is also grown in Africa, Central America, Ethiopia and other warmer regions of the world. It is suitable for cultivation in dry areas. As a vegetable, it is easily digestible, even by patients. The fruits contain 0.2% protein, 2.9% carbohydrates, 0.5% fat and 11 mg of vitamin C per 100 g fresh weight. It is affected by many fungal diseases, of which powdery mildew is one of the most important diseases that quantitative and qualitative losses to the crop. The symptoms appear as small floury patches first on the lower surface followed by upper surface of the leaves. The cheapest, practical and economical control of the disease can be achieved by the genetic stock resistant to the disease. Keeping in view the present study was undertaken with the objective to identify the resistant germplasms of bottle gourd against powdery mildew under hot arid conditions.



Indian Horticulture, 6-8, 2012

Goma Yashi to enrich fruit basket

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ABSTRACT

Goma Yashi is a short-statured, spineless, prolific-bearer, early-maturing variety of bael. It has thin rind, less seed, high pulp and very less fiber, high TSS, less acidity, uniform ripening with good color of pulp, and is highly suitable to grow under high-density planting system. The elite genotype was identified and seeded on the basis of its elite horticultural traits and was subsequently propagated through in-situ patch budding and evaluated under field condition for eight years. It outperformed the control in flowering, fruiting behavior, and fruit quality under rain fed conditions in western India.



Response of nitrogen and row spacing on quality and economics of Onion cv. N-53 under arid environment

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ABSTRACT

An experiment was conducted to investigate the response of nitrogen and row spacing on quality parameters and economics of onion cv. N-53 under arid environment at Research Farm, College of Agriculture (Swami Keshwanand Rajasthan Agricultural University), Bikaner. The experiment was laid out in a Randomized Block Design with five levels of Nitrogen viz. 0, 50, 100, 150 and 200 kg ha⁻¹ and three levels of spacing 10, 15 and 20 cm, The result indicated that the statistically maximum number of leaves (8.36 and 803), volume of bulb (54.89 cc and 51.70 cc), diameter of bulb (4.75 cm and 4.68 cm), weight of bulb (49.57 g and 45.77 g), allyl-propyl disulphide (6.29 mg/100g and 6.21 mg/100g) and nitrogen content in leaves (0.953% and 0.959%) and bulb (1.40% and 1.35%) were recorded with application of 150 kg nitrogen ha and 15 cm row spacing, respectively. Whereas, chlorophyll content in leaves (1.58 mg/g and 1.47 mg/g) was recorded maximum with 200 kg nitrogen ha⁻¹ and 15 cm row spacing, respectively. B: C ratio (2.08 and 2.17) was observed highest in 150 kg nitrogen ha⁻¹ and 15 cm row spacing, respectively.



Variability and association studies in tomato germplasm under high-temperature arid region

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Central Institute for Arid Horticulture, Bikaner-334006,

ABSTRACT

Genetic variability and correlation studies were carried out for 12 traits in 23 genotypes of tomato grown during spring-summer of 2009 under hot, arid agro-climatic conditions. Genetic variability, heritability and expected genetic advance revealed significant differences for all the traits studied. PCV and GCV were high for fruit weight, number of fruits per plant, plant height and fruit yield per plant. High heritability with high genetic advance as percentage of mean was observed for yield per plant (93.2 %) as also for average fruit weight (92.8 %), number of fruits per plant (73.4 %) and plant height (50.1 %) indicating the role of additive gene effects and for effectiveness of selecting for these traits. Correlation studies revealed that fruit yield had significant positive correlation with fruit weight, fruit length, fruit diameter and number of fruits per plant, both at the genotypic and phenotypic levels, indicating mutual association of these traits. Negative correlation of days to flowering and days to first harvest on yield per plant suggested indirect selection for earliness for yield improvement.



Indian horticulture, 57(4): 15-16, 2012

Thar Bhadavi - new cluster bean

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ABSTRACT

The tender pods of cluster bean are nutritious and used extensively as vegetable in the country. The performance of vegetable type varieties under rainfed conditions of the hot arid region of Rajasthan is very poor. Thus, Thar Bhadavi as a new variety with thin arid medium long pods of high quality. Its production technology for better yield potential under rainfed (250 - 350 mm rains) conditions of the desert agro-climate has been developed.



Development of PCR-based diagnostic probe to detect begomo viruses infecting chilli in the hot arid region of Rajasthan

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ABSTRACT

A survey was conducted in major chilli-growing hot arid regions of Rajasthan, namely, Bikaner, Nagur, Jodhpur and Jalore districts, during November 2009. Among the four districts surveyed for chilli leaf curl disease (ChLCD), maximum disease incidence was recorded in Jodhpur (98%) followed by Jalore district (88%). The number of whiteflies was also counted in top, middle and bottom leaf of chilli plants grown in these areas. The average number of whiteflies per plant ranged from 0.0 to 4.0. Higher number of whiteflies (4.0) was recorded in Jodhpur and lowest (1.8) in Jalore district. On the basis of conserved region in the genome of begomoviruses infecting chilli, a set of primers was designed to amplify all begomoviruses infecting chilli by PCR; ChCPF 5'-ATTAGGGCTAAGAAT TATGTC-3' and ChCPR 5'-AAATTCCAATCTTTATTAATT-3'. These primers were validated by cloning and sequencing (HM004433) of PCR-amplified products and detection from infected chilli leaf samples. These primers were utilised while screening chilli cultivars against begomovirus infection in the asymptomatic plants. Our investigation suggests that the leaf curl disease of chilli is widespread in the hot arid regions of Rajasthan and is caused by a begomovirus associated with a satellite DNA b. The PCR primers designed in this study could be highly useful in chilli breeding programmes.



Biology and morphometric variation within local species of kharif grasshopper, *Hieroglyphus nigrorepletus* Bolivar in South-western Rajasthan

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ABSTRACT

The mean development period from egg to adult was 62.2 days and the adult males lived a little longer (52.10 days) than the females (43.60 days). A single female could lay about 2 egg pods with nearly 32 eggs per pod that had a hatchability of 66.40 per cent. The duration of nymphal stage I was the shortest (5.80 ± 0.35), while that of the nymphal stage VI was the longest (11.20 ± 0.42). The observed linear morphometric variation within the local species of the *H. nigrorepletus* was evident as per mean values for the different traits measured. The lengths of antennae, tegmina, hind wing, body up to genitalia I wing tip, pronotum, and the sternal region were relatively more for the females than the males; similarly the width of tegmina, body, pronotum, and the sternal region were also relatively more for the females. The maximum coefficient of variation was noted for the length of hind pretarsus (male) 16.75% and minimum was recorded in width of body (male) 2.81% in *H. nigrorepletus (brachypterus)*. In *H. nigrorepletus (trachypterus)*, the maximum coefficient of variation was found in length of fore pretarsus (male) 17.61 and minimum variation was recorded in length of hind legs (female) 3.84%.



Screening of ridge gourd varieties/genotypes [*Luffa acutangula* (Roxb.) L.] for resistance against fruit fly (*Bactrocera cucurbitae* (Coquillett)) in hot arid region of Rajasthan

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ABSTRACT

Host plant resistance is an important component for management of the melon fruit fly, *Bactrocera cucurbitae* (Coquillett) owing to difficulties associated with its chemical and biological control. Ridge gourd varieties/ genotypes viz., AHRG-49, Arka Sujata, AHRG-29, AHRG-36, AHRG-47, AHRG-41, S. Manjari, AHRG-31, AHRG-33, AHRG-42, AHRG-30, AHRG-57, S. Uphal, Pusa Nasdar, AHRG-35, Jaipuri Long, AHRG- 23, AHRG-56, AHRG-53, AHRG-58, AHRG-50, AHRG-28, AHRG-43, AHRG-44, AHRG-46, AHRG-48, AHRG-52, AHRG-59 and AHRG-61 were evaluated to screen out the suitable resistant/susceptible varieties/ genotypes against the fruit fly in hot arid region of Rajasthan. The results imparted that the percentage of fruit infestation and larval population per fruit on tested varieties/ genotypes of ridge gourd varied significantly. Pooled data showed that the AHRG-49, AHRG-33, AHRG-42, AHRG-30, AHRG- 23, AHRG-58, AHRG-50, AHRG-28, AHRG-43, AHRG-52 and AHRG-59 were categorized as susceptible varieties/ genotypes with fruit infestation (70.85%, 68.13%, 57.97%, 55.93%, 70.17%, 55.00%, 53.25%, 65.75%, 57.82%, 69.68% and 65.83%, respectively) and larval population per fruit (22.27, 28.92, 25.93, 22.73, 22.63, 24.28, 22.27, 23.42, 24.12, 21.97, 24.93 and 24.13, respectively). Whereas, the varieties/ genotypes AHRG-29, AHRG-57 and Pusa Nasdar had fruit infestation (17.92%, 16.22% and 18.50%, respectively) and larval population per plant (16.60, 13.45 and 14.55, respectively) and declared as resistant varieties/ genotypes to fruit fly. The AHRG-47,



AHRG-31, AHRG-48 and AHRG-61 with fruit infestation (78.02%, 80.13%, 80.10% and 79.42%, respectively) were highly susceptible varieties/ genotypes to fruit fly in pooled data of both the seasons viz., 2011 and 2012. Lower values of host plant susceptibility indices based on fruit infestation (HPSI) were recorded on resistant varieties/ genotypes , AHRG-29, AHRG-57 and Pusa Nasdar (36.12%, 32.69% and 37.29%, respectively) could be used as a source of resistance for developing ridge gourd varieties/ genotypes resistant to fruit fly.



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Response of okra (*Abelmoschus esculentus* (L.) Moench.) to irrigation methods and mulching under hot arid conditions

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ABSTRACT

Different irrigation methods and mulching materials were tested at CAZRI, RRS, Bikaner during 2009 and 2010 on okra crop under hot arid conditions. Irrigation methods viz., drip (I) and furrow (F) and mulching materials viz., plastic (M), hessian cloth (M2), indigenous materials (M3) and no mulch (M4) were evaluated in Split plot design with three replications using the okra cv. Varsha Uphar. Among the various treatments drip irrigation and plastic mulch alone and their interaction resulted in maximum plant height, number of branches, number of fruits per plant, fruit weight, fruit yield per plant and yield per hectare. Drip irrigation increased 13.5, percent and 12.9 percent fruit yield/ha over furrow method in 2009 and 2010, respectively. Plastic mulch recorded the highest fruit yield/ha in both the year which was 10.2, 17.7 and 32.7 percent higher compared to hessian cloth, indigenous material and no mulch, respectively.



Relative toxicity of newer insecticide molecules against *Spodoptera litura*

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ABSTRACT

On the basis of LC₅₀, the order of toxicity was chlorantraniliprole > emamectin benzoate > indoxacarb > spinosad > pyridalyl > fluendiamide > bifenthrin > koranda and > polytrinC with the relative toxicity of 37.75, 37.75, 3.28, 1.91, 1.61, 1.24, 1, 0.83, 0.68 by direct spray method. LC₅₀ obtained by leaf-dip method revealed that chlorantraniliprole (0.0001) was most effective followed by emamectin benzoate (0.0002) and indoxacarb (0.0012). The order of relative toxicity was 203, 101, 16.9, 2.86, 1.97, 1.83, 1.6, and 1.4 for chlorantraniliprole, emamectin benzoate, indoxacarb, spinosad, koranda, pyridalyl, polytrin C and flubendamide, respectively. Thus, irrespective of bioassay methods, chlorantraniliprole, emamectin benzoate and indoxacarb were most toxic to Sonapat strain of *Spodoptera litura*.



Allelochemical resistance traits of muskmelon (*Cucumis melo*) against the fruit fly (*Bactrocera cucurbitae*) in a hot arid region of India

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ABSTRACT

Host plant resistance is an important component for management of the melon fruit fly, *Bactrocera cucurbitae* (Coquillett), owing to difficulties associated with its chemical and biological control. Various biochemical traits including total sugar, reducing sugar, non-reducing sugar, tannins, phenols, alkaloids, flavinoid and pH contents of fruit were studied on 11 varieties/ genotypes of muskmelon, *Cucumis melo* L., in relation to resistance against *B. cucurbitae* under field conditions. Significant differences were found in tested varieties/ genotypes for fruit infestation and larval density per fruit. AHMM/BR-1, RM-50 and AHMM/BR-8 were the most resistant; MHY-5, Durgapura Madhu and Pusa Sarabati were moderately resistant; AHMM/BR-13, Pusa Madhuras and Arka Jeet were susceptible; whereas Arka Rajhans and GMM-3 were the highly susceptible varieties/ genotypes to fruit fly in both seasons, 2011 and 2012. The larval density per fruit increased with an increase in percent fruit infestation and there was a significant positive correlation ($r = 0.97$) between percent fruit infestation and larval density per fruit. Total sugar, reducing sugar, non-reducing sugar and pH were lowest in resistant and highest in susceptible varieties/ genotypes, whereas tannins, phenols, alkaloids and flavinoid contents were highest in resistant and lowest in susceptible varieties/ genotypes. Total alkaloid and pH contents explained 97.96% of the total variation in fruit fly infestation and 92.83% of the total variation in larval density per fruit due to alkaloids and total sugar contents.



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Information System for Arid Fruit Crops

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ABSTRACT

At present days the conventional extension system has been facing several challenges in delivering information to farmers as farmers need is much more diversified and more knowledge driven to address them is beyond the level of grass root extension functionaries. It is possible to deliver information timely by computer based technologies and Information Communication Technologies (ICT), which are interlink among extension, research, marketing network and farm communities to provide information at the arid region, Information System for Arid Fruit Crops was developed at Central Institute for Arid Horticulture, Bikaner. The software was developed using MS-Access as back-end and asp pages and html pages, java script as front-end to provide easy interaction with database is developed. This System integrates the accumulated expertise of various disciplines into a frame work that best addresses the specific problems and on-site needs of the farmers. It combines experimental and conventional knowledge with reasoning skills of specialists to help farmers in making best decisions for raising a successful crop. The fruit crops chosen for the Information System are Aonla, Ber, Bael, Pomegranate and Date palm. The Information System has 5 modules, one each for each fruit crop. Each module further divided into 3 sections, such as 1. Production Management, 2. Statistics of the fruit crop, 3. Post Harvest Management. Further these modules are subdivided into sub modules covering different parameters of fruit crops information. It has also provision to update the information of fruit crops. The Information System is useful for Agricultural Extension Agents farmers, and other stake holders involved in Arid Horticulture to realise higher productivity and production of fruit crops through improved knowledge and skill sets.



Agricultural extension in India – the effectiveness of the Agricultural Technology Management Agency

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ABSTRACT

This paper assesses the effectiveness of India's Agricultural Technology Management Agency (ATMA) through a study of the Ahmednagar district of Maharashtra state and the Dahod district of Gujarat state. Fifty ATMA farmers and fifty non-ATMA farmers were randomly selected from each district. In Ahmednagar, the beneficiary farmers recorded a high increase in yield, returns and income from their wheat crop, and thus there was a high effectiveness index compared with that of the non-beneficiary farmers. In Dahod, where ATMA had been operational for a shorter time, there was a very low increase in yield, returns and income for the maize crop of beneficiary farmers, and thus the effectiveness index of ATMA was low. The authors assess the programme in the light of such findings and offer recommendations for future extension strategies.



Organoleptic rating of RTS prepared from pulp of Bael cultivars

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ABSTRACT

Bael (*Aegle marmelos Correa.*) is a nutritive and medicinally important fruit and also known as bilvpatra, shripahal and Bengal quince. Fruit is eaten as fresh and also used for making several value added products. All the parts of the bael tree viz. stem, bark, root, leaf, flowers, seed oil or fruits of any stage of maturity and ripen are used for preparation *Ayurvedic* medicines and it is major constituent of *Dashmool*. The fruit is generally available from March to May month. Important aspect of fruit is therapeutic and nutraceutical value, which could safeguard stomach ailments and imp health of rural populations. The bael pulp is used as a base of various products like squash, jam, toffee, slab, powder, nectar beverage, RTS, etc. Bael fruit pulp of cultivar NB-5, CISH Bael-2 and Goma Yashi was used to make ready to serve drink adding sugar@ 700g/l of pulp or juice. This RTS was further diluted with water in 30:70 for sensory evaluation to assess quality of products. Organoleptic score indicated that ready to serve drink varied among pulp of bael varieties and RTS prepared from pulp of Goma Yashi was found better by getting highest score than other varieties. The utilization of fruits pulp for preparation of delicious drink has been discussed in this paper.



Exploitation of somaclonal variations in improvement of fruit crops - A review

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ABSTRACT

Clonal propagation through micropropagation is hailed as a revolutionary technology as it can be achieved in a short time and space with limited number of plant propagules. Recent studies have shown that cell or tissue cultures undergo frequent genetic changes. Variants selected in tissue cultures have been referred to "somaclonal variation". Though, genetic variations may be considered obstructive and worthless from the point of clonal fidelity, it opens a window of opportunity for increased genetic variability relatively rapidly and without applying a sophisticated technology, which may itself have numerous application in plant breeding and genetic improvements. The recovery of novel variants can be enhanced by applying suitable *in vitro* selection pressure. Tissue culture induced somaclonal variation in fruit crops is similar to variations induced with chemical and physical mutagens, which proffers an opportunity to unearth natural variability for their potential crop improvement.



**Status of stone weevil, *Aubeus himalayanus* Voss
(*Curculionidae: Coleoptera*) in India: An emerging pest
of ber (*Ziziphus mauritiana* Lamk)**

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ABSTRACT

The Indian jujube, popularly known as ber (*Ziziphus mauritiana* Lamarck), is an important fruit crop grown in arid and semi arid regions of India and worldwide. Nutritionally, the fruits are rich in protein, phosphorus, calcium; carotene and India, there are various factors responsible for yield losses in terms of quantity as well as quality. Of these, biotic stress such as pests and diseases are of prime importance. Among the various insect-pests infesting ber, the stone weevil *Aubeus himalayanus* Voss (*Curculionidae: Coleoptera*) seems to be is a new threat to ber cultivation in India as in recent years station has been reported in different ber growing region viz., Anantapur (Andhra Pradesh), Rahuri (Maharashtra), Jobner (Rajasthan), Bijapur (Karnataka) and Bikaner (Rajasthan). In addition, the infestation of this pest was also reported from Bangladesh. The adult female weevil, characterized by dark brown snout, usually lays eggs on the stylar end of fruits the distal end. The newly emerged white colour grubs enter into seed by making puncture in endocarp at immature stage and starts feeding on soft seed coat. Later it enters into endosperm moving downward and starts feeding upon of the seed, and pupates within the seed by making hallow galleries. The weevil completes its life within a single fruit. The infestation results in severe fruit drop at initial stage of fruit set. The damage intensity of stone weevil varies with cultivars as varieties with larger stone are preferred over those, which have higher pulp content. Periodical monitoring of orchard for weevil incidence is essential for devising suitable strategies for efficient management of pest in time. Detection at advance stages of infestation would render it difficult to manage as pests enters into the seed.



Production potential and economics of aonla based Agri-horti system under rainfed semi -arid ecosystem of western India

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ABSTRACT

A field trial was carried out to find out the practicalities and economics of suitable and profitable cucurbitaceous vegetables as intercrops (bottle guard, pumpkin, bitter guard, cucumber, sponge guard) on 7 to 10 years aonla orchard over the year of 2007 -2011 at the Experimental Farm of Central Horticultural Experiment Station (CIAH), Vejalpur, Panchmahals (Godhra), Gujarat under rainfed semi arid ecosystem of western India. Among the different cucurbitaceous vegetable intercrops, aonla + bottle gourd combination fetched the maximum net economic return of Rs. 147312.80/ ha with the B: C ratio 4.44 followed by aonla + pumpkin (Rs. 100525.00/ha with the B: C ratio 3.11) whereas the lowest economic return was recorded in control followed by aonla + sponge gourd purely under rainfed conditions of semi-arid ecosystem India. Based on the results, it has been confirmed that the aonla + bottle gourd combination is most effective' substantial additional income without affecting the aonla yield when compared to other treatment combinations. In order to its remunerativeness as additional income, it needs to be popularized among the farmers which not only will system productivity but also the space left the aonla orchards will be utilized efficiently.



In-vitro propagation of virus tolerant rootstock Carrizo citrange

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ABSTRACT

Studies on in-vitro propagation of virus tolerant rootstock Carrizo citrange were carried out using nodal segments of nucellar seedlings. Murashige and Skoog (1962) medium supplemented with BAP, kinetin for shoot proliferation and NAA and (SA for rooting were used in different concentration in alone or in combinations. Amongst for rooting BAP and kinetin, 1.0 mg^l⁻¹ BAP was found better. BAP was found better cytokinin in respect to reducing time needed to bud break and longer shoot length as compared to kinetin. Kinetin was superior cytokinin than BAP in respect to per cent survival and shoot length. In case of BAP with kinetin combinations maximum number of shoot (9.30) was obtained on BAP 2.0 mg^l⁻¹ + kinetin 0.5 mg^l⁻¹ and shoot length (2.50 cm) on BAP 0.5 mg^l⁻¹ + kinetin 1.0 mg^l⁻¹ NAA was found as better auxin in comparison to ISA for rooting of microshoots. Interaction of NAA with IBA, the minimum time taken to root induction (17.40 days) was recorded on NAA 0.1 mg^l⁻¹ + (SA 0.5 mg^l⁻¹ maximum number of roots (9.60) on NAA + IBA (0.5 mg^l⁻¹ each) and root length (7.10 cm) on NAA + IBA (1.0 mg^l⁻¹ each) were recorded. The rooted plantlets were successfully acclimatized in greenhouse, in pot containing soil, perlite and vermiculite in equal proportions. About 83.00 per cent success was recorded after 60 days of transfer from culture room.



Occurrence of fungal diseases of bottle gourd in Rajasthan

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ABSTRACT

A survey was conducted in four districts of Rajasthan, viz., Bikaner, Hanumangarh, Jaipur and Sri Ganganagar for occurrence of fungal diseases of bottle gourd. *Alternaria* leaf blight and *Cercospora* leaf spot diseases were found to be prevalent during rainy season in bottle gourd. The highest disease incidence (35.33%) and disease severity (24.0%) of *Alternaria* leaf blight were observed at Maharkala, Chomu (Jaipur) followed by Shikarpura (Jaipur) with 31.67% disease incidence and 22.50% disease severity. Minimum disease incidence (8.67%) and disease severity (4.0%) were found at 10 MLD, New Gharsana (Sri Ganganagar). Maximum disease incidence (26.67%) with disease severity (13.0%) of *Cercospora* leaf spot was noticed at Blaken, Chomu (Jaipur) followed by Govindpura [Jaipur] with disease incidence of 23.50% and disease severity of 12.33%, whereas, the minimum disease incidence (7.50%) and disease severity (2.0%) of *Cercospora* leaf spot were found in Lunkaransar Tehsil of Bikaner.



Screening of watermelon genotypes for resistance to mosaic disease under hot arid conditions of Rajasthan

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ABSTRACT

Mosaic disease is one of the most important diseases in the production of watermelon under arid and semi-arid regions of India. Field trials were conducted to screen 13 watermelon/mateera genotypes viz., RW-I77-3, RW-187-2, GP-20, GP-35, GP-42, Thar Manak, AHW-19, AHW-65, Asahi Yamato, Sugar Baby, Arka Manik, Bikaner Local-I and Barmer Local-I for resistance against mosaic disease with normal cultivation practices during summer 2011 and 2012 at Plant Pathology Block of Central Institute For Arid Horticulture, Bikaner under field conditions. Resistant genotypes were categorized on the basis of disease incidence. Among 13 watermelon/mateera genotypes, none was found immune against disease. One variety 'Asahi Yamato' showed resistance with less than 10.0% disease incidence, ten genotypes were categorized as moderately resistant ranging from 10.1 to 25.0% disease incidence and two genotypes such as RW-I77 -3 and GP-20 having more than 25.0% disease incidence proved susceptible against mosaic disease.



Utilization of date palm fruits for making delicious biscuits

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ABSTRACT

The ripe fruits of date palm (*doka* or *khalal*) are used for fresh consumption and processing. Date fruit pulp is used for flavoring the bakery products. In India, limited work has been carried out on post harvest management for proper utilization of date fruits. Keeping this in view, an attempt was made to utilize doka stage fruits for preparation of nutritious biscuits. The small size, astringent in taste, unfit for dry date and pind khajoor these can be utilized to prepare biscuits, The fruits were cut in to pieces, after removing seeds, for drying and grinding to make powder. Biscuits were prepared in bakery by adding date pulp powder in ratio of 10, 20 and 30% in wheat flour and other ingredients like sugar, milk and ghee. In control biscuits date pulp powder was not mixed, The study indicated that date biscuits prepared by adding of 10 or 20% pulp powder were suitable on organoleptic score basis for taste, flavor, appearance and acceptability as well as rich in sugars and protein from nutrition point of view.



Field efficacy of fungicides and bio-agents against *Alternaria* leaf spot of Mung bean

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ABSTRACT

Under laboratory conditions, out of 13 fungicides, hexaconazole (400 & 300 ppm) completely inhibited the fungal growth of *Alternaria alternata* and was found as the most effective fungicide. Among 6 bio-agents, *Trichoderma viride* gave highest fungal growth inhibition (51.7%), followed by *T. harzianum* (45.3%) and *T. virens* (41.4%). In field, among 11 fungicides, three sprays of hexaconazole (0.03%) proved most effective fungicide for controlling the disease of mung bean with minimum disease severity (6.3%), minimum disease incidence (13.5%) and maximum grain yield (868.0 kg/ha). Further, the next best fungicides were mancozeb (0.25%) and indofil Z-78 (0.2%). Among 6 bio-agents, *T. viride* gave highest grain yield (740.0 kg/ha) with minimum disease severity (17.4%) and disease incidence (29.4%), followed by *T. harzianum*.



Micropropagation of lasora (*Cordia myxa* Roxb.)

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ABSTRACT

A protocol for in vitro propagation of lasora (*Cordia myxa* Roxb.) was standardized using nodal segments. Single node segments, prepared from the new vegetative shoots, were cultured on Murashige and Skoog (1962) medium supplemented with 2.0, 4.0 and 6.0 mg l⁻¹ kinetin and BAP alone or in combination with 0.01 mg l⁻¹ NAA. The best response (93.6%) was observed with 4.0 mg l⁻¹ kinetin. The regenerated shoots from nodal segments were excised aseptically and transferred onto the rooting medium supplemented with 2.0 mg/l each of NAA and IBA along with 750 mg l⁻¹ activated charcoal was found superior (90.6%) over the other hormonal combinations for rooting response. Inoculation of arbuscular mycorrhizal fungi during ex vitro hardening stage resulted in higher survival (97%) and improved growth of micro-propagated lasora plantlets.



Phytochemical constituents and antioxidant activities of some Indian jujube (*Ziziphus mauritiana* Lamk.) cultivars

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ABSTRACT

Twenty-eight varieties of Indian jujube were estimated for various health-promoting compounds such as ascorbic acid, total flavonoids, flavanol, O-dihydric phenol and total phenolics. The antioxidant capacity was also measured by cupric reducing antioxidant capacity (CUPRAC), ferric reducing antioxidant power (FRAP) and 1,1 diphenyl-2-picryl hydrazyl (DPPH) assays. The ascorbic acid content varied from 47.81 to 160.12mg/100g, total phenolics from 48.69 to 196.34 mg/100g, total flavonoids from 60.32 to 173.11mg/100g, flavanol from 25.21 to 70.59 mg/100g and O-dihydric phenol from 5.03 to 19.26 mg/100g fresh weight. The average antioxidant activities were 1.6–6.33 and 1.22–5.49 μ M TE/g as determined by the CUPRAC and FRAP assays, respectively. Likewise, according to the results obtained, cv. ZG-3 was found to exhibit the strongest DPPH free radical scavenging activity followed by Katha Phal and Thar Sevika. The study also revealed a considerable amount of variation among the genotypes tested in relation to their phenolic content and antioxidant activity.



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Improved crossing technique and identification of true F1 hybrids of *Ziziphus mauritiana* Lam. by molecular markers

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More

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ABSTRACT

Breeding in *Ziziphus mauritiana* Lam. through hybridization is limited by its small sized flowers, cross incompatibility, low fruit-set and poor retention. In the present study, emasculation of flowers 2 h before anthesis and pollination by placement of dehisced flowers on stigma in inverted position resulted in increased fruit-set. Crossing of *Z. mauritiana* cultivars Gola and Thar Sevika (early maturity and fruit quality) with cultivars BS-1 (powdery mildew resistant) and Tikadi (fruit fly and frost tolerant) showed that Thar Sevika is cross compatible with BS-1 and Tikadi whereas Gola is cross compatible with BS-1 only. Among the crosses fruit-set range was 2.31–10.92%. Based on the presence of male parent-specific DNA fragment produced by RAPD and ISSR markers 13 out of 14 F1 progeny seedlings were found to be true hybrids. This is the first report in *Z. mauritiana* on the identification of true hybrids among F1 progenies using molecular markers.



Studies on in-vitro organogenesis in date palm

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ABSTRACT

In-vitro organogenesis is the best method to overcome the problem of somaclonal variations and obtain true to-type date palm plants. In the present investigation, activated charcoal (AC) (1.5 and 3.0 g l⁻¹), polyvinylpyrrolidone (PVP) (1.0 and 2.0 g l⁻¹) and thiourea (250.0 and 500.0 mg l⁻¹) were separately added to the half-strength Murashige and Skoog medium to test the survival, browning of tissue/media and suitability of the growth of explants. Date palm cv. Halawy seedlings shoot tip cultured under dark condition showed that AC (1.5 g l⁻¹) was suitable for explant survival, minimized browning and supported growth for one month than other treatments. Half-strength MS medium supplemented with 1.5 g l⁻¹ AC and different treatment combinations NAA (0.0, 0.1 and 1.0 mg l⁻¹) with either 2-ip or TDZ (1.5 and 3.0 mg l⁻¹) were used for axillary shoot production in dark conditions. Out of 12 treatments, 3.0 mg l⁻¹ 2-iP + 0.1 mg l⁻¹ NAA was superior for axillary shoots production within three months. Half strength MS medium supplemented with different concentrations of GA3 (0.0, 0.25, 0.5, 1.0 and 2.0 mg l⁻¹) along with 1.0 mg l⁻¹ NAA was used for shoot elongation. These cultures were kept under 16 h light (2000 lux) and 8 h dark for one month. Out of five treatments tested, 0.5 mg l⁻¹ GA3 + 1.0 mg l⁻¹ NAA was found optimum for shoot elongation. The results drawn from this study will be highly useful in micropropagation of date palm seedlings compared to off-shoot/ sucker by organogenesis.



Influence of pre- and post-harvest treatments on shelf-life and quality attributes of ber fruits

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ABSTRACT

An experiment was conducted to observe the effects of pre-harvest treatments followed by storage under different packaging materials on shelf-life and quality of ber cv. Seb fruits during storage at ambient conditions ($35 \pm 5^\circ\text{C}$; $65 \pm 5\%$ RH). The physiological loss in weight was maximum (46.0%) in control (P0 = Packing under simple paper bags of grey colour) after storage, while lowest reduction (2.8%) in packed poly bags (ziplocked with pinhead holes) (P6 treatment) even after 10 days of storage. The later treatments recorded merely 66% of darker fruits that the other treatments (100%). Highest shrivelled and undesirable fruits were also observed under control. Vitamin C and titrable acidity decreased continuously but total soluble solids (TSS) and total sugars increased initially and decrease afterwards. The highest TSS (23.66°Brix) was observed for the tree which received pre-harvest spray of (on tree canopy 45 days before harvesting) CaCl_2 (0.4%) + boric acid (1.0%) and TSS substantially reduced (17.6°Brix) under control (pre-harvest spray with normal water). Average fruit weight also improved (24.58 g) in trees receiving pre-harvest spray with 0.4% CaCl_2 . Boric acid (1.0%) also drastically reduced fruit length (3.18 cm) and diameter (3.24 cm), while CaCl_2 (0.4%) positively affected the fruit size (3.52 and 3.56 cm). Thus, the pre-harvest spray of CaCl_2 (0.4%) + boric acid (1.0%) coupled with completely packed poly bags (ziplocked with pinhead holes) was efficient in prolonging the shelf-life and quality of ber fruits.



Impact of front line demonstrations on productivity Okra cv. Gujarat Okra-2 in Panchmahals district of middle Gujarat

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ABSTRACT

The present study was carried out at Panchmahals district of middle Gujarat during 2011-12. Okra is one important vegetable crop of the country and India is the largest producer in the World. The development of the Agriculture primarily depends on the application of the scientific technologies by making the best use of available resources. One of the major constraints of traditional okra farming is low productivity because of non-adoption of advanced technologies. To increase the production, productivity and quality of agricultural produce, Front Line Demonstrations is conducting farmers' field. All the recommended practices were provided to the selected farmers. The data related to cost of cultivation production, productivity, gross return and net return were collected as per schedule and analyzed. Results of the present study revealed that the improved variety of Okra Gujarat Okra-2 recorded the higher yield (105.90 q/ ha) as compared to check (87.60 q/ ha) traditionally grown by the farmers. The percentage increase in the yield over local check 20.89 was recorded. The technology gap in terms of productivity (9.1 q/ha) were computed. The technology index values were recorded. The results of study indicated the gap existed in the potential yield and demonstration yield is due to soil fertility and weather conditions. By conducting Front Line Demonstrations (FLDs) of proven technologies, yield potential of Okra can be increased upto great extent. This will substantially increase the income as well as the livelihood of the farming community.



In-vitro propagation of virus tolerant rootstock Carrizo citrange

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ABSTRACT

Studies on in-vitro propagation of virus tolerant rootstock Carrizo citrange were carried out using nodal segments of nucellar seedlings. Murashige and Skoog (1962) medium supplemented with BAP, kinetin for shoot proliferation and NAA and (SA for rooting were used in different concentration in alone or in combinations. Amongst for rooting BAP and kinetin, 1.0 mg^l⁻¹ BAP was found better. BAP was found better cytokinin in respect to reducing time needed to bud break and longer shoot length as compared to kinetin. Kinetin was superior cytokinin than BAP in respect to per cent survival and shoot length. In case of BAP with kinetin combinations maximum number of shoot (9.30) was obtained on BAP 2.0 mg^l⁻¹ + kinetin 0.5 mg^l⁻¹ and shoot length (2.50 cm) on BAP 0.5 mg^l⁻¹ + kinetin 1.0 mg^l⁻¹ NAA was found as better auxin in comparison to ISA for rooting of micro shoots. Interaction of NAA with IBA, the minimum time taken to root induction (17.40 days) was recorded on NAA 0.1 mg^l⁻¹ + (SA 0.5 mg^l⁻¹ maximum number of roots (9.60) on NAA + IBA (0.5 mg^l⁻¹ each) and root length (7.10 cm) on NAA + IBA (1.0 mg^l⁻¹ each) were recorded. The rooted plantlets were successfully acclimatized in greenhouse, in pot containing soil, perlite and vermiculite in equal proportions. About 83.00 per cent success was recorded after 60 days of transfer from culture room.



Effect of sodium chloride on gas exchange, antioxidative defense mechanism and ion accumulation in different cultivars of Indian jujube (*Ziziphus mauritiana* L.)

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ABSTRACT

An experiment was conducted to study the effect of NaCl (electric conductivity of 0, 4, 8, 12, and 16 dS m⁻¹) on growth, gas exchange parameters, water status, membrane injury, chlorophyll stability index and oxidative defense mechanisms in two cultivars (Gola and Umran) of Indian jujube (*Ziziphus mauritiana*). Results showed that the dry mass and leaf area reduced linearly with increasing levels of salinity. Net photosynthetic rate (PN), transpiration (E), and stomatal conductance (gs) were comparatively lower in Umran which further declined with salinity. Leaf relative water content, chlorophyll (Chl) stability and membrane stability also decreased significantly under salt stress, with higher magnitude in Umran. Superoxide dismutase (SOD), peroxidase (POX) and catalase (CAT) activities were higher in Gola whereas hydrogen peroxide (H₂O₂) accumulation and lipid peroxidation (MDA content) were higher in control as well as salt treated plants of Umran. The Na⁺ content was higher in the roots of Gola and in the leaves of Umran, resulting in high K⁺/Na⁺ ratio in Gola leaves. Thus it is suggested that salt tolerance mechanism is more efficiently operative in cultivar Gola owing to better management of growth, physiological attributes, antioxidative defense mechanism, and restricted translocation of Na⁺ from root to leaves along with larger accumulation of K⁺ in its leaves.



Drumstick (*Moringa oleifera* Lamk.) improvement for semiarid and arid ecosystem: Analysis of environmental stability for yield

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ABSTRACT

Integrating yield and stability of genotypes tested in unpredictable environments is a common breeding objective. The importance of stability estimation has more values in perennial crops such as drumstick (*Moringa oleifera* Lamk), as it has occupied the area for many years. Drumstick is found both in annual and perennial forms, where the former type bears only edible pods and the latter produces both edible and non edible bitter pods. In India, the west and northern part has perennial types predominantly due to which the commercial cultivation of drumstick remain at poor level in this region. Hence, the main goal of the study is to identify a superior genotype for the rain fed areas among 14 genotypes. Stability analysis was assessed by yield stability statistic (y_i), yield regression statistic (r_i) and yield distance statistic (d_i). The analysis of variance revealed that the genotype were highly significant for all characters under the environment studied. However, number of flowers per plant showed non significance for environments in the study. $G \times E$ (Genotypic \times Environment interaction), $E + (G \times E)$ [Environment + (Genotype \times Environment)] and E [Environment (Linear)] showed significant values for all the characters. Pooled deviation exhibited significance for number of fruits per plant and yield per plant. Among the genotypes studied, PKM-2, MO-1 and PKM-1 were found stable for number of fruits per plant and yield due to bi value around unity and non significant $S^2 d_i$ value. Hence, PKM-2 and MO-1 were found to fit for favorable environment and PKM-1 for unfavorable environment for commercial cultivation for semi arid region of India.



Evaluation of *Morinda tomentosa* accession under zero irrigation conditions of semi-arid ecosystem

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ABSTRACT

Morinda sp. belongs to family Rubiaceae and the plant is believed to have originated in India and South East. It is also known by different vernacular names in different parts of world like nuna, ach, Indian mulberry awl, great *Morinda*, cheese fruit, mouse's, pineapple, jumbie breadfruit, hog apple, pain killer, du, aledi and bilimbi. It is grown wildly in many throughout India viz. Madhya Pradesh, Gujarat, Andhra Pradesh etc. It is hardy green small tree flowers and fruits throughout the year under agro-climatic conditions, but more prominently rainy season (April to August). A total of sixteen fruits were randomly collected from all the direction of each genotype to record the qualitative and quantitative morphological characters. The extent of variation in physico-chemical traits of fruits from different location was recorded. A total of 20 genotypes were collected which had fairly wide spectrum of variability with respect to growth, flowering, fruiting behaviour and quality attributes. The samples of leaf, bud, flower and fruit were brought to the laboratory for morphological study and fruit quality attributes. The observations on qualitative characteristics like tree habit, and leaf morphology were recorded visually. Observation on the leaf morphology was in terms of leaf shape, leaf apex, leaf margin and leaf colour was taken as illustrated by Wilde et al., 1972 and Simpson, 2006. The mature fruits of various genotypes differing in shape, size and appearance were collected from disease free plant to study the variability in physico-chemical attributes. Fresh samples in form of leaf, flower, fruit and seeds of selected genotypes of *Morinda* were collected for further study.



Assessment of morphological diversity in ber (*Ziziphus mauritiana* Lamk)

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ABSTRACT

Ber (*Ziziphus mauritiana* Lamk.) is a multipurpose tree fruit crop of the hot arid regions, which holds high economic value in terms of nutritious fruits, medicinal properties, and fodder for the cattle. A large number of varieties of ber are being grown in different parts of the country. However, there is a considerable confusion in ber cultivars nomenclature as they have unique local names and name variants. In addition, information on genetic diversity of plants is vital, from the perspective of breeding, for efficient choice of parents for hybridization. At Central Institute for Arid Horticulture, Bikaner the morphological diversity in ber has been noticed for growth habit; foliage characteristics such as leaf apex and base, leaf size, leaf curving, leaf shape, leaf pubescence and thorn characteristics like thorniness and thorn shape. Likewise, variation had also been noted in fruit characteristics such as presence or absence of anthocyanin blush on immature fruits, fruit surface, fruit apex, fruit shape, fruit size, fruit weight, mature fruit colour, pulp texture, pulp cavity, stone apex, stone shape, stone size, stone weight, pulp: stone ratio and quality attributes such as soluble solid contents, acidity and ascorbic acid contents in as many as 314 varieties available in germplasm block. This study would help identification & characterization of ber varieties and elucidation of their morphological relationships based on the mentioned traits following the International Union for the Protection of New Varieties of Plants (UPOV) guidelines. In the future this data may be used for the purpose of registration.



Field reaction of watermelon genotypes for resistance against *Alternaria* leaf blight disease under hot arid conditions of Rajasthan

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ABSTRACT

Alternaria leaf blight disease is a serious bottleneck in the production of watermelon in India. A field trial was carried out during summer season of 2012 to screen 19 watermelon genotypes (RW-177-3, RW-187-2, Charleston Gray, Mahbooby, IC-315313, IC-325808, GP-42, GP-35, GP-20, Thar Manak, AHW-19, AHW-65, Asahi Yamato, Sugar Baby, Arka Manik, Bikaner Local, Barmer Local, Churu Local, and Jaisalmer Local) for resistance against *Alternaria* leaf blight disease under field conditions with normal cultivation practices at Central Institute for Arid Horticulture, Bikaner. Disease severity in watermelon genotypes was recorded at maturity stage on the basis of per cent leaf area affected and field reaction due to *Alternaria* leaf blight was categorized by using 0-5 rating scale. Disease incidence was also calculated. Disease incidence and disease severity in 19 watermelon genotypes ranged from 5.0-50.00% and 5.75 to 21.50%, respectively. Out of them, none was found immune as well as resistant against *Alternaria* leaf blight. Only two varieties Asahi Yamato and Arka Manik were found moderately resistant against this disease with minimum disease severity of 5.75 and 7.80%, respectively. Fourteen genotypes were categorized as moderately susceptible and remaining 03 genotypes (GP-20, RW-177-3 and GP-35) proved susceptible against this disease. During the study period, genotypes have not high disease severity due to unfavourable environmental conditions for the disease development. However, it is concluded that only two varieties Asahi Yamato and Arka Manik were found moderately resistant against *Alternaria* leaf blight disease of watermelon.



Development of an organic integrated pest management (IPM) module against insect-pests of muskmelon in arid region of Rajasthan, India

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ABSTRACT

Four different muskmelon production systems (two conventional, one conventional IPM, and one organic IPM) were compared in field experiments at the Central Institute for Arid Horticulture, Bikaner during two years. The organic IPM system proved to be the most effective and economical approach (B: C ratio 8.80:1) against melon aphid (*Aphis gossypii*), leaf eating caterpillar (*Diaphania indica*), hadda beetle (*Epilachna vigintipunctata*) and cucurbit fruit fly (*Bactrocera cucurbitae*) in which the lowest incidence was recorded as compared to other modules. The organic IPM module-III comprised of growing resistant genotype (RM-50), spray of neem oil at 20 DAS, installation of pheromone trap (10/ hectare) at 42 DAS, spray of tumba fruit extract (TFE 5%) at 50 DAS and spray of spinosad 46 SC at 60 DAS was the most effective. The conventional I (farmer's practices) was the second most effective system against muskmelon major pests during both years. The benefit-cost ratio of the tested muskmelon production systems in the control of insect-pests decreased in the following order: module-III (B: C ratio 8.80:1) > module-I (B: C ratio 7.74:1) > module-IV (B: C ratio 6.60:1) > module-II (B: C ratio 3.56:1).



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Report of *Dictyla cheriani* (Hemiptera: Tingidae) on Indian cherry (*Cordia myxa*) in Rajasthan, India: Incidence and morphometric analysis

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ABSTRACT

The infestation of *Dictyla cheriani* (Drake) (Hemiptera: Tingidae) on Indian cherry (*Cordia myxa* L.), was noticed in 2010 at the Experimental Farm of Central Institute for Arid Horticulture and other fields of Bikaner district, Rajasthan, India. The maximum incidence was observed in October (51.67% on bold and 76.67% on small seeded plants) and minimum was in January (11.67% on bold and 21.67% on small seeded plants). The number of this lace bug ranged between (0.5 to 8.8 on bold and 4.5 to 25.97 on small seeded plants) nymphs and adults per leaves. This species is characterised by body oblong, pale testaceous with brownish or fuscous markings, with collar and hood yellowish brown, body beneath reddish dark with thoracic sterna darker. Antenna is yellowish brown; 1/3 part of 4 segment blackish. Antenna is rather slender, segmental measurements: I, 0.12 mm; II, 0.09 mm; III, 0.80 mm; IV, 0.22 mm. The mean body lengths of the male and female adult vary and were recorded as 2.17 mm and 2.34 mm, respectively.



Effect of spacing on growth and biomass production in bael (*Aegle marmelos Correa.*) under hot arid conditions

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ABSTRACT

Bael (*Aegle marmelos Correa.*) is a suitable tree for growing different parts of the country for fruits as well as for its medicinal uses. All plant parts are used in ayurvedic formulations. *Bael* saplings were planted at a distance of 1 m x 1 m, 1.5 m x 1.5 m and 2 m x 2 m under drip irrigation system to assess the plant and root growth and biomass yield. The finding of the study revealed that close planting at 1 x 1 m was suitable for better growth and high biomass production (leaves/shoot/roots) under arid conditions. However, for root growth and development the planting of saplings at 2 x 2 m spacing gave better results.



Impact of front line demonstrations in transfer of sesamum production technology

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ABSTRACT

Sesamum (*Sesamum indicum L.*) is as one of the most important oil crops of the Panchmahal district of Gujarat. However, its productivity of sesamum in the district is very low. Attempts are made to improve productivity and to increase area under sesamum by adopting HYVs (high yielding variety). In order to compare conventional sesamum with HYVs varieties, 50 front line demonstrations were carried out in systematic manner on farmers field to show the worth of a new varieties in comparison to local check and thereby convincing farmers about potentialities of improved production management practices of sesamum for further adoption, involving feasible and effective scientific package of practices. The demonstrations clearly showed enhancement of productivity, at the same time area under sesamum cultivation was also noticed to be enhanced. The yield was found to be increase from 369kg/ha in local check to 470kg/ha in demonstrations. Similarly, the benefit cost ratio for HYVs varieties was found to increase to 1.65 as compared to local check (1.29). The economic and benefit cost ratio can be further improved to 1.68 by giving slightly higher inputs for cultivation and marketing. The impact of FLDs was analysed which showed improvement of knowledge and satisfaction of farmers as the main reason for mass scale adoption.



Characterization of *Morinda tomentosa* genotypes under rainfed conditions of western India

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ABSTRACT

A field trial was conducted to characterize *Morinda tomentosa* Heyne ex Roth genotypes which were established during 2009 under field condition during the years 2011-13 at Experimental Farm of Central Horticultural Experiment Station (CIAH-ICAR) Vejalpur, Panchmahals (Godhra), Gujarat. The vegetative morphomatrix in terms of plant height, stem girth, plant spread, number of primary branches and number of secondary branches varied between 3.10–4.70 cm, 19.10-36.08 cm, 2.27-3.87 m, 6.23-13.45 and 12.12-26.00, respectively, whereas leaves morphology, viz. leaf length, breadth, petiole length and vein pairs ranged between 15.00-25.00 cm, 8.00-16.50 cm, 1.25-2.29 cm and 7.43-11.33 per leaf, respectively. Yield plant during 3n1 year varied between 3.50-9.41 kg being highest in CHESN 1 and the lowest in CHESN 21 in all the evaluated genotypes. The quantitative fruit characters in terms of fruit weight, length, breadth, number of pyrines, number of seed/fruit and fresh weight of seed ranged between 19.20-47.10 g, 2.49-4.80 cm, 2.34-3.98 cm, 10.95-23.95, 25.17-50.65 and 0.06-0.11 g, respectively. Variations in values of TSS, pH, vitamin C and acidity, protein, phenols, tannins, Ca, K, Na, and Zn ranged between 6-12° brix, 3.50-7.00; 21.15-40.15 mg/100g, 1.16-1.51 per cent, 0.09-0.29 g, 11.12-20.05 mg, 0.25-0.46 g, 90.10-102.00 mg, 36.12-49.92 mg, 80.16–93.90 mg and 0.10-0.29 mg among the genotypes characterized for their biochemical composition. Based on the overall observations, CHESN I, CHESN 16 and CHESN 31 were found to better with respect to most of the qualitative and quantitative characters than rest of the genotypes evaluated under rainfed conditions of western India.



Characterization of bael (*Aegle marmelos*) varieties under rainfed hot semi-arid environment of western India

A. K. Singh, Sanjay Singh, R. S. Singh, H. K. Joshi and S. K. Sharma

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ABSTRACT

The present study was undertaken to evaluate the performance of different varieties of bael (*Aegle marmelos* Correa.), established through in-situ patch budding during the year 2003, at Experimental Farm of Central Horticultural Experiment Station (CIAH), Yejalpur, Panchmahals (Godhra), Gujarat under rain fed hot semi-arid ecosystem of western India during the years 2010-12. The results of study revealed that the different varieties of bael exhibited considerable variation for vegetative, floral. Yield and physico-chemical attributes of bael fruits. The vegetative growth in terms of plant height, stem girth, plant spread (E-W) and plant spread (N-S) varied between 3.38-5.15m, 28.95-88.39 cm and 3.74-7.68 m and 3.40-7.52 m. respectively, while the terminal leaf length, breadth, lateral leaf length and breadth ranged between 10.72-15.02 cm, 5.85-9.38 cm, 7.45-11.38cm and 4.13-6.57cm, respectively. Different varieties of bael exhibited wide variations with respect to morphometrics of vegetative characters under rainfed conditions of western India. Varieties also showed wide differences for floral traits with regards to bud size, flower size and other floral organs. The morphological features of fruit of different varieties, viz. fruit yield (40.50-69.29 kg),



fruit weight (0.43-4.25 kg), length (10.61-19.59 cm), width (9.40-22.00 cm) and fruit girth (29. J 0-70.00 cm) also showed variations. Physical composition of bael fruit exhibited wide variation in their shell weight (115.25-560.05g), shell thickness (0.16-0.31 cm), number of seed/fruit (90.34-212.25), total fresh seed weight (17.34-43.41 g), number of seed sacs (10.23-19.17), fibre weight (15.91-1 06.50g) and pulp weight/fruit (0.27-3.67 kg). The qualitative characters of fruit in terms of TSS mucilage, TSS pulp total sugar, reducing sugar, non reducing sugar, vitamin C, total phenols, acidity and TSS to acid ratio ranged between 37.00-49.50° brix 30.57-37.45° brix, 16.15-19.98%. 3.30-4.95%, 12.85-15%, 13%, 17.13-21.03 mg/100g 2.34-2.75% 0.30-0.49% and 68.88-124%, respectively. All the varieties of bael showed significant differences for qualitative and quantitative morphological characters under rainfed hot semi arid environment.



Characterization of bael (*Aegle marmelos*) varieties under rainfed hot semi-arid environment of western India

A K Singh, Sanjay Singh, R S Singh, H K Joshi and S K Sharma

Central Horticultural Experiment Station (CIAH), Vejalpur, Panchmahals (Godhra)

ABSTRACT

The present study was undertaken to evaluate the performance of different varieties of bael (*Aegle marmelos* Correa.), established through in-situ patch budding during the year 2003, at Experimental Farm of Central Horticultural Experiment Station (CIAH), Vejalpur, Panchmahals (Godhra), Gujarat under rainfed hot semi-arid ecosystem of western India during the years 2010-12. The results of study revealed that the different varieties of bael exhibited considerable variation for vegetative, floral, yield and physico-chemical attributes of bael fruits. The vegetative growth in terms of plant height, stem girth, plant spread (E-W) and plant spread (N-S) varied between 3.38-5.85m, 28.95-88.39 cm and 3.74-7.68 m and 3.40-7.52 m, respectively, while the terminal leaf length, breadth, lateral leaf length and breadth ranged between 10.72-15.02 cm, 5.85-9.38 cm, 7.45-11.38cm and 4.13-6.57cm, respectively. Different varieties of bael exhibited wide variations with respect to morphometrics of vegetative characters under rainfed conditions of western India. Varieties also showed wide differences for floral traits with regards to bud size, flower size and other floral organs. The morphological features of fruit of different varieties, viz. fruit yield (40.50- 69.29 kg), fruit weight (0.43-4.25 kg), length (10.61-19.59 cm), width (9.40-22.00 cm) and fruit girth (29.10-70.00 cm) also



showed variations. Physical composition of bael fruit exhibited wide variation in their shell weight (115.25- 560.05g), shell thickness (0.16-0.31cm), number of seed/fruit (90.34-212.25), total fresh seed weight (17.34-43.41 g), number of seed sacs (10.23-19.17), fibre weight (15.91-106.50g) and pulp weight/fruit (0.27-3.67 kg). The qualitative characters of fruit in terms of TSS mucilage, TSS pulp, total sugar, reducing sugar, non reducing sugar, vitamin C, total phenols, acidity and TSS to acid ratio ranged between 37.00-49.50° brix, 30.57-37.45° brix, 16.15-19.98%, 3.30-4.95%, 12.85-15.13%, 17.13-21.03 mg/100g, 2.34-2.75%, 0.30-0.49% and 68.88-124.83, respectively. All the varieties of bael showed significant differences for qualitative and quantitative morphological characters under rainfed hot semi arid environment.



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Standardization of softwood grafting in chironji (*Buchanania lanzan* Spreng.) under semi-arid environment of western India

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ABSTRACT

The experiment was conducted for two consecutive years at CHES, Vejalpur (Godhra), Gujarat to standardize time of softwood grafting in chironji (*Buchanania lanzan* Spreng.). Softwood grafting was carried out at monthly interval commencing July to June. Bud sprout (68.00%) and graft success (66.66%), were noted highest in July. Length of sprout and number of leaves were recorded highest in March. Irrespective of scion and rootstock maximum accumulation of nitrogen and carbohydrate contents were recorded in March. Softwood grafting in July may be adopted for multiplication of elite chironji genotypes.



Dynamics of vegetative morphomatrix, productivity and economics of NA 7 aonla (*Emblica officinalis*) in different planting systems under rainfed conditions

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ABSTRACT

A field experiment was conducted to determine the effects of different planting systems and densities on plant growth and their relation to yield and quality attributes of NA 7 aonla (*Emblica officinalis* Gaertn) during the years 2011-2013 under rainfed hot semi- arid ecosystem of western India. The present study contained 5 planting systems as treatments namely, square, hedgerow, double hedge row, cluster and paired system. Different planting systems significantly influenced the vegetative growth, yield and quality of fruits during both the years of experimentation. The highest plant height was noted in double hedgerow system (7.80 m) and the lowest in paired system (7.08 m). Consequently, the rootstock (59.82cm), scion girth (58.38 cm) and plant spread (6.99 cm) was measured maximum in square system of planting. However, these parameters were measured the lowest in double hedgerow followed by hedgerow and cluster planting systems. Result of study revealed that the mean yield/plant (110.24 kg) was recorded the highest in square but the yield/ha were recorded maximum in double hedgerow (225.90 q) followed by hedgerow (202.65 q) and cluster (170.37 q). During the experimentation,



a considerable difference in yield over previous year was observed among the different planting systems. An increase in yield over square system by the rest of the system ranged between 83.8% - 132.39% being highest in double hedgerow and lowest in paired system, whereas per cent increase in yield in double hedge row over other systems ranged between 26.44-132.39 being the maximum and minimum upon square and hedgerow systems of planting respectively, There were significant differences amongst different planting system with regards to fruit physical and quality attributes. Among the different planting systems, the square system exhibited before values for physical qualities, whereas chemical attributes like TSS, total sugar, vitamin C and total phenols were observed maximum in double hedgerow planting system. The net economic return was computed with double hedgerow (Rs192 270.00 and 243 035.00) followed by hedgerow (Rs 150800.00 and Rs 195650) and it was minimum in square (Rs 83 950.00 and Rs 107 605.00) system of planting.



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Long term effect of INM on aonla (*Emblica officinalis*) and soil quality under rainfed hot semi-arid environment

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ABSTRACT

The experiment was conducted on seven and eight years old aonla (*Emblica officinalis* Gaertn) tree of NA-7 to study the influence of various levels of organic (FYM and biofertilizers) and inorganic (NPK) sources of nutrients on morphometric, productivity and quality attributes of aonla and soil quality during 2009-10 and 2010-11 under hot semi-arid ecosystem. Significant improvement was recorded in soil quality by application of different combinations of NPK, FYM and biofertilizers. The vegetative growth, yield and quality of aonla was influenced considerably by the application of different sources of nutrients. The maximum vegetative growth was recorded in the plants which were applied with standard doses of NPK which was followed by farm yard manure plus 50% of the standard dose of NPK. The maximum mean yield per plant (48.45 kg) was recorded in the plants treated with standard doses of NPK followed by FYM + 50% of standard dose of NPK (45.27 kg). TSS, total sugar, vitamin C and total phenol were influenced considerably by the application of different organic sources of nutrients being highest in T₅ (FYM + *Azotobactor* + VAM) treatment. The soil properties in terms of pH and EC declined whereas hydraulic conductivity, organic carbon increased from their initial values with the application of various organic sources of nutrient in different combinations, while, pH, EC, hydraulic conductivity, bulk density and organic carbon of the basin soil I treated with standard dose of NPK were not improved considerably.



Genetic diversity analysis in a set of Caricaceae accessions using resistance gene analogues

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In order to assess genetic diversity of a set of 41 Caricaceae accessions, this study used 34 primer pairs designed from the conserved domains of bacterial leaf blight resistance genes from rice, in a PCR based approach, to identify and analyse resistance gene analogues from various accessions of *Carica papaya*, *Vasconcellea goudotiana*, *V. microcarpa*, *V. parviflora*, *V. pubescens*, *V. stipulata* and *Jacaratia spinosa*. Of the 34 primer pairs fourteen gave amplification products. A total of 115 alleles were identified from 41 accessions along with 12 rare and 11 null alleles. The number of alleles per primer pair ranged from 4 to 10 with an average of 8.21 alleles/primer pair. The average polymorphism information content value was 0.75/primer. The primers for the gene Xa1 did not give any amplification product. As a group, the Indian *Carica papaya* accessions produced a total of 102 alleles from 27 accessions. The similarity among the 41 accessions ranged from 1% to 53%. The dendrogram made from Jaccard's genetic similarity coefficient generated two major clusters showing that the alleles of *Jacaratia spinosa* and *Vasconcellea* accessions were distinctly different from those of *Carica papaya* accessions. All the alleles were sequenced and eleven of them were allotted accession numbers by NCBI. Homology searches identified similarity to rice BLB resistance genes and pseudogenes. Conserved domain searches identified gamma subunit of transcription initiation factor IIA (TFIIA), cytochrome P450, signaling domain of methyl-accepting chemotaxis protein (MCP), Nickel hydrogenase and leucine rich repeats (LRR) within the sequenced RGAs.



A high-throughput DNA extraction protocol and its utilization in molecular characterization of noni (*Morinda citrifolia L.*) genotypes

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ABSTRACT

This study describes the standardization of DNA isolation protocol and DNA based molecular characterization of Noni, potentially designated as *Morinda citrifolia L.* Total Genomic DNA was isolated from fresh and young leaves of *M. citrifolia* and *M. tomentosa* following CTAB method with three indispensable modifications which includes methanol and PVP treatment to remove phenolics with PCI and long incubation in ethanol for enhancement of quantity of DNA. Upon gel documentation of isolated DNA by modified method evinced single discrete band of genomic DNA and yielded significantly superior, 441.20 ng/μl average concentration of DNA over thirteen different genotypes tested with absorbance ratio of DNA at A260/A280 with a mean value of 1.81 as compared to 1.66 by conventional method. Molecular characterization of 13 noni



genotype was done with 40 RAPD and 15 SSR molecular markers. Among 40 RAPD markers, only 20 showed polymorphism among the 13 genotype of Noni. RAPD dendrogram showed two major clusters with coefficient value 0.39. The genotypes of *M. tomentosa* were found in cluster (A) and (B) whereas, *M. citrifolia* was observed in cluster (A). Genotypes CHESN11 and CHESN12 had highest similarity with maximum co-efficient value 0.699) which falling under same cluster A while CHESN8 and CHESN1 with least similarity and noted in different Sub cluster A2 and A1. Out of the 15 SSR primers, 5 detected polymorphic with 25-scorable bands among 13 accessions of *M. citrifolia* and *M. tomentosa*. The sizes of amplified products ranged from 66 to 5229 bp. Dendrogram for SSR based on Jaccard's similarity co-efficient showed two major clusters with coefficient value 0.53. The genotypes of *M. tomentosa* were found in cluster (A) and cluster (8), while *M. citrifolia* was observed only in cluster (A). Genotypes CHESN11 and CHESN12 had highest similarity with maximum co-efficient value (0.857) which falling under same cluster A even as CHESN12 and CHESN3 with least similarity observed in two different clusters A and B.



Standardization of protocol for in-vitro shoots tip grafting in Kinnow mandarin (*Citrus deliciosa*)

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ABSTRACT

An experiment to standardize the rootstocks and PGRs for success and survival of in-vitro shoot tip grafting in Kinnow mandarin (*Citrus deliciosa*) was conducted during the year of 2007-08 at Department of Horticulture, Agricultural Research Station, Sriganganagar, and Rajasthan. For this, in-vitro generated and 2-3 weeks etiolated old - seedlings of Cleopatra, rough lemon and carrizo were used as rootstocks. The seedlings were grafted by shoot tips measuring = 1 mm in length containing apical meristem and one or two leaf primordial which were excised from in-vitro generated shoots and grafted on rootstocks. Among different rootstocks used twelve days old seedlings of Carrizo recorded the maximum success (56.60 %) and length of shoot (1.43cm). Among the concentrations of the PGRs tried to accelerate the growth of new shoot and survival per cent of STG, BAP @ 1.0 mg/l was found to be best in minimizing the time taken to bud break (12.12 days) and recorded maximum shoot length (3.10 cm). The results of the study revealed that the maximum survival (66.90 %) was observed with 2, 4-D @ 3.0 mg/l in all the PGRs tried for growth promotion of scion shoots. It is also revealed from the study that the 90 % grafted plants survival in greenhouse at after 45 days after shoot tip grafting. Based on the observations, the Carrizo as rootstocks, BAP and 2, 4-D were found to be the best protocol for shoot tip grafting in Kinnow mandarin.



Effect of spacing on growth and biomass production in bael (*Aegle marmelos* Correa) under hot arid conditions

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ABSTRACT

Bael (*Aegle marmelos* Correa.) is a suitable tree for growing different parts of the country for fruits as well as for its medicinal uses. All plant parts are used in ayurvedic formulations. Bael saplings were planted at a distance of 1 m x 1 m, 1.5 m x 1.5 m and 2 m x 2 m under drip irrigation system the plant and root growth the biomass yield. The finding of the study revealed that close planting at 1 x 1 m was suitable for better growth and high biomass production (leaves/shoot/roots) under arid conditions. However, for root growth and development the planting of saplings at 2 x 2 m spacing gave better results.



Effect of blending and storage on the physico-chemical, antioxidants and sensory quality of different squashes

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ABSTRACT

Amongst *Rhododendron arboreum*, Kilmora (*Berberis asiatica*), Ghengharu (*Crataegus crenulata*) and Galgal (*Citrus pseudolimon*), the highest (51.06 mg/100 ml) ascorbic acid was recorded in Galgal followed by Kilmora. The total antioxidants were found maximum (19.88 mm TE/l) in *Rhododendron* followed by Kilmora (14.12 mm TE/l). In all the treatments, TSS and acidity of the blended squashes was found to increase and decrease significantly faster at ambient (18–20°C) conditions than low (4°C) temperature. The highest (12.5 mg/100 ml) ascorbic acid was recorded in T9 (Galgal juice) and lowest (5.0 mg/100 ml) in T1, (*Rhododendron* juice) T5, (Kilmora juice) T7 (Ghengharu juice) and T8 (Ghengharu 15% + Galgal (5% + Ginger 5%)), which was found to decrease significantly during storage both at ambient and low temperature. The reducing and total sugars in the blended squashes increased significantly during storage at both conditions. The total antioxidants were



maximum (5.00 mm TE/l) in T1 (Rhododendron juice), which reduced to 4.65 and 4.84 mm TE/l after 6 months storage at ambient and low temperature respectively.

Out of 10 treatments tried, the blended squashes (T2 Rhododendron 15% + Galgal 5% + ginger 5%, T4 Rhododendron 10% + Ghengharu 5% + Galgal 5% + ginger 5% and T3 Rhododendron 15% + Ghengharu 5% + Galgal 5%) prepared in combination with Rhododendron petal juice had an edge over other treatments (T1, T5, T6, T7, T8, T9, T10) in the overall quality. The prepared products had a shelf life of 6 months at ambient conditions, whereas at low temperature the products may be stored for one year without any microbial spoilage. The cost of production of the prepared products calculated was as low as 38.33 to 50.00% compared to the similar products (mango squash) available in the market.



Genetic diversity analysis for quantitative traits in hermaphrodite ridge gourd [*Luffa acutangula* (Roxb.) L.]

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ABSTRACT

A study was carried out to determine variability, heritability, genetic advance, correlation and path analysis in hermaphrodite ridge gourd for eight quantitative characters. The fruit length had the highest heritability (93.5%) followed by node at which first hermaphrodite flower appeared (78.0%). This trait provides ample scope for varietal improvement through selection. Significant positive correlation was found between fruit yield per plant and fruit weight (0.877), number of fruits per cluster (0.590) and fruit length (0.356) at phenotypic level. Significantly negative and desirable correlation at phenotypic level was observed between fruit yield per plant and days to first fruit harvest (-0.403), days to first hermaphrodite flower (-0.337) and node at which first hermaphrodite flower appeared (-0.315). The maximum direct and desirable effect on fruit yield per plant was exerted by fruit length (0.850), number of fruits (0.334), days to first fruit harvest (-0.019) and node at which first hermaphrodite flower appeared (-0.057) at phenotypic level.



Biology and management of ber fruit fly, *Carpomyia vesuviana* Costa (Diptera: Tephritidae): A review

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ABSTRACT

Ber fruit fly, *Carpomyia vesuviana* Costa (Tephritidae: Diptera) is one of the notorious monophagous pests of ber in India, Pakistan and Middle East countries. The fly infest most of the *Ziziphus* species grown in the world and cause the damage internally and in serious case it causes severe yield loss up to 80% or even upto 100% damage. The external temperature, relative humidity and rainfall and soil moisture, soil temperature and soil depth are found to be critical factors for the activity and the adult fly emergence from soil. The favourable temperature for pupal development and adult emergence is 30°C, pupation at 3 to 6 cm depth of soil was ideal for adult emergence. Alternating rainfall ranging from 20 to 40 mm and 62 to 85% relative humidity also promotes fly activity. Prophylactic measures are the essential components for the successful management of *C. vesuviana*. Field sanitation, destruction of wild bushes, collection of infested fruits and summer ploughing to expose the overwintering pupa to hot summer breaks the reproduction cycle of fly. Growing of resistant cultivars like Tikidi, Umran, Mundia, Banarasi, Sanaur-1, Safeda selection, Illaiciihi, Mirchia, Zg-3 and Chuhara would give better yield and also reduces the protection cost. However, synthetic chemicals are presently employed as major tools against fruit fly, organophosphate and synthetic pyrethroid insecticides are in extensive use. Availability of potential biocontrol agents and botanic pesticides are very limited. Therefore, it is necessary to incorporate the all available tactics in integrated manner and incorporation of neem based formulations and biological pesticide, spinosad, bait application, male annihilation technique are essential to manage the *C. vesuviana* in a successful manner in the scenario of organic cultivation.



Evaluation and correlation for growth, yield and quality traits of ridge gourd (*Luffa acutangula*) under arid conditions

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ABSTRACT

Landraces of ridge gourd [*Luffa acutangula* (Roxb.) L.] are spread over a wide range of environments in India and their fruits are consumed as vegetable. The dry fruits of six commonly grown genotypes were collected from different parts of Rajasthan. The collected materials were evaluated during summer season of 2011 and 2012 under hot arid conditions of western Rajasthan for growth traits, flowering, yield, yield components and quality traits. The evaluated genotypes showed significant variation for most of these traits, except pH of flesh. Average number of fruits per plant was the highest in AHRG 29 (21.75) and the lowest in AHRG 27 (17.30), which had the highest fruit length (27.26cm), fruit diameter (5.13cm), ovary length (8.06 cm) and fibre content (1.96 g/100g edible portion). The highest fruit hardness was also recorded in AHRG 27 (4.91 kg/cm²), whereas the lowest in AHRG 29 (3.54 kg/cm²). Significant correlation coefficients among growth, flowering, yield, yield traits and quality traits were found. The marketable yield/plant had positive and highly significant correlation with fruit weight (0.834) and number of marketable fruit/ plant (0.624) at phenotypic level. The results of this study could be used in breeding programs for improving local landraces of ridge gourd grown in Rajasthan, India.



Genetic diversity and population structure analyses of *Morinda tomentosa* Heyne, with neutral and gene based markers

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ABSTRACT

Morinda tomentosa Heyne (Rubiaceae) an evergreen small tree also known as Aal or Indian Mulberry or Nunaa has broad range of therapeutic and nutritional value and is broadly used for making morindone dye for the dyeing of silk, cotton and wool. This is the first report wherein twenty genotypes of *M. tomentosa*, an underutilized fruit plant collected from Madhya Pradesh, India were studied for genetic diversity analyses using 131 Start Codon Targeted Markers (SCoT) (gene based) and 97 Random Amplified Polymorphic DNA (RAPD) and 70 Inter Simple Sequence Repeat (ISSR) (neutral) markers. SCoT markers showed the highest level of polymorphism, Shannon's Information Index and Polymorphism Information Content (70.23 %; $0.3 I \pm 0.27$. 1.89 ± 0.103) while the total number of bands per primer (7.0) was highest for ISSR markers. Nei's gene diversity (0.20) was found similar for both ISSR and SCoT markers. And geographical clustering was most pronounced with ISSR followed by SCoT and RAPD markers. Cumulative marker data revealed best clustering of genotypes based on their areas of the collection. And individually, our results showed the efficacy of both SCoT and ISSR (co-phenetic correlation values of 0.79 and 0.76 respectively) over RAPD (co-phenetic correlation value of 0.69) markers for genetic diversity and geographical patterning studies of *M. tomentosa*. Additionally, structure analysis grouped the twenty *M. tomentosa* genotypes into two sub-populations, this structuring and the identified markers can be utilized for making further strategies for collection and conservation of *M. tomentosa* from Madhya Pradesh and other states of India as well as for global collections.



Example varieties for DDS testing in muskmelon (*Cucumis melo* L.)

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ABSTRACT

The present study was carried out for morphological characterization of thirteen reference varieties of muskmelon (*Cucumis melo* L.) to validate DUS testing guidelines using plant descriptors adopted from the DUS guidelines of PPV &FRA. Among 34 morphological characteristics studied, 19 were visually assessed and 15 were measured. Under results, no intra-varietal variation was observed for any of the visual characteristics examined. Further, the expression of characters in different varieties remained same for the three consecutive years confirming the uniformity and stability of the variety for visual characteristics. The varieties were grouped into different categories for each character based on 34 descriptors which may be used as reference varieties. The morphological characterization of extant varieties was completed to establish distinctness of the candidate variety from all other varieties to utilize these varieties as reference material for protection of other varieties under PPV &FR Act. A strict maintenance breeding of the reference varieties, including the example varieties, and use of alternate example varieties for conduct of DUS testing in muskmelon, if needed, are also suggested.



Phenology, floral biology and pollination in bael varieties under rainfed semi-arid conditions of western India

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ABSTRACT

The present paper deals with phenological events, flower biology, foraging behaviour of flower visitors, pollen germination (in-vitro) and stigma receptivity of different bael (*Aegle marmelos* Correa) varieties under rainfed hot semi-arid conditions of western India. Phenology of all the plants in terms of leaf initiation started from 1st week of May to 4th week of June, leaf fall initiation from 2nd week of April to 4th week of June. The inflorescence pattern was observed specific in each variety i.e., axillary uniparous cyme, axillary biparous cyme, terminally axillary multiparous cyme. The peak period of flowering among all the varieties was early fortnight of June. Inking of flower opening in different varieties started from 4.00 A.M. to 9 .00 A. M. but peak period of anthesis was noticed between 5.00 to 7.45 A.M. As soon as flowers open, different kinds of insects like honey bees, bugs, butterflies, ants, houseflies start visiting flowers during 6-9 P.M. in a large number to collect forage materials and help in pollination. Visually, the floral morphology of different variety appeared to be more or less similar, but the quantitative as well as qualitative characters of different floral organs were differed in terms of arrangement



and number of petals and sepals. The number of flowers per inflorescence was recorded the maximum in Pant Shivani (24.67) followed by NB-16 (23.93) and Pant Sujata (21.24) and it was recorded the minimum in Pant Urvashi and CISHB-1 (6.97). A single flower of variety produced an average of 45.98 anthers being maximum in Pant Urvashi (61.23) and least was observed in Pant Aparna (36.67). Stigma receptivity was observed maximum at the day of anthesis in Pant Urvashi (68.53%) and one day after anthesis in NB-7 (14.37%) among all the varieties. All the varieties had pollen viability more than 95 % being highest in NB- 7.



Studies on physiological parameters in tissue culture and sucker plants of date palm (*Phoenix dactylifera* L.) cultivars

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ABSTRACT

Production of planting material in date palm (*Phoenix dactylifera* L.) is the major constraint in commercial cultivation. This is on account of fact that rate of sucker production is limited and differs from variety to variety. Therefore, for production of planting material, recourse to tissue culture has been taken. Presently, at global level, few organizations are producing tissue culture plants but their performance is yet to be ascertained. Accordingly, the present study was planned to compare the photosynthetic parameters in 4 years old tissue culture/ sucker plants of date palm cv. Khalas and Khuneizi at vegetative growth stage. It was observed that in cv. Khuneizi the plants obtained from tissue culture/ sucker do not differ much in their photosynthetic parameters. However, in cv. Khalas the rate of photosynthesis at vegetative growth stage was higher as compared to plants obtained from sucker. Similar trend was observed for other parameters also such as transpiration rate, carboxylation efficiency and water use efficiency. Data on morphometry of leaflet also revealed that leaflets of cv. Khuneizi (Tissue culture and sucker) were at par but in cv. Khalas the leaflets of tissue culture plants were significantly larger than that of sucker plants. Therefore, our results demonstrate that plants obtained from tissue culture and sucker do not differ much in terms of photosynthetic parameters under arid conditions



Impact of intercrop on incidence of ber fruit fly, *Carpomyia vesuviana* Costa (Diptera: Tephritidae) under hot arid eco-system

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ABSTRACT

Among the six treatments, all the five intercrop combinations showed less incidence of fruit fly over sole ber (control), which was statistically significant. The trend was similar in all three different environments (spacing). At 16 m x 12 m spacing, the least damage of fruit fly was recorded in the combinations, ber + marigold (0.25 %) followed by ber + radish (0.51%) and ber + mustard (0.88%). The treatment consists of ber + coriander showed minimum fly attack (1.18%) followed by ber + mustard (1.56%) in 8 m x 8m planted rows. Under 6 m x 6 m spacing ber + marigold combination recorded least incidence (1.47%) followed by ber + radish (1.70 %), ber + mustard (2.27%) and ber + coriander (2.78%). Ber + mustard combination was comparatively better against fruit fly in all three different environments. The fruit attack was low (1.10%) in the wider row spaced (16 m x 12 m) combinations and it was inverse in closer planted rows of ber trees. The study concludes that, intercropping of pest repellent crops like mustard and marigold could be a viable option to curb the fruit fly incidence; thereby reducing the expenses on pesticide application. Further, such intercropping practices also brings additional monetary return in the ber based diversified farming through harvest of the intercrops.



Traditional vegetables and their use pattern among the farming communities of western Rajasthan

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ABSTRACT

It reveals that several kind of traditional vegetables are consumed by the farming communities grown by the farmers in study area (Bikaner and Nagaur district) of the hot arid region of western Rajasthan. The majority of the farmers/local people of the study areas use the vegetables as fresh or after dehydration or value addition in their daily diet throughout the year. They convert them in form of value addition in different forms and use them as preserved fruits/vegetables as their daily dietary food stub. The farmers of the study area, had a lot of own wisdom and experiences through which they prepare various value added products of arid fruits and vegetables for earning money and for their own consumption. The major value added products as prepared by farmers/local peoples by using their own indigenous technological knowledge (ITKs)/ traditional technological knowledge were: pickles of sangari of khejri, kachri, ber, ker, lasora, tumba, clusterbean, local mushroom, carrot, chilli, round melon, Indian aloe, karonda, aonla, brinjal, etc. The dehydrated products like dehydrated pods (sangari) of khejri, clusterbean, khinip, moth bean, green gram; dehydrated kachri, snapmelon (fofalia), round melon, local mushroom, bottle gourd, carrot, ken lasora; dehydrated leaves of gram, fenugreek, bathua, mustard, carrot, spinach, flower buds of Phog (fogle); shek/ juice of mattera, kachri, snapmelon, bottle gourd, bitter gourd, ber, aonla; jam, jelly of karonda, ber, aonla, snapmelon, kachri, bottle gourd; dry powder of kachri, ker, lasora; roasted seeds, magaj, laddu, cold drinks, oil, Sweets of mattera seeds; rayata and other recipes of fog, gourd, fenugreek, round melon, spinach, kinpoli, etc. were prepared by farmers/local peoples regularly as per season and availability of the above fruits and vegetables.



Improved Rhododendron squash: processing effects on antioxidant composition and organoleptic

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ABSTRACT

The main objective of the present investigation was to develop an improvised method for the preparation of Rhododendron squash, which otherwise had a narrow consumer's acceptability, despite being rich in antioxidants due to faulty preparation procedure and to compare the superiority of the new method over existing preparation method by examining various antioxidants and total antioxidant capacity. For the preparation of squashes in the present investigation, Rhododendron petals were heated with water at 80 °C for 20 min and left for 3-hour (or 180 min) followed by filtration and addition of sugar with or without ginger juice. Leaving Rhododendron petals with water for 3-hour at room temperature following heating facilitated maximum recovery of anthocyanin in water. Rhododendron squashes, prepared through improvised method, were compared with a Rhododendron squash collected from the market (control) for their physico-chemical characteristics, antioxidants and sensory quality attributes. The improvised Rhododendron squashes registered higher values for most of the parameters than the control.



Host plant resistance (HPR) traits of ridge gourd (*Luffa acutangula*(Roxb.) L. against melon fruit fly, (*Bactrocera cucurbitae* (Coquillett)) in hot arid region of India

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ABSTRACT

Host plant resistance is an important component of integrated pest management of the melon fruit fly, *Bactrocera cucurbitae* (Coquillett). Various phenotypic traits including length of ovary pubescence, rind hardness, rind thickness, fruit length, fibre content, and fruit diameter and alleochemical traits including flavonoid content, ascorbic acid, free amino acid, tannins content and phenols content of fruit were studied on fifteen varieties/genotypes of ridge gourd, *Luffa acutangula* in relation to resistance against *B. cucurbitae* under field conditions in the hot arid region of India. Significant differences were found in tested varieties/genotypes for fruit infestation and larval density per fruit. The varieties/genotypes AHRG-57 (15.92%), AHRG-29 (17.67%) and Pusa Nasdar (18.27%) were found resistant; AHRG-41 (21.77%), AHRG-35 (25.38%), Arka Sujata (30.08%), AHRG-36 (34.8%), S. Manjari (39.67%) and S. Uphar (42.3%) were moderately resistant; AHRG-30 (55.67%), AHRG-42 (57.63%) and AHRG-33 (57.67%) were susceptible; AHRG-47 (77.75%) and AHRG-31 (79.72) were found the highly susceptible varieties/genotypes to melon fruit fly infestation. A significant positive



correlation ($r = 0.96$) was also observed between percent fruit infestation and larval density per fruit. The percent fruit infestation and larval density had significant positive correlation with fruit length and diameter and negative correlation with length of ovary pubescence, rind hardness and rind thickness. Based on Kaiser Normalization method, two principal components (PCs) were extracted explaining cumulative variation of 90% in melon fruit fly infestation and length of ovary pubescence, rind thickness, flavonoid content, ascorbic acid, free amino acid, tannins content, and phenols content were the reliable variables for characterization of resistance. Ridge gourd varieties/genotypes AHRG-57, Pusa Nasdar and AHRG-29 were classified as resistant to *B. cucurbitae* and these could be used in future breeding program as resistant sources.



Effect of sowing time on productivity and economics of okra (*Abelmoschus esculentus*) under semi-arid conditions

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ABSTRACT

An investigation to study the effect date of sowing on productivity of okra (*Abelmoschus esculentus* L. Moench) cv. Gujarat Okra 2 was carried out at the five farmer's field at Panchmahals district of central Gujarat under on farm trial during 2011-12 and 2012-13. The maximum plant height (97.15 cm) at the time of first flowering, number of branches (4.10), pod length (11.55 cm), pod diameter (14.20 cm), number of pods/plant (9.25), pod weight (32.40g) and fruit yield (10.41 tonnes/ha) were recorded in T₂. The minimum time (60.50 days) for flowering was recorded in T₁. The maximum gross return (Rs.116265) and net return (Rs.86980) was recorded in T₁ followed by T₃ (Rs. 87590, 58390) and (Rs.75895, 45778) in T₂. The maximum B: C ratio (3.97) was recorded in T₁ followed by T₃ and T₂. The B: C ratio is one of most important aspect for selection of particular crop and season by the farmers to maximize the productivity and net return. The farmers of adjoining area have realized the effect of sowing time on productivity and net return and have adopted this technology.



Prevalence of major insect pests and predators of pigeon pea (*Cajanus cajan L.*) in middle Gujarat

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ABSTRACT

A survey was conducted on pigeon pea crop in Panchmahals district of Gujarat. A total of 3 talukas were surveyed to record major pigeon pea pests namely Spiny brown bug, *Clavigralla gibbosa* Spinola, Tur pod bug, *Riptortus pedestris* Fb., Green stink bug, *Nezara viridula* Linn., Aphids, *Aphis craccivora* Koch, *Aphis fabae* Scopoli, Cow bugs, *Otinotus oneratus* W., *Oxyrachis tarandus* E, Scale insect, *Ceroplastodes cajani* Maskell, *Icerya purchasi* Maskell, Mealybugs, *Phenacoccus solenopsis* Tinsley, *Paracoccus marginatus* W.& G., *Coccidohystrix insolita* Green, Leaf hoppers, *Empoasca kerri* Pruthi, Plume moth, *Exelastis atomosa* Walshingham, Pod borer, *Helicoverpa armigera* Hubner, Spotted pod borer, *Maruca testulalis* Geyer, Hairy caterpillars, *Spilosoma obliqua* Walker, Leaf webbers/folders, *Grapholita critica* Meyr., Blue butterfly, *Lampides boeticus* Linn., Blister beetles, *Mylabris pustulata* Thumberg, Ash/Grey weevil, *Mylocerus undecimpustulatus* Faust, Thrips, *Megalurothrips usitatus* Bagnall, Eriyophid mite, *Aceria cajani* Channa., Pod fly, *Melanogromyza obtusa* Malloch, and Termite, *Odontotermes* spp., Out of these pests, 9 insect species each were observed as regular and sporadic pests whereas other 2 as major and 5 as minor pests respectively. Total number of 25 insect pests' species and 8 species of predators were recorded on pigeon pea crop during the period of study. The predators recorded mainly belonged to orders Coleoptera, Hymenoptera, Dictyoptera, Araneida and Neuroptera.



Field evaluation of bottle gourd genotypes for resistance against *Alternaria* blight in western Rajasthan

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ABSTRACT

Seventeen bottle gourd genotypes such as Pusa Naveen, Pusa Samridhi, Udaipur Local, Pusa Santushti, Pusa Sandesh, PSPL, Chomu Local, Azad Harit, Panchmahal Local, Arka Bahar, Thar Samridhi, PN-22, DBG-5, DBG-6, Jodhpur Local, IC-567538 and Sriganganagar Local were evaluated for resistance against *Alternaria* blight during rainy season of 2011 and 2012 under field conditions. Among them, 06 varieties such as Pusa Naveen, Pusa Samridhi, Pusa Sandesh, Pusa Santushti, Arka Bahar and PSPL showed moderately resistant having 4.87–8.62% disease severity and 10 genotypes were categorized as moderately susceptible (13.0 to 24.75%) while one germplasm ‘Chomu Local’ proved susceptible against this disease.



Characterization of Date Palm (*Phoenix dactylifera* L.) Cultivars on the Basis of Amino Acid Spectrum

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ABSTRACT

Acquaintance with genetic diversity among date palm (*Phoenix dactylifera* L.) cultivars is essential for cross breeding. Objectives of this study were characterization of date palm cultivars on amino acid spectrum and evaluation of phylogenetic relationship among date palm cultivars. Five date palm cultivars were investigated and rich diversity was demonstrated among these cultivars. A total of 14 amino acid spots were recognized on thin layer chromatogram (TLC). The similarity coefficient worked out for five date palm cultivars ranged from 0.29 to 0.67. Cultivar Khalas and Sewi were most similar cultivars having similarity coefficient of 0.67 and made a cluster with cultivar Dayri. Whereas, cultivar Halawy and Khuneizi constructed a separate cluster with similarity coefficient of 0.55. Cultivar Khalas and Dayri revealed minimum similarity and maximum diversity among all the investigated cultivars.



Standardization of time of softwood grafting in mahua (*Bassia latifolia*) and khirni (*Manilkara hexandra*) under semi-arid environment of western India

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340

ABSTRACT

The experiment was conducted during consecutive years of 2005-06 and 2006-07 at Central Horticultural Experiment Station (Central Institute for Arid Horticulture-ICAR), Vejalpur (Godhra), Panchmahal, Gujarat to standardize time of softwood grafting in mahua (*Bassia latifolia* Roxb.) and khirni (*Manilkara hexandra* (Roxb.) Dub.) under semi-arid environment of western India. Soft wood grafting was carried out at monthly interval commencing from July to June during both the years. Sprouting was found to be the earliest in March (26 days in mahua and 27.4 days in khirni). Maximum time for bud sprouting was taken in the month of September (34.00 days) and November (33.50 days) in mahua and khirni respectively. The highest percentage of graft success was also noted in March, i.e. 70.00 % in mahua and 76.66 % in khirni, it was closely followed by July, August and June. Least percentage of success was noted in the month of September and November in mahua and khirni respectively. Length of sprout was also recorded highest in March after 180 days after grafting in both the crops (28 cm in mahua and 22 cm in khirni). Similar trend was recorded in respect of number and diameter of sprouts. Softwood grafted plants of mahua had higher number of leaves than khirni grafts, whereas it was found to be highest in the month of March in both the crops. Irrespective of scion and rootstock, the maximum accumulation of nitrogen and carbohydrate content was recorded in March, while it was found in lower concentration during December, January and February. Soft wood grafting in mahua is to be followed during March, April and July, while March, July and August may be the appropriate time for grafting of khirni under semi-arid environment of western India.



**First report of *Colotis amata* (Lepidoptera: Pieridae) on
Salvadora persica (Capparales: Salvadoraceae) in
Rajasthan, India: incidence and morphometric analysis**

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ABSTRACT

An infestation of the small salmon Arab, *Colotis amata* (F.) (Lepidoptera: Pieridae), on pilu (*Salvadora persica* L.; Capparales: Salvadoraceae) plants was first noticed in 2012 at the Experimental Farm of the Central Institute for Arid Horticulture and other fields of Bikaner District, Rajasthan, India. The maximum incidence (80%) was observed on 18 Dec and the minimum (13%) on 4 Sep. The average numbers of insects ranged between 6.2 and 22.3 larvae per 3 leaves. Adults of this small butterfly were salmon-pink in color. Eggs were laid singly on leaves or young shoots and were 0.58–0.72 mm in length, 0.38–0.43 mm in width, and white in color when first laid, later developing red blotches. The length and width of 1st instar larvae were 1.98–2.29 mm and 0.36–0.48 mm, respectively. The lengths of 2nd, 3rd, and 4th instars were 5.04 mm, 9.77 mm, and 14.27 mm, respectively. The 5th instars were 19.30 mm long and 3.33 mm wide. Pupae were 14.10 mm long and 5.73 mm wide and laterally compressed. Adults were salmon-pink in color, and females had a body length of 9.71 mm and a wingspan of 33.62 mm. Bodies of males were 7.59 mm long and their wingspan measured 25.67 mm. The lengths of male and female antennae were 4.63 mm and 5.46 mm, respectively.



Antixenotic and allelochemical resistance traits of watermelon against *Bactrocera cucurbitae* in a hot arid region of India

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ABSTRACT

Host plant resistance is an important component of integrated pest management of the melon fly, *Bactrocera cucurbitae* (Coquillett) (Diptera: Tephritidae). We studied various antixenotic and allelochemical traits in the fruit for 15 varieties/genotypes of watermelon *Citrellus lanatus* (Thunb.) Matsumara & Nakai (Cucurbitales: Cucurbitaceae) in relation to resistance against *B. cucurbitae* under field conditions in a hot arid region of India. Results showed significant differences in tested varieties/genotypes in levels of fruit infestation and larval density per fruit. The varieties/genotypes 'Asahi Yamato' (12.73%), 'AHW/BR-16' (15.10%), and 'Thar Manak' (18.27%) were found to be resistant; 'Durgapura Lal' (23.03%), 'Sugar Baby' (26.67%), 'AHW/BR-12' (29.73%), 'Arka Manik' (34.15%), 'Charleston Gray' (38.70%), 'AHW-65' (35.80%), and 'AHW-19' (48.97%) were found to be moderately resistant; and 'IC 582909' (53.18%), 'AHW/BR-60' (55.52%), 'BSM-1' (59.10%), 'AHW/BR-137' (60.58%), and 'AHW/BR-9' (67.37%) were found to be susceptible to fruit fly infestation. Significant positive correlation ($r = 0.99$; $P < 0.01$) was observed between percentage fruit infestation and larval density per fruit. Percentage fruit



infestation and larval density per fruit were significantly and positively correlated with fruit length ($r = 0.57$ and 0.55 , respectively) and with days to first fruit harvest ($r = 0.75$ and 0.76 , respectively), but negatively correlated with length of ovary pubescence ($r = -0.91$ and -0.91 , respectively), rind hardness ($r = -0.86$ and -0.87 , respectively), and rind thickness ($r = -0.77$ and -0.75 , respectively). Maximum variation in fruit infestation and larval density were explained by length of ovary pubescence (82.5 and 83.6%, respectively) followed by fruit length (4.3 and 3.0%, respectively) and rind thickness (3.2 and 2.0%, respectively). Free amino acid content was lowest in the resistant 'Asahi Yamato' and highest in the susceptible 'BSM-1', whereas the contents of phenols, tannins, total alkaloids, and flavonoids were highest in resistant and lowest in susceptible varieties/genotypes. Flavonoid and total alkaloid contents explained 88.4 and 92.0%, respectively, of the total variation in fruit fly infestation and in larval density per fruit.



Evaluation of resistance in different varieties/genotypes of bottle gourd (*Lagenaria siceraria*) against *Cercospora* leaf spot under field conditions

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ABSTRACT

Cultivation of resistant or tolerant cultivars is one of the best options to minimize the losses due to diseases. Seventeen bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] varieties/genotypes (Pusa Naveen, Pusa Samridhi, Udaipur Local, Pusa Santushti, Pusa Sandesh, PSPL, Chomu Local, Azad Harit, Panchmahal Local, Arka Bahar, Thar Samridhi, PN 22, DBG 5, DBG 6, Jodhpur Local, IC 567538 and Sriganganagar Local) were evaluated for resistance against *Cercospora* leaf spot during the rainy season of 2011 and 2012 under hot arid field conditions of Rajasthan. Among them, none was found immune or resistant, four varieties (Pusa Naveen, Pusa Santushti, Pusa Samridhi and Pusa Sandesh) were found to be moderately resistant and four (PSPL, Arka Bahar, PN22 and DBG6) were moderately susceptible and the remaining nine were susceptible.



Seasonality and management of stone weevil, *Aubeus himalayanus* Voss (Curculionidae: Coleoptera): An emerging pest in Indian Jujube (*Ziziphus mauritiana* L.)

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ABSTRACT

The ber (*Ziziphus mauritiana* Lamarck) is an important fruit crop grown in arid and semi arid regions of India and elsewhere. Nutritionally, the fruits are rich in protein, phosphorus, calcium, carotene and vitamin C. In India, productivity tends to be low because of various biotic stresses such as pests and diseases. Of the various insect pests infesting ber, the stone weevil *Aubeus himalayanus* Voss (Coleoptera: Curculionidae) is a new threat to ber cultivation in India. This was recorded as a new pest of ber in India for the first time in the state of Andhra Pradesh in 1994. Serious attacks were later reported in Rahuri, Maharashtra and Jobner, in 1996, and in Karnataka during 1998. Recently, infestations of this pest were reported in Bikaner and Rajasthan in 2010 and in Bangladesh in 2009. The females lay their eggs on the styler end of fruits, or rarely on the distal end. The newly emerged white coloured grubs enter the seeds by making a puncture in the endocarp of the immature fruits, and starts feeding on the soft seed coat. Later it enters the endosperm, feeds on it, and pupates within the seed. The weevil completes its life within a single fruit. The infestation results in severe fruit drop at the initial stage of fruit set. The damage intensity of the stone weevil varies with cultivars; stoned varieties are preferred more than the pulp rich varieties. Periodical monitoring of orchards for weevil incidence is essential for timely implementation of control strategies. Delayed detection makes management difficult as they enter the seed.



Characterization of aonla (*Emblica officinalis*) varieties under zero irrigation semi-arid conditions

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ABSTRACT

A field study was conducted to differentiate the aonla (*Emblica officinalis* Gaertn) varieties for their vegetative and fruit characters under rainfed hot semi-arid ecosystem of western India during the years 2012-14. Among the cultivars, growth habit was observed upright spreading, tall upright, tall spreading, tall drooping and tall semi- spreading. The foliage was visualized as dense and sparse among all the cultivars. The leaflet colour (green to pale yellowish green), shape (oblong, oval oblong and elliptical), apex (obtuse and acute) also varied among the cultivars. The size of leaves in terms of length and breadth ranged between 1.25-1.47 cm and 0.23-0.37 cm, respectively. The time of fruit set and time of fruit maturity differed considerably among the varieties. The maximum fruit set (51.95%) and fruit retention (26.40%) were recorded in NA 7, whereas same was recorded minimum (36.21%) in Banarasi and Francis (11.34%). Variations in fruit shape, i.e. triangular, flattened oblong, flattened oval, and flattened round, whereas size of the fruit was observed as small large and medium among observed varieties. The highest fruit weight (33.90 g) and specific gravity (1.43) were found in Banarasi while these traits were recorded the lowest in Kanchan and Francis, respectively. The qualitative physico-chemical characters, viz. fruit juice content, acidity, pulp content, vitamin C content, TSS, TSS/acid ratio and stone weight ranged between 40.00-64.45%, 1.34-2.56%, 23.95-31.95 g, 334.12- 461.76 mg /100gm , 8.00-11.50% and 3.61- 6.74 g and 1.97-2.08 g, respectively. The stone of the fruit also varied with respect to its shape (triangular and oval round) and size (large, medium and small) under rainfed hot semi-arid environment of western India.



Phytochemicals and antioxidants in watermelon (*Citrullus lanatus*) genotypes under hot arid region

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ABSTRACT

Ten genotypes of red-fleshed watermelon [*Citrullus lanatus* (Thunb.)] were estimated for various health promoting bioactive compounds. The evaluated genotypes showed wide variability in total phenols, total flavonoids, tannin, total carotenoids and lycopene contents. The antioxidant activity was estimated by using *in vitro* assay of cupric reducing antioxidant capacity (CUPRAC). The significant difference ($P=0.05$) was observed among evaluated watermelon genotypes for different phytochemicals and antioxidants. The total phenols varied from 16.77 to 21.41 mg/g, total flavonoids 55.60 to 100.93 mg/100g and tannin content 35.07 to 60.83 mg/100g on dry weight basis. Total carotenoids and lycopene ranged from 4.90 to 8.06 mg/100g and 3.74 to 6.80 mg/100g, respectively on fresh weight basis. The average antioxidant activity was found to be varied from 40.13 to 84.05 $\mu\text{mol TE}/100\text{g}$ fresh weight. The results indicate that red-fleshed genotypes of watermelon are good source of antioxidants and showed significant variability for different phytochemicals and antioxidants that could be exploited to develop new cultivars/hybrids of superior quality for nutritional security.



AHMM/BR-8 (IC0599709; INGR 14043), a muskmelon (*Cucumis melo* L.) germplasm with monoecious sex form

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ABSTRACT

Muskmelon (*Cucumis melo* L.) is an important cucurbitaceous crop grown as a 'Desert Crop' throughout the warmer parts of world. Being cross pollinated crop it showed heterosis for earliness, fruit size, fruit weight, flesh thickness, total soluble solids, fruit flavour, transportability and fruit yield. Presently the main attention is being paid on the development of FI hybrids due to high yield, uniform fruit shape, size as well as consistently excellent quality. Keeping in view, a monoecious line of muskmelon was identified and purified through inbreeding from the genetic stock collected from Sirohi district of Rajasthan. Single plant selection was exercised based on earliness, fruit size, flesh colour and TSS. Finally, the obtained population was tested for stability and observed stable monoecious sex form. Plants of IC0599709 produced round fruits with salmon orange coloured flesh and develop full slip at ripening. The biochemical analysis has been done for total sugar (336.97 mg/g), tannin content (0.12 mg/g), phenol content (34.73 mg/g) and flavonoid content (1.05 mg/g) on dry weight basis. Thus, the presence of stable monoecious sex form in IC0599709 could be utilized in F I hybrid production of muskmelon.



DUS characterization of muskmelon (*Cucumis melo*) varieties

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ABSTRACT

The present study was carried out for morphological characterization of twelve reference varieties of muskmelon (*Cucumis melo* L.) collected from ICAR institutes and SAUs to validate DUS testing guidelines using plant descriptors adopted from the DUS guidelines of PPV and FRA. Among 34 morphological characters studied, 19 were visually assessed and 15 were measured. The fruit shape in longitudinal section was expressed as ovate (MHY 5), elongated globe (Arka Rajhans), oblate (GMM 3, Kashi Madhu) and obovate (Durgapura Madhu). The rind colour of fruit have been grouped as yellow (Kashi Madhu), yellow green (Durgapura Madhu) and orange (Arka Jeet). The sutures on fruit surface were found to be absent in Arka Jeet, MHY 3 and present in Hara Madhu, Kashi Madhu varieties. With respect to netting on fruit surface the varieties have been grouped as absent of netting (Arka Jeet, MHY 5) and moderate netting (RM 50, Punjab Sunehri). The flesh colour was expressed as creamish white (Arka Jeet), grey orange (GMM 3), yellowish green (Durgapura Madhu), green (Hara Madhu) and orange (Kashi Madhu). Under results, no intra-varietal variation was observed for any of the visual characteristics examined. Further, the expression of characters in different varieties remained same for the three consecutive years confirming the uniformity and stability of the varieties for visual characteristics. The varieties were grouped into different categories for each character based on 34 descriptors which may be used as reference varieties. Identified 6 traits as grouping traits, viz. sex expression (at full flowering), fruit shape in longitudinal section, rind colour of fruit, sutures on rind, surface netting of fruit and fruit flesh colour. The morphological characterization of extant varieties was completed to establish distinctness of the candidate variety from all other varieties to utilize these varieties as reference material for protection of other varieties under PPV&FR Act.



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The lacks of widespread dissemination of research findings hamper the due recognition for novelty of the research results. This was the genesis for preparing the present book of abstracts of research papers published (from 1993 to 2015) out of work done on arid horticulture at ICAR-Central Institute for Arid Horticulture, Bikaner, an institute under aegis of Indian Council of Agricultural Research. Majority of the work was done on arid fruits (ber, datepalm, aonla, bael, jamun, karonda, phalsa, pilu, lasora, pomegranate, kinnow and citrus) and vegetables (snapmelon, kachari, watermelon, long melon, muskmelon, bottle gourd, moringa, khejri, ridge gourd and sponge gourd).

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