

National Seminar on Research, Development and Marketing of Cashew

The seminar was concluded with resolutions drawn in the plenary session which is summarized below:

1. Research programmes in cashew should be reoriented as per the needs of future, looking into the changing scenario of stiff international competition from countries like Vietnam and others and meeting indigenously, the raw nut requirement of processing industries / cashew manufacturers and exporters.
2. The benefits of technologies claimed by scientists must be demonstrated in the farmers' field through conducting demonstration trials so that farmers and processors are convinced with the new technologies. Transfer of technology should be given utmost importance so that the improved technologies are adopted by the farmers and impact of the technologies felt in the field level so that production target is achieved consistently in order to support the processing industries.
3. In order to overcome the shifting of cashew farmers to other crops (e.g. rubber) and fluctuation of raw nut price, possibilities of 'Adoption of Villages by Cashew Industries and /or Contractual Farming' may be explored for extension of the scientific technologies to the end users for 'Mutual Sustainable Benefits'. Potential of 'Organic Cashew' may be explored keeping in view the sustainability in international market.
4. Utilization of cashew apple needs to be improved considerably so that wastage of huge quantities of cashew apple an economically important biomass, is diligently avoided. For achieving this, besides popularizing the already available technologies for cashew apple processing, research technologies may be explored for cost effective technologies for alternative uses of cashew apples and cashew apple wastes for production / extraction of Ascorbic acid, Ethanol, Bio-fuels, etc.
5. Introduction of crop insurance policy in cashew needs to be considered so that farmers are protected from unforeseen circumstances such as loss of yield due to pests and diseases, weather factors, forest fire / fire hazards, etc.

In addition, marketing and developmental issues, and management, plant protection, processing and value namely crop improvement, crop production and presentations of lead papers by experts in respective fields of the Seminar included the stiff competition in the international markets. Indian cashew industry in general and Indian cashew farmers in particular become sustainable in future despite the need for all out efforts to make the Indian cashew Promotion Council of India, emphatically mentioned about Harkrishnan R. Nair, Vice-chairman, Cashew Export Almond, in his Key note cum Presidential address. Shri Almond, in relation to the other dry nuts like scenario of cashew in relation to the other dry nuts like While highlighting the international export and import like Blossom blight in cashew.

Urgent need for addressing the weather related problems developed by Dr BSKKV, Dapoli. He also indicated the technology for extraction of CNSL by using solar energy, processors in the country. Dr Mehta highlighted the novel the domestic raw nut production to meet the requirement of strategic research for achieving the immediate increase in Paeth (Dr BSKKV), Dapoli emphasized the need for Chacheilior, Dr. Balasahab Sawant Konkarn Krishi Vidhya in his inaugural address. Dr Vijaya Mehta, Vice-Chancellor, Dr. Balasahab Sawant Konkarn Krishi Vidhya research in the country and the future needs. gave brief account of an over view of the status of cashew Director, National Research for Cashew, Puttur, Karnataka, introductory remarks in the inaugural session. Dr M G Bhat, dignitaries, delegates and the invites while presenting the Research Complex for Goa, Old Goa welcomed all the At the out set, Dr V S Korikanthimath, Director, ICAR Baner, etc.

Development, Private and Public Corporation Sectors, Cashew Processors and Cashew Processors Association, Goa, the Guests of Mapusa, Goa and Shri Surendra Kamat, President, Goa Gurdatta D Bhakta, Director, Bhakta Distilleries Pvt Ltd, (Horticulture), ICAR, New Delhi, in the presence of Shri the Chief Guest, Dr H P Singh, Deputy Director General, While addressing the delegates in the Plenary Session, etc were focused in the technical sessions.

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One unit can hold about 100 strings, each of which can be Rs. 20,000/- for the first year and Rs. 30,000/- during the second and third years. for a unit of the size of 5m x 5m. Calculated economics of culture indicated a net profit of of Rs. 2-3/- in the market in Goa.

seeded ropes. The musseel of size over 5 cm fetched a price of culture with a yield of 570 kg in 5m x 5 m rack bearing 40 indicated an average growth of 42.5 g (7.5 cm) in 133 days produced. Field trials on green musseel in backwater creek, musseels continuously feeding on excessive plankton help in bioremediation by reducing organic load through growth period considerably. Musseel culture in shrimp farms continuous feeding in raft culture, thereby reducing the musseels have to stop feeding during low tides as against is advantageous than in nature (inter-tidal zone) where Kochi. Growth of musseels in ropes suspended fully in water under raft culture method, were laid out both in backwater creek, in collaboration with CMFRRI, Goa, research demonstrations on culture of green musseel (*Perna viridis*) To popularize musseel farming in Goa, research

Musseel culture in backwater creeks of Goa

RESEARCH HIGHLIGHTS

V.S. Korikanthimath

dependence on neighbouring states.

more production of vegetables per year and reduces the of 15 tonnes/hectare, which will add almost 50 per cent productivity level of 10 tonnes/hectare to national average well. Thus, the immediate goal would be to raise the present production and productivity of vegetables in Goa. There is an enormous scope for producing organic vegetables as in Agriculture and Goa State Horticulture Corporation have been quite encouraging in the recent years to increase the production in collaboration with the Goa State Department of Agriculture and Goa State Horticulture Corporation have and productivity of these high value crops. Our reach technologies will go a long way in increasing the production followed by large scale cultivation with improved production of improved varieties/hybrids in major vegetable crops yield gap is wide with hybrid vegetables. Hence introduction of vegetables are low compared to national varieties and the population. But the productivity levels of these types of fetch premium price and are in demand among the local hybrid vegetables in major crops. The local vegetable types improvement would be to introduce large scale cultivation of local population and tourists. The priority area of the vegetable area and production to meet the requirement of improved varieties/hybrids in tomato.

It is high time to devise a sustainable policy to improve resistant varieties/hybrids in tomato.

possible during *rabi* season. The problem of bacterial wilt extended summer seasons. Cultivation of tomato is also were successfully demonstrated during *kharif* and *rabi* Other crops like baby corn and sweet corn cultivation potato to record a yield of around 65 quintals per hectare. evaluated under Goa condition. The consecutive trials on farmers' jaggery bails for the management of *B. cucurbitae* in hill cucumber prevented a loss of about 4.7 t/ha resulting 1.15.3.

one of the intensive methods practiced during November-January extension up to March-April in Goa. The major vegetables grown in this method are sweet potato, brinjal, up during *rabi* extended summer on paddy fallow lands. Brinjal is an important vegetable crop during *rabi* season and there are two popular local types viz., Agassim and Taleigo. The Agassim type has oblong dark purple fruit with soft flesh, where as Taleigo is round with light purple colour. The flesh of Agassim is soft and pulpy while it is hard in Taleigo and hence the latter keeps better in storage. Both the varieties are highly susceptible to bacterial wilt disease. In order to combat high incidence of wilt problem, an intensive survey was carried out to collect all available germplasm for wilt resistance as well as high yield.

In this endeavour, ICAR Research Complex for Goa has made all out efforts to collect, conserve and improve the local germplasm available in vegetable crops especially in brinjal, chilli and vegetable cowpea, apart from collection, efforts are being made to introduce new vegetable crops as well as new varieties in major crops to improve the production and productivity of vegetable crops in the state of Goa. Cool season crops like potato, Chinese cabbage, beet root, palak, palak, cabbage were also introduced and

PARTICIPATION IN SEMINAR / SYMPOSIA / WORKSHOPS

- V S Korikanthimath**
Special Interactive Workshop on Administrative and Financial Matters for the ICAR Institutes placed under Southern/Western Zone, held at NIANP, Bangalore on 26-27 October, 2007.
International Seminar on Coastal Agriculture held at Kolkatta during 28 - 30 October, 2007
- S Subramanian**
Review meeting of the ornamental fish seed production held at CIFA, Bhubaneswar during 24-25th September, 2007.
Special Interactive Workshop on Administrative and Financial Matters for the ICAR Institutes placed under Southern/Western Zone, held at NIANP, Bangalore on 26-27 October, 2007.
8 Asian Fisheries Forum held at Central Marine Fisheries Research Institute, Kochi, India during 20-24th November, 2007.
Workshop on marine fisheries of Goa: Resources and sustainable utilization held at FSI, Vasco-da-Gama on 28th November, 2007.
- M S Ladaniya**
National conference on New developments in food processing- Next generation technologies for healthy foods held at Hotel Taj Beach Resort, Fort Aguada, Goa during 5-6 October, 2007.
National conference on Banana, held at Trichy during 25- 28 October, 2007.
- J R Faleiro**
Training on "Techniques for semiochemical research" at the Project Directorate on Biological Control, Bangalore from 17-25, September, 2007
- H M Wasnik**
National Rajbhasha Sammelan held at Puri, Orissa during 21 - 23, November, 2007 Organised by Bhartiya Rajbhasha Parishad at Puri (Orissa).
- S P Singh**
Training programme on leadership and personality development held at NAARM, Hyderabad during 5-12 July, 2007.
- B L Manjunath**
Third National Symposium on Integrated Farming Systems & its Role towards Livelihood Improvement held at Durgapur, Jaipur during 26-28 October, 2007.
- E B Chakurkar**
XXIII Annual Convention of ISSAR and National Symposium on " Challenges in improving Reproductive efficiency of Farm and Pet animals" held at Veterinary College Orisa University of Agriculture and Technology Bhubaneswar Orisa during 7-9 December 2007.
- S B Barbuddhe**
59th Congress of German Society of Hygiene and Microbiology (DGHM) held at Goettingen, Germany during 30 September to 4 October, 2007.
- K N Mohanta**
Workshop on Sustainability of Indian Aquaculture Industry held at Indian Institute of Technology, Kharagpur, during 28-29th September, 2007.
Workshop on marine fisheries of Goa: Resources and sustainable utilization held at FSI, Vasco-da-Gama on 28th November, 2007.
8th Asian Fisheries Forum" held at Central Marine Fisheries Research Institute, Kochi, during 20-24th November, 2007.
- S Manivannan**
Summer school on excess rainfall management in vertisols held at CIAE, Bhopal during 18 August - 8 September, 2007.
- R Ramesh**
Workshop on Taxonomy capacity building for fungi (Ascomycetes and Hypomycetes) held at Goa University, Bambolim Goa during 26-29 September 2007.
- M Thangam**
OTSC training on advances in protected cultivation of vegetables held at Centre for Protected Cultivation Technology (CPCT), IARI, New Delhi during 10-21 December, 2007.
- S Priyadevi**
National conference on banana held at National Research Centre for Banana, Trichy during 25-28 October, 2007.
- J Ashok Kumar**
Training programme on Intelligent reporting system (IRS) to nodal officers/data entry operators of Research Institute held at NAARM, Hyderabad during 30-31 August, 2007.
- Ram Ratan Verma**
Summer school on excess rainfall management in vertisols held at CIAE, Bhopal during 18 August - 8 September, 2007.
Training on soil and plant analysis held at IISS, Bhopal during 10-15 September, 2007.

PERSONALIA

Promotions

Dr. J. R. Faleiro, Senior Scientist was promoted to Principal Scientist w.e.f. 29-05-2006.
Dr. S. Manivannan, Scientist Senior Scale was promoted to Senior Scientist w.e.f. 05-10-2007.
Shri Edward Crasta, T-4 was promoted to T-5 (Technical Officer) w.e.f. 01-07-2007.
Shri Sidharth K. Marathe, T-4 was promoted to T-5 (Technical Officer) w.e.f. 27-10-2007.
Smt. Madina Sollaipuri, T-4 was promoted to T-5 (Technical Officer) w.e.f. 20-11-2007.

Appointments

Shri Yeshwant Gauns was appointed as T-3 w.e.f. 01-09-2007.
Shri Payak Padkar was appointed as SS Gr-I w.e.f. 26-07-2007.

Transfer

Shri Mahesh Kumar Mulani, Asst. Finance & Accounts Officer was transferred to NCIPM, New Delhi w.e.f. 01-07-2007.

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Printed at : Sahyadri Offset Systems, Corlim, Goa. Ph.: 2285704



NEWSLETTER

ICAR RESEARCH COMPLEX FOR GOA



Vol. 9 No. 2

JULY TO DECEMBER - 2007

From the Director's Desk....



Vegetable production in Goa

India has made substantial growth in production and productivity of vegetable crops with a total annual production of over 88.6 million tonnes next only to China. India's share in world production of vegetables is 11.4 per cent. The average productivity of vegetables is 14.4 tonnes per hectare. The advent of hybrid technology coupled with greater concern for nutritional security among the people, the vegetable production in the country is progressing in the right direction. Although the national productivity is around 15 tonnes per hectare, production and productivity of vegetables in some of the states are static around 10 tonnes/ha only. In these states, there is an urgent need to reorient the production strategy so that vegetable production gets impetus.

Goa state being an internationally renowned tourist destination with huge influx of tourists both from India and abroad throughout the year, the requirement of fresh fruits and vegetables is always high. In Goa, the area under vegetable crops during 2006-07 was 8,213 ha with the annual production of about 84,290 tonnes. The average productivity works out to be around 10 tonnes per hectare which is very low compared to national average. The present magnitude of vegetable cultivation is very low and disproportionate to the Goan and floating population. Hence, bulk of vegetable requirement is met from the neighbouring states like Karnataka and Maharashtra.

There are two systems/types of vegetable cultivation in Goa. The first one is rainfed cultivation as Goa receives exceptionally good amount of rainfall (2500-4000mm/year). The low-lying areas are used for rainfed paddy cultivation in *kharif* and vegetables are raised in paddy fallow in *rabi* extended summer with protective

irrigation, where as sloppy areas without water stagnation are used for raising vegetable crops during *kharif* season.

The second system of cultivation is with assured irrigation facility. This type of cultivation starts normally after the monsoon. The areas covered under this type are plateau and low-lying sandy belts. Unlike the other states, where deep wells or canals serve as the sources of irrigation, here shallow dug out pits are used for irrigating the fields as the water table is very high. It facilitates easy distribution of water from the shallow pits.

The vegetable cultivation on hill slopes is purely rainfed, the major crops cultivated being cucurbits (cucumber, ridge gourd, snake gourd, bitter gourd, pumpkin, cocchine, musk melon.), okra, chillies etc. The method of cultivation is same as that of shifting cultivation in the states of north eastern region. The slopes are cleared and vegetables are cultivated on ridges and furrows. This operation is completed before the onset of monsoon (May). Immediately after the onset of monsoon, seeds are dibbled directly on the ridges in case of okra and cucurbits and seedlings are planted in case of chillies. The farmers are using the same piece of land for 2-3 years, after which, a new area is cleared and taken up for vegetable cultivation.

Hill cucurbits namely cucumber, ridge gourd, bitter gourd and snake gourd are cultivated by a specialized group of farmers in Goa called *mollekars* belonging to tribal communities. These cucurbits are cultivated during *kharif* at the foot hills of Western Ghats in the Goa region. There are no reports on the exact area under these crops in Goa. However, the cultivation of these cucurbits has steadily increased in the State over the years and can be roughly estimated to be around 500 hectares of which cucumber occupies 50 per cent of the area followed by ridge gourd (30%), bitter gourd (10%) and snake gourd (10%). The melon fly, *Bactrocera cucurbitae* (Diptera: Tephritidae) causes extensive damage to these crops with losses in yield going up to 25 per cent. Often farmers resort to use of harmful insecticides to control this pest which are mostly sourced through unscientific pesticide dealers, thus farmer ending up with incorrect interventions.

Due to the detailed studies and the sustainable approach for controlling the melon fly in hill cucurbits of Goa using Bait Application Technique, the tribal farmers have learnt to manage this pest by squirting food baits instead of using harmful insecticides. The technology tested through wide-area village-level programmes for three years

Detection of *R. solanacearum* from soil and brinjal

Detection of *R. solanacearum* from soil using PCR was standardized. Following the modified method of soil DNA isolation a minimum of 68 *R. solanacearum* cells were detected using PCR. In addition the pathogen was also detected from the healthy plants, weeds in the brinjal field by PCR with some modification in the sampling procedure. Change in physiology of brinjal in response to treatment with

antagonistic bacteria and challenge inoculation of with *R. solanacearum* was studied. Result revealed that antagonistic bacteria induced defense enzymes and PR protein in the host immediately after infection by the pathogen. These defense enzymes and induced PR proteins may play a major role in pathogen suppression.

Area-wide village level management of the melon fly, *B. cucurbitae*

Farmer participatory trials were taken in Goa in one acre cucumber farms during Kharif, 2007 with an aim to educate the farmers on Bait Application Technique (BAT) and also to assess the effectiveness of BAT vis-a-vis plots treated with insecticide for the management of *B. cucurbitae*. Results indicated that baits prepared with locally available material viz., Banaralbanana + Jaggery gave control of *B. cucurbitae* at par with insecticide (malathion 50EC) and were both superior to the imported protein hydrolysate (Table 1).

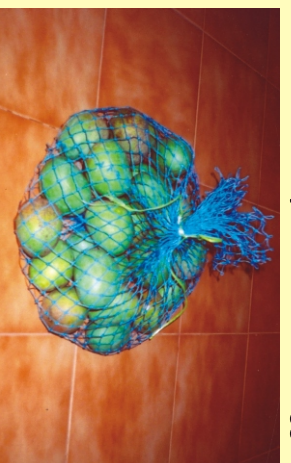
Sl. No	Treatments	Trial-I	Trial-II
1	PH	11.15 (3.80)bc	14.38 (6.29)D
2	Banana	13.16 (5.47)B	16.61 (6.23)D
3	Banana +Jaggery	09.19 (2.80)C	11.41 (4.05)C
4	Insecticide	10.09 (3.08)bc	10.48 (3.37)C
5	Control	26.58 (20.24)a	25.70 (18.95)a
	CD (p=0.05)	3.53	2.96

Figures in parenthesis denote original values, using Arc sin transformation

Hot Water Treatment of mango controls Orchard fly

Trials on Hot Water Treatment (HWT) of mangoes conducted at ICAR Research Complex for Goa revealed that fruits treated at 48°C for both 1.0 and 1.5 hours, effectively controlled the orchard fly, *Bactroera* spp. The infestation in untreated control was 25 per cent with *B. dorsalis* and *B. caryae* emerging from these fruits. Further, fruits artificially inoculated with eggs and larvae (1st

& 1st instars) and subjected to the above hot water treatments revealed that HWT was effective in killing the above stages of *Bactroera* species. Organoleptic analysis showed that the overall quality of fruit is not affected by hot water treatment with aroma and sweetness improving in treated fruits.

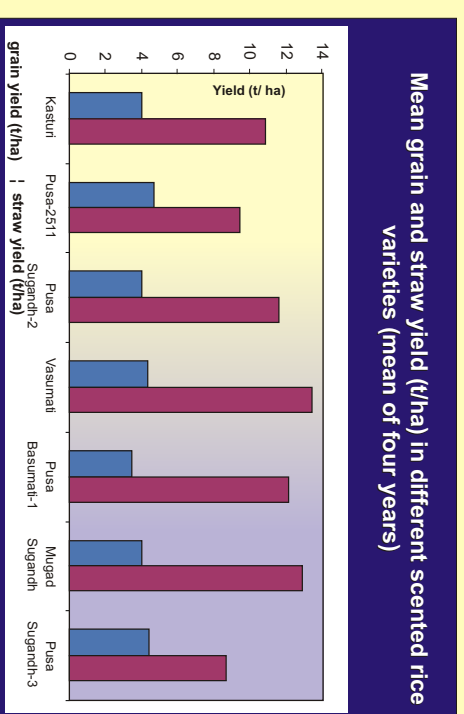


Selection of scented rice for higher profitability

Field experiments were conducted for 3 years during 2004-06 at ICAR Research Complex for Goa, to assess the feasibility of improving profitability from rice cultivation through introduction of suitable scented rice varieties and their value addition. The trials involved comparison of 7 scented rice varieties viz., Kasturi, Pusa Sugandh 2, Pusa Sugandh 3, Pusa Sugandh 5, Vasumati, Mugad Sugandh and Pusa Basmati-1 in randomized block design with 3 replications.

The pooled mean grain yield indicated that variety Pusa Sugandh 5 was significantly superior (4.66 t/ha) over Pusa Basmati-1. The milling per cent of the varieties ranged from 60 to 68 % with Pusa Sugandh 5 recording 67 % milling.

Highest gross and net returns were obtained through processing and value addition especially with variety Pusa Sugandh 5 (Rs 61 705 /ha and Rs 29885 /ha, respectively) indicating the feasibility of enhancing the net returns by 72 %.



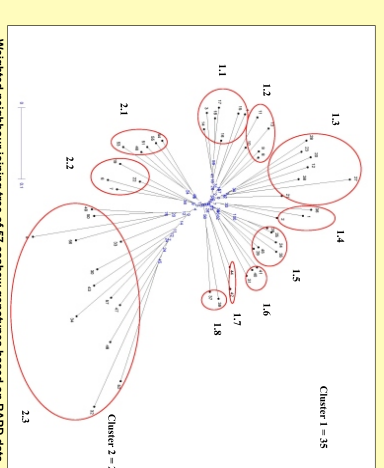
Molecular Diversity Analysis of Cashew Genotypes

Seventy three RAPD primers identified many alleles among the 57 genotypes. The allele size ranged from 0.3 – 3.6 Kb across primers and genotypes of cashew. A total of 193 amplicon profiles were available for comparison of the accessions, of which 147 were polymorphic. On an average 5.05 numbers of amplicons per primer could be scored, all of which were major bands. Polymorphic level per primer was 3.97.

All the cashew accessions were observed to be in between the dissimilarity coefficients, fully bootstrapped (1000), of 0.09 and 0.51 which indicated 49 per cent of similarity at molecular level among the cashew accessions studied. The lowest dissimilarity of 0.09 was observed between the genotypes Kudl-1 and Kudl-2 (Sl. nos. 17 and 18), while the highest dissimilarity coefficient of 0.51 was between the genotypes Sarvan-1 and Agond-2 (Sl. nos. 27 and 32).

The weighted neighbour-joining diversity tree (fig 1) constructed based on the RAPD data indicated two broad clusters among the 57 cashew genotypes. The Cluster 1, the broad group, comprised of 35 genotypes, while the cluster 2 had 22 genotypes. The first cluster could further be divided into as many as 8 sub-groups, though with relatively lesser confidence, compared to cluster 2. But a pair-wise similarity was more apparent within this broad group and pinpointed five pairs, comprising of genotype numbers 37 & 38 (Sattan 4 & 5); 40 & 41 (Ashley 1 & Sattan 30/4); 26 & 25 (Lauloim 3 & 4); 8 & 9 (Ganpa 1 & Karapur 2); as well as 17 & 18 (Kudl 1 & 2).

While the Cluster 2 comprised of 22 genotypes, within which, at least three sub groups (Sub clusters 2.1, 2.2 and 2.3) comprising of five, four and 13 genotypes in each,



MAJOR EVENTS

QRT visits the Institute

The Quinquennial Review Team comprising of Dr. S. L. Mehta as Chairman and Dr. Y. S. Nerkar, Dr. S. P. Patanjaliappa, Dr. K.V.Peter, Dr. K.V.Devaraj and Dr. V.L.Deopurkar as Members visited the Institute to review the work done by the ICAR Research Complex for Goa for five years ending March, 2006. QRT had its first meeting during 12-13 June, 2007. Dr. V.S.Korkikantnath, Director of the Institute welcomed the team. Subsequently, he made presentations on research achievement and activities of the Institute during the period under review. Following the report of the Director, concerned Project leaders also highlighted research achievements by their groups. Dr. S. Subramanian, the Secretary presented Action Taken Report on the last QRT report (1994-95 to 2000-01). After the presentation, Chairman and Members in their introductory remarks appreciated the Director and the Scientists for the excellent presentation made by them. They also indicated the expectations of stakeholders in the new globalized environment and the role Goan agriculture can play in bringing prosperity to the farming community. The visit was quite extensive and all scientists were on the farm to explain the work been carried out by them. The team also visited the farmer's fields who adopted new



technologies under transfer of technology programmes of the Institute. The team members were pleased to see good crops especially the stand and productivity.

The team visited for the second occasion during 2-5 November, 2007. During the visit, discussions were held with development departments and progressive farmers. After thorough discussions the draft recommendations were prepared.