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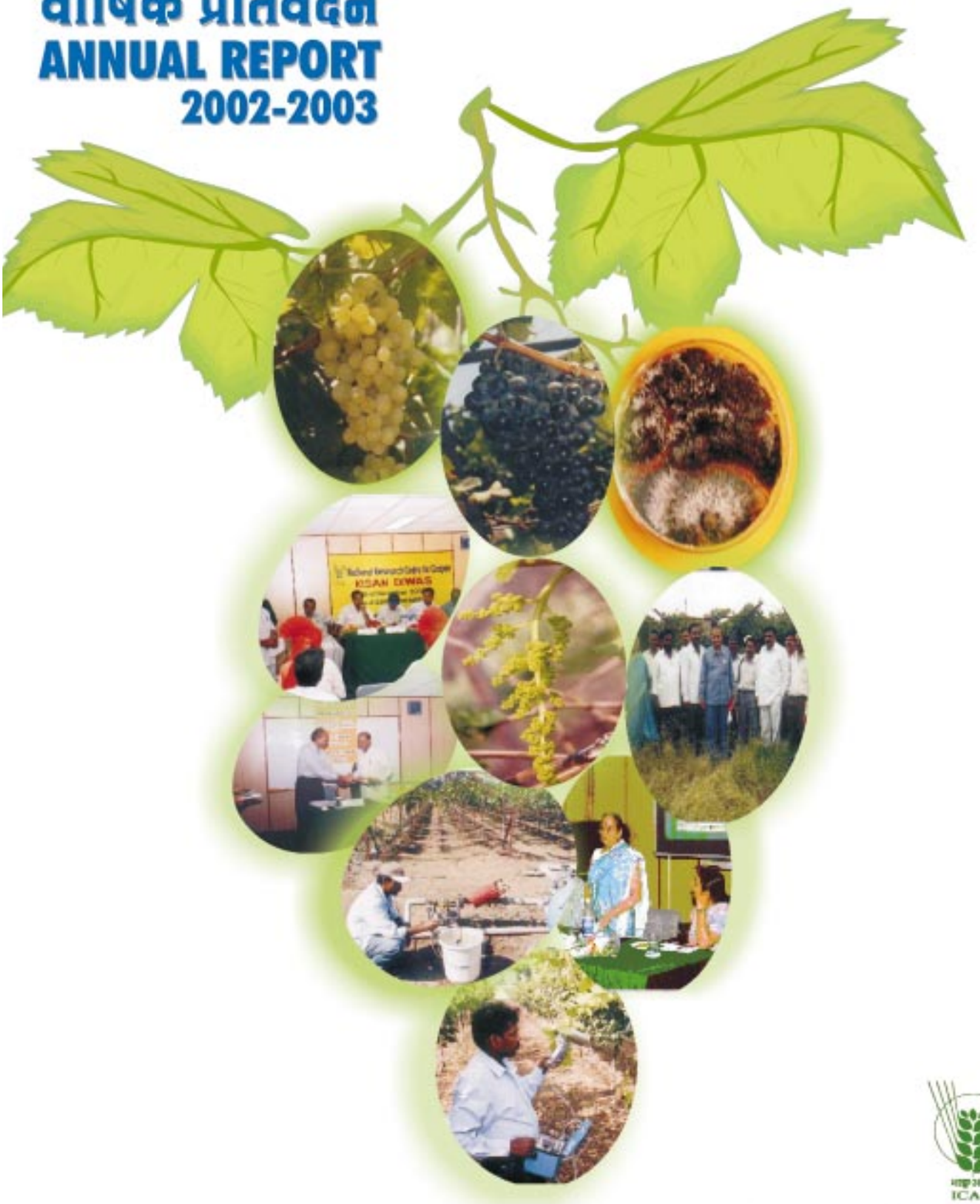

राष्ट्रीय अंगूर अनुसंधान केन्द्र
National Research Centre for Grapes

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राष्ट्रीय अंगूर अनुसंधान केन्द्र
(भारतीय कृषि अनुसंधान परिषद)
डाक पेटी नं. 3, मांजरी फार्म डाकघर, पुणे - 412 307.

NATIONAL RESEARCH CENTRE FOR GRAPES
(Indian Council of Agricultural Research)
P.B. No. 3, P.O. Manjri Farm, Solapur Road, Pune - 412 307.

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Content

PREFACE

Development of land, augmentation of irrigation facilities and acquiring of new instruments and tools was continued to strengthen the infrastructure facilities. Centre continued the research activities under the on going Institute and other projects funded by the APEDA, DBT and NATP. Work on newer research areas particularly on bioremediation of pesticide residues in fresh grapes and grape germplasm information system on indigenous and introduced varieties was initiated. Quality status of raisin produced in Maharashtra and Karnataka in the context of Codex Alimantirus quality food standards was initiated and completed.

Important contributions were made in the field of research. Surveys on pest risk analysis in collaboration with APEDA, revealed that the Indian vineyards are free from fruit fly infestation, including vineyards in the vicinity of mango and guava orchards. Further, it was also revealed that the Indian vineyards are free from the presence of *Botrytis cinerea* (gray mould disease), which is major fungal pathogen causing economic loss in grapes in most of the countries in the world. This information was submitted to the Ministry of Agriculture to use in non-tariff measures in the import of fresh grapes and processed products.

Scientists delivered talk on various areas of viticulture in the Annual Seminar in Pune as well as the regional seminars in different locations of Maharashtra State Grape Growers' Association with membership of twenty two thousand. Vineyards in Sangli and Solapur districts of Maharashtra faced severe drought during the period and, therefore, emphasis was given on educating the growers about viticulture management during water scarcity. In this context, a bulletin on 'Appropriate and economical use of water in grapevine cultivation' based on the experimental data collected at the Centre was published. 'Kisan Diwas' and technology transfer sessions were organized in order to disseminate the technical information to the growers on various facets of viticulture through dialogue, exhibition and farm visits. Scientists also participated in the seminars organized at Hyderabad and Bijapur for the benefit of grape growers in Andhra Pradesh and Karnataka, respectively.

In order to review, monitor and evaluate the research programmes and research and development activities of the Centre, QRT, RAC, IMC and SRC meetings were conducted and the reports were submitted to the Council.

I hope the information provided in the report will be useful and of interest to the grape growers, scientists, technologists and students working in the field of viticulture and enology.

I would like to express my gratitude to the DDG (Hort.), Dr. G. Kalloo for guidance and encouragement during the period. I also take this opportunity to thank all the staff of this Centre for their direct and indirect contribution in various activities and programmes of the Centre and to bring out this report.

Place : Pune
Date : 30th September 2003

(P.G. ADSULE)
Director (Acting)

Executive Summary

National Research Centre for Grapes, working under the aegis of Indian Council of Agricultural Research, New Delhi since 1997 has the mandate of crop improvement, sustaining the productivity and diversified use of grape. The research is carried out in the broad areas of crop improvement, crop production, crop protection and postharvest technology.

The first Quinquennial Review Team for the Centre was constituted by the Council during the year and the team held extensive meetings with scientists, other staff, IMC, growers etc., reviewed the overall progress and has submitted its report to the Council. Meetings of the RAC, SRC, IMC and IJSC were also conducted as per the schedule and their recommendations were followed in finalizing the technical programme of the projects.

During the year Centre got recognition from many funding agencies and several research proposals were approved. Two research projects were sanctioned by the Department of Biotechnology and one consultancy project by the State Bank of India. Besides the 12 institute projects, research was carried out under two NATP projects, two DBT projects, two APEDA projects and several contract research projects. The salient achievements under each area are given below.

Crop improvement

Seven wine varieties and five natural mutants were added to the germplasm collection bringing the total number of accessions to 374. The grape accessions were characterized based on morphological traits and evaluated for traits like early ripening, self budbreaking, raisin quality, juice quality etc. A 17- 3 for raisin and Country Bangalore for juice were found to be promising. Several accessions with self budbreaking were identified. Genetic variability among the accessions and heritability of several quantitative traits were analysed. Positive correlation was observed between yield per vine and bunch number, yield and mean bunch weight, juice percentage and berry diameter.

Graphical user interface for grape germplasm information system containing menus for the application and input and output forms were designed. Biotechnological research at the Centre was started with the financial assistance from the Department of Biotechnology and the best protocol for DNA extraction was worked out.

Crop production

In scion-stock compatibility experiment, Thompson Seedless and Flame Seedless scions showed maximum compatibility with Dogridge B and 99 R stocks respectively. Grafting of immature scion on mature stock or mature scion on immature stock gave successful graft. A potting mixture consisting of soil, FYM and cocopeat in equal proportion resulted in better establishment and early sprouting of cuttings for grafting.

DRIS norms for the vineyards, based on petiole nutrient contents were developed. Among the different diagnostic parameters, P/N, K/N, P/Zn had greater physiological rationale during flowering stage whereas N/P and N/K were critical during bud differentiation stage. Na was found to be the most common limiting nutrient.

In the experiment on improving water use efficiency using rootstocks, under reduced level of irrigation higher brix yield and bunch weight was obtained from the grafted vines compared to the own rooted vines. Use of mulch and Antistress at 75 per cent of the recommended irrigation level gave brix yield on par with the recommended irrigation level, thus, saving 25 per cent of irrigation water. Similarly use of subsurface irrigation resulted in saving of 25 per cent water.

Application of CPPU on bunch having more than 10 leaves resulted in thick pedicel and higher berry diameter. Quality of Sharad Seedless could be improved with the use of GA_3@50 ppm and 30 ppm at 3-4 mm and 6-7 mm berry size stage respectively along with 6 BA@10 ppm.

Crop protection

Forecasting based disease management using Metwin 2 software resulted in saving of as much as 11 sprays during one year of production cycle as compared to conventional schedule based management. Use of acrylic polymer Antistress and chitosan improved efficiency of sulphur and hexaconazole and increased the shelf life of grapes. Potassium bicarbonate at the rate of 0.5 per cent and surfactant also improved efficiency of hexaconazole.

Use of fungicides viz. thiophenate methyl, mancozeb and sulphur in combination with bud breaking chemical, hydrogen cyanamide did not affect sprouting in vines. Drenching of *Botryodiplodia* affected vines with bavistin significantly increased the brix yield of the affected vines.

Preharvest treatment of grapes with chitosan alone or in combination with *Trichoderma harzianum* 5R improved the shelf life of grapes.

Dissipation rate kinetics of the insecticide thiamethoxaim, fungicides diniconazole, bioregulator N-ATCA and herbicide glyphosate in grape berries and vineyard soil were studied. Residues of all these agrochemicals dissipated

following 1st order rate kinetics. Pre-harvest intervals (PHI) for thiamethoxaim, diniconazole and N-ATCA were found to be respectively 17, 21 and 10 days for recommended dose and 19, 26 and 12 days for double dose. The residues of glyphosate dissipated with half-life of 13.86 and 14.74 days following single and double dose of applications, respectively.

Significant bioremediation of the residues of the insecticide methomyl on grape berries was obtained by the commonly used biocontrol agent *Trichoderma harzianum*.

Postharvest technology

Quality standards for Indian raisins were formulated and harmonised with the Codex standards for promoting the export of this produce. The Indian raisins complied to all the criteria of the Codex standards except physical parameters in terms of more number of cap stems.

Transfer of technology

Transfer of technology and information was an important activity of the Centre during the year. Scientists of the Centre undertook field visits regularly to interact with the growers and assess the problems faced by them at different stages of viticulture. Growers were suitably advised to overcome the problems. Scientists also participated in several seminars organized by the growers' societies and shared expertise on various facets of viticulture.

Scientists also shared the latest technologies in viticulture in the annual seminar organized by the Maharashtra State Grape Growers' Association at Pune wherein about 3000 growers hailing not only from Maharashtra but also from Andhra Pradesh, Karnataka and Tamil Nadu participated.

Under the SBI Uptech programme, Centre has adopted several villages in Maharashtra and all the technical help was provided to the growers to increase yield and proportion of exportable grapes.

To identify the technology to be transferred and impact analysis of technology generated by the Centre, an interface meeting of the scientists with a leading expert was organized.

Human resource development

Eight scientists, one technician and four administrative staff were trained in their respective areas of work.

Revenue generation

The Centre generated Rs. 16.32 lakhs as revenue through the sale of plant material, farm produce, consultancy and contract research.

Infrastructure and future thrust

The infrastructure at the Centre was strengthened with the construction of a poly house (under a DBT project), establishment of LAN, procurement of several modern equipments and improvement in irrigation facilities. The future thrust of the Centre will be on crop improvement mainly for wine purpose, biotechnology, postharvest technology and technology assessment and refinement.

Introduction

The National Research Centre for Grapes was established by the Indian Council of Agricultural Research (ICAR) to provide research support to the grape industry of India. The centre notionally started functioning with effect from 16th September 1993, first from IIHR Bangalore and then in Pune at Manjri, from 18th January 1997 but full-fledged activities could begin only when 46.78 ha of land was acquired on 29th January 1998.

Mandate

To undertake mission oriented programme involving basic and strategic research for resolving the major biotic and abiotic constraints affecting the grapes production and productivity.

Location

The Centre is located at Manjri, Pune at 559 m above mean sea level on Pune-Hyderabad National Highway No. 9, commonly known as the Solapur Road. It is easily approachable by road.

Staff position

Category	Sanctioned	Filled	Vacant
Research & Management Personnel	1	0	1
Scientific	15	12	3
Technical	8	8	0
Administrative	8	8	0
Supportive	5	5	0
Total	**37**	**33**	**4**

All the scientific, technical and administrative staff is being trained regularly in various national and international institutes to upgrade their knowledge and skills. Every staff has undergone training on information technology. So far, the staff has attended more than 70 training programme in their specialized fields.

Achievements till date

Infrastructure

The Centre started functioning from its Laboratory-cum-Administrative building from May 2001.

A total area of about 32 acre has been planted with Thompson Seedless, Tas-A-Ganesh, Flame Seedless and Sharad Seedless cultivars for various experimental trials and 374 indigenous and exotic spp./ varieties / hybrids etc. to establish the germplasm repository.

Flat roof gable system of training, drip irrigation and fertigation facilities have been established. Boundary wall cum fencing for part of the farm area has been completed and a few farm roads were laid.

The soil science, pesticide residue, plant pathology, plant physiology and biotechnology laboratories have been equipped with several sophisticated and basic facilities for research. A polyhouse for raising *in vitro* plantlets is constructed with financial assistance from the Department of Biotechnology, New Delhi.

Research

The Centre has developed a field gene bank of grape germplasm comprising of 374 accessions collected from different sources in India and abroad. The germplasm contains commercial varieties for table, raisin, juice and wine purpose, rootstock varieties, clonal selections and several wild species. Evaluation of this germplasm has resulted in the identification of several useful accessions. A17-3, a clonal selection from Centennial Seedless has been identified for table purpose. Country Bangalore and E 12/2 have been identified as suitable for juice production and Cabernet Sauvignon and Merlot for red wine production.

Better yield and quality of commercial cultivars on Dogridge rootstock compared to own root, was observed under soil and water salinity conditions. The compatibility of Dogridge rootstock for Thompson seedless was established. No significant effect of inverted bottleneck by using Dogridge rootstock on growth or yield parameters was recorded in the studies carried out for the last 3 years. This rootstock is being popularised among farmers in areas of water and salinity stress.

An irrigation schedule based on pan evaporation has been developed for water management in grapes. The schedule has improved the water use efficiency by 141 per cent. The importance of fertigation was demonstrated in vineyards under Indian conditions.

Growth stage wise fertilizer application through drip resulted in 60 per cent savings in fertilizer use over the conventional method of soil application. The cause of bunch stem necrosis and inward leaf curl was found due to the nutrient deficiency and could be corrected by appropriate nutrient dose application.

Hydrogen cyanamide treatment to induce early and uniform budbreak in grafted Thompson Seedless vines was standardised. Continuous use of hydrogen cyanamide for the last 3 years did not have any deleterious effect on vine growth, productivity or quality of fruits. The treatments also did not result in any residues in grapes at harvest.

A disease forecasting software, Metwin 2 from Austria was tested for forecasting of diseases under Indian conditions and it was found useful in the forecasting of downy mildew and anthracnose disease. Forecasting based disease management resulted in saving of as much as 11 sprays during one year of production cycle as compared to conventional pre-determined schedule based management.

Based on the survey carried out for 3 years, it was found that *Botrytis cinerea*, causing serious pre- and postharvest decay of grapes in other countries, is not found in India. The Centre has appraised Ministry of Agriculture to use in non tariff measures in the import of fresh grapes and processed products. Surveys on pest risk analysis also revealed that the Indian vineyards are free from fruit fly infestation, including vineyards in the vicinity of mango and guava orchards. This information will be useful in the export of grapes.

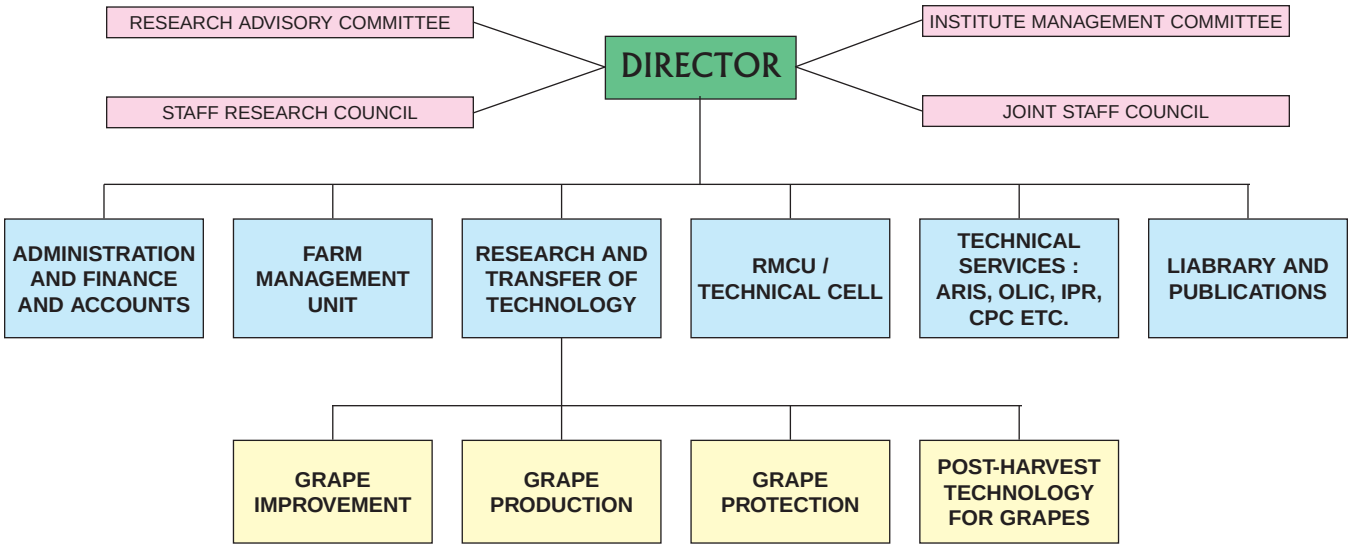
Single pre-harvest treatment with calcium chloride or nitrate @ 1 per cent aqueous solution during 75 to 105 days after pruning, harvesting the berries at green stage and with 20°B, cutting the bunch above the knot, pre-cooling the produce within four hours of harvest, use of high-density polyethylene polyliner and absorbent tissue paper for packing prolonged the shelf life of Thompson Seedless grapes after cold storage.

Pre-harvest sprays with Benomyl @ 0.05 per cent at 20 and 10 days before harvest or with *Trichoderma harzianum* isolate 5 R, at 20 and 3 days before

harvest and packing grapes with lower dose of sodium meta bisulphite (2.3 g per 5 kg grape) effectively prevented post-harvest decay as well as minimised the sulphur dioxide injury caused at higher doses of sodium meta bisulphate.

The safe waiting period for benomyl, chlorpyriphos, hexaconazole, mancozeb, iprodione and methomyl was determined for recommending to the grape growers for the safe use of chemicals. Washing grapes with 1 per cent or 2 per cent NaCl or 0.05 per cent $NaHCO_3$ was effective in dislodging the residues of carbendazim and hexaconazole from the berry surface.

Organizational Setup



Financial Statement

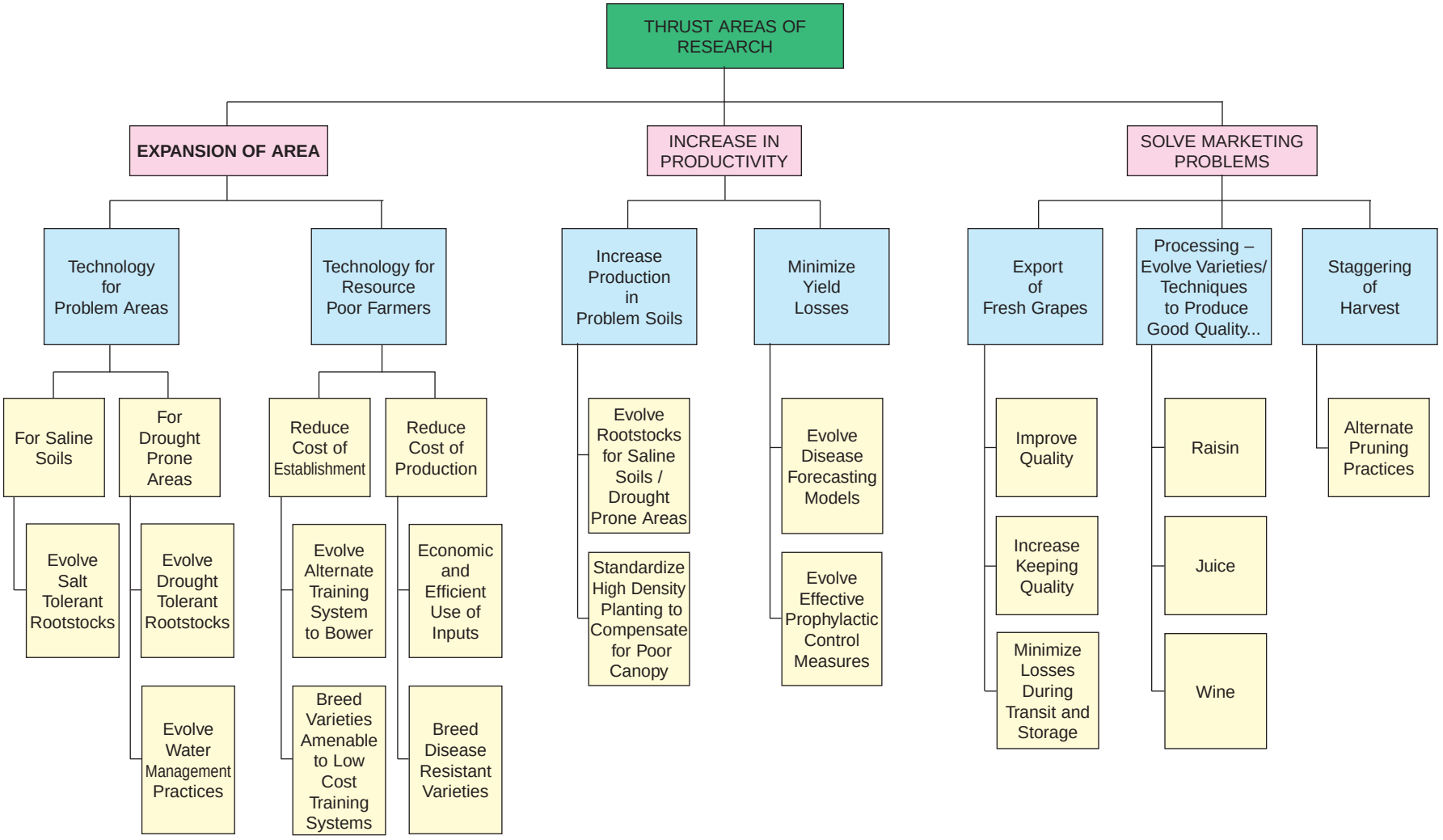
(Rs. in Lakhs)

Heads	R.E. 02-03		Expenditure 02-03		Final Grant		Revenue Generated
	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	
Estt. Charges	2.92	50.20	2.91	50.20	2.92	50.20	
O.T.A.	–	0.05	–	0.05	–	0.05	
T. A.	2.50	0.60	2.50	0.60	2.50	0.60	
Other charges	130.70	20.45	130.70	20.45	130.70	20.45	
Works	8.88	–	8.88	–	8.88	–	
Total	**145.00**	**71.30**	**144.99**	**71.30**	**145.00**	**71.30**	**16.32***

* *Revenue of Rs. 16.32 lakhs was generated against the target of Rs. 5.00 lakhs through training, consultancy, contract research and services and sale of planting material and farm produce.*

Research was carried out under twelve institute research projects, two NATP, two DBT funded and two APEDA sponsored projects. Research Advisory Committee, Staff Research Council and Institute Management Committee meetings were conducted regularly and their suggestions / recommendations taken for the formulation and prioritisation of research programmes and infrastructure development of the Centre. The first Quinquennial Review Team visited the Centre and has submitted its recommendations to the Council. Apart from the Centre's vineyards, need based research was also carried out in the R & D farm of Maharashtra State Grape Growers' Association at Manjri and in growers' vineyards.

Thrust Areas of Research



Research Achievements

Genetic Resource Management and Crop Improvement

Collection, conservation, characterization and evaluation studies

G. S. Karibasappa and P. G. Adsule

Collection

Seven wine varieties *viz.*, Zinfandel, Muscat White, Chardonnay, Symphony, Tinta Madeira, Shiraz and Chenin Blanc were collected from the growers' fields in Nasik district of Maharashtra.

In addition, five natural mutants, two of Tas-A-Ganesh and one each of Thompson Seedless, Kishmish Rozavis and Sonaka have been identified from the growers vineyards and successfully established as M1 progeny in the field. The mutants of Tas-A-Ganesh and Thompson Seedless are characterized by higher leaf thickness and vigorous canes, whereas mutant of Kishmish Rozavis has white berries instead of red coloured. The Sonaka mutant has deeply lobed leaves, which is an indicator of drought tolerance. At present the germplasm has a cumulative collection of 374 accessions.

A white mutant of Kishmish Rozavis (inset)

Conservation

The germplasm is being maintained as active field collection on a perennial programme.

Characterisation

Two hundred and seventy two accessions were studied for phenotypical characters. Days to bud initiation and bud breaking, percentage of canes bearing fruits, shoot length and number of leaves at peak flowering were also recorded.

Three hundred and twenty nine accessions were characterized for bark and leaf nature. Bark pliability, peeling flakes, inner bark colour, mature leaf size, number of leaf lobes, mature leaf tooth shape, mature leaf petiole sinus shape and leaf hair type were studied.

Biomass which is related to vine vigour was recorded after foundation and fruit pruning in two hundred and eighty four accessions.

A mutant of Sonaka with distinct leaf characters

Evaluation

a. Maturity / ripening period

Two hundred and fifty six accessions were studied for the period of maturity / ripening on the basis of days taken to veraison (initiation of berry softness) from fruit pruning. The accessions were classified based on their maturity period (Table 1).

Table 1. Evaluation of grape accessions for maturity

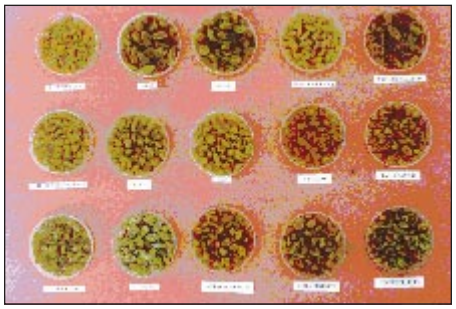
Sl. No.	Maturity	Maturity period	Number of accessions
1.	Very early maturity	<105 days	95
2.	Early maturity	106 to 115 days	120
3.	Medium maturity	116 to 125 days	40
4.	Late maturity	> 126 days	1

Accessions like Venus, Early Perlette, Superior Seedless (Brazil), A 18-3, A 17-3, Cardinal, Beauty Seedless, Charas, E 29/4, Arka Krishna, Pearl of Csaba, Delight, Feteasca Alba, Pusa Urvashi, Seibel 9309, Centennial Seedless etc were the early ripeners, whereas Doradillo was the late ripener.

b. Evaluation for raisins

Thirty one white and coloured seedless grape varieties were evaluated for their raisin quality using Australian dip emulsion and shade drying method. Data is presented in table 2. Raisin recovery was found to be maximum in Sultanine-II followed by H-5 clone of Thompson Seedless, Sultana Seedless, Kishmish Rozavis, E 12/3, Kishmish Rozavis White mutant (KRW mutant), Tas-A-Ganesh, Centennial Seedless etc. Bold sized raisins were obtained in Superior Seedless, A17-3, A 39-2, Centennial Seedless, Crimson Seedless and A 18-3. However, the pleasant flavoured and more acceptable raisins were obtained from A 17-3, A 39-2, Superior Seedless and KRW mutant.

Black raisins



White raisins

Table 2. TSS, raisin yield and size of raisin in grape varieties

Sl. No.	Variety	TSS (°B)	Raisin recovery (%)	Raisin weight (g)
1.	Sultanine-II	20.74	30.30	0.378
2.	H-5 clone	23.20	28.60	0.399
3.	Sultana Seedless	24.46	28.53	0.411
4.	Kishmish Rozavis	25.90	28.51	0.385
5.	E 12/3	22.50	28.50	0.417
6.	KRW mutant	23.40	27.80	0.330
7.	Tas-A-Ganesh	23.86	27.60	0.386
8.	Centennial Seedless	22.20	27.50	0.863
9.	Sharad Seedless	22.40	27.50	0.339
10.	Merbein Seedless	22.00	27.00	0.390
11.	A 39-2	19.46	26.82	0.870
12.	E 32/8	22.50	26.70	0.445
13.	Black Monukka	23.00	26.70	0.418
14.	Manik Chaman	21.94	26.53	0.447
15.	Superior Seedless	20.00	26.50	0.979
16.	Pusa Seedless	22.50	26.00	0.435
17.	E 12/7	20.00	25.00	0.395
18.	Thompson Seedless	24.33	24.85	0.413
19.	Crimson Seedless	21.50	24.50	0.701
20.	A 18-3	21.80	24.50	0.699
21.	Early Perlette	22.50	24.50	0.472
22.	Flame Seedless	22.26	24.28	0.527
23.	Thompson Seedless (Italy)	21.33	24.18	0.419
24.	Marroo Seedless	20.50	23.50	0.388
25.	Loose Perlette	21.00	23.50	0.486
26.	A 17-3	21.93	23.10	0.903
27.	Pusa Urvashi	19.00	22.30	0.407
28.	Arka Shweta	18.33	21.42	0.507
29.	Arkavati	15.56	20.86	0.335
30.	A 39-3	16.86	20.15	0.350
31.	Perlette	18.00	16.92	0.382
	Mean	21.45	25.31	0.493
	CD at 5%	2.60	3.78	0.069

c. Evaluation for juice

Nine varieties were evaluated for juice quality. Data on juice recovery, brix, acidity and organoleptic score of varieties is presented in table 3. Overall acceptance of the juice based on organoleptic score was better for Country Bangalore followed by Gulabi × Bangalore Purple, Concord, Arka Shyam and Pusa Navrang. However, juice yield per vine from these varieties ranged between poor to moderate. Further experiments are in progress.

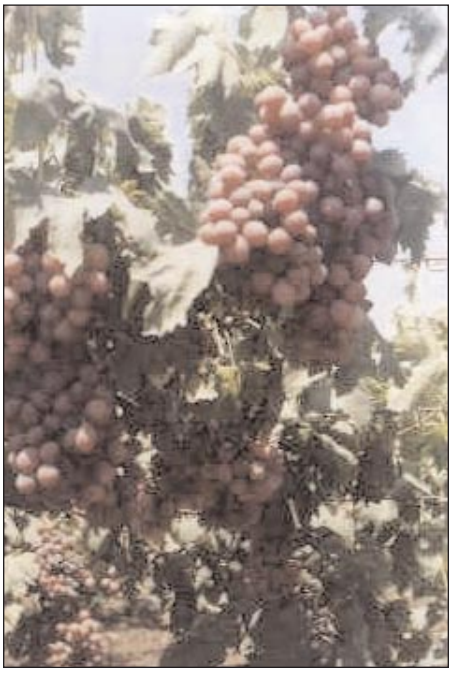
Characteristics of juice from grape varieties

Table 3. Yield, brix, acidity and palatability of juice of grape varieties

Variety	Juice yield (l/vine)	Juice recovery (%)	TSS (°B)	Acidity (%)	Organoleptic (10 point scale)			
					Color	Consis--tency	Taste	Total
Arka Shyam	4.37	52.67	21.80	0.50	7.50	7.10	8.00	22.60
Beauty Seedless	10.31	87.00	17.40	0.44	6.20	5.50	5.60	17.30
Concord	5.71	53.30	17.40	0.76	8.10	8.80	7.40	24.30
Country Bangalore	7.37	66.67	16.50	0.62	7.80	8.05	9.35	25.20
Pusa Navrang	5.99	68.00	17.90	0.59	9.10	7.50	5.46	22.06
Rubi Red	3.91	60.67	17.20	0.82	8.00	6.30	5.55	19.85
Thompson Seedless	7.37	86.67	21.00	0.48	6.60	6.50	6.40	19.50
Venus	3.31	64.00	24.40	0.43	7.05	7.40	5.50	19.95
Gulabi × Bangalore Purple	6.85	67.40	18.00	0.52	8.00	7.40	9.10	24.50
Mean	6.13	67.40	19.10	0.57	8.00	7.20	6.93	21.70
CD at 5%	2.32	2.50	0.58	0.15	1.20	1.45	1.05	_

d. Self bud breaking in grape accessions

The need for application of bud breaking chemical i.e. hydrogen cyanamide @1.5 per cent a.i. after October pruning was evaluated in 37 varieties. Fifteen varieties viz. Pusa Navrang, Christmas Rose, Marroo Seedless, Superior Seedless, E 29/6, E 29/3, E 32/8, Vermentino, Trebbiano, Garganega, Catawba, Hussain Black Kabuli, MA × RR, Carignane and Sultana Red were found to be self-bud breaking. Thus, labour and chemical cost can be saved in these varieties.



Christmas Rose - a self bud-breaking variety

e. Classification of grape accessions based on bunch number and bunch weight

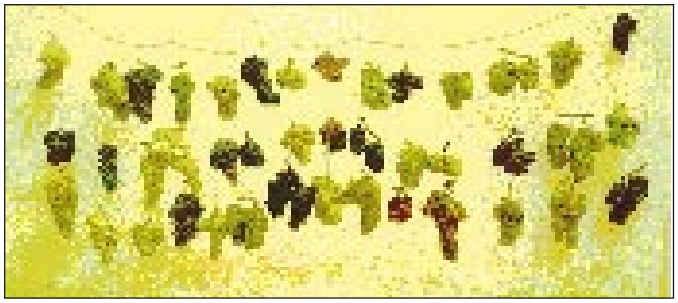
Based on the observations recorded for two consecutive years, an attempt was made to classify 138 grape accessions based on bunch number and bunch weight (Table 4). The results indicated the general heterogeneity level in the collection for bunch number and bunch weight. A maximum number of accessions were grouped under the category of 100-250 g bunch weight and 31-60 bunches per vine. Most of the commercial cultivars were also grouped under these categories. A negative non-significant correlation (-0.089) was observed between these two parameters.

f. Genetic variability and heritability among quantitative characters and scope for selection

Nine parameters were studied for genetic variability, heritability and expected genetic gain (Table 5) in 138 grape accessions. High Phenotypic Coefficient of Variation (PCV) was observed for yield per vine, mean bunch weight, bunches per vine and berry diameter, the last three parameters are the yield determinants. However, scope for genetic advancement through selection exists only for yield through bunch number and mean bunch weight. Further improvement in quality parameters like TSS, juice percentage and berry

Table 4. Classification of grape accessions based on number of bunches and mean bunch weight

Average bunch wt.(g)	No. of bunches / vine						
	<10	10-20	21-30	31-40	41-60	>60	Total
	Number of accessions						
<100	2	3	1	3	8	4	**21**
100-150	3	2	4	6	9	3	**27**
150-200	1	4	5	5	3	4	**22**
200-250	0	7	9	9	5	4	**34**
250-350	0	4	3	3	3	5	**18**
350-500	0	2	3	4	4	1	**14**
>500	0	0	0	2	0	0	**2**
Total	**6**	**22**	**25**	**32**	**32**	**21**	**138**



Variability in bunch among grape germplasm

diameter is limited through direct selection, but through planned hybridisation these characters can be improved.

The correlation coefficients among these characters indicated that very high positive significant correlations existed between yield per vine and bunch number (0.699), yield and mean bunch weight (0.624), TSS and TSS: Acid ratio (0.488), juice percentage and berry diameter (0.307), mean bunch weight and biomass (0.213). Whereas high negative correlations existed between acidity and TSS: acid ratio (-0.820), berry diameter and TSS (-0.364), juice percentage and TSS (0.311).

Table 5. Genetic variability among 138 grape accessions

Variable	Mean ± SEM	Range	PCV	GCV	Heritability	Expected genetic gain
Biomass (kg)	0.95 ± 0.03	0.09 - 4.78	70.12	61.36	0.7659	94.51
Bunches / vine (No.)	45.13 ± 1.34	1.33 - 157.00	70.62	64.87	0.8438	104.85
Bunch wt. (g)	194.0 ± 5.10	24 - 826	69.15	65.20	0.8888	108.10
Yield (kg/5.41m^2)	8.59 ± 0.37	0.20 - 48.00	103.94	99.08	0.9086	166.10
Berry diameter (mm)	14.00 ± 0.13	9.00 - 20.50	13.00	10.53	0.8100	18.52
Juice (%)	66.28 ± 0.71	30.0 - 90.0	95.26	57.12	0.5996	15.53
TSS (°B)	20.95 ± 0.24	12.1 - 32.0	15.52	12.37	0.6361	17.36
Acidity (%)	0.49 ± 0.01	0.15 - 1.09	30.80	26.37	0.7333	39.73
TSS: acid ratio	48.29 ± 1.29	14.0 - 113.0	36.37	29.27	0.6479	41.45

Genetic enhancement studies
(G. S. Karibasappa)

Promising selections and varieties were crossed with some known sources of disease resistance for developing varieties with better characteristics and resistance to disease. Two hundred and seventy eight hybrid plants were obtained. Some of the rootstock varieties were also crossed for developing rootstocks with better adaptability. Eighty three hybrids were obtained. Evaluation of these hybrids is in progress.

Grape germplasm information system

Kavita Mundankar

The graphical user interface for grape germplasm information system was designed in which menu of the application and input and output forms were designed. Logic for procedure and function was also developed. The main menu of the application has options of Maintenance, Information, Search, Reports, Window and Help. Input forms for data entry has options for Passport data, Characterization data and Evaluation data of germplasm. Forms for Germplasm information, Comparison and Search of germplasm data and photographs have been designed. Functions and procedures have been written to perform the task of

i. Selection of data using drop down list, check box and radio buttons

ii. Initialisation and display of graphical components on the console under different context

iii. Validation of data during data entry and before storing the data to database

iv. Storing the user entered data to database

v. Enabling the changes to the already stored values in the database

vi. Generating messages to the user giving warnings, alerts and help in case of system and program errors.

Standardization of DNA extraction from grape leaf

Anuradha Upadhyay

This work was carried out under the project entitled 'Molecular tagging of downy mildew resistance in grapes' which was initiated during this year with the partial financial assistance from the Department of Biotechnology. The objective of this project is to identify molecular marker/s closely associated with the downy mildew resistance in grape and to develop fast and reliable screening procedures for resistance breeding.

DNA extraction protocol

Three different stages of leaf viz. 3rd, 4th and 5th from growing tip were used to extract DNA. Three different protocols viz. (1) Lodhi's protocol (2) Modified CTAB protocol and (3) without liquid nitrogen (LN2) protocol, were tested using sodium dodecyl sulphate (SDS) as detergent at three different concentrations.

Restriction digestion of grape DNA

The extracted DNA was quantified spectrophotometrically by recording absorbance at 260 nm. The A_{260} / A_{280} ratio was used as an estimate of quality. The data was analysed by factorial RBD to study the effect of different parameters on DNA yield.

As the data in table 6 indicate, only leaf stage significantly affected DNA yield. Maximum DNA was obtained from 4th leaf. DNA yield was at par in all the protocols. However, DNA obtained in LN2 protocol was sheared and not suitable for molecular biology experiment. Considering the ease and cost of extraction, modified CTAB i.e. protocol 2 will be used for further extraction. The extracted DNA could be restricted with EcoRI and Hind III and was also found suitable for PCR amplification.

Table 6. Mean DNA yield (µg/g fresh weight) from different treatments

Treatment	Protocol	Leaf stage	Detergent concentration	
			CTAB	SDS
1	124	103	145	86
2	163	209	116	116
3	103	78	170	103
Significance level	NS	0.001	NS	NS

Treatment details : Protocol 1, 2, 3 are Lodhi's, modified CTAB and without LN_2 respectively. Leaf stage 1, 2, 3 are 3rd, 4th & 5th leaf from growing tip, respectively. Detergent concentration 1, 2, 3 are 2 per cent, 3 per cent and 4 per cent of CTAB and 1 per cent, 1.5 per cent and 2 per cent of SDS.

Successful graft of Flame Seedless on Dogridge B

Crop Production

Graft performance of Thompson Seedless and Flame Seedless on different rootstocks

R. G. Somkuwar and S. D. Ramteke

For combating the problems of drought as well as soil and water salinity, raising grape vineyard on rootstocks has become a pre-requisite. At present, Dogridge rootstock is the most popular one, but there are other promising rootstocks under evaluation. An experiment was conducted to study the graft performance of Thompson Seedless on different rootstocks and Flame Seedless on Dogridge B, 110 R, 99 R and St. George. Data is presented in Table 7.

There were no significant differences in case of graft success of Thompson Seedless or Flame Seedless on the different rootstocks. The number of days taken for bud sprout was minimum for Dogridge B in case of both the varieties. Similarly the shoot length in both the varieties was maximum on Dogridge B rootstock. In Thompson Seedless, near unity stock : scion ratio was recorded with St. George, while in Flame Seedless it was with 110 R.

Table 7. Graft performance of Thompson Seedless (TS) and Flame Seedless (FS) on different rootstocks

Rootstocks	Success rate of grafts (%)		Days taken for bud sprout		Stock-scion ratio		Shoot length (cm)	
	TS	FS	TS	FS	TS	FS	TS	FS
Dogridge B	91.66	83.33	16.60	16.34	1.12	0.85	111.32	109.70
St. George	75.01	85.00	18.86	17.36	1.02	0.91	58.33	55.00
110 R	90.00	92.50	17.01	17.20	0.92	1.04	80.02	103.60
99 R	84.91	83.33	18.07	18.43	0.86	1.15	61.10	68.06
1103 P	91.66	-	17.37	-	0.91	-	66.30	-
SO4	73.88	-	16.94	-	0.82	-	58.81	-
Salt Creek	83.33	-	19.16	-	0.84	-	94.50	-
1613 C	58.33	-	19.44	-	0.79	-	55.66	-
SEM ±	8.327	8.809	0.582	0.438	0.048	0.049	9.604	7.017
CD %	NS	NS	1.76	1.35	0.14	0.15	29.12	21.62

Growth performance of Thompson Seedless on different rootstocks

R. G. Somkuwar and S. D. Ramteke

Growth performance of three-year old Thompson Seedless was studied on four different rootstocks. Shoot length and internodal length were significantly higher in St. George, Dogridge B and Salt Creek than 1613 C (Table 8). Cane diameter was significantly more in Dogridge B and Salt Creek than 1613 C and St. George. Similarly number of canes as well as per cent fruitful canes were significantly higher in Dogridge B, followed by Salt Creek, 1613 C and St. George.

Table 8. Growth parameters of three year old Thompson Seedless on different rootstocks

Treatments	Shoot length (cm)	Internodal length (cm)	Cane diameter (mm)	No. of canes / vine	Per cent fruitful canes/vine
Dogridge B	108.48	4.24	8.44	46.65	83.76 (66.54)
Salt Creek	102.86	4.08	8.02	35.75	61.20 (51.50)
1613 C	88.30	3.34	7.22	33.66	72.86 (59.64)
St. George	122.42	4.10	6.82	35.20	75.80 (60.54)
SEM ±	6.95	0.16	0.20	2.59	2.71
CD at 5%	21.41	0.50	0.62	8.00	8.38

*Numbers in parentheses are angular transformed values.

Performance of Tas-A-Ganesh on different Dogridge rootstocks

R. G. Somkuwar and S. D. Ramteke

Studies on the yield and quality parameters of Tas-A-Ganesh grafted on the two morphologically different Dogridge rootstocks, popularly called as Dogridge A and Dogridge B, in comparison to that of own rooted vines were continued.

Yield and berry diameter were found to be maximum in Tas-A-Ganesh grafted on Dogridge B followed by Dogridge A and least in own rooted vines (Table 9). TSS was at par in both the rootstocks and significantly low in own rooted vines. However, there was no significant difference in case of bunch weight, berry length, acidity and 50-berry weight between the rootstocks. Results are consistent to the earlier observations.

Table 9. Performance of Tas-A-Ganesh on different rootstocks

Rootstock	Yield / vine (kg)	Bunch weight (g)	Berry diameter (mm)	50 berry weight (g)	Berry length (mm)	T.S.S (°B)	Acidity (%)
Dogridge A	5.58	151.77	14.42	87.31	2.15	20.48	0.71
Dogridge B	6.35	168.42	16.50	93.78	2.15	20.25	0.65
Own root	4.21	142.48	14.11	83.11	2.15	19.44	0.65
SEM ±	0.25	15.98	0.14	7.62	0.04	0.25	0.17
CD at 5%	0.78	NS	0.43	NS	NS	0.78	NS

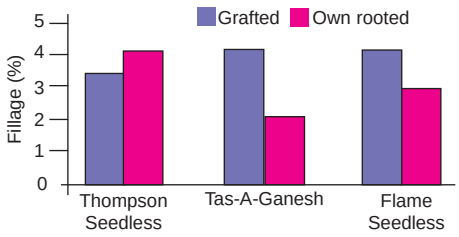
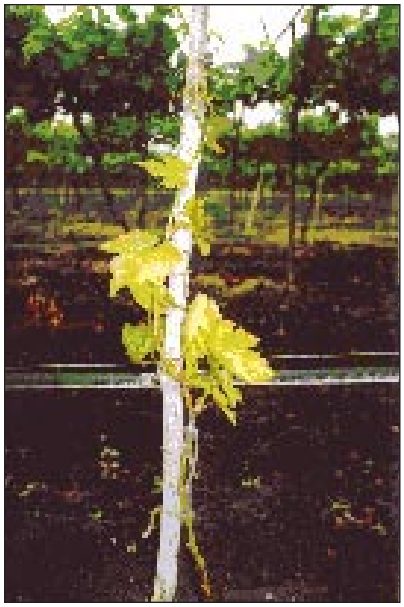


Fig. 1. Effect of Dogridge B rootstock on fillage in grape varieties



Successful graft with immature rootstock and mature scion

Fillage in grape varieties

R. G. Somkuwar and S. D. Ramteke

The conversion of fruitful buds into tendrils is called as fillage. This happens mostly due to application of more nitrogenous fertilizers and irrigation water during the period of bud differentiation (45 to 60 days after foundation pruning). The objective of this experiment was, therefore, to study the effect of rootstocks on fillage in different grape varieties. In the first experiment, Thompson Seedless variety grafted on six rootstocks was compared to own rooted vines. The differences were non significant for fillage. These results indicate that rootstocks do not have any impact on the fillage in Thompson Seedless.

In the second experiment, three grape varieties i. e. Thompson Seedless, Tas-A-Ganesh and Flame Seedless grafted on Dogridge B rootstock were compared with own rooted vines. Fillage was significantly higher in grafted Tas-A-Ganesh and Flame Seedless (Fig. 1) but not in case of Thompson Seedless as observed in the previous experiment also.

Effect of maturity of stock and scion on graft success

R. G. Somkuwar and S. D. Ramteke

Dogridge B rootstock is being used for establishment of new vineyards specially in Maharashtra and Andhra Pradesh. The commercial practice is to graft mature scion on mature stock. But sometimes due to non-availability of mature stock or mature scion during appropriate period, several months are wasted. An experiment was therefore, undertaken to study the suitability of immature shoots of Tas-A-Ganesh and Dogridge B for grafting to avoid wastage of time.

Results with combinations of mature and immature stock and scion indicated graft success in the combinations of immature stock and mature scion or mature stock and immature scion. However, results with immature stock and immature scion were not encouraging. Observations on shoot length after 45 days indicated that grafting of the mature scion on immature stock is better than grafting on mature stock possibly due to better sap flow in the former.

Table 10. Response of potting mixture to propagation of grape through cuttings

Treatments	Days taken for sprouting	Percent success	Shoot length (cm)
1. Cocopeat alone	14.33	49.33 (44.60)	29.00
2. Soil	13.66	48.33 (44.02)	32.33
3. Soil + FYM + Cocopeat(1:1:1)	6.33	75.66 (60.66)	42.33
4. Soil + Cocopeat (1:1)	8.00	68.33 (55.95)	41.33
5. Soil + Cocopeat (2:1)	10.00	63.66 (53.05)	36.33
6. Soil + Cocopeat (4:1)	9.66	52.66 (46.51)	36.00
7. Soil + Cocopeat (8:1)	10.33	51.33 (45.74)	34.33
8. Soil + FYM (1:1)	8.66	65.00 (53.74)	39.66
9. Soil + FYM (2:1)	11.00	55.66 (48.25)	32.00
10. Soil + FYM (4:1)	10.00	49.66 (44.78)	28.00
11. Soil + FYM (8:1)	13.66	50.00 (44.98)	33.00
SEM ±	0.68	2.25	1.67
CD at 5%	2.03	6.63	4.93

Earlier sprouting and higher shoot length was recorded when grafting was done in mid August than in mid or late July. Further observations on the successful grafts in field are in progress.

Effect of potting mixture and pre-treatments on rooting of cuttings

R. G. Somkuwar, J. Sharma and S. D. Ramteke

Potting mixture plays an important role in rooting and growth of cuttings. An experiment was conducted using potting mixture in different combinations as given in table 10. Significantly higher establishment was recorded in soil + FYM + cocopeat as compared to all other treatments. The same treatment recorded minimum days for sprouting and maximum shoot length. It is concluded that potting mixture of soil + FYM + cocopeat in equal proportion gives good success in establishment of Dogridge B cuttings.

Some growers practise dipping the cuttings in cow urine for better rooting. This indigenous technological know-how was tested for different rootstocks viz. Dogridge B, Dogridge A, 1103 P and Salt Creek. Observations on per cent establishment, days taken for sprouting and shoot length indicated that cow urine alone cannot substitute for IBA which is used for inducing rooting. Cow urine dip for 24 hours + quick dip in 2000 ppm IBA was at par with water dip for 24 hours + quick dip in 2000 ppm IBA, but cow urine dip for 24 hours without use of IBA was at par with water dip for 24 hours. Further experiments on use of cow urine with lower concentrations of IBA will be conducted.

Single cordon horizontal

Standardization of training system and method for own rooted and grafted Tas-A-Ganesh

R.G. Somkuwar

Canopy management plays an important role in the overall productivity and quality of produce. The most common training system followed in the country is the bower or pandal system. However, the most modern and used in leading grape growing countries for productivity and quality is the flat roof gable training system. Studies were therefore, undertaken to compare the performance of modern training system (FRG) with the common training system (Bower). In both training systems vines were raised on own roots as well as grafted on Dogridge B rootstock. The details of the canopy modification under different systems of training are given below:

Single cordon diagonal

T1 - Single cordon horizontal,

T2 - Single cordon diagonal,

T3 - Double cordon horizontal,

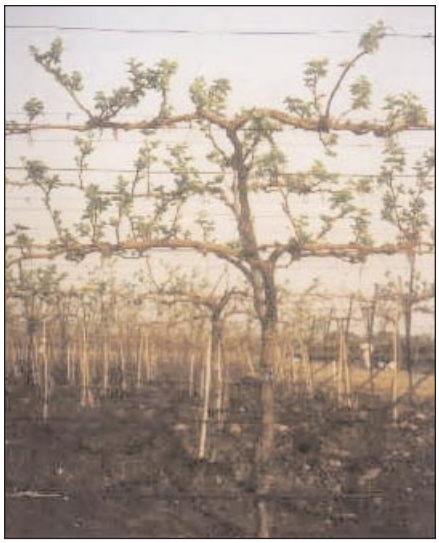
T4 - Double cordon diagonal,

T5 - Four cordon horizontal

T6 - Four cordon diagonal.

October biomass gives an indication of cane diameter and its vigour. Under this experiment, biomass was significantly more in case of Bower as compared to FRG. Grafted vines recorded more pruning weight than own rooted vines in both systems of training (Table 11).

Cane diameter was higher in bower compared to FRG. It was more in grafted vines compared to own rooted vines. The interaction effect was found to be non significant. Fruitful canes were more in own rooted vines compared to grafted vines but were found to be non significant for trellises, training methods and also for the interactions. More number of bunches were



Four cordon horizontal

Table 11. October biomass in different training systems and methods

Training methods	Biomass (kg/vine)				
	FRG		Bower		Mean of C
	Own root (O)	Rootstock (R)	Own root (O)	Rootstock	
T1	0.535	1.142	0.552	1.580	0.952
T2	0.540	1.042	0.675	1.397	0.913
T3	0.475	1.339	0.725	1.300	0.959
T4	0.617	1.427	0.625	1.550	1.055
T5	0.569	0.821	0.545	1.502	0.859
T6	0.778	1.290	0.747	1.350	1.041

	FRG		Bower	
Mean of A	0.881		1.0455	
	(O)		(R)	
Mean of B	0.615		1.311	
	FRG		Bower	
	O	R	O	R
Mean of A × B	0.585	1.177	0.645	1.446

Significance		
Factors	SEM ±	CD at 5%
A	0.017	0.048
B	0.017	0.048
C	0.029	NS
A × B	0.024	0.068
B × C	4.215	NS
A × C	4.215	NS
A × B × C	5.961	NS

Factor A → Training system, Factor B → Root system, Factor C → Training method

recorded in own rooted vines in both the training systems compared to grafted vines (Table 12). They were also more in FRG than in bower. More bunch weight was recorded under rootstock compared to own rooted vines. Maximum weight was recorded under FRG compared to bower.

Four cordon diagonal

Table 12. Number of bunches in different training systems and methods

Treat-ments	Numbers of bunches				
	FRG		Bower		Mean of C
	Own root	Root stock	Own root	Root stock	
T1	37.55	36.50	43.30	24.60	32.33
T2	39.00	31.90	44.80	28.75	36.11
T3	46.70	42.75	55.15	29.55	43.53
T4	45.45	37.10	53.25	25.45	40.31
T5	52.62	58.10	38.70	32.20	45.40
T6	41.45	42.45	46.20	34.25	41.08
Mean of A x B	**43.79**	**41.50**	**46.90**	**29.13**	-
Mean of A	**42.64**		**38.01**		-

Treat-ments	Interaction of B×C	
	Own root	Rootstock
T1	42.42	30.65
T2	41.90	30.32
T3	50.92	36.15
T4	49.35	31.27
T5	45.66	45.15
T6	43.82	38.35
Mean of B	**45.34**	**35.31**

Factors	Significance	
	SEM±	CD at 5%
A	0.763	2.156
B	0.763	2.156
C	1.322	NS
A × B	1.080	3.05
B × C	1.870	NS
A × C	1.870	NS
A × B × C	2.645	NS

Effect of single and double stem on growth and yield parameters of Tas-A-Ganesh grafted on Dogridge B in FRG

R.G. Somkuwar

The vines are generally trained on a single stem, but sometimes, the growers train vine on double stem too expecting more storage from the same plant which will result in better fruitfulness and yield. An experiment was set up to verify the sanctity of this practice on Tas-A-Ganesh vines grafted on Dogridge B rootstock and trained on FRG. Horizonatal or diagonal single, double and four cordon canopy was developed on single as well as double stem as follows.

Single Stem	Double Stem
Single cordon horizontal	Single cordon horizontal
Single cordon diagonal	Single cordon diagonal
Double cordon horizontal	Double cordon horizontal
Double cordon diagonal	Double cordon diagonal
Four cordon horizontal	Four cordon horizontal
Four cordon diagonal	Four cordon diagonal

The differences in October biomass were non-significant for stem systems as well as training methods, however, the interaction effect was significant. Number of canes per vine plays an important role for bunch number in grapes. There was significant difference in number of canes per vine among stem system as well as training methods. Number of canes was more under double stem (32.46) compared to single stem (28.98). Maximum canes in double stem were recorded under four cordon horizontal followed by double cordon horizontal. Whereas in single stem, four cordon diagonal recorded maximum canes per vine (32.30) followed by double cordon horizontal (32.25). The interaction effect was also found to be significant.

The differences in fruitful canes were significant only for training methods. Maximum fruitful canes were recorded under four cordon horizontal (69.85%) followed by four cordon diagonal (68.01%). The differences in number of bunches per vine were non-significant for stem system, but were significant for training methods. More number of bunches (64.37) were recorded under four cordon horizontal compared to four cordon diagonal (47.97). Significant differences were recorded for average bunch weight in stem system only. More bunch weight was recorded under single stem compared to double stem. The other factors were non-significant.

There was no effect of stem system on yield, whereas the training methods differed significantly. Maximum yield was recorded under four cordon horizontal followed by four cordon diagonal. The interaction effect was found to be non-significant.

Effect of bunch retention on quality and yield in Sharad Seedless

R. G. Somkuwar and S. D. Ramteke

Number of bunches on a vine plays an important role in quality of grapes. An experiment was conducted to study the effect of bunch retention on yield and quality of one year old Sharad Seedless. The treatments were 30, 35, 40, 45 and more than 45 bunches retained per vine. Significant differences were recorded for berry and bunch weight, berry diameter, TSS, acidity and yield (Table 13) but there was no difference in berry length. Maximum yield was recorded under 40 bunches per vine but it was at par with 35 and 30 bunches per vine and significantly more than 45 or more than 45 bunches per vine treatment. Bunch weight decreased with increase in the number of bunches. Considering the appropriate level of yield, berry diameter and TSS, retention of 40 bunches per vine was found to be optimum.

Table 13. Effect of bunch retention on quality and yield in Sharad Seedless

No. of bunches / vine	50 berry weight (g)	Bunch weight (g)	Berry diameter (mm)	T.S.S (°B)	Acidity (%)	Yield/ vine (kg)
30	101.69	174.03	15.25	20.64	0.68	5.705
35	97.33	174.02	15.27	21.65	0.76	6.027
40	76.10	151.60	16.60	22.57	0.77	6.239
45	64.92	108.65	14.15	21.80	0.64	4.450
> 45	65.66	111.48	14.52	19.77	0.76	4.328
SEM ±	3.202	5.253	0.195	0.55	0.28	0.22
CD at 5%	9.86	16.18	0.60	1.70	0.09	0.69

Effect of girdling on yield and quality of Sharad Seedless

R. G. Somkuwar, J. Sharma and S. D. Ramteke

The consumers prefer bunches with bigger size berries. By using some of the horticultural practices like girdling, the berry size can be increased. An experiment was conducted on one year old Sharad Seedless grafted on Dogridge B rootstock to study the effect of girdling either on the trunk or on the cane, at different stages of berry development.

Maximum berry diameter was recorded when girdling was done at 45 or 60 days after pruning (Table 14). The same trend was also observed for average bunch weight. There was no effect of girdling on berry length. The yield recorded was more under the trunk girdling done at 60 days after pruning followed by 45 days after pruning. No effect of girdling on cane diameter, shoot length, leaf weight or acidity was recorded.

Table 14. Effect of girdling on yield and quality of Sharad Seedless

Treatments	No. of leaves/ vine	Berry diameter (mm)	Yield/ vine (kg)	T.S.S (°B)	Bunch weight (g)
Trunk girdling at 45 DAP*	771.12	16.27	6.547	22.90	225.62
Trunk girdling at 60 DAP	725.37	16.17	6.842	23.80	168.00
Trunk girdling at 75 DAP	893.50	15.82	5.417	24.85	162.75
Cane girdling at 75 DAP	764.37	13.85	4.167	21.15	166.75
Cane girdling at 90 DAP	755.12	15.00	3.482	22.70	174.75
Control	573.62	14.17	3.067	24.07	185.12
SEM ±	35.71	0.22	0.272	0.55	11.07
CD at 5%	107.62	0.67	0.82	1.67	33.36

* DAP: Days after pruning

Relationship between leaf area available per bunch and berry characters

S. D. Ramteke and R. G. Somkuwar

The experiment was conducted to determine the relationship between leaf area and proportionate increase in berry diameter. Shoots with 3, 6, 9 and 12

leaves above the bunch were selected for the study. Observations on berry diameter, acidity and TSS were recorded at 15 days intervals from berry set till harvest.

The significant differences were observed with respect to berry diameter up to 75 days after berry set. After 90 days till harvest the differences were non significant. However, significantly higher TSS was recorded when 12 or 9 Leaves were present above bunch. The significantly higher berry diameter was recorded when the leaves available for a bunch were more than 12 above the bunch.

Developing the petiole nutrient guides for grapes raised on rootstocks

J. Sharma, S. D. Shikhamany and R. K. Singh

Petiole samples were collected and analysed for macro and micronutrients at the stages of bud differentiation and full bloom from the vineyards of Sangli region during 2001-2002. The data on yield and its related parameters were also recorded. DRIS norms were worked out for medium yielding vineyards and imbalance among the nutrients was diagnosed in low yielding vineyards. Amongst the nutrient ratios selected to form the diagnostic parameter, P/N (0.260), K/N (1.761), P/Zn (0.0056) had greater physiological rationale during flowering stage. Nutrient ratios N/P (3.02) and N/K (0.68) were observed to be critical during the bud differentiation stage. Further, Na followed by Mg and Ca were found to be the most common limiting nutrients, while excessive accumulation of K, Mn and Fe was noticed. Nutrient concentration during flowering stage in high and low yielding population differed significantly and nearly 60.97 per cent of the variation was attributed to the magnesium content.

Developing fertigation schedule for grafted vines

J. Sharma, A. K. Upadhyay, S. D. Shikhamany and R. K. Singh

This experiment was started in the year 2000 to improve the fertilizer use efficiency and develop a fertigation schedule. Three fertigation doses applied under three different schedules were compared with recommended soil application of NPK. The treatment details are as follows:

Treatment details for fertigation schedule at different stages of growth

Treatment	NPK
	Schedule-1
T1	80%
T2	60%
T3	40%
	Schedule-2
T4	80%
T5	60%
T6	40%
	Schedule-3
T7	80%
T8	60%
T9	40%
T10	100% (Soil Application)

Stage of vine growth	Schedule-1			Schedule-2			Schedule-3		
	N	P	K	N	P	K	N	P	K
Bud differentiation stage (Per cent distribution of nutrient doses)									
Pre-differentiation	30	-	-	30	10	-	20	20	-
Differentiation	-	60	-	10	60	10	10	40	10
Post-differentiation	-	-	30	-	-	30	-	-	20
Full bloom stage									
Pre-bloom	30	-	-	20	-	10	20	10	-
Bloom set and shatter	-	30	-	10	20	20	10	20	20
Berry growth to veraison	30	-	30	30	10	30	30	-	20
Veraison to harvest	-	-	30	-	-	-	-	-	20
After harvest	10	10	10	-	-	-	10	10	10

The data on yield and its related attributes and nutrient content are presented in tables 15 and 16. All the fertigation treatments were statistically at par with conventional treatment (T10) both in terms of yield as well as brix yield. However, in all the schedules, the treatment 40 per cent of NPK through fertigation led to highest yield and brix yield compared to other treatments. No significant differences were observed amongst all the treatments for the biomass recorded during back and fruit pruning. At bud differentiation stage, P content varied significantly among different treatments. Treatment T8 and T10 had significantly lower P content in petiole. At full bloom stage, all the treatments had optimum nutrient content and there were no significant differences amongst the treatment.

Table 15. Yield, brix yield and biomass in different fertigation treatments

Treatment	Yield (t/ha)	Brix yield (t/ha)	Biomass (t/ha)	
			October 2002	April 2003
T1	12.4	2.79	3.45	2.26
T2	12.2	2.86	3.79	2.35
T3	12.6	2.91	3.34	2.35
T4	11.6	2.57	3.18	2.23
T5	12.0	2.67	3.18	2.19
T6	12.8	2.95	3.12	2.17
T7	12.3	2.83	3.18	2.21
T8	12.3	2.87	3.28	2.21
T9	12.4	2.94	3.21	2.12
T10	12.2	2.75	2.91	2.14
CD at 5%	1.2	NS	NS	NS

Fertigation increases fertilizer use efficiency and the fertilizer requirement under this technique is less than half of the requirement under traditional soil application of fertilizers.

Table 16. Petiole nutrient contents and fertilizer use efficiency under fertigation treatments

Treatment	Bud differentiation stage			Full bloom stage		
	N (%)	P (%)	K (%)	N (%)	P (%)	K (%)
T1	1.12	0.418	1.62	1.058	0.446	1.94
T2	1.05	0.442	1.57	1.093	0.447	1.94
T3	0.93	0.450	1.52	1.055	0.462	1.95
T4	1.04	0.420	1.49	1.052	0.458	1.94
T5	1.05	0.423	1.51	1.058	0.470	1.93
T6	1.03	0.405	1.56	1.062	0.475	1.98
T7	1.03	0.422	1.53	1.065	0.465	1.94
T8	1.05	0.398	1.53	1.038	0.462	1.94
T9	1.02	0.420	1.57	1.027	0.475	1.93
T10	1.04	0.313	1.51	1.067	0.458	1.88
CD at 5%	0.08	0.038	NS	NS	NS	NS

The findings corroborates earlier two years' result that through fertigation 60 per cent saving can be made in fertilizer usage compared to soil application.

Effect of sources and level of iron on the nutrition and productivity of Thompson Seedless

J. Sharma and A.K. Upadhyay

Iron deficiency symptoms

Most of the vineyards are in soils which are either calcareous or having high pH. In these soil types, iron deficiency is quite common. An experiment was therefore initiated on one year old vines in 2002 during fruiting season to improve the iron efficiency. Following are the treatment details:

T1	37.50 kg ferrous sulphate/ha
T2	50.00 kg ferrous sulphate/ha
T3	37.50 kg ferrous sulphate/ha through cow dung slurry
T4	50.00 kg ferrous sulphate/ha through cow dung slurry
T5	2.50 kg Fe-EDDHA/ha
T6	5.00 kg Fe-EDDHA/ha
T7	10 kg ferrous sulphate + 2.5 L humic acid
T8	20 kg ferrous sulphate + 2.5 L humic acid
T9	Cow dung slurry
T10	Humic acid 2.5 L/ha

* Fruit Pruning (75 per cent of the total dose under each treatment applied in 3 equal units) at 30, 60, 90 days after pruning.
* Foundation Pruning (25 per cent of the total dose under each treatment in two equal splits) 40 and 70 days after pruning. All the other cultural practices remain uniform for all the treatments.

The observations will be recorded in subsequent years.

Use of rootstocks for improving water use efficiency in Tas-A-Ganesh

J. Sharma, A. K. Upadhyay and R .K. Singh

Own rooted (L) and grafted (R) vines under moisture stress condition

Drought tolerance is a genetic character of a particular plant species. *Vitis vinifera* is not known for drought tolerance. All the major grape growing regions of India suffer from water scarcity. To cope up with this problem, use of rootstocks has become inevitable. Complete information on the effect of rootstocks on growth, drought tolerance and water relations of *Vitis vinifera* vines is not available under the Indian conditions. In the present study, two year old Tas-A-Ganesh vines grown on their own roots were compared with those grafted on Dogridge B and Dogridge A with three irrigation treatments viz. 50 per cent, 75 per cent and 100 per cent of the recommended irrigation level based upon pan evaporation rate. The vines were raised on Flat Roof Gable system. The irrigation water had an EC of 1.8 dS/m and pH 8.30. The EC (1.2) of the soil was 0.46 dS/m and pH 7.75. The water-soluble chlorides in the soil was 102 ppm.

Both the rootstocks produced significantly higher yield, brix yield and average bunch weight as compared to own rooted vines at lowest level of irrigation i.e. 50 per cent of recommended irrigation level (Table 17). Though non-significant, the performance of rootstock was superior as compared to own rooted vines at higher irrigation level (75 per cent of the recommended level). The own rooted vines had less canopy which further affected the quality of the berries due to sunburn. The own rooted vines showed defoliation of leaves whereas the leaves of the vines grafted on rootstocks remained intact till the end of the cropping season. This was reflected in the pruned biomass during

foundation and fruit pruning. Highest pruned biomass at both the prunings was found in case of Dogridge rootstock at all irrigation levels. The two rootstocks did not differ significantly between themselves in terms of yield and quality at all the levels of irrigation. The EC of the soil at the end of the cropping season increased up to 2.93 dS/m. The results of this study demonstrate the importance of rootstocks for higher productivity and quality of produce under saline and water scarcity conditions.

Table 17. Effect of different irrigation levels on the performance of grafted and own rooted Tas-A-Ganesh

Treatment	Brix yield	Yield (t/ha)	Bunch wt. (g)	Biomass (kg/vine)	
				Foundation pruning (April)	Fruit pruning (October)
P I Irrigation level (50 % of the recommended irrigation level)					
Own root	2.30	11.20	150.00	0.43	0.81
Dogridge A	3.27	14.63	189.67	0.61	0.96
Dogridge B	3.00	13.46	189.00	1.13	1.07
P II Irrigation level (75 % of Recommended irrigation level)					
Own root	3.88	17.57	194.33	0.50	1.03
Dogridge A	4.02	18.36	191.00	0.76	1.66
Dogridge B	4.29	18.24	203.67	1.35	1.88
P III Irrigation level (Recommended irrigation level)					
Own root	4.06	18.13	218.33	0.75	1.35
Dogridge A	4.49	19.91	221.67	1.07	1.73
Dogridge B	4.56	20.48	246.33	1.33	2.08
SEM ±	0.14	0.50	8.40	0.035	0.079
CD at 5%	0.41	1.49	25.18	0.10	0.24

Application of bagasse as mulch

Use of mulch and Antistress for improving water use efficiency

J. Sharma and A.K. Upadhyay

Presently most of the vineyards in arid and semiarid regions of the country are facing acute water scarcity. Cultural practices like mulch and anti-transpirants can be used to minimize the evapotranspiration losses of water. However, the information is lacking under Indian conditions. In the present study, mulch (Bagasse) and anti-transpirant (Antistress) was applied on two year old Tas-A-Ganesh vines grafted on Dogridge B.

The treatments of mulch and Antistress at 75 per cent of the recommended irrigation level (T8) was significantly superior over other treatment combinations at 50 per cent and 75 per cent of the recommended irrigation level in terms of both yield and brix yield (Table 18) and this was at par with the recommended irrigation level (T9) suggesting a saving of 25 per cent of irrigation water. Highest average bunch weight was recorded in the treatment T9, which was at par with T8. In general, the treatments intended to minimize evaporation/ transpiration losses produced higher pruned biomass during the fruiting season.

Table 18. Effect of mulch and antitranspirant on performance of Tas-A-Ganesh grafted on Dogridge B rootstock

Treatments	Brix yield (t/ha)	Yield (t/ha)	Bunch wt. (g)	Biomass (kg/vine)	
				Foundation pruning (April)	Fruit pruning (October)
50 % of the recommended irrigation level					
T1 No mulch and no Antistress	2.57	11.02	171.71	1.15	1.47
T2 Mulch	2.71	11.88	194.64	1.24	1.63
T3 Antistress	2.94	12.67	187.28	1.08	1.59
T4 Mulch + Antistress	2.94	12.85	190.26	1.22	1.68
75 % of the recommended irrigation level					
T5 No mulch and no Antistress	3.18	14.47	174.84	1.21	1.74
T6 Mulch	3.20	14.20	193.20	1.20	1.83
T7 Antistress	3.16	14.88	177.65	1.24	1.87
T8 Mulch + Antistress	4.02	18.47	208.23	1.33	1.96
Recommended irrigation level	3.82	17.21	237.54	1.56	1.97
SEM ±	0.28	1.04	12.29	0.14	0.074
CD at 5%	0.83	3.13	36.85	0.42	0.22

Use of subsurface method of irrigation for improving water use efficiency

J. Sharma and A.K. Upadhyay

Subsurface irrigation is known to reduce the evaporation losses as the water is applied directly in the root zone. However, in heavy soils laying of perforated pipes/ drip line in subsurface (root zone) is costlier as special kinds of drippers are to be used. Also the application of chemicals is required to prevent the entry of roots into the emitter/dripper. This further adds to the cost of production. Hence, in this study PVC pipes with holes on all sides to allow both lateral and vertical movement of water were inserted to a depth of 9" for subsurface irrigation. The water was applied through microtubes from the dripper in the pipes. The treatment details are given in table 19.

Table 19. Treatment details of subsurface method of irrigation

Treatment	Description
T1 :	50 % of the recommended irrigation level through surface irrigation
T2 :	50 % of the recommended irrigation level through subsurface irrigation
T3 :	75 % of the recommended irrigation level through surface irrigation
T4 :	75 % of the recommended irrigation level through subsurface irrigation
T5 :	Recommended irrigation level through surface irrigation

Subsurface irrigation

The subsurface irrigation treatment at 75 per cent of the recommended irrigation level (T4) was significantly superior over other treatment combinations at 50 per cent and 75 per cent of the recommended irrigation level in terms of both the yield and brix yield (Table 20) but, this was at par with the recommended irrigation level (T5) suggesting a saving of 25 per cent

of irrigation water. Subsurface irrigation treatments at 50 and 75 per cent level of irrigation produced significantly higher pruned biomass than surface irrigation treatments at those irrigation levels. Highest average bunch weight was recorded in the treatment T5, which was significantly superior over other treatments.

Table 20. Effect of subsurface irrigation on performance of Tas-A-Ganesh grafted on Dogridge B rootstock

Treatments	Brix yield (t/ha)	Yield (t/ha)	Bunch wt.(g)	Biomass (kg/vine)	
				Foundation pruning April	Fruit pruning October
T1	2.92	13.34	182.24	0.71	0.97
T2	3.27	15.31	198.85	1.03	1.55
T3	3.77	16.78	190.82	0.85	1.68
T4	4.27	18.90	200.43	1.18	1.87
T5	4.31	19.60	227.51	1.03	1.91
SEM ±	0.06	0.19	4.47	0.044	0.055
CD at 5%	0.17	0.56	13.20	0.13	0.16

Effect of CPPU on bunch and berry development

S. D. Ramteke and R. G. Somkuwar

The quality of grapes particularly for the export is determined by the berry size and colour and pulp crispness or firmness. To achieve these qualities, the growers use various bio-regulators. Indiscriminate use of CPPU, a commonly used bio-regulator, led to abnormalities like abnormal growth of pedicel and berry scorching at the growers level. The present experiment was, therefore, conducted to study the effect of CPPU on berry size and morphological traits. CPPU @ 1 or 2 ppm was applied to bunches having 3 - 6, 7 - 10 or more than 10 leaves above the bunch. The observations on berry diameter, pedicel thickness, leaf area and shoot length were recorded. Among the different parameters studied, pedicel thickness has relevance in increasing the shelf life. Significantly more thick pedicels was recorded with both treatments when more than 10 leaves were retained above the bunch. In none of the treatments pedicels were abnormal. The variation in berry size was recorded at later stages and significantly more berry diameter was recorded when more than 10 leaves were available per bunch. Therefore, when CPPU has to be used, the number of leaves available per bunch should be at least 10 or more above the bunch to avoid its abnormal effects.

Enhancement of the GA_3 efficacy by different adjuvents

S. D. Ramteke and R. G. Somkuwar

An experiment was conducted to study the effect of various adjuvants on the bioefficacy of GA_3 in Thompson Seedless grapes under the flat roof gable system. The pH of the spray solution of GA_3 was adjusted to 3.0 - 3.5, 5.5 - 6.0, 6.0 - 6.5 and 6.5 - 7.0 using citric acid, phosphoric acid or urea phosphate. The observations on berry and bunch characters were recorded after the harvest. Maximum berry diameter recorded with citric acid at pH 6.5 - 7.0 followed by same adjuvant at pH 6.0 - 6.5, although the differences among treatments were non significant. But significant differences were recorded in berry weight. All the treatments, except urea phosphate adjusted to pH 6.0 - 7.0, recorded more berry weight than the control i.e. GA_3 at

alkaline pH (> 7.5). Significantly higher berry weight was recorded with citric acid at pH 6.5 - 7.0 followed by same adjuvant at pH 6.0 - 6.5. There was no effect of treatments on bunch weight, TSS, acidity, pedicel thickness and compactness ratio. Results showed that adjusting the pH of the spray solution to 6.0 - 7.0 with citric acid enhances the bioefficacy of GA_3 in improving the quality of grapes.

Use of bio-regulators to improve the quality of Sharad Seedless

S. D. Ramteke and R. G. Somkuwar

Sharad Seedless, a coloured variety is gaining popularity for export. An experiment was conducted to study the possibility of improving the berry size of this variety by the application of 30, 40 or 50 ppm GA_3 along with 10 or 20 ppm 6 BA at 3 - 4 mm berry size. Uniform concentration of 30 ppm GA_3 and 10 ppm 6 BA were applied to all treatments at 6 - 7 mm berry size. The observations on the berry characteristics and shelf life indicated significantly higher berry weight and berry diameter in treatment with 50 ppm GA_3 with 10 ppm 6 BA. Differences in the other parameters including shelf life were non significant.

Sharad Seedless at 3-4mm berry size

Use of growth retardants to increase the bud fruitfulness

S. D. Ramteke and R. G. Somkuwar

In viticulture, growth retardants are used to reduce the shoot vigour which is detrimental to the bud fruitfulness. In this experiment, varying levels of different growth retardants viz. CCC (chlormequat), Ethephon (ehtrel), Paclobutrazol (cultar) and Cypermethrin (tilt) were used at different growth stages. The observations on shoot length, cane diameter, internodal distance, biomass, leaf area, specific leaf weight and bud fruitfulness were recorded.

Significant differences among treatments were observed in shoot length, cane diameter, internodal distance, mean leaf area and biomass production. In general shoot length was reduced with the application of all the chemicals at higher concentrations and more frequency. The cane diameter was reduced with single application at lower concentration of the retired. The internodal distance and leaf size were reduced with the application of cultar and tilt at higher concentration. Application of all the treatments resulted in reduced biomass. No significant differences were recorded with respect to bud fruitfulness. These results indicate that application of these chemicals twice may be required for desirable results. For further confirmation of results experiment is in progress.

Crop Protection

Usefulness of disease forecasting software Metwin 2 for management of downy mildew and anthracnose

S. D. Sawant and Indu S. Sawant

Two adjacent blocks were maintained with i) Fungicide sprays given as per the forewarning shown by the disease forecasting software which was based on the prevailing weather data, ii) A pre-decided spray schedule, which is prepared based on the number of days after fruit & foundation pruning & includes sprays for all the important diseases at different growth stages of the vine.
Recommended fungicides were used in both the blocks and the vines were regularly observed to ensure that disease control, as expected in commercially grown vineyards was achieved. Details of the sprays given in

Forecasting software gave reliable prediction of the risk of downy mildew and anthracnose disease and was useful in preventing unnecessary sprays of fungicides

both the blocks are given in table 21. The table indicates that disease forecasting based management required total of seventeen fungicide sprays for one year of production cycle, while spray schedule based management required twenty eight fungicide sprays. Thus, a total of eleven sprays were saved within one year of production cycle. Schedule based management after foundation (April) pruning included more number of sprays for the control of downy mildew / anthracnose and powdery mildew, while the disease forecasting based management did not include a single spray for the control of these diseases. During monsoon, when light rains and cloudy climate prevail for long time, it is difficult to decide the likelihood of appearance of powdery mildew or downy mildew or anthracnose. Hence, as a preventive measure, fungicide sprays to control all the three diseases are given either as mixture of two or three fungicides or a single fungicide in quick succession. On the other hand, the disease forecasting software with the help of automatic weather recorder indicates precisely the possibility of risk of disease infection and based on the predictions, proper fungicide can be selected for the control of the predicted disease.

Therefore, forecasting based management was found useful for deciding the type of fungicide to be sprayed at appropriate time.

Table 21. Comparison of number of fungicide sprays in the disease forecasting based management and spray schedule based management

	Spray schedule based management			Disease forecasting based management		
	Systemic	Non-systemic	Total	Systemic	Non-systemic	Total
Number of sprays during foundation to fruit pruning						
Downy mildew (DM)	0	0	0	1	0	1
Anthracnose (AN)	1	0	1	0	0	0
Powdery mildew (PM)	3	2	5	3	2	5
DM + AN	1	4	5	0	4	4
AN + DM + PM	1	0	1	0	0	0
PM + DM	0	3	3	0	0	0
PM + AN	1	0	1	0	0	0
Total	**7**	**9**	**16**	**4**	**6**	**10**
Number of sprays during fruit to foundation pruning						
DM	1	0	1	0	0	0
DM + AN	0	1	1	0	1	1
AN	1	0	1	0	0	0
AN + DM + PM	0	0	0	0	0	0
PM + DM	0	1	1	0	0	0
PM + AN	0	0	0	0	0	0
PM	6	2	8	4	2	6
Total	**8**	**4**	**12**	**4**	**3**	**7**

Use of acrylic polymer 'Antistress' and chitosan to improve the bio-efficacy of sulphur and hexaconazole

S. D. Sawant and Indu S. Sawant

The experiment was conducted after foundation pruning. When sulphur @ 2 g per L and hexaconazole @ 0.5 ml per L were sprayed alone, the disease control in sulphur treatment was significantly less than that in hexaconazole treatment. However, both PDI and PSI were significantly less in hexaconazole than in sulphur. When these fungicides were sprayed in combination with

Antistress (4.0 ml per L), i.e. either as tank mix or as separate spray of Antistress, before or after the fungicide sprays, there was no difference in PDI and PSI recorded in sulphur and hexaconazole treatments, indicating that the efficacy of sulphur can be improved by using it along with Antistress. Moreover these combination treatments showed significant decrease in PDI and PSI as compared to when these fungicides were used alone. These results confirm the earlier observations.

A similar experiment was conducted after fruit pruning using chitosan (1.0 g per L) in combination with hexaconazole (0.5 g per L) or sulphur (2.0 g per L). Although spray of chitosan alone has shown higher PDI as compared to sprays of Antistress (4.0 ml per L), sulphur or hexaconazole alone, but PSI in chitosan treatment was at par with that of Antistress. Sulphur or hexaconazole in combination with either Antistress or chitosan showed reduction in PDI and PSI in comparison to sprays of fungicides alone. All treatments increased the yield over control, while hexaconazole, alone or in combination with either Antistress or chitosan showed marginal increase in yield over rest of the treatments.

One-half of grapes from above treatments were given pre-harvest treatments with *Trichoderma* (10^6 cfu per ml) and shelf-life studies were conducted in 2 kg cardboard boxes used for local marketing. Observations on PLW recorded after 4 and 8 days of storage at 25°C indicated that treatments with Antistress or chitosan alone or in combination with pre-harvest treatments with *Trichoderma* showed reduction in PLW as compared to the control. Similar trend was also observed in freshness ratings in these treatments.

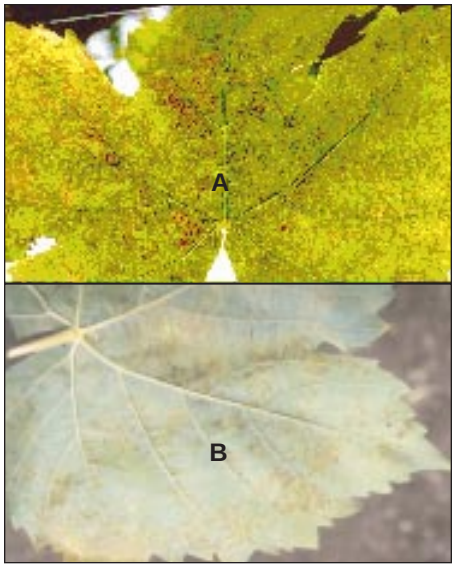
Powdery mildew infection on leaf

Bio-efficacy of bicarbonates alone or in combination with hexaconazole for control of powdery mildew

S. D. Sawant and Indu S. Sawant

The experiment was conducted after foundation pruning. Potassium, sodium and ammonium bicarbonates were used at a concentration of 0.5 per cent or 1 per cent. Treatments were imposed when powdery mildew incidence was noticed and observations on per cent disease control index (PDCI) were recorded five days after the last spray. Observations on fruitful canes and size of bunches were recorded after fruit pruning. Data indicates that all the three bicarbonates at both the concentrations i.e. 0.5 per cent and 1 per cent show control of powdery mildew over the untreated control but the PDCI recorded at 0.5 per cent were significantly lower than that recorded at 1 per cent or 0.2 per cent wettable sulphur. At 0.5 per cent best PDCI was shown by potassium bicarbonate, followed by sodium bicarbonate and ammonium bicarbonate. Disease controlled by potassium bicarbonate at 1 per cent was at par with that in case of 0.2 per cent sulphur. The results indicated that the bicarbonates are potential eradicators of powdery mildew in grapes. However, sodium bicarbonate at 1 per cent showed reduction in per cent fruitful canes, while potassium bicarbonate 1 per cent and sulphur 0.2 per cent treatments showed increase in fruitful canes over control. These results confirmed previous years observations.

The second experiment was conducted after fruit pruning, with potassium bicarbonate spray at 0.5 or 1 per cent concentration in combination with hexaconazole and a surfactant. Treatments were imposed as preventive sprays and observations were recorded on per cent disease index (PDI) on leaves and bunches and per cent sporulation index (PSI), after 5 days of last spray. When used alone, potassium bicarbonate at 1 per cent concentration showed significant decrease in PDI on leaves as compared to 0.5 per cent concentration. When these treatments were given in combination with the



Control of powdery mildew with potassium bicarbonate
A) upper surface B) lower surface

surfactant, there was significant reduction in PDI on leaves, but differences within the concentration were non-significant. On bunches, the PDI was marginally reduced by 1 per cent treatment as compared to the 0.5 per cent treatment.

The bioefficacy of hexaconazole alone or in combination with potassium bicarbonate or surfactant or potassium bicarbonate and surfactant, did not significantly change as far as PDI on leaves was concerned. However, PDI on bunches indicated that the efficiency of hexaconazole increased significantly in combination with surfactant. Further, the best control of powdery mildew on the bunches was achieved when hexaconazole was used in combination with potassium bicarbonate or potassium bicarbonate and surfactant. All treatments showed increase in yield over control.

Based on above observations it could be concluded that for the management of powdery mildew, hexaconazole at 0.5 per cent can be used in combination with potassium bicarbonate at 0.5 per cent and surfactant. Performance of hexaconazole is improved probably because of (i) better control on bunches due to better spray coverage achieved by surfactant and (ii) reduced sporulation on infected area due to use of potassium bicarbonate.

Testing the possibility of using fungicides and biocontrol agents along with hydrogen cyanamide while treating canes after pruning

S. D. Sawant, Indu S. Sawant and S. D. Ramteke

Hydrogen cyanamide was applied in combination with various fungicides and formulations of biocontrol agents. Observations on number of sprouts per cane were recorded after 10 days of pruning. There was no difference in sprouting in any treatment. Results indicated that hydrogen cyanamide can be used in combination with fungicides viz. Thiophanate methyl, mancozeb and sulphur. It also can be used in combination with biocontrol agents such as *Trichoderma* and *Verticillium*. Laboratory experiments on effect of hydrogen cyanamide on *Trichoderma*, *Verticillium* and the bioefficacy of thiophanate methyl, mancozeb and sulphur are also in progress.

Effect of fungicide treatment on yield and quality of fruits of *Botryodiplodia* vines

Indu S. Sawant and S. D. Sawant

The drip area of *Botryodiplodia* affected vines was drenched, twice with 0.1 per cent bavistin @ 1 litre and 2 liters per vine at 15 and 30 days after fruit pruning and its effect on yield and quality parameters of Thompson seedless grafted on Dogridge rootstock was studied. Fungicide drench significantly increased the yield and brix yield in the affected vines but had no effect on the quality parameters. Results indicate that the brix yield of the *Botryodiplodia* affected vines can be increased by fungicide treatments.

GLRV symptoms on Chardonnay

Presence of grape viruses in wine varieties

S. D. Sawant and Indu S. Sawant

Leaf rolling and red pigmentation (in case of red varieties), which are typical symptoms of Grapevine Leaf Roll Virus (GLRV) were observed during January - February 2003, in wine varieties from different areas of Maharashtra. Old leaves from symptomatic vines were collected and tested for GLRV strain 1+3 and 2 using commercially available ELISA kits. The OD

values were recorded at 405 nm. The results of ELISA tests are summarized below:

Sample description		Results
Variety	**Location**	
Chardonnay and Ugni Blanc	Narayangaon	Infected
Vignoir, Pinot Noir, Merlot, Zinfundel, Sauvignon Blanc, Chenin Blanc	Narayangaon	Healthy
Pinot Noir	Nimni	Healthy
Merlot	Malgaon, Nasik	Healthy
Pinot Noir, Vermintinon	NRCG, Pune	Infected
MR x RR-76-3, Greenach, Merlot, Saperavi, LRV-1	NRCG, Pune	Healthy

Chardonnay and Ugni Blanc from Narayangaon and Pinot Noir and Vermintino from the germplasm collection block at NRC Grapes, Pune tested positive for GVLR.

Other incidences of diseases

Indu S. Sawant and S. D. Sawant

The following diseases were recorded from the areas mentioned against them:

- *Rhizoctonia solani* on infected stems from Latur area.
- *Agrobacterium* galls on stem near collar region from Baramati area and on shoots and collar from Indapur area. This is the second year that *Agrobacterium* galls were observed in vineyards.
- *Sclerotium* collar rot on collar region from Usmanabad area.
- *Phomopsis* on stems from Usmanabad area.

Agrobacterium galls on stem

Efficacy of chitosan in combination with *Trichoderma* in minimising post harvest decay of cold stored grapes

Indu S. Sawant and S. D. Sawant

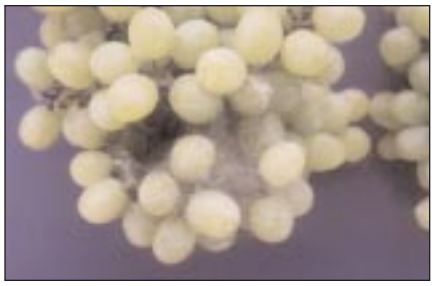
Control of post-harvest decay in grapes, cold stored at 0 ± 0.5°C, by preharvest sprays of chitosan @ 1.0, 0.5 and 0.25 g per L alone or in combination with *Trichoderma harzianum* 5 R @ 1×10^6 cfu per ml, was studied. *T. harzianum* was sprayed 20 and 5 days before harvest. Chitosan was sprayed 4 and 2 days respectively after the *Trichoderma* sprays. Before cold storage, grapes were packed with sodium metabisulphite @ 0.0 or 2.3 g per 5 kg grapes. Observations on decay and desiccation were recorded after 30 days of cold storage and thereafter on shelf.

There was no decay when preharvest spray of chitosan @ 1 g per L was given in addition to spray with *Trichoderma* and the grapes were packed with 2.3 g sodium metabisulphite. Treatment with chitosan alone @ 1 g per L recorded significantly lower decay (5th day on shelf) and physiological loss in weight (2nd day on shelf) than the control i.e. packing grapes with 3.5 g sodium meta-bisulphite per 5 kg grapes. However, on the 6th day the grapes developed fungal growth on the pedicels. Chitosan treatment along with 2.3 g sodium meta-bisulphite reduced the fungal growth on the pedicel while maintaining the freshness and the PLW. Results indicate that preharvest treatment with chitosan alone or in combination with *Trichoderma* can enhance the shelf life of grapes stored at 0 ± 0.5°C.

Control of postharvest decay by *Trichoderma*
(*A) Trichoderma* (B) control

Effect of handling practices on post harvest decay of cold stored grapes

Indu S. Sawant and S. D. Sawant



Rhizopus rot of grapes

Thompson seedless grapes were subjected to various simulated injuries that are normally caused during handling and transporting, before packing them with 2.3 g sodium meta-bisulphite and cold storing at 0 ± 0.5°C for 30 days. The grapes were sprayed with a suspension of the common postharvest pathogens viz. *Alternaria, Cladosporium, Aspergillus, Rhizopus, Botryodiplodia* and *Penicillium* four days before harvest, to increase the inoculum load. One set of the grapes was sprayed with water a day before spraying with the fungal pathogens. The salient observations recorded after cold storage are as follows:

- Irrespective of the type of injury or the pathogen, significantly more decay was observed in grapes sprayed with water.
- Pre-harvest water spray significantly increased *Rhizopus* induced decay in all the three types of injury treatments.
- *Alternaria* infection was more in over ripe berries.
- Horizontal shaking damaged the bottom berries. The split berries with oozed out juice were colonized by *Aspergillus*, while the bruised berries were colonised by *Alternaria* / *Cladosporium.*
- Vertical shaking loosened the pedicel attachment, resulting in more damage due to *Alternaria*.
- In grapes subjected to bruising injury mainly *Alternaria* and *Cladosporium* were observed. *Aspergillus* infection was observed only where the juice had oozed out from injured berries.
- Berries detached at the time of shaking were not colonized by any organism due to protective effect of sulphur dioxide till the wound dried.

The absence of *Botrytis cinerea* from Indian grapes was reported to the APEDA and the Department of Agriculture and Co-operation to use as non tariff measures in case of the import of fresh grapes and its process products in the country.

Post harvest pathogens of grapes

Indu S. Sawant and S. D. Sawant

The survey was conducted to observe the post harvest pathogens in grape varieties during different times of harvest in Maharashtra. The varieties were Thompson Seedless, Tas-A-Ganesh, Flame Seedless, Sonaka, Sharad Seedless, Cabernate Souvignone, Merlot, Chardhonnay and Bangalore Purple. The pathogens observed were *Alternaria, Aspergillus, Penicillium, Cladosporium, Rhizopus* and *Botryodiplodia*. No sample showed the presence of *Botrytis cinerea*. In the surveys conducted so far *Botrytis* was not detected in any of the grape samples. This gives a strong indication that *Botrytis cinerea* as post harvest pathogen is not present in grapes grown in hot tropical region.

Persistence and dissipation of glyphosate residues in vineyards

Kaushik Banerjee

Glyphosate, a broad-spectrum herbicide, is frequently used in viticulture as a total weed killer. No information was available regarding the persistence and effect of this herbicide in/on soils under viticulture in India. A field trial was, therefore, undertaken to study the persistence and dissipation rate kinetics of glyphosate residues in soil to work out its half-life at different doses.

Glyphosate (Glycel 41 SL) was applied on bare soil @ 4 and 8 kg per ha in separate plots. The representative soil samples were collected at regular time intervals starting from the day of application till 60 days. The samples were analysed by the HPLC method. Dissipation of glyphosate followed 1st order rate kinetics in both the treatment levels. The residues could be detected up to 35 days at single dose and up to 40 days at double dose. The residues dissipated with half-life of 13.86 and 14.74 days following single and double dose of applications, respectively.

Microbial bioremediation of methomyl residues in grape berries

Kaushik Banerjee and Indu S. Sawant

Efforts were made to reduce the residue load of methomyl on grape berries through microbial bioremediation. The suspension of commonly used bio-control agent, viz. *Trichoderma harzianum* 5R was sprayed on the grape bunches @ 1×10^6 spores per ml, 3 days after the foliar spray of the commercial insecticide formulation Lannate 40 SP @ 2.5 and 5 g per L. A control was maintained, where, the bio-control agent was not sprayed following the foliar spray of Lannate.

Significant bioremediation was observed. In the *Trichoderma* treated grapes, the residues dissipated by 47.91 and 57.99 per cent in contrast to 34.02 and 47.48 per cent in control for recommended and double dose applications of methomyl, respectively.

Monitoring the pesticide residues in commercial grape varieties

Kaushik Banerjee

Eleven samples belonging to different grape varieties, viz. Thompson Seedless, Sharad Seedless, Bangalore Blue and Pandhari Sahebi, were analysed for the residues of the pesticides sprayed on the grape vines during fruit set to harvest. The pesticides analysed included the insecticides, viz. dichlorvos, methomyl and monocrotophos and the fungicides viz. cymoxanil, hexaconazole, mancozeb, metalaxyl, myclobutanil, thiophanate-methyl and triadimefon. In all the samples the residues were below the detectable limit.

Post Harvest Technology

Standardization of quality of Indian raisins with reference to codex standards and harmonization of Indian standards

P. G. Adsule and Kaushik Banerjee

Raisin samples were collected from the raisin units at Sangli, Solapur and Bijapur area, the major raisin producing districts in the country and analysed for various quality parameters specified under the Codex standards. Raisin samples drawn from other countries were also used for reference. The aim of this study was to formulate quality standards for Indian raisins, which are not in existence under the PFA and FPO and subsequently harmonize the same with the Codex standards for promoting the export of this produce.The study revealed that the Indian raisins comply with all the physico-chemical, microbiological and organoleptic parameters specified under the Codex except for the physical parameters namely the number of cap stems and stem pieces in unit quantity. It is proposed to fix the moisture level of Indian raisins to 14-16 per cent against the Codex standard of 18 per cent. The study highlights the need to develop suitable technology for efficient cleaning and grading of the raisins preferably by adopting mechanical means.

Evaluation of wine quality of grape varieties grown at different locations

S. D. Sawant and P. G. Adsule

The following varieties were collected from the locations indicated against their names. Preliminary observations on TSS, pH and titrable acidity (citric acid) were recorded and juice was fermented with the cultures of *Saccharomyces cerevisiae* (Premier Cuvee and Red Pasteur) from Red Star Company and K1-V1116 culture from (Lalvin Company) or natural fermentation at 15-20°C temperature. Further observations on wine quality parameters i.e. alcohol percentage and volatile acidity will be recorded.

Variety	Location
Cabernet Souvignon, Siraz	Nimni, Sangli
Cabernet Souvignon, Siraz	Malegaon, Miraj
Merlot, Siraz	Kasegaon, Pandharpur
Merlot, Cabernet Souvignon, Shiraz, Thompson Seedless, Tas-A-Ganesh	NRC Grapes, Pune
Merlot, Chardonnay	Mangalvedha, Solapur
Zinfandel, Siraz	Nasik
Shiraz	Pimpalgaon, Nasik

Collaborative and externally funded projects

Sustainable management of agro-biodiversity - augmentation and evaluation of grape germplasm (NATP funded project)

G. S. Karibasappa

All the grape accessions are grafted on Dogridge rootstock and are maintained as field gene bank since 1998. Twelve vines per accession are planted at a spacing of 10 x 6 feet. Data on three representative plants per entry were recorded as described in the code directory as per the minimal descriptors' list for grapes. The complete passport i.e. accession and collection data and characterization i.e. morphological and preliminary evaluation data on one hundred and thirty eight accessions for forty-nine descriptors was recorded. A catalogue for one hundred and thirty eight accessions was prepared and submitted to the NBPGR, New Delhi. Further work is in progress.

Induction of downy mildew resistance in commercial cultivars of grapes through cross breeding and *in vitro* embryo rescue methods (NATP funded project In collaboration with NCL, Pune and ARI, Pune)

G. S. Karibasappa

The crossing was carried out during May to July i. e. during the off season flowering in staggered conditions using fresh or air dried and cold stored pollens. The berries were harvested after 30 - 35 days of crossing. Some bunches were treated with BAP @ 30 ppm prebloom and 7 days after the crossing. A total of 3173 berries were given to NCL for embryo rescue studies, out of which 480 berries were open pollinated and the rest 2693 berries were crossed with various donors for downy mildew resistance.

During the year pre-hardened embryo rescued plants from the previous year crosses were obtained from NCL, Pune. Out of 409 plants 325 hybrid plants have been established under green house conditions. Further studies are in progress.

Micropropagation of selected grape varieties and rootstocks and DNA fingerprinting of germplasm (DBT funded project in collaboration with NCL, Pune and ARI, Pune)

G. S. Karibasappa

The project was started in May 2002 with the objective of development of protocols for micropropagation of commercial grape varieties and rootstocks to produce uniform, healthy and quality planting material in large quantity at a time. The explants were collected from the field grown nucleus mother plants of 2 cultivars (Red Globe and 2A clone of Thompson Seedless). Similarly, explants were obtained from the field grown nucleus mother plants of rootstock varieties such as 110 Richter (*Vitis berlandieri* × *V. rupestris*) and 1103 Paulsen (*Vitis berlandieri* × *V.rupestris*). Shoot tips bearing 3-4 just opened leaves and single nodal segments from semi hard wood cuttings were provided to NCL, Pune for micropropagation studies. Fully opened leaf samples of 107 accessions were given to ARI, Pune for DNA analysis using RAPD and ISSR polymorphism.

Molecular tagging of downy mildew resistance in grapes (DBT funded project)

Anuradha Upadhyay, G. S. Karibasappa and Indu S. Sawant

Report presented on page 9 under Crop Improvement.

To develop irrigation schedule for grapes (ICAR Network project - concluded)

J. Sharma, S. D. Shikhamany, A. K. Upadhyay and R .K. Singh

This project was concluded in 2002. However, to verify the earlier results, the experiment was continued for one more year. This experiment was aimed at developing an irrigation schedule to improve the water use efficiency in Thompson Seedless grapes raised on Dogridge B rootstock. The treatment details are given in table 22.

Table 22. Percent replenishment rate of pan evaporation (Pan factor = 0.7)

	T1	T2	T3	T4	T5	T6	T7	T8
Days after foundation pruning								
0–40	80	60	40	80	60	40	80	60
41–60	80	60	40	60	40	20	40	20
61–120	80	60	40	60	40	20	40	20
121–to fruit pruning	80	60	40	60	40	20	40	20
Day after fruit pruning								
0–40	80	60	40	80	60	40	80	60
41–55	80	60	40	60	40	20	40	20
56–105	80	60	40	80	60	40	80	60
106–to harvest	80	60	40	80	60	40	80	60
Harvest to foundation pruning	80	60	40	40	20	0	20	00

Irrigation requirement of grapevines could be reduced by half by irrigating the vines at the rate of only 60 % replenishment of pan evaporation at shoot growth stage (0-40 days) after foundation / fruit pruning and berry development and ripening stages; at 20 % repleminishment rate at fruit bud differentiation, bud development and cane maturity (which coincides with rainy season), berry set and shatter; and no irrigation after harvest to foundation pruning.

The data on yield and its attributes are presented in table 23. During the experimental period, total rainfall was 319.2 mm with 100 rainy days, of which 19 days had more than 4 mm rainfall. Significant yield differences were obtained within the treatments. Treatment T8 recorded the highest yield of 14.2 t per ha whereas treatment T6 recorded significantly lower yield (10.2 t per ha). Brix yield among the treatments were found to be at par however, treatment T8 recorded the highest brix yield. The data corroborates the earlier years' findings that imposing the stress at the stage of bud differentiation and berry set and shattering stage did not have any adverse effect on yield and quality of the crop besides saving a considerable quantity of water. Irrigating the vines @ 40 per cent or less rate of replenishment of pan evaporation (T3 and T6) at critical growth stages like shoot growth and berry growth and ripening period reduced the yield, brix yield and biomass compared to other treatments.

Table 23. Effect of irrigation treatments on brix yield, yield and biomass

Treatments	Brix yield (t/ha)	Yield (t/ha)	Biomass (t/ha)	
			October	April
T1	2.8	13.2	2.5	3.7
T2	2.7	13.3	2.1	3.2
T3	2.4	10.5	1.1	2.5
T4	2.8	12.5	2.4	3.0
T5	2.8	12.4	1.9	2.5
T6	2.3	10.2	1.1	2.4
T7	2.6	12.3	1.9	3.0
T8	3.1	14.2	2.0	3.2
SEM ±	–	1.0	0.1	0.2
CD (5%)	–	2.8	0.4	0.5

The above results indicated that irrigation scheduling based on pan evaporation improved the water use efficiency without reducing the yield and quality. Different rates of irrigation did not affect the TSS and acidity of the juice significantly. The nutrient status of the vines under all the treatments was in optimum range and there were no significant differences amongst the treatments. Treatment T8 led to 51 per cent savings in irrigation water. This irrigation schedule is recommended for heavy soils.

Survey and surveillance in western India for infestation of grapes and mangoes by oriental fruit fly

(APEDA sponsored project in collaboration with MPKV, Rahuri; KKV, Dapoli; MAU, Parbhani; PDKV, Akola and GAU Navsari)

S. D. Sawant

An extensive survey of grape growing areas of Maharashtra was conducted to assess the presence of fruit fly infestation in grape. Fruit Fly is a serious quarantine issue for export of fruits like mango, guava and pomegranate. Samples were collected from fourteen vineyards located in 6 grape growing districts of Maharashtra and observed under controlled laboratory conditions for the emergence of fruit fly. Most of the selected vineyards were in close

vicinity of orchards of mango and/or guava and had received at least one rain 3-4 days before harvest. Fruit fly was not observed in any of the collected sample.

Contract research projects

Bioefficacy of new formulations / preparations of bioregulators

S. D. Ramteke, R.G Somkuwar, S. D. Sawant and J. Sharma

The bioregulators were tested for their effect on growth, yield and quality parameters of Thompson Seedless at single or multi-locations. The trials were conducted as per the protocol suggested by the sponsorers. The details are given in table 24

Table 24. Details of bioregulators tested for their bioefficacy in grapes

Sl. no.	Bioregulator	Active ingrediant	Trial sponsored by
1.	Pro-gibb	Water soluble tablet containing 20 % Gibbrellic acid	M/S Sumitomo Chemical India Pvt. Ltd., Mumbai
2.	Biovita	Natural organic product containing extract of *Ascophyllum nodusam*	M/s. PI industries Ltd., Udaipur
3.	Biopower and Bioforce	Biopower : mixture of amino acids, plant growth promoting triterpenoids, siderophore and attenuated bacteria fortified with blue green algae in the granule form. Bioforce : mixture of amino acids, phytohormones, macro & micro elements & plant growth stimulating triterpenoids in liquid forms.	M/s Nirmal Seeds Pvt. Ltd., Jalgaon
4.	Quantum	Plant bio stimulant chemically known as N-ATCA (N-acetyl Thiozolidine - 4 - Carboxylic acid) and contains 5 per cent N-ATCA and 0.2 per cent folic acid.	M/s Sudarshan Chemical Industries Ltd. Pune

Testing of bio-efficacy of new fungicides for control of mildews

S. D. Sawant and Indu S. Sawant

In field trials conducted during fruiting season of 2002-03, following new fungicides showed their potential in control of diseases in grape.

Sl. No.	Fungicide formulation	Dose (Formulation per litre spray water)	Disease controlled	Sponsored by
1.	Amistar 25 SC (Azoxystrobin)	0.8 ml	Powdery mildew	M/s Syngenta India Ltd.,Mumbai
2.	Score 25 EC (Difenoconazole)	0.5 ml	Powdery mildew	M/s Syngenta India Ltd.,Mumbai
3.	Myclobutanil 10 WP (Myclobutanil)	0.4 g	Powdery mildew	M/s Nagarjuna Agrichem Ltd., Hyderabad
4.	Sumi-8 25WP (Diniconazole)	0.4 g	Powdery mildew	M/s Sumitomo Chemicals India Pvt. Ltd., Mumbai
5.	Folicure 250 EW (Tebuconazole)	0.5 g	Powdery mildew	M/s. Bayer (India) Ltd., Mumbai
6.	KX-007 42SC (Fomoxate + Cymoxanil)	0.5 ml	Downy mildew	M/s. DuPont India Pvt. Ltd., Gurgaon
7.	JE-874 10EC (Famoxate)	0.09 ml	Downy mildew	M/s. DuPont India Pvt. Ltd., Gurgaon

Persistence and dissipation of agrochemical residues in berries

Kaushik Banerjee

Three field trials were conducted to study the persistence and dissipation pattern of the residues of the fungicide, Sumi-8 25WP; bioregulator, Quantum and the insecticide, Actara in grape berries to work out the safety standards. The trials were conducted to generate residue data required for registration of these new pesticides for viticulture. The details are given in table 25.

Table 25. The preharvest intervals for some new agrochemicals

Sl. No.	Pesticide formulation	Dose Formulation	Spray/Dip interval	Half-life (days)	PHI (days)	Trial sponsored by
1.	Sumi-8 25WP (Diniconazole)	1 g / l	60, 45 and 30 DBH	4.95	20.60	M/s Sumitomo Chemicals India Pvt. Ltd., Mumbai
		2 g / l		4.84	25.20	
2.	Quantum(N-ATCA)	1 ml / l	Spray at 45 and 75 DAP and dip at 102 and 110 DAP	5.80	9.08	M/s. Sudarshan Chemicals Industries Ltd. Pune
		2 ml / l		5.80	11.58	
3.	Actara (Thiamethoxaim)	12.5 g a.i./ha	Spray at 45 and 30 DBH	-	17	M/s. Syngenta India Ltd. Mumbai.
		25.0 g a.i./ha		-	19	
		50.0 g a.i./ha		-	29	
4.	Actara (Thiamethoxaim)	0.025 g a.i./vine	Single soil drenching	26**		M/s. Syngenta India Ltd. Mumbai.
		0.05 g a.i./vine		29**		
		0.10 g a.i./vine		35**		

**Days for complete dissipation

Technology Assessed and Transferred

The following technologies have been evaluated at the Centre during last three years.

Rootstocks

Performance of Thompson Seedless and Tas-A-Ganesh on Dogridge B rootstock and own rootes was compared. The vines grafted on rootstock performed better in terms of better yield and quality. Rootstocks provide advantage in adverse conditions like drought, salinity and alkality of soil and water. The pure planting material of Dogridge B is being propagated and supplied to the growers.

Rootstock nursery

Irrigation Schedule

An irrigation schedule based on pan evaporation and plant growth stage has been developed. On farm experiments resulted in 40 per cent saving in water requirement and water use efficiency increased to the extent of 114 per cent.

Use of Bio-regulators

Application of several bio-regulators and commercial formulations viz. GA_3 CPPU, Combine, etc. at various fruit developmental stages resulted in better berry diameter and crispness. The best bio-regulators and their respective concentrations have been worked out.

Ideal rachis elongaton by GA_3

Disease Forecasting based Disease Management

Usefulness of disease forecasting software Metwin 2, for disease management was evaluated and demonstrated. Disease forecasting based disease management resulted in saving of 11 sprays during one year. This amounts to considerable saving on fungicide and the cost of labour, thus bringing down the overall cost of production. This will also help in reducing the residual levels of pesticides. This technology has been adopted by Abhinav Grape Growers Cooperative Society at Junnar. The information on weather, disease forcasting and evaporation is provided to the members, through answering machine attached to the telephone. Regular guidance on use of disease forecasting results to safely reduce sprays of fungicide is being given to growers in this area. The growers are finding it very useful to reduce expenditure on disease control.

Inauguration of digital display board weather data and forecasting at Abhinav grape growers' co-operative society

The scientists disseminated these technologies to the grape growers through several field visits and participation in seminars organised by their societies.

Farm Visits

- Dr. S. D. Shikhamany in collaboration with Maharashtra State Grape Growers' Association visited the fields to assess the damage due to hail-storm in vineyards around Latur and Osmanabad districts of Maharashtra on 16th July 2002 and suggested measures to rectify the damage.
- Dr. R. G. Somkuwar visited vineyards in Kasegaon and Pandharpur to study the training systems and fruitfulness under these systems on 31st November 2002.

Participation in Growers' Seminar

- Dr. S. D. Shikhamany, Dr. S. D. Sawant and Dr. J. Sharma visited the problematic vineyards and participated in the growers' seminar at Solapur and Sangli during 15-17th April 2002.

- Dr. S. D. Shikhamany, Dr. S. D. Sawant and Dr. J. Sharma participated in the grape growers' seminar organized by the Karnataka Grape Growers' Association on 8th May 2002 at Bijapur and delivered a lecture on the cultural practices to be carried out from April pruning to October pruning to obtain adequate shoot growth, bud fruitfulness and cane maturity under the prevailing situation of hot weather, water shortage and soil and water salinity in northern Karnataka.

- Dr. S. D. Shikhamany, Dr. S. D. Sawant and Dr. J. Sharma delivered lectures on 'Package of practices', 'Management of diseases and pests in grapes' and 'Nutrient management in grapes' respectively to the grape growers of Abhinav Grape Growers' Association, Junnar on 19th May 2002.

- Dr. P. G. Adsule and all the Scientists of the Centre participated in the Annual Seminar of Maharashtra State Grape Growers' Association, Pune during 24-25th August 2002. In the seminar, the following lectures were delivered:

  - Prospects of wine industry in Maharashtra - Dr. P. G. Adsule.
  - Disease management strategy after October pruning - Dr. S. D. Sawant.
  - Management of micro nutrients and fertigation - Dr. J. Sharma.

- Dr. P. G. Adsule along with Dr. G. S. Karibasappa and Dr. S. D. Ramteke participated in the seminar organized by the Karnataka Grape Growers' Association to deliberate on the grape cultivation and post-harvest technology at Tikota on 8-9th September 2002.

- Dr. P. G. Adsule along with Dr. G. S. Karibasappa participated in the seminar on Grape Cultivation and Post-harvest Technology organized by Maharashtra State Grape Growers' Association - Sangli Unit on 22nd September 2002. Dr. P. G. Adsule delivered a talk on 'Post-harvest technology of grape'.

- Dr. P. G. Adsule participated in the Farmers' Meet arranged by Junnar Agricultural Development Branch of SBI at Junnar on 23rd September 2002 and delivered lecture on 'Post-harvest technology of grapes with reference to marketing'.

- Dr. G. S. Karibasappa, Dr. S. D. Sawant and Dr. J. Sharma participated and delivered lectures to the grape growers of Maharashtra State Grape Growers' Association at Solapur on 23rd September 2002, Nasik on 24th September 2002 and Babaleshwar on 26th September 2002.

- Dr. S. D. Sawant, Dr. S. D. Ramteke and Dr. J. Sharma delivered lectures at Sangli on 22nd September, Solapur on 23rd September, Nasik on 24th September and Babaleshwar on 26th September 2002.

- Dr. S. D. Sawant, Dr. R. G. Somkuwar and Dr. J. Sharma delivered lectures at Nasik, Babaleshwar, Solapur and Sangli from 21-26th September 2002.

- Dr. G. S. Karibasappa delivered a lecture on 'Strategies of management after October pruning in grape vineyards' to grape growers of Yelburga, Koppal district, Karnataka on 11th October 2002.

- Dr. S. D. Sawant, Dr. S. D. Ramteke, Dr. A.K. Upadhyay and Dr. Jagdev Sharma participated in the seminar organized by Abhinav Grape Growers' Society at Junnar on 26th October 2002.

- Dr. P. G. Adsule, Dr. R. G. Somkuwar and Dr. A.K. Upadhyay visited vineyards in Tasgaon and Atpadi Talukas participated in the seminar on 'Viticulture Management during Water Scarcity' at Tasgaon organized by Sangli Unit of Maharashtra State Grape Growers' Association on 6th December 2002 and suggested short and long term strategy to save the grape vineyards at various stages of growth.
- Dr. R. G. Somkuwar delivered a lecture on 'Modern grape cultivation'in the Seminar organized by Rashtriya Chemicals & Fertilizers, at Thal in Alibagh on 13th December 2002.
- Dr. P. G. Adsule, Dr. G. S. Karibasappa, Dr. S. D. Sawant, Dr. R. G. Somkuwar and Dr. A. K. Upadhyay participated in the seminar on 'Water Management for Grape & Pomegranate' organized by Baramati Taluka Co-op. Phalotpadak Sangh Ltd., State Bank of India (SBI) and Krishi Vigyan Kendra, at Baramati on 16th January 2003 and advised the growers on various facets of crop production.
- Dr. R. G. Somkuwar surveyed grape vineyards at Kasegaon, Pandharpur and advised growers on canopy management under the water stress on 14th February 2003.
- Dr. P. G. Adsule along with the scientists participated in the 'Technical Seminar on Grapes' organized by Abhinav Grape Growers Association, Agar, Junnar on 18th February 2003 and provided necessary guidance to the growers.

Participation in Agricultural Show

The Centre actively participated in Indian Agri Trade Fair Kisan 2002 held at Pune during 11-15 December. Dr. A.K. Upadhyay was the Nodal Officer for the event. The stall received overwhelming response and was visited by almost 1500 farmers hailing from different regions, who were shown and explained the technologies developed by the Centre.

Participation in All India Grape Show

Dr. P. G. Adsule, Dr. S. D. Sawant, Dr. R. G. Somkuwar, Dr. A. K. Upadhyay, Dr. Kaushik Banerjee, Dr. S. D. Ramteke and Dr. Jagdev Sharma participated in the All India Grape Show organized by Ministry of Agriculture, Govt. of India, New Delhi in association with Maharashtra State Dept. of Agriculture at Sangli from 21st to 23rd February 2003 and judged the entries for various categories. Dr. P. G. Adsule was the chairman of the judging committee and also chaired the technical session on grape processing industry organised on the occasion.

Centre's stall at the All India Grape Show being visited by Shri. Prakash Bapu Patil, M. P. of Sangli constituency

On Campus discussion with growers

More than thousand growers from Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Madhya Pradesh visited the centre individually or in groups for advice on various aspects of viticulture and discuss their specific problems related to the varieties, canopy management, nutrient and water management, quality improvement, disease and pest control etc.

Education and Training

Training Acquired

Name	Training Title	Period	Organized by
A. Deputation abroad			
Dr. J. Sharma	International Course on Pressurized Irrigation System	28th May to 16th July 2002	CINADCO, SHECAYIM, Israel
B. Trainings in India			
I. Scientific staff			
Dr. R. G. Somkuwar	MS-Office (Basic)	30th Sept. –5th Oct. 2002	IASRI,New Delhi
Dr. Anuradha Upadhyay	Techniques in Plant Genetic Engineering and Molecular Breeding	5–25th Nov. 2002	NRC on Plant Biotechnology, IARI, New Delhi
Dr. Indu S. Sawant and Dr. Jagdev Sharma	Information Technology in Agriculture	3–23rd Dec. 2002	NAARM, Hyderabad
Dr. Indu S. Sawant	Molecular Biological Techniques for Horticultural Crops	27th Dec. 2002 to 4th Jan. 2003	Indian Institute of Spices Research, Calicut
Dr. G. S. Karibasappa	Trainers Training Programme on Plant Genetic Resource Management	13th Feb.–5th March 2003	N.B.R.G.R., New Delhi
III. Administrative Staff			
Sh. A. Srinivasamurthy and Sh. O. Babu	Consulting workshop on 'Constitutional Amendments and Oprations of Reservation Order for SC/ST/OBC in Govt. Services	1–5th Aug. 2002	Third World Development Centre, New Delhi at Trivandrum
Sh. A. Srinivasamurthy	Management Development Programme on Analysis of Financial Statement	2–6th Sept. 2002	National Institute of Financial Management, Faridabad.
Sh. A. Srinivasamurthy and Sh. B.N. Ramchandrappa	Financial Management System of NATP	16–17th Sept. 2002	ICAR, New Delhi at Bangalore
Sh. A. Srinivasamurthy	Hindi Workshop	11th Oct. 2002	National Institute of Public Administration, Bangalore
Sh. A. Srinivasamurthy and Sh. L. R. Gopalkrishanan	Retirement Planning & Benefits Calculation	21–25th Oct. 2002	Third World Development Centre, New Delhi at Manali, Himachal Pradesh
IV. Technical Staff			
Ms. Shailaja V. Satam	गहन हिंदी प्रशिक्षण व कार्यशाला	18–22nd Feb.	NAARM, Hyderabad

Training Given

- ☆ Dr. S. D. Shikhamany served as a resource person in 1st Integrated Training Programme on Grapes for 2002-2003 organized by APEDA Regional Office, Hyderabad from 30-31st May 2002.
- ☆ Dr. Indu S. Sawant conducted a 6 weeks summer training programme in Plant Pathology laboratory on 'Utilization of pesticides by *Trichoderma* as nutrient sources' for M.Sc. Mycology student of Pune University.
- ☆ Dr. Indu S. Sawant conducted a 1 week summer training on 'Selective isolation and enumeration of *Trichoderma* spp. from soils for B.Sc. Microbiology students of Ramnarain Ruia College, Mumbai.
- ☆ Dr. Anuradha Upadhyay worked as visiting faculty to impart training in RFLP and PCR based markers to the participants of training on 'Molecular Biological Techniques for Horticultural Crops' organized by Indian Institute of Spices Research, Calicut from 27th December 2002 to 4th January 2003.

Scientists participating in the training programme organised by IISR

Awards and Recognitions

- ☆ Dr. G. S. Karibasappa has been nominated as external examiner for post-graduate studies by University of Agricultural Sciences, Dharward.
- ☆ Dr. Indu S. Sawant has been nominated as the member of Institute Management Committee of the National Research Centre for Onion and Garlic, Pune for the period of three years.
- ☆ Dr. Anuradha Upadhyay received ICAR team research award. She was the member of team at CPCRI, Kasargod who got this award for significant achievements in coconut conservation and characterization.
- ☆ Dr. S. D. Ramteke was given 'Sanstha Bhushan' award by Rashtriya Shikshan Sanstha, Lakhani, dist. Bhandara, Maharashtra for his academic achievements.

Welfare, Development and Empowerment of Women

The centre provided employment to women on 4840 mandays under contract labour scheme, which constituted 36% of total mandays.

Experiments to replace commonly used bower training system with more labour friendly FRG system are in progress. The new system will reduce the drudgery to women employees. Women laborers are oriented appropriately while dealing with chemical/fertilizer application in the farm vis-a-vis their safety and health hazards.

Difficulties associated with Bower Training System

Linkages and Collaboration including Externally Funded Projects

Externally Funded Projects

	Title	Source of Funding
1.	Collection and Augmentation of Grape Germplasm under multi institutional project on Plant Bio-diversity.	NATP
2.	Molecular Tagging of Downy Mildew Resistance in Grapes	DBT

Linkages

Centre has established linkage with Cancer Research Institute, Tata Memorial Centre, Mumbai to identify cancer inhibiting phenolics in grapes. Pesticide free grapes from seeded, seedless, white and coloured varieties have been provided for the analysis.

Collaborating Projects

	Title	Source of Funding	Collaborating Centres
1.	Induction of Downy Mildew Resistance in Commercial Cultivars of Grapes through Cross Breeding and *in-vitro* Embryo Rescue Methods	NATP	NCL, Pune ARI, Pune
2.	Survey and Surveillance in Western India for Infestation of Grapes and Mangoes by Oriental Fruit Fly	APEDA	M.P.K.V.,Rahuri, K.K.V.,Dapoli, M.A.U., Parbhani, P.D.K.V., Akola, G.A.U., Navsari
3.	Micro-propagation of Selected Grape Varieties & Root-stocks and DNA Finger Printing of Grape Germplasm	DBT	NCL, Pune ARI, Pune

Project reports are presented on pages 30-33.

List of Approved on-going Institute Projects

1. Management of Genetic Resources of Grapes (***G. S. Karibasappa,*** *J. Satisha (On Study leave), P. G. Adsule, S. D. Sawant, S. D. Ramteke and A. K. Upadhyay)*
2. Grape Germplasm Information System (***Kavita Y. Mundankar*** *and G. S. Karibasappa)*
3. Molecular Tagging of Downy Mildew Resistance in Grapes *(**Anuradha Upadhyay,** G. S. Karibasappa and Indu S. Sawant)*
4. Evaluation of Grape Rootstocks for Salinity and Drought Tolerance

   (***R.G.Somkuwar****, J.* Satisha (on *Study leave*), *Jagdev Sharma and S. D. Ramteke)*
5. Standardization of Canopy Architecture to Maximize the Production of Export Quality Grapes (***R. G. Somkuwar****, S. D. Ramteke and S. D. Sawant)*
6. Developing the Petiole Nutrient Guides for Grapes Raised on Rootstocks *(**Jagdev Sharma,** S. D. Shikhamany, R. K. Singh and A. K. Upadhyay)*
7. Improving Nutrient Use Efficiency in Grapes *(**Jagdev Sharma,** R. K. Singh, A. K. Upadhyay and Indu S. Sawant)*
8. Use of Bio-Regulators to Increase the Productivity and Export Quality of Grapes from Grafted Vines (***S. D. Ramteke****, J. Satisha (on SL) and R. G. Somkuwar)*
9. Improving Fungicide Use Efficiency in Grapes ***(S. D. Sawant****, Indu S. Sawant and Kaushik Banerjee)*
10. Management of Newly Emerging Grape Diseases of Economic Importance ***(Indu S. Sawant*** *and S. D. Sawant)*
11. Management of Post-harvest Decay in Grapes for Export *(**Indu S. Sawant,** S. D. Sawant and Kaushik Banerjee)*
12. Monitoring of Agrochemical Residues in Grapes ***(Kaushik Banerjee)***

Publications

Research Articles

1. Banerjee, Kaushik. 2002. Persistence of iprodione in grapes (*Vitis vinifera* L.). *Indian Journal of Agricultural Sciences* 72(5) : 290-291.
2. Sawant, S. D.; Sawant, Indu S. and Banerjee, Kaushik. 2002. Minimizing sulphur dioxide injury in table grapes (*Vitis vinifera*) for export by pre-harvest benomyl sprays. *Indian Journal of Agricultural Sciences* 72(11): 636-639.
3. Ramteke, S. D.; Somkuwar, R. G.; Satisha, J. and Shikhamany, S. D. 2002. Effect of pre-harvest calcium dips on storage of Thompson Seedless grapes. Proc. Of National Seminar on 'Role of plant physiology for sustaining quality and quantity of food production in relation to environment' organized at UAS, Dharwad on 5-7th December 2001. pp. 158-160.

Papers Presented in Seminars / Symposia

1. Sawant, Indu S.; Sawant, S. D. and Banerjee, Kaushik. 2002. Use of biocontrol agent *Trichoderma harzianum* 5R for management of post-harvest decay in export grapes. Presented in International Symposium on Molecular Approaches for Improved Crop Productivity & Quality held at TNAU, Coimbatore from May 22-24, 2002.
2. Adsule, P. G.; Sawant, Indu S. and Sawant, S. D. 2002. Role of various treatments of fruits and vegetables in extending the shelf life. In the National Workshop on 'Newer Vistas in Handling and Processing Technologies for Horticultural Crops' organized by NSIT, New Delhi on 14-15th June 2002.
3. Adsule, P. G. and Banerjee, Kaushik. 2003. Export potential and value addition of grapes. Paper presented in 'Seminar on Regional Agro-wealth: Opportunities for Value Addition and Exports'. jointly organized by Maharashtra Academy of Sciences and Bhabha Atomic Research Centre held at Mumbai March 28-29, 2003.

The following papers were presented in 2nd International Congress of Plant Physiology held at Indian Agricultural Research Institute, New Delhi, 8-12th January 2003.

4. Banerjee, Kaushik; Ramteke S. D.; Somkuwar, R. G. and Sawant, S. D. 2003. Terminal residues of N-ATCA and its effect in grape. Abs. No. S12-P3, pp. 498.
5. Ramteke, S. D.; Somkuwar, R. G.; Shikhamany, S. D. and Banerjee, Kaushik. 2003. Effect of 'Quantum' on increasing growth, yield and quality of grapes. Abs. No. S12-P7, pp. 500.
6. Somkuwar R. G. 2003. Importance of retention of knot on bunch stalk and pre-cooling on shelf life of Thompson Seedless grapes. Abs. No. 57-P3, pp. 330.

The following papers were presented in 6th Agricultural Science Congress held at Indian Institute of Soil Science, Bhopal, 13-15th Feb. 2003.

1. Banerjee, Kaushik. 2003. Management of thiophanate-methyl residues in grapes. Abs. No. P-279, pp. 195.
2. Ramteke S. D. 2003. Effect of GALA for berry thinning and shelf life of Thompson Seedless grapes. Abs. No. 165, pp. 115
4. Somkuwar, R. G. and Ramteke, S. D. 2003. Effect of artificial shading on berry development and retention of green colour of berries in Tas-A-Ganesh grapes. Abs. No. P-174, pp. 122.

Popular Articles

1. Adsule, P. G. 2002. Prospects of wine industry in Maharashtra (in Marathi) *Drakshavritta Souvenir* Aug. 2002. pp. 217-221.
2. Adsule, P. G. and Banerjee, Kaushik. 2003. National scenario of quality pertaining to fresh grapes and processed products. *Drakshalata* (February). pp. 31-35.
3. Banerjee, Kaushik. 2002. Use of Methomyl for effective control of sucking insect pests of grapes (in Marathi) *Drakshavritta Souvenir* Aug. 2002. pp. 118-119.
4. Banerjee, Kaushik. 2003. Management of agrochemical residues in grapes (in Marathi). *Shetkari* (March). pp. 46-47.
5. Karibasappa, G. S. 2002. Different techniques of raisin production and methodology adopted in Maharashtra (in Marathi). *Drakshavritta Souvenir* Aug. 2002. pp. 210-216.
6. Karibasappa, G.S; Somkuwar, R. G.; Karad, Sunil, R. and Adsule, P. G. 2003. Planting of grapes (in Marathi). *Drakshalata* (February). pp. 8-12.
7. Ramteke, S. D. 2002. Production of export quality grapes (in Marathi). *Shetkari* Sept. 2002. pp. 39-42.
8. Ramteke, S. D. 2002. Use of Gibberellic acid in grape vineyard (in Marathi). *Drakshvritta Souvenir,* Oct 2002. pp. 1-4.
9. Ramteke, S. D. 2002. Use of growth regulators in grapes after October pruning (in Marathi). *Phalbagcritta,* Oct 2002. pp. 174-176.
10. Ramteke, S. D. 2002. Use of growth regulators in grapes (in Marathi). *Drakshavritta Souvenir* Aug. 2002. pp. 174-176.
11. Ramteke, S. D. 2003. Production of grapes for export (in Marathi). *Shetkari* (March). pp. 7-10.
12. Ramteke, S. D. 2003. Production of grapes for export (in Marathi). *Drakshalata* (February). pp. 13-18.
13. Ramteke, S. D. 2003. Use of growth regulators in grape vineyard (in Marathi). *Kisan Shakti* (March). pp. 47-51.
14. Sawant, S. D. and Sawant, Indu S. 2002. Disease management strategy in grapes for downy mildew, powdery mildew, anthracnose, *Botryodiplodia* and other diseases. *Drakshavritta Souvenir* Aug. 2002. pp. 85-107.
15. Sharma, Jagdev. 2002. Few tips for effective fertigation (in Marathi). *Drakshavritta Souvenir* Aug. 2002. pp. 70-72.
16. Sharma, Jagdev. 2002. Nutrient management after October pruning (in Marathi). *Drakshavritta Souvenir* Aug. 2002. pp. 51-52.
17. Somkuwar R. G. Growing grape vineyard on rootstock and care up to first harvest (in Marathi). *Drakshavritta Souvenir* Aug. 2002. pp. 21-24.
18. Somkuwar, R. G. 2002. Care of grape vineyard after April pruning (in Marathi). *Drakshavritta* (May 2002), pp. 6-7.
19. Somkuwar, R. G. 2002. Planting of grape vineyard - operations from planting to October pruning (in Marathi). *Drakshavritta* (May 2002).
20. Somkuwar, R. G. 2002. Planting of grape vineyard on rootstock - a need of the hour (in Marathi). *Drakshvritta.* pp. 2-11.
21. Somkuwar, R. G. 2002. Successful grafting on rootstock (in Marathi). *Baliraja.* Pp. 25-26.
22. Somkuwar, R. G. 2003. Where to establish grape vineyard (in Marathi). *Shetkari* (March). pp. 5-6 & 32.

23. Somkuwar, R. G. and Adsule, P. G. 2003. Grape vineyard on rootstock (in Marathi). 2003. *Shetkari* (March). pp. 15-16.

24. Somkuwar, R. G. and Ramteke, S. D. 2002. Pre-harvest practices to improve grape quality (in Marathi). *Baliraja.* pp. 33-35.

25. Somkuwar, R. G.; Adsule, P. G. and Upadhyay, A.K. 2002. Sustaining grape production under water scarcity condition (in Marathi). *Drakshvritta (*December). pp. 3-5.

26. Somkuwar, R. G.; Ramteke, S. D.; Karad, Sunil R. and Adsule, P. G. 2003. Grapes : Harvesting and storage for long duration (in Marathi). *Shetkari* (March). pp. 37-38 & 42.

Technical Bulletin

1. Sharma, Jagdev. 2003. Appropriate and economical use of water in grapevine cultivation. (Eds.) Adsule, P. G. and Upadhyay, Anuradha. Technical bulletin No.3, National Research Centre for Grapes, Pune, pp. 22.

Institute publications

1. About National Research Centre for Grapes. Information bulletin. 2003 National Research Centre for Grapes, Pune, India. pp. 15.

Others

1. The technical material for the following bulletins was compiled and sent to the ADG (Hort.) for publication at their end
   i. Production of table grapes
   ii. Package of practices for export of table grapes
2. A manuscript for a technical bulletin on "Grape cultivation" was got translated in Hindi from Rajbhash Vibhag, Government of India and sent to Directorate of Extension, Ministry of Agriculture, N. Delhi for publication at their end.

Meeting of QRT, RAC, IMC, SRC with significant decisions

QRT Meeting

Quinquennial Review Team of the Centre is as follows :

Dr. K. S. Chouhan	Ex. Vice Chancellor, RAU, Bihar, Chairman
Dr. Ranvir Singh	Dean, College of Agric. G.B.P.U. A & T, Pantnagar
Dr. S. S. Kadam	Dean, MPKV, Rahuri
Dr. Y. R. Sarma	Ex. Director, I.I.S.R., Calicut
Dr. Mruthyunjaya	Director, NCAP, New Delhi
Dr. B.R.V. Iyengar	Ex. Head, Div. of Soil Sci., I.I.H.R., Bangalore
Dr. Indu Sawant	Sr. Scientist, NRC Grapes, Pune. Member secretary

QRT visiting export unit at Junnar

The team for the first QRT of the centre met and reviewed the research achievements, relevance of the research programmes, infrastructure, collaborations and linkages, organisation and management and constraints.

They interacted with the scientists and other staff of the centre, the IMC members and also visited nearby vineyards, export packing units, wineries etc. and interacted with growers, exporters and brewers.

After thorough deliberation the team prepared its report and submitted it to the council.

The team expressed that germplasm collection; registration of indigenous germplasm; breeding for resistance to biotic stresses; technology to sustain productivity under stress imposed by drought, salinity and diseases; improving input use efficiency; reducing cost of cultivation; organic viticulture; integrated diseases and pest management; post-harvest management; processing for commercial products; awareness of international market trend; effective transfer of technology should be given importance.

RAC meeting in progress

Research Advisory Committee Meeting

Following are the members of the second RAC.

Dr. B.S. Chundawat	Ex. V.C., Gujarat Agricultural University; Chairman
Dr. G. Satyanarayana	Prof. & Head (Retd.) Hort, A.P.A.U., Hyderabad
Dr. Raghbir Singh	Prof. (Hort.), P.A.U., Ludhiana
Dr. B. R. V. Iyangar	Head, Soil Science (Retd.), I.I.H.R., Bangalore
Dr. K.V. Krishnamurthy	Head, Plant Tissue Culture Div., NCL, Pune
Dr. M. Uday Kumar	Prof. & Head, Dept. of Crop Science, U.A.S., Bangalore
Dr. R.D. Rawal	Head, Div. of Pl. Pathology, I.I.H.R., Bangalore
Dr. S.D. Shikhamany	Director, NRC Grapes, Pune
Dr. D.S. Rathore	A.D.G. (Hort.), ICAR, New Delhi
Sh. M. S. Nain	Grape Grower, Bhagpat, Uttar Pradesh
Dr. Indu S. Sawant	Sr. Scientist, NRC Grapes, Pune; Secretary

The 5th Research Advisory Committee meeting of the Centre was held on 23rd July 2002 under the Chairmanship of Dr. B.S. Chundawat, Ex. Vice-Chancellor, Gujarat Agricultural University. Dr. Raghbir Singh, Sh. Mahipal Singh Nain and A.D.G. (Hort.) could not attend the meeting.

During deliberations, the Committee emphasized the need to prioritise the research programmes in order to resolve the immediate and long term needs of the grape growers from different regions of the country and selection of horticulturally superior clones with higher levels of drought and salt tolerance from the existing commercial varieties and identification of locations suitable for table, raisin, juice and wine grapes in different viticulture zones in order to diversify the production. It was then followed by presentations of progress report and action taken report. Each project was discussed in detail and the Committee made its recommendations.

Institute Management Committee Meeting

Following are the members of the second IMC.

Dr. P. G. Adsule	Director, NRC Grapes, Pune; Chairman
Dr. G. S. Karibasappa	Sr. Scientist, NRC Grapes, Pune
Dr. Indu S. Sawant	Sr. Scientist, NRC Grapes, Pune
Dr. R. G. Somkuwar	Sr. Scientist, NRC Grapes, Pune
Dr. Kaushik Banerjee	Scientist Sr. Scale, NRC Grapes, Pune
ADG (Hort.)	ICAR, New Delhi
Shri. Mahipal Singh Nain	Grape Grower, Bhagpat, Uttar Pradesh
Shri. A. Srinivasamurthy	AAO (I/c) NRC Grapes, Pune, Secretary

The 12th IMC meeting was held under the Chairmanship of Dr. P. G. Adsule, Director on 5th February 2003. The IMC reviewed the progress of land development and construction work of residential quarters. Committee also approved reappropriation of funds under Plan and Non-plan for 2001-02 and distribution of honourarium under contract research programmes as per norms.

The 13th IMC meeting was held under the Chairmanship of Dr. P. G. Adsule, Director on 13th March 2003 to interact with the Chairman and members of QRT. The Committee discussed several scientific issues with the QRT and reallocation of funds for equipments in EFC of the Centre.

Staff Research Council Meeting

The 7th meeting of Staff Research Council was held from 9 - 12th July 2002 under the Chairmanship of Dr. S. D. Shikhamany. The Project Leaders presented the progress of the work and technical programme for next year were reviewed. The Plenary Session on 12th July was chaired by Dr. D.S. Rathore, Asstt. Director General (Hort.). He advised the scientists to have a clear perspective of the objectives, aims and the purpose of the project and always use latest technologies / methodologies for experimentation.

The mid-term SRC was held on 8th October 2002 under the chairmanship of Dr. P. G. Adsule to fine tune the technical programme and discuss the problems encountered in project implementation.

Plenary session of SRC

Consultancy, Patents and Commercialization of Technology

Consultancy project

SBI Project Uptech : Increasing production and productivity of grapes in Western Maharashtra

P. G. Adsule, R. G. Somkuwar, S. D. Sawant, A.K. Upadhyay, S. D. Ramteke and J. Sharma

This project was initiated with the financial support of State Bank of India with the following major objectives:

i. To assist farmers in adopting latest technology to increase the productivity of grapes keeping in view the quality and need based inputs
ii. To promote production of exportable grapes as per the requirements and norms of export market
iii. Implementation of eco-friendly practices to make way for more stable and sustainable agricultural production
iv. To train road to adopt new techniques to increase storability and shelf life of table grapes
v. Educating farmers and creating awareness in improved technologies through workshops, seminars and farmers meet
vi. Impact studies on adoption of improved technologies by the farmers

The project has three locations in Maharashtra viz. at Pimpalgaon Baswant in Nashik district, Pandharpur in Solapur district and Tasgaon in Sangli district.

Field visits were undertaken at least once in a month by multidisciplinary team of scientists to advise the growers on problems faced by them. Shortage of irrigation water was the major problem in Tasgaon and growers were advised on growth stagewise irrigation to conserve on water requirement. They were

Scientist explains the effects of flood irrigation before pruning

Scientist explains the control of powdery mildew under dry weather conditions at Nashik

Abnormality in bunch development due to excess use of GA_3

also advised on practices of canopy and nutritional management under drought condition. Powdery mildew was a problem and they were advised on its management. In Pandharpur, due to poor knowledge of viticulture, farmers were following wrong practices resulting in poor yield and quality. They were advised on training system, shoot thinning, fertigation schedule, appropriate stages for bioregulators' application, irrigation schedule, micronutrient application, mulching to minimise water loss through evaporation, use of vermicompost and biocontrol agents for disease management etc. In Nashik, growers were advised on vineyard establishment, integrated disease management and quality improvement through bioregulators and other practices.

Introduction, evaluation, multiplication and supply of grape varieties suitable for export (APEDA funded project)

P. G. Adsule, G. S. Karibasappa, S. D. Sawant, R. G. Somkuwar and J. Sharma

Three introduced cultivars viz. Red Globe, Italia and Crimson Seedless, with high export potential are being evaluated at seven locations in Maharashtra, Andhra Pradesh, Tamil Nadu and Karnataka. The locations are Nimbkar Agriculture Research Institute, Phaltan and Vineyard of Sri. Rajendra Kashinath Sonawane, Khedgaon, Nashik District in Maharashtra; Horticulture Farms at Chigicherla, Anantapur and Vikarabad in Andhra Pradesh, Vineyard of Mr. Mirza Jaffer Hussain, Theni and Department of Fruit Crops, Horticulture College and Research Institute, TNAU, Coimbatore in Tamil Nadu and Division of Fruit Crops, IIHR, Bangalore in Karnataka.The plant material was multiplied and distributed to the centers for raising the vineyards under the technical guidance of this Centre. The observations on field performance will be recorded at regular intervals by multidisciplinary team of scientist.

Other Consultancy programmes

Name	Consultancy provided to
P. G. Adsule G. S. Karibasappa Indu S. Sawant S. D. Sawant R. G. Somkuwar A. K. Upadhyay Kaushik Banerjee S. D. Ramteke J. Sharma Kavita Mundankar	APEDA, New Delhi for revising the following two manuals: i. Pre-harvest manual for production of table grapes for exports ii. Post-harvest manual of package of practices for export of table grapes
Dr. S. D. Sawant	Aventis Cropscience India Ltd., Delivered lecture on Disease Management in Grape to Officers of the company
Dr. S. D. Sawant	Mahagrapes, Pune, Group Discussion with growers in Manerajuri (Sangli)

Participation of Scientists in Conferences, Meetings, Workshops, Seminars, Symposia etc.

- ☆ Dr. Indu S. Sawant participated in the 'International Symposium on Molecular Approaches for Improved Crop Productivity and Quality' at TNAU, Coimbatore and presented a lead paper entitled "Use of biological contract agent *Trichoderma harzianum* for management of post-harvest decay in export grapes".
- ☆ Dr. P. G. Adsule participated in the National Workshop on 'Newer Vistas in Handling and Processing Technologies for Horticultural Crops organized by NSIT, New Delhi on 14-15th June 2002 and to present a lead technical paper entitled 'Role of various treatments of fruits and vegetables in extending the shelf life'.
- ☆ Dr. S. D. Shikhamany and Dr. P. G. Adsule participated in the seminar on 'Grape wine park' chaired by Dr. Patangrao Kadam, Hon'ble Minister for Industries, Maharashtra State at Palus, district Sangli on 8th July 2002.
- ☆ Dr. P. G. Adsule, Dr. S. D. Sawant and Dr. G. S. Karibasappa participated in the field launching of 'Project Uptech' on Grapes of State bank of India at Tasgaon on 2nd August 2002 as a consultancy programme.
- ☆ Dr. P. G. Adsule participated in a review meeting convened by Joint Secretary, DAC, Ministry of Agriculture, New Delhi on fruit fly studies awarded to NRC Grapes on 6th August 2002.
- ☆ Dr. R. G. Somkuwar, Dr. Kaushik Banerjee and Dr. S. D. Ramteke participated in 2nd International Congress of Plant Physiology held at Indian Agricultural Research Institute, New Delhi, 8-12th January 2003.
- ☆ Dr. Indu S. Sawant and Dr. S. D. Sawant participated in 'National Symposium on Prospecting of Fungal Diversity and Emerging Technologies' organized by Mycological Society of India at Agharkar Research Institute, Pune on 6-7th February 2003 and presented a paper on *'Phytophthora* species associated with decline of Coorg mandarin in Coorg district of Karnataka'.
- ☆ Dr. P. G. Adsule and Dr. Kaushik Banerjee participated in a Seminar on 'Regional Agro-wealth : Opportunities for Value Addition and Exports' jointly organized by Maharashtra Academy of Sciences and Bhabha Atomic Research Centre at Mumbai on March 28-29, 2003.

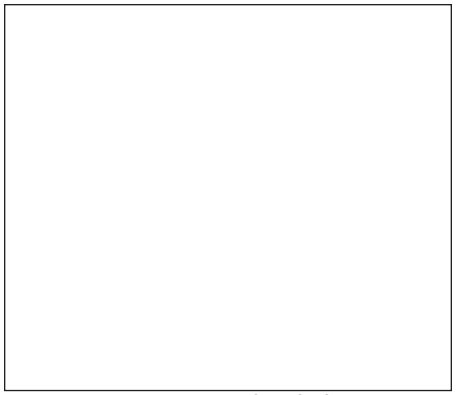
Distinguished Visitors

- ☆ Dr. M. Mahadevappa, Chairman, ASRB, New Delhi visited NRC Grapes on 15th May 2002.
- ☆ Dr. P.V. Phirke, Joint Director (Hort.), Govt. of Maharashtra along with some Ethiopian delegates visited NRC Grapes on 28th June 2002.
- ☆ Mr Vijay Sardana, Executive Director, International Trade Consultancy, Centre for International Trade in Agriculture & Agri based Industries visited the Centre on 10th July 2002. He delivered a talk on WTO and Grape in India.
- ☆ Dr. D.S. Rathod, ADG (Hort.) visited the centre on 12th July 2002 and chaired plenary session of SRC meeting. He also visited laboratories and vineyards.
- ☆ Dr. A.G. Sawant, Chairman, ASRB, New Delhi visited the Centre on 20th September 2002 and chaired the interface meeting for the transfer of technology.

Dr. D. S. Rathod, ADG (Hort.) seeing the automatic weather station

- ☆ Sh. R. S. Kanade, IES, Director (Agri) Planning Commission visited the Centre on 1st October 2002.
- ☆ Dr. D.G. Dhandar, Director, CIAH, Bikaner visited the Centre on 20th November 2002.
- ☆ Dr. Patricia Imas, India Coordinator, International Potash Research Institute, Israel visited the Centre on 20th December 2002 to study the drip irrigation / fertigation in grapes.
- ☆ Sh. Sopan Kanchan, Chairman, Confederation of Indian Horticulture and President, Grape Grower Federation of India visited the Centre on 23rd December 2002.
- ☆ Dr. J.V. Goud, Ex-Vice Chancellor, UAS, Dharwad visited the Centre on 3rd January 2003.
- ☆ Dr. Hema Pandey, Director, NRC Women in Agriculture, Bhubaneshwar visited the Centre on 1st February 2003.
- ☆ Dr. K.C. Garg, ADG (Hort.), visited the Centre on 13th March 2003 and interacted with the QRT as a member of IMC.

Infrastructure Development



Homepage of website

Website launched

Website of NRC Grapes was launched on 14th November 2002 by Dr. K.S. Chouhan, Ex. Vice Chancellor, RAU, Bihar and Chairman, QRT of the Centre. The website can be accessed with the address http://nrcgrapes.mah.nic.in. The website gives comprehensive information about the Centre and its activities.

Laboratory infrastructure

Infrastructure for basic and applied research was strengthened by procuring several sophisticated equipments during the period. Equipments like PCR machine, refrigerated microfuge, solid phase extractor, environmental shaker etc. were installed. Information technology also received attention and several computers with latest configuration and peripherals were added. Local Area Network (LAN) and CDM server which facilitate access of CDs through network were installed.

Personnel

Name of the official	Designation
RMP	
Dr. S. D. Shikhamany	Director (till 25.07.2002)
Dr. P. G. Adsule	Director (Acting w.e.f. 26.07.2002) and Principal Scientist, Post-harvest technology
Scientific	
Dr. G. S. Karibasappa	Senior Scientist, Horticulture
Dr. Indu. S. Sawant	Senior Scientist, Plant Pathology
Dr. S. D. Sawant	Senior Scientist, Plant Pathology
Dr. R. G. Somkuwar	Senior Scientist, Hortculture
Dr. Anuradha Upadhyay	Senior Scientist, Biotechnology
Dr. A. K. Upadhyay	Scientist Sr. Scale, Soil Science (w.e.f. 16.10.2002)
Dr. Kaushik Banerjee	Scientist Sr. Scale, Agriculture Chemical
Dr. S. D. Ramteke	Scientist Sr. Scale, Plant Physiology
Dr. Jagdev Sharma	Scientist Sr. Scale, Soil Science -
Mr. J. Satisha	Scientist, Hort. (On study leave)
Mr. R. K. Singh	Scientist, Soil Science - Soil Physics (till 14.10.2002)
Ms. Kavita Y. Mundankar	Scientist, Computer Application
Technical	
Mr. U. N. Borse	T-3 (Agri. Engg.)
Mr. P. B. Taware	T-3 (Farm Technician)
Mr. P. B. Jadhav	T-2 (Driver)
Mr. S. S. Bhoite	T-1 (Field Asstt.)
Mr. E. G. Kamble	T-1 (Field Asstt.)
Mr. B. B. Khade	T-1 (Lab. Tech.)
Ms. S. V. Satam	T-1 (Computer Operator)
Mr. B. J. Phalke	T-1 (Lab. Tech.)
Administrative	
Mr. A. Srinivasamurthy	AF & AO
Mr. O. Babu	Assistant
Mr. L. R. Gopalakrishnan	Assistant
Mr. B. M. Chavan	Personal Assistant
Mr. B. N. Ramchandrappa	Sr. Clerk
Mr. K. Ali	Sr. Clerk
Mr. N. S. Pathan	Jr. Clerk
Ms. Anita Mathew	Jr. Clerk
Supporting	
Mr. S. S. Donde	SSG-II (Messenger)
Mr. K. G. Raskar	SSG-I (Messenger)
Mr. B. R. Chakankar	SSG-I (Mali)
Mr. S. V. Lendhe	SSG-I (Mali)
Ms. Lata Pawar	SSG-I (Mali)
Sh. V. D. Gaikwad	SSG-I (Messenger)*
Sh. N. K. Najan	SSG-I (Messenger)*

*Transferred along with posts from ICAR Research Complex, Patna

Other Activities

Meetings and Celebrations

Central Committee Visits Drought Affected Vineyards in Maharashtra

Central committee in a drought affected vineyard

As per the directives from the Dept. of Agril. & Cooperation, Ministry of Agriculture, New Delhi, A Committee consisting of Dr. P. G. Adsule, Director, Dr. T.I. Mathewkutty, Dy. Commissioner (Hort.), DAC, Ministry of Agriculture, New Delhi, and Dr. B.N. Godjekar, Dy. Director (Hort.), Dept. of Agriculture, Govt. of Maharashtra visited Sangli district on 8th and 9th January 2003. Dr. J. Sharma, Scientist (SS), NRC for Grapes (ICAR), Pune, also accompanied and assisted the Committee on assessing the drought situation. The team visited 12 affected gardens at random in Tasgaon, Atpadi, Miraj, Kavathe Mahakal and Jath talukas of Sangli district. The team met the owners of the most affected grape vineyards and discussed the availability of water and the crop condition. The committee observed that most of the vineyards were seriously affected. Some of the gardens were affected beyond rejuvenation. The water sources including nalas, small riverlets, open wells and tube wells were completely dried up and the grape growers were transporting water from a distance of 20 - 30 km.

Interface Meeting on Transfer of Technology

Interface meeting

A meeting of scientists for the transfer of technologies from the Centre was held on 20th September 2002 under the Chairmanship of Dr. A.G. Sawant, Chairman, ASRB, New Delhi. Dr. P. G. Adsule, Director briefed the Chairman on the mandate, activities and the research programme of the Centre.

The project leaders presented the technologies developed along with the impact analysis on these technologies. Dr. A.G. Sawant expressed his happiness on the close interaction of NRC Grapes with the grape growers / entrepreneurs. He advised the scientists to be sensitive to the global scenario and future market demands, and all technology development programs should aim at elevating the economic level of farmers. He also highlighted need to develop technologies for organic cultivation of grapes and the importance of the dissemination of the technology through various means.

Kisan Diwas Organized at NRC Grapes

Kisan diwas celebration

Grape growers felicitated on 'Kisan diwas'

NRC Grapes celebrated the Kisan Diwas on December 23, 2002, to mark the birth centenary of former Prime Minister of India Late Ch. Charan Singhji, who hailed from a rural peasant family and worked tirelessly for the upliftment of rural community. During his political career he mobilized support for peasant ownership of land, implemented reforms and prevented tax increases on farmers.

To celebrate the Kisan Diwas, daylong programmes were held. Ten grape growers were felicitated with pheta, shawl and a certificate for their significant contribution in the area of grape production, processing and marketing.

The following farmers were honoured on the occasion:

Mrs. Padmaja P. Chitale, Mr. Vasudev Chimanrao Kathe, Mr. Rajendra Kakde, Mr. Shankarrao Bajirao Bhalerao Mr. Ramdas Madhavrao Jagtap, Mr. Nagnath H. Kankape and Mr. K. R. Mane from Maharashtra; Mr. K. Anantha Reddy, from Andhra Pradesh. Mr. Prakash S. Gani from Karnataka and V. Ramamoorthy from Tamil Nadu.

Sh. D. B. Mogal, President, Maharashtra State Grape Growers' Association, Sh. B.M. Kokare, President, Karnataka State Grape Growers' Association, Sh. C. Kanaka Reddy, President, The Hyderabad Grape Growers' Marketing & Processing Co-operative Society Ltd., and Thiru D. Radhakrishnan, President, Cumbum Valley Grape Growers' Welfare Association of Tamil Nadu were the other dignitaries present in the function.

A technical bulletin entitled 'About NRC Grapes' was released on this occassion. Mr. Sopan Kanchan, Chairman, Confederation of Indian Horticulture and President, Grape Growers' Federation of India was the Chief guest. Director Dr. P. G. Adsule honoured Sh. Sopan Kanchan by offering shawl and pheta and highlighted his efforts to promote grape industry in India and Maharashtra in particular.

National Science Day

The Centre celebrated National Science Day on 28th February . Dr. Y.S. Nerkar, Director, Agricultural Research & Extension, Vasantdada Sugar Institute, Pune was the Chief Guest. Dr. P. G. Adsule, Director, presided over the function. Dr. Anuradha Upadhyay, Sr. Scientist (Biotechnology) introduced the theme for this year celebrations '50 Years of DNA, 25 Years of IVF, the Blueprint of Life'. A debate on 'Genetically Modified foods : A Boon or Bane' was organised on the occassion. Dr. Nerkar recounted his experiences in plant breeding and emphasized how the keen observation and perseverance leads to new innovation. Dr. S. D. Sawant proposed the vote of thanks. Dr. Indu S. Sawant was the coordinator of the programme.

National Science Day celebration

हिंदी पखवाड़ा समारोह

राष्ट्रीय अंगूर अनुसंधान केन्द्र में 13- 28 सितंबर तक हिंदी पखवाड़ा मनाया गया। 13 सितंबर को हिन्दी पखवाड़े का शुभारम्भ निदेशक डॉ. पी. जी. अडसुले ने किया। अपने सम्बोधन में निदेशक ने राजभाषा हिन्दी के प्रचार एवं प्रसार के लिए कर्मचारियों का आव्हान किया। सभी अधिकारियों और कर्मचारियों ने हिन्दी में काम करने की शपथ ली। हिन्दी पखवाड़े के दौरान विभिन्न प्रतियोगिताओं जैसे निबन्ध लेखन, सुलेख, काव्य पाठ, गद्य पाठ, अन्ताक्षरी, अनुवाद, वाक प्रतियोगिता का आयोजन किया गया। जिनमें सभी ने उत्साहपूर्वक भाग लिया। निबन्ध प्रतियोगिता में दैनिक जीवन में भ्रष्टाचार पर सारगर्भित लेख और स्वरचित कविता पाठ उल्लेखनीय रहे। 28 सितंबर को समापन दिवस पर श्रीमती प्रभा माथुर, एक सक्रिय समाजसेविका एवं हिन्दी लेखिका मुख्य अतिथि रहीं।

हिंदी पखवाड़ा

मुख्य अतिथि ने अपने विचारक सम्बोधन में हिन्दी प्रगति में अवरोधों का विश्लेषण किया। विभिन्न प्रतियोगिताओं के विजेताओं को पुरस्कार वितरित किये गये। इस कार्यक्रम की आयोजिका डॉ. अनुराधा उपाध्याय द्वारा धन्यवाद प्रस्ताव के साथ समारोह की समाप्ति हुई।

Institute Foundation Day

The Centre celebrated its foundation day on 18th January. All the staff members enthusiastically participated in the cultural and entertainment programmes organized to mark the celebration. During closing programme, Dr. P. G. Adsule, Director felicitated the staff members promoted during the year and distributed the prizes to the winners of different events organized on the occasion.

Death Anniversary of Dr. G. S. Cheema

The Centre commemorated 31st death anniversary of Krishi Maharshi Dr. G. S. Cheema on 2nd January 2003 to pay tribute to his great contributions for the development of Indian Horticulture in general and grape industry in

particular. Retired Lt. General Cheema, the son of Dr. G. S. Cheema graced the occasion as the Chief Guest.

Dr. P. G. Adsule, Director described Dr. G. S. Cheema as the father of Indian horticulture, who had developed several commercial high yielding grape varieties of which Cheema Sahebi and Selection 7 are very popular. To mark his contribution towards grape research and development the Laboratory-cum-Administrative building of this Centre is named as Dr. G. S. Cheema Bhavan.

Independence Day

Independence day was celebrated on 15th August with joy and splendour. Dr. P. G. Adsule, Director, hoisted the flag. In his address, he called upon the staff to work towards betterment of the society in general and farming community in particular. The children of staff members sang patriotic songs on the occasion.

Republic Day

The Centre celebrated Republic Day on 26th January with joy and splendour. Dr. P. G. Adsule, Director, hoisted the flag. In his address, he called upon the staff to work towards betterment of the society in general and farming community in particular. The children of staff members sang patriotic songs on the occasion.

Farewell to Dr. S. D. Shikhamany

Farewell to Dr. S. D. Shikhamany

Dr. S. D. Shikhamany, the Founder Director got relieved from NRC Grapes on 25th July 2002 to take charge as Director, IIHR, Bangalore. Dr. Shikhamany had been holding the charge of the Centre since its inception.

During his tenure, he was instrumental in acquiring the land for the establishment of the Centre from the State Govt. of Maharashtra. Under his able guidance, 32 acres of vineyard was established for experimental purpose; more than 350 grape germplasm was collected from India and abroad, the main office-cum-laboratory building was constructed and essential laboratory and farm equipments were purchased. Research projects were formulated based on bottom up approach and good rapport was established with grape growers' associations and extension agencies, which created a strong base for transfer of technology. He was also instrumental in getting outside funding for research and transfer of technology programmes.

Institute Committees

Official Language Implementation Committee

Several steps were undertaken to promote official language at the Centre as per the directives from Rajbhasha Vibhag, Government of India. All the rubber stamps were made bilingual. Different performa viz. leave application, joining reports, indents etc were made bilingual. Several administrative staff wrote file noting in Hindi and they were suitably awarded for their efforts.

Institute Joint Staff Council

The first Institute Joint Staff Council was constituted with effect from October 2002 for a period of three years with Drs. G.S. Karibasappa, Indu S. Sawant, R.G. Somkuwar, Kaushik Banerjee and Sh. A.S. Murthy as members official side and Shriyuts L.R. Gopalkrishnan, U.N. Borse, B.J. Phalke, K.R. Raskar, B.R. Chakankar as members staff side and Dr. Anuradha Upadhyay and Sh. N.S. Pathan as secretaries from officials and staff side respectively.

Women Cell

Women cell was constituted under the Chairmanship of Dr. Indu S. Sawant and with Ms. Shailaja Satam and Mrs. Anita Mathew as members to look after the welfare of the women employees and cater to the issues and grievances pertaining to them.

Energy Audit

Dr. G.S. Karibasapp, Sr. Scientist (Horticulture) is nominated as Nodal Officer, Energy Efficiency and Savings Measures as per the directives from Govt. of India.

Intellectual Property Rights information and commercialisation

As per council's directives, Dr Indu S. Sawant was nominated as the nodal officer to sensitise the staff and look after the IPR issues, including coordinating with the IPR cell at the Head Quarter.

Consultancy Processing Cell

The CPC is functioning under the chairmanship of Dr S. D. Sawant with Dr Anuradha Upadhyay, Dr K. Banerjee, Dr S. D. Ramteke and Dr J. Sharma, AFAO, AAO and Ms. Shailaja V Satam as members to assess and process the proposals for consultancy, contract services, training, workshop etc.

Vigilance Officer

Dr. Anuradha Upadhyay, Sr. Scientist (Biotechnology) as appointed as Vigilance Officer with effect from January 2003.

Other Committees

To look after the various activities of the Centre, the following committee were in operation:

1. Research Management & Coordination Unit
2. Technical Cell
3. Publication Committee
4. Store Purchase Committee
5. Farm Management Committee
6. Library
7. Works
8. Photography
9. Sports activities
10. ARIS Cell

Meteorological Data

Month and Year	Air temperature (°C)		Relative Humidity (%)		Pan evaporation (mm)	Day length (hr)	Total rainfall (mm)	No. of rainy days	No. of rainy days with>4 mm rain
	Min	Max	Min	Max					
April 2002	19.12	38.83	19.23	86.87	5.9	11.64	02.6	2	0
May 2002	23.68	37.38	36.06	91.87	7.7	12.18	09.4	6	1
Jun 2002	22.56	31.70	68.07	99.17	4.4	11.42	150.2	18	7
July 2002	22.04	30.76	73.63	99.70	4.1	10.65	18.4	12	1
Aug. 2002	20.86	28.12	87.94	100.00	1.8	10.10	75.8	25	7
Sep. 2002	19.60	31.57	65.10	100.00	2.6	10.88	52.2	11	3
Oct. 2002	17.67	33.77	38.58	100.00	4.3	10.31	04.0	5	0
Nov. 2002	13.41	31.26	33.00	99.83	3.7	10.54	01.6	5	0
Dec. 2002	10.78	30.71	32.65	99.61	3.6	09.85	01.0	4	0
Jan. 2003	11.52	31.14	34.74	99.74	3.3	09.64	01.4	6	0
Feb. 2003	14.29	35.37	23.18	96.71	5.2	10.08	02.0	3	0
Mar. 2003	12.45	37.35	16.42	79.35	6.8	09.71	00.6	3	0

Source : Weather Station, NRC for Grapes, Manjri, Pune.

कार्यकारी सारांश

राष्ट्रीय अंगूर अनुसंधान केन्द्र वर्ष 1997 से भारतीय कृषि अनुसंधान परिषद के तत्वाधान में अंगूर की फसल उन्नति, उपज बनाए रखना और उसकी प्रयोग विभिन्नता की दिशा में कार्यरत है। केन्द्र में फसल सुधार, फसल उत्पादन, फसल संरक्षण और कटाई उपरांत प्रौद्योगिकी के सामान्य क्षेत्रों में अनुसंधान कार्य प्रगति पर है।

वर्ष के दौरान केन्द्र की प्रगति की समीक्षा के लिए पहली पंचवर्षीय पुन:परीक्षण दल का संगठन हुआ। दल ने केंद्र का भ्रमण किया तथा वैज्ञानिको एवं कर्मचारियों, बागवानों और संस्थान प्रबंध समिती के सदस्यों से विचारविमर्श करके अपनी रिपोर्ट परिषद को भेजी । अनुसंधान सलाहकार समिती, स्टाफ अनुसंधान परिषद और संस्थान प्रबंध समिती की बैठकें भी समयानुसार आयोजित की गयीं और सिफारिशों या सुझावों को विभिन्न परियोजनाओं के तकनीकी कार्यक्रम निर्धारण में प्रयोग किया गया।

केन्द्र को विभिन्न आर्थिक सहायता एजेंसी से मान्यता मिली और कई अनुसंधान परियोजनाओं को स्वीकृति मिली । नयी दिल्ली स्थित जैवप्रौद्योगिकी विभाग ने दो अनुसंधान परियोजना और भारतीय स्टेट बैंक ने एक सलाह परियोजना को स्वीकृति दी । 12 संस्थान परियोजनाओं के अतिरिक्त दो एन. ए. टी. पी., दो डी. बी. टी., दो एपीडा और कई अनुबन्धित अनुसंधान परियोजनाओं के अन्तर्गत कार्य किया गया । प्रत्येक क्षेत्र में प्राप्त उपलब्धियों का सार निम्नलिखित है।

फसल सुधार

सात मदिरा किस्म और पाँच प्राकृतिक उत्प्रेरित प्रविष्ठियों को जननद्रव्य संग्रह में सम्मिलित किया गया । अंगूर प्रविष्ठियों को बाह्य रूप गुणों के आधार पर चरित्रांकन और विभिन्न गुणों जैसे पाउडरी मिलड्यू अवरोधकता, पूर्व पकन, स्वयं कली स्फुटन, किशमिश गुणवत्ता और जूस गुणवत्ता के लिए मूल्यांकन किया गया। ए 17-3 किसमिश के लिए, कन्ट्री बैंगलोर किस्म जूस के लिए आशावान पायी गयी। कई प्रविष्ठियों में स्व:कली स्फुटन पाया गया। प्रविष्टियों में जैनिक विभिन्नता और कई मात्रात्मक गुणों की आनुवांशिकी का अध्ययन किया गया। प्रति बेल उपज और गुच्छा नम्बर, उपज और गुच्छा वजन, तथा जूस मात्रा और मणि व्यास आदि में सार्थक सह संबन्ध पाया गया।

अंगूर जननद्रव्य सूचना पद्धति के अन्तर्गत ग्राफिकल युज़र इन्टरफेस की रूपरेखा बनाई गयी जिसमें तथ्य डालना और प्रस्तुत सूचना सामग्री की कार्यसूयी है।

केन्द्र में जैवप्रौद्योगिक विभाग की वित्तीय सहायता से जैवप्रौद्योगिकी के क्षेत्र में अनुसंधान आरम्भ किया गया और अंगूर पर्णों से डी.एन.ए. निकालने की सर्वोत्तम विधि विकसित की गयी।

फसल उत्पादन

कलम - मूल कांड संगति प्रयोगों में, थॉमसन सीडलैस और प्लेम सीडलैस

की क्रमश: डॉगरीज बी और 99 आर मूलकांड से अनुरूपता पायी गयी।

अपरिपक्व सांकुर टहनी और परिपक्व कांड एवं परिपक्व सांकुर टहनी और अपरिपक्व कांड में सफलतम कलम लगायी गयी। कलम के लिए गाँठ का मिट्टी, आहता खाद और नारियल छिलके के बुरादे के मिश्रण में रोपण से उच्चतम सफलता और शीघ्र स्फुरण हुआ।

पर्णवृन्त पोषण मात्रा के आधार पर अंगूर बाग के लिए ड्रिस पध्दति विकसित की गयी। विभिन्न लक्षण सूचकों में से फॉस्फोरस/नाइट्रोजन, पोटाश/नाइट्रोजन और फॉस्फोरस/ज़िंक का पुष्पन अवस्था में और नाइट्रोजन/फॉस्फोरस तथा नाइट्रोजन/पोटाश की कली विभेदन अवस्था में महत्वपूर्ण भूमिका होती है। सोडियम सर्वाधिक सीमा निर्धारण पोषक पाया गया। मूलकांड के प्रयोग से जल उपयोग क्षमता सुधार के प्रयोगों में, सिंचाई पानी में कमी की स्थिति में कलमी लताओं में स्वमूल युक्त की अपेक्षा अधिक उपज और गुच्छा वजन था। सिफारिश सिंचाई के सिर्फ 75% स्तर पर मल्च और एन्टीस्ट्रेस के प्रयोग से इस स्तर पर उपज पूर्ण सिफारिश सिंचाई से प्राप्त उपज के बराबर ही प्राप्त हुई। अत: सिंचाई जल में 25 प्रतिशत की बचत हुई। इसी प्रकार, उपसतह सिंचाई से भी 25 प्रतिशत पानी की बचत हुई।

दस से अधिक पत्ती वाले गुच्छे पर सीपीपीयू के छिड़काव से मणि व्यास और पर्णवृन्त मोटाई में वृद्धि हुई। 50 एवं 30 पीपीएम जिबरालिक एसिड का क्रमशः 3-4 मिमी और 6-7 मिमी मणि व्यास अवस्था पर 10 पीपीएम बीए के साथ उपचार से शरद सीडलैस की गुणवत्ता में सुधार हुआ।

फसल संरक्षण

पारम्परिक समयसारणी अनुसार रोगप्रबंध के मुकाबले मेटविन 2 सोफ्टवेयर पर आधारित रोग प्रबंधन से, एक वर्ष में रसायनों के 11 छिड़कावों की बचत हुई। एन्टीस्ट्रेस और काइटोसान के प्रयोग से सल्फर और हैक्ज़ाकोनाजोल की प्रभावशीलता और अंगूरों की शेल्फ लाइफ में बढ़ोत्तरी हुई। 0.5 प्रतिशत स्तर पर पोटेशियम बाइकारबोनेट और फैलावक के प्रयोग से भी हैक्ज़ाकोनाज़ोल की प्रभावशीलता में वृद्धि हुई।

कली स्फुटन कारक हाइड्रोजन साइनामाइड के साथ कवकनाशी जैसे थायोफिनेट मिथाइल, मेंकोज़ेब और सल्फर के उपयोग से लताओं में कली स्फुटन पर कोई प्रतिकूल प्रभाव नहीं पड़ा। *बॉट्रिडिप्लोडिया* प्रभावित लताओं को बेविस्टिन से पूरी तरह भिगोने से उपज में वृद्धि पायी गयी।

कटाई से पहले, अंगूरों पर सिर्फ काइटोसन या इसके साथ *ट्राइकोडरमा* के प्रयोग से अंगूरों की शेल्फ लाइफ में वृद्धि पायी गयी।

अंगूरों और मिट्टी में कीटनाशी थायमिथोक्ज़ाक, कवकनाशी डिनिकोनाज़ोल, वृद्धि कारक एन. एटका और खरपतवारनाशी ग्लाइफोसेट के विघटन दर क्रिया का अध्ययन किया गया। इन सभी कृषी रसायनों का क्षय प्रथम श्रेणी दर क्रिया के अनुसार हुआ। थायामिथोक्ज़ाम, डिनिकोनाज़ोल और एन.एटका की सिफारिश मात्रा के छिड़काव के लिए कटाई पूर्व अवधि क्रमश: 17,

21 और 10 दिन तथा सिफारिश और दुगुनी मात्रा के लिए अवधि क्रमश: 19, 26, 12 दिन निर्धारित की गयी। ग्लाइफोसेट की सिफारिश और दुगुनी मात्रा के लिए अर्धजीवनावधि क्रमश: 13.86 और 14.74 दिन पायी गयी।

अंगूरमणि पर कीटनाशी मैथोमिल अवशिष्ट का जैवनियंत्रक *ट्राइकोडरमा हरज़ियानम* द्वारा प्रभावशाली जैवनिवारण हुआ।

कटाई उपरान्त प्रौद्योगिकी

भारतीय किशमिश के निर्यात को बढ़ावा देने के लिए उनकी गुणवत्ता मापदण्ड निर्धारित किए गए और उन्हें कोडेक्स मापदण्डों से संगतिशील किया गया। भारतीय किशमिश, कुछ भौतिक गुण जैसे डंठल, के अलावा सभी गुणों में कोडेक्स मापदण्डों के अनुरूप पाई गई।

प्रौद्योगिकी स्थानान्तरण

वर्ष के दौरान, सूचना और तकनीकी स्थानान्तरण, केन्द्र का मुख्य क्रिया कलाप रहा। अंगूर खेती की विभिन्न अवस्थाओं पर आनेवाली समस्याओं के आंकलन और समाधान के लिए तथा बागवानों से सम्पर्क हेतु केन्द्र के वैज्ञानिकों ने नियमित रूप से प्रक्षेत्र भ्रमण किया। बागवानों की विभिन्न संस्थाओं द्वारा आयोजित सेमिनारों में भी वैज्ञानिक ने बढ़-चढ़ कर भाग लिया। भारतीय स्टेट बैंक के अपटैक कार्यक्रम के अन्तर्गत महाराष्ट्र के विभिन्न गाँवों को अंगीकृत किया गया है और वहां के बागवानों को निर्यात योग्य अंगूर की उपज में वृद्धि के लिए सभी तकनीकी सहायता दी गई।

केन्द्र द्वारा विकसित विभिन्न तकनीक की पहचान और इन तकनीक के प्रभाव का आंकलन करने के लिए देश के अग्रणी विशेषज्ञों और वैज्ञानिकों की विचार विमर्श बैठक आयोजित की गयी।

मानव संसाधन विकास

आठ वैज्ञानिकों, एक तकनीकी सहायक और चार प्रशासनिक कर्मियों को उनके क्षेत्रों में कार्यक्षमता बढ़ाने के लिए प्रशिक्षण के लिए भेजा गया।

राजस्व उत्पादन

केन्द्र ने पौध सामग्री और उत्पाद की बिक्री, सलाहमशविरा, प्रशिक्षण कार्यक्रम और अनुबन्धित अनुसन्धान द्वारा, 5.0 लाख लक्ष्य के मुकाबले रू. 16.32 लाख की आय अर्जित की।

मूलभूत सुविधाओं का विकास

केन्द्र में पॉलीहाउस के निर्माण, लोकल एरिया नेटवर्क की स्थापना, सिंचाई सुविधाओं में सुधार तथा विभिन्न आधुनिक उपकरणों की खरीद द्वारा बुनियादी सुविधाओं का विकास किया गया।

केन्द्र में भविष्य में मदिरा उद्देश्य के लिए फसल सुधार, जैवप्रौद्योगिकी, कटाई उपरान्त प्रौद्योगिकी और तकनीक आंकलन और प्रसंस्करण आदि क्षेत्रों को बल दिया जायेगा।