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NATIONAL RESEARCH CENTRE FOR ARID HORTICULTURE
BIKANER-334003, INDIA

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Annual Report for 1996-97

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Cover Photographs

Front : A fruiting twig of *ber*
Back : Top : Polynet house at NRCAH farm
Bottom : Inner view of polynet house

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INTRODUCTION

The hot arid region occupies nearly 12 per cent land surface of India in the States of Rajasthan, Gujarat, Haryana, Punjab, Andhra Pradesh, Karnataka and Maharashtra. The production of horticultural crops in this region is confined to a few small pockets having irrigation water. It is now realised that horticultural crops particularly perennial fruit trees, not only provide nutrition and income security to the people but can also ameliorate the harsh environment of the arid region. However, the geophysical and agroclimatological constraints for production of these crops in arid areas necessitated development of special production technologies. Since the available research set up for this purpose in the State Agricultural Universities and in the Institutes of the ICAR was inadequate, the Indian Planning Commission, as recommended by the Working Group on Agricultural Research and Education, approved the establishment of National Research Centre for Arid Horticulture (NRCAH) during the Seventh Five Year Plan.

To make the Centre functional, Project Coordinator, All India Coordinated Research Project on Arid Zone Fruits (AICRP on AZF) located at CCS HAU, Hisar was assigned additional duties of its Officer on Special Duty (OSD) in November, 1990. After identification of land for the establishment of NRCAH, the Project Coordinator along with Coordination Unit was shifted from Hisar to Bikaner in March, 1993 and merged with NRCAH.

Mandate

To conduct mission oriented research for improvement in productivity of horticultural crops and development of horticulture-based cropping system under arid environment; and to act as a repository of information related to arid horticulture.

Mission/objectives

*To introduce, collect, characterize, conserve and evaluate the biodiversity of horticultural crops under arid environment.

*To utilize the available biodiversity and improve the target fruit crops such as *ber*, pomegranate, *aonla*, date palm and cucurbitaceous, leguminous and sola-

naceous vegetables to develop high quality and productive types having tolerance to biotic and abiotic stresses.

*To study the factors related to rapid multiplication of propagules in case of established as well as new crops and the problems related to their growth and development.

*To standardize agrotechniques with respect to efficient use of soil, water and nutrients for increased horticultural productivity involving water harvesting and conservation techniques under rainfed conditions, efficient use of the scarce irrigation water and nutrient management.

*To study the ecophysiological parameters of cropping system models for utilization of high temperature and radiation resources.

*To develop postharvest technology package for extended use of the horticultural produce of arid region.

*To develop integrated pest and disease management technologies for horticultural crops under arid environment.

The salient research achievements of the Centre during 1996–97 were:

(i) Five progenies of *mateera* genotypes, viz. AHW-18, AHW- 19, AHW-65, AHW-108 and AHW-118 and 7 of *kachari* viz. AHK- 5, AHK-26, AHK-99, AHK-109, AHK-155, AHK-200 and AHK-202 were found to be promising.

(ii) Among snapmelon genotypes, AHS-6, AHS-10, AHS-14, AHS-19, AHS-50, AHS-54 and AHH-64 were found promising for this region.

(iii) 124 genotypes of *ber*, 92 genotypes of pomegranate, 60 of cactus pear, 7 genotypes of *aonla*, 3 of *karonda*, 3 of guava, 1 each of *jamun, khirni, sapota,* lemon and 2 each of mango, *phalsa,* Indian aloe were collected and are under evaluation.

(iv) Extensive survey was conducted in Shekhawati and Bharatpur region for *ber* and in Bikaner and adjoining areas for *Prosopis*. Based on this, 11 genotypes of *Z.mauritiana* and 3 genotypes of Z. *rotundifolia* and 10 genotypes of *Prosopis cineraria* have been identified.

(v) Presence of growth inhibiting substances in cuttings of *Capparis decidua* was demonstrated which may have role in root regeneration.

(vi) Detailed spectrum of mineral nutrients in promising lines of *Prosopis cineraria (khejri)* has been worked out.

GERMPLASM CONSERVATION

Mission A : Introduction, collection, characterisation, conservation and evaluation of horticultural biodiversity.

A.1.1 Collection, conservation and evaluation of *ber.*

143 cultivars of *ber* have been collected from several stations (Table 1) and budded *in situ* to develop a 'National Repository'. Of these, 124 varieties survived which are being maintained.

Table 1: Collection of *ber* cultivars.

Source	No. of cultivars collected	Time of collection	No. of cultivars survived
CAZRI, Jodhpur	22	July, 1996	21
MPKV, Rahuri	66	September, 1996	61
CCS HAU, Hisar	52	August, 1996	39
Regional Station (IARI), Karnal	2	August, 1996	2
CHES (IIHR), Godhra	1	February, 1997	1

A survey was conducted in collaboration with SKN College of Agriculture, Jobner during February, 1997 to identify *Ziziphus* species and *ber* varieties in Shekhawati and Bharatpur region of Rajasthan. Eleven types of Z. *mauritiana* were identified during the survey (Table 2).

Boradi (Ziziphus mauritiana var. *rotundifolia)*

Out of 20 genotypes identified during 1995-96, budwood of 17 were collected during August, 1996. Two genotypes of *boradi* in Shekhawati region have also been identified during 1996-97. These types have attractive red colour. Seedlings of these 22 types alongwith some rootstock types are being raised in nursery for evaluation.

Table 2: Fruit characters of *Z. mauritiana* collected from Shekhawati and Bharatpur region.

Acc. No.	Fruit size (cm)	Fruit volume (ml)	Fruit wt. (g)	Stone wt. (g)	Remarks
1.	3.0 x 2.6	11.0	10.7	1.8	Sweet fruits and heavy fruiting
2.	3.6 x 2.9	12.6	12.9	12.9	Attractive fruits
3.	3.0 x 2.3	8.0	8.1	0.8	—
4.	3.6 x 2.4	9.0	9.2	1.1	—
5.	3.7 x 2.3	8.8	9.0	1.2	Good drying quality
6.	2.6 x 2.6	10.4	10.0	1.0	Good taste, heavy fruiting and less attack of fruitfly
8.	2.9 x 2.2	4.0	4.1	1.1	Free from fruitfly
9.	2.9 x 2.1	5.4	5.4	0.7	Good taste
10.	3.2 x 2.5	7.0	7.6	1.0	—
11.	4.9 x 2.7	17.0	13.5	1.3	Free from powdery mildew but susceptible to *Isariopsis* leaf spot

A.1.2 Collection, conservation and evaluation of pomegranate.

To develop 'National Repository' of pomegranate at NRCAH, Bikaner, a collection and *in situ* conservation of germplasm was initiated during 1995. Three plants of each genotype has been planted at a distance of 6m x 4m. Ninety two collections are being maintained (12 collections of 18 month age and remaining of 6-8 month age).

A.1.3 Collection, conservation and evaluation of *aonla.*

Six cultivars of *aonla* from Faizabad and one from Gujarat were collected.

Two orchard blocks, one of NA7 and the other of NA6 alongwith suitable pollinizers were planted during September, 1996. In NA6, 87.3 per cent and in NA7 81.4 per cent plants established. Seedling rootstocks of *aonla* have also been planted in one hectare area for *in situ* collection of genotypes.

A.1.4 Collection, conservation and evaluation of prickly pear.

Germplasm Collection

Cactus pear genotypes collected from various organisations/places are being maintained at the Centre. Table 3 depicts the collections made during 1996-97. A fruiting type cactus, introduced earlier from USA by Dr. R.S. Paroda, D.G., ICAR, was collected from Ashoka Hospital Fatehpur-Shekhawati. Fifty one cactus clones were introduced from Texas A & M University, Kingsville, USA in January, 1997.

Evaluation of cactus pear genotypes

Forty four cactus clones were planted at 3 × 1m spacing in three replications during monsoon, 1996. Data on sprouting of cladodes shows that except

Table 3: Cactus pear collection and conservation at NRCAH.

Place of collection	No. of Type/Varieties	Time of collection
NARI, Phaltan (M.S.)	39 (2)	Sept., 1995
Jhunjhunu	1(1)	Dec., 1995
Jodhpur	1(1)	Feb., 1995
CSSRI, Karnal	5	Aug., 1996
Ashok Hospital Fatehpur-Shekawati	1	Nov., 1996
Beer Sheva, Israel	3	Dec., 1996
Texas, USA	51	Jan., 1997

(Figures in parenthesis are indigenous types.)

clones 1240, 1248, 1267, 1287, 1311, 1324, 1325 and local types, all types started sprouting 30 days after planting under field conditions. The number of cladodes formed/plant (six month after planting) indicates that clone 1118, 1269, 1271, 1278, 1288, 1292, 1308 and 1314 produced more number of sprouts per plant than the other genotypes. Except clone 1269, none of the genotype produced flowers during the first year of planting.

Out of 51 cactus genotypes brought from Texas, USA, 48 survived and are being multiplied. Two cladodes of each genotype were received in the form of pieces having on an average 300-400g weight. After treatment with 0.2 per cent bavistin, the cladodes were planted in earthen pots filled with sand + clay + manure mixture. Observations on sprouting of cladodes show that vegetable type clone 1308 sprouted 24 days after planting while the other genotypes took more than 30 days period for first sprout. At present, 100 cactus genotypes are under evaluation.

A.1.5 Collection, conservation and evaluation of *Prosopis cineraria.*

Characters of *Prosopis cineraria* pods

Immature green pods *(sangri)* of 30 genotypes identified during 1995-96 around Bikaner, were analysed by hedonic rating test. Two years pooled data presented in Table 4 clearly dipict that two genotypes (No.3 and 21) have given the highest cumulative quality score and were liked very much. Eight genotypes were liked moderately. Therefore, these ten genotypes are considered horticulturally important and can be considered for further improvement.

Table 4: Quality rating (score) of unripe pods of some promising *Prosopis cineraria* types for vegetable purpose (pooled data)

Genotype	Length	Thickness	Appearance	Tenderness	Taste	No. of seeds per pod	Wt. per seed	Score	Rating
1	7	9	9	9	6	8	7	7.9	LM
2	8	9	5	9	9	7	7	7.7	LM
3	8	9	8	8	9	8	6	8.0	LVM
4	8	9	8	6	8	9	6	7.1	LM
5	4	9	5	9	7	7	7	6.8	LS
6	5	9	6	3	7	8	8	6.6	LS
7	5	9	5	3	7	7	6	6.0	LS
8	4	9	1	1	8	5	7	5.0	NLND
9	4	9	6	6	8	5	7	6.4	LS
10	8	9	5	8	6	8	7	7.3	LM
11	5	9	8	5	8	6	6	6.7	LS
12	4	9	3	3	3	8	7	5.3	NLND
13	7	9	8	8	9	8	5	7.7	LM
14	2	9	1	9	9	3	5	5.4	NLND
15	5	9	4	9	7	5	7	6.6	LS
16	5	9	5	6	7	5	8	6.4	LS
17	6	9	4	9	3	8	7	6.6	LS
18	5	9	2	8	7	5	6	6.0	LS
19	5	9	3	9	6	7	8	6.7	LS
20	7	9	5	9	7	6	7	7.1	LM
21	8	9	9	8	8	9	5	8.0	LVM
22	6	9	8	9	6	8	5	7.3	LM
23	6	9	4	8	7	7	5	6.6	LS
24	4	9	4	2	7	7	7	5.7	NLND
25	4	9	1	8	3	7	7	5.6	NLND
26	4	9	1	9	8	9	7	6.7	LS
27	5	9	3	9	7	7	8	6.9	LS
28	6	9	4	6	6	8	6	6.4	LS
29	6	8	8	9	9	6	5	7.3	LM
30	5	9	3	8	7	7	7	6.6	LS

NLND - Neither Liked Nor Disliked; LS - Liked Slightly; LM - Liked Moderately; LVM - Liked Very Much

Nutritional quality of *Prosopis cineraria* pods

Immature green pods of 30 promising types of *P. cineraria* from Bikaner and adjoining areas were analysed for crude nitrogen, phosphorus, potassium, calcium and magnesium contents.

The data given in Table 5 reveal that mineral contents differ significantly among these types. The nitrogen content varied

Table 5: Mineral content of the unripe pods of some promising *Prosopis cineraria* types at vegetable stage.

Genotype	Protein	N	P	K	Ca	Mg
1	15.63	2.5	0.22	0.50	3.20	0.90
2	16.25	2.6	0.22	0.60	4.00	0.85
3	13.13	2.1	0.22	0.55	4.10	0.85
4	15.63	2.5	0.23	0.60	3.80	0.85
5	20.00	3.2	0.26	0.85	4.00	0.85
6	18.13	2.9	0.23	0.65	3.65	0.80
7	18.75	3.0	0.26	0.65	3.20	0.75
8	14.38	2.3	0.25	0.65	3.25	0.75
9	13.13	2.1	0.25	0.80	4.00	0.85
10	15.63	2.5	0.25	0.80	3.90	0.80
11	14.38	2.3	0.27	0.35	3.90	0.80
12	13.13	2.1	0.23	0.85	3.90	0.85
13	13.13	2.1	0.24	0.63	3.50	0.85
14	14.38	2.3	0.23	0.65	3.60	0.80
15	15.63	2.5	0.26	0.90	3.20	0.75
16	15.63	2.5	0.21	0.90	3.30	0.70
17	13.13	2.1	0.24	0.90	3.40	0.75
18	14.38	2.3	0.25	0.85	3.40	0.75
19	17.50	2.8	0.26	0.80	3.60	0.75
20	14.38	2.3	0.26	0.85	3.65	0.80
21	15.63	2.5	0.23	0.85	3.50	0.80
22	14.38	2.3	0.21	0.90	3.50	0.80
23	15.00	2.4	0.21	0.90	3.50	0.80
24	13.75	2.2	0.21	0.90	3.50	0.80
25	15.00	2.4	0.21	0.65	3.50	0.75
26	13.75	2.2	0.23	0.60	3.60	0.70
27	14.38	2.3	0.21	0.67	4.00	0.67
28	15.63	2.5	0.26	0.65	4.10	0.65
29	13.13	2.1	0.25	0.65	3.80	0.70
30	15.00	2.4	0.23	0.65	3.65	0.60
Mean	15.01	2.4	0.24	0.74	3.64	0.78
CD at 5%	3.10	0.49	0.029	0.21	0.81	0.24

from 2.1 to 3.2 per cent with a mean value of 2.4 per cent. Accordingly, crude protein varied from 13.13 to 20.00 per cent with mean value of 15.01 per cent. The phosphorus content differed significantly and ranged from 0.21 to 0.27 per cent with mean value of 0.24 per cent. The potassium content varied from 0.50 to 0.90 per cent. The Ca and Mg contents ranged from 3.20 to 4.00 per cent and 0.65 to 0.90 per cent, respectively.

A.2. Collection, conservation and evaluation of cucurbitacious crops.

A.2.1 Evaluation and improvement of *mateera (Citrullus lanatus)*

Evaluation of selfed progenies

The generations of *mateera* were evaluated in two seasons, viz. summer and rainy season. In summer 1996, 56 and 134 progeny lines of second and first selfed generations respectively, were evaluated. Twenty five parameters related to growth, maturity, yield and fruit components were taken into consideration for evaluation and screening of these lines. However, major emphasis was given on flesh content, firmness, colour and TSS. Thirty four progenies of 17 genotypes and 54 progenies of 37 genotypes were selected after evaluation of second and first selfed generation, respectively.

In rainy season, 34 progenies of third and 54 progenies of second selfed generation were sown. In both cases major emphasis was given on screening for flesh content, firmness, colour, TSS, taste and seed content. After evaluation of third and second selfed generations, 19 progenies of 10 genotypes and 6 progenies of 5 genotypes, respectively, were found to be promising (Table 6).

The progenies of genotypes AHW-1, AHW-12, AHW-16, AHW-18, AHW-19, AHW-82, AHW-108, AHW-118, AHW-123 and AHW-140 were found to be promising after third generation owing to desirable fruit quality characters and productivity under rainfed situation. The progenies of genotypes AHW-18, AHW-19, AHW-108 and AHW-118 produced more than four marketable fruits per vine and had TSS around 7 per cent.

After second generation, the progenies of genotype AHW-18, AHW- 19,

Table 6: Classification of some promising genotypes of *mateera* on the basis of important characteristics.

Characters	Group	Genotype
Days to first harvest (DAS)		
(i) <75	Early	AHW-65, 118
(ii) 75-80	Mid-season	AHW-18, 19, 65, 73, 82, 118
(iii) >80	Late	AHW-1, 12, 16, 19, 20, 82, 108, 118, 123, 140
No. of marketable fruits per plant		
(i) <3	Moderate bearing	AHW-82
(ii) 3-4	Medium bearing	AHW-1, 12, 16, 18, 19, 20, 82, 123
(iii) >4	heavy bearing	AHW-18, 19, 65, 73, 108, 118, 140
Fruit weight (kg)		
(i) <3	Small	AHW-12, 65, 73, 108
(ii) 3-4	Medium	AHW-16, 18, 19, 20, 82, 108, 118, 123
(iii) >4	Large	AHW-1, 19, 140
TSS(°Brix)		
(i) <7	Moderate sweet	AHW-12, 16, 82, 118, 123
(ii) 7-8	Sweet	AHW-1, 12, 18, 19, 20, 65, 108, 118, 140
(iii) > 8	Very sweet	AHW-65, 73
Flesh firmness	Solid	AHW-12, 16, 18, 19, 20, 65, 82, 108, 118
	Semi solid	AHW-1, 12, 65, 73, 82, 123, 140
Flesh colour	Pink	AHW-1, 18, 19, 20, 65, 73, 82, 108, 118, 123, 140
	Dark pink	AHW-12, 16, 19, 65, 108, 118

AHW-20, AHW-65, AHW-73, AHW-108 and 118 were found to be promising. The progenies of genotype AHW-65 exhibited stable andromonoecious sex form, early in maturity (72.6 DAS), highest fruit set per plant (13.12) and produced 4.52 marketable fruits per plant which had TSS around 8 per cent.

Survey and evaluation of *mateera* germplasm

Thirty eight accessions of *mateera* collected in collaboration with NBPGR, Regional Station, Jodhpur during 1995, were also evaluated during rainy season, 1996 which showed variability in growth, maturity, fruit yield and quality attributes.

A.2.2 Performance of commercial watermelon cultivars and selected *mateera* lines under irrigated and *"bari"* cultivation.

A study was undertaken during summer, 1996 to compare the performance of commercial watermelon cultivars with that of the advanced lines of *mateera* under irrigated as well as *"bari"* cultivation using limited water only at the time of sowing commonly practised for growing on the rainfed dunes around Bikaner. The commercial cultivars were Durgapura Meetha, Durgapura Keshar, MHW-11, NHW-102, MHW-1, Sugar Baby, MHW-6, Arka Manik and Arka Jyoti and the two *Mateera* genotypes were AHW-18 and AHW-19. Observations were recorded on growth, maturity, fruit yield and quality characters.

Under irrigated conditions, the experimental results (Table 7) reveal that both the *mateera* lines (AHW-18 and AHW-19) produced marketable fruits 8-12 days earlier than in the commercial cultivars. From line AHW-18 first harvest was made 74 days after sowing. The maximum number of marketable fruits per plant was in AHW-19(5) and the minimum was in Arka Manik (2). No cracking was observed in the fruits of *mateera* lines whereas the fruits of commercial genotypes showed variable degree of cracking. Fruit weight did not differ significantly. In terms of fruit weight and number per plant, the *mateera* lines outyielded the commercial cultivars. Maximum TSS value was recorded in Durgapura Meetha (9.2%) and the minimum in AHW-18(7.2%). The vines of *mateera* AHW-19 were the longest (4.30 m) closely followed by those of AHW-18 (4.12 m).

Under the *"bari"* system of cultivation (Table 8), both the *mateera* lines showed early anthesis in first female flower (42-44 days). In commercial cultivars, it took 75-88 days. The number of female flowers (14) and fruit set per plant (6.5) were maximum in *mateera* lines. In contrast, no fruit setting was observed in the commercial cultivars. The *mateera* lines AHW-18 and AHW-19 respectively produced 2.75 and 3.75 marketable fruits per plant giving the first harvest 76 and 78 days after sowing. These lines also exhibited the maximum length of vines and number of branches per plant.

Table 7: Performance of watermelon and *mateera* genotypes under irrigated conditions.

Genotypes	Days to first female flower	Node to first female flower	Fruit set per plant	Days to first harvest	Cracked fruits per plant	Fruits per plant	Fruit weight (kg)	TSS (°Brix)	Flesh colour	Fruit shape	Seed content	Vine length (m)	No. of branches per plant
Durgapura Meetha	50	3.0	6	91	1	3.0	4.75	9.2	Red	Round	Average	3.80	5.1
MHW-11	51	4.5	6	81	2	2.5	5.80	8.5	Red	Oblong	Average	3.10	5.0
MWM-102	55	4.5	9	83	2	2.2	5.20	8.6	Dark pink	Round	Few	3.52	6.6
Arka Manik	58	12.5	7	86	1	2.0	4.12	8.4	Dark pink	Oblong	Few	3.24	6.0
Arka Jyoti	51	6.0	9	83	3	2.0	4.35	9.0	Dark pink	Oblong	Few	2.95	6.5
AHW-18	43	5.5	8	74	0	3.5	5.50	7.2	Pink	Oblong	Average	4.12	4.8
AHW-19	48	6.1	9	78	0	5.0	4.50	7.4	Pink	Oblong	Average	4.30	4.5

Table 8: Performance of watermelon and *mateera* genotypes under *bari* system.

Genotypes	Days to first female flower	Female flowers/ plant	Fruit set/plant	Days to first harvest	Vine length (m)	No. of branches per plant	Fruits per plant	Fruit weight (kg)	TSS (°Brix)
MHW—11	78	3	0	—	1.4	3.0	0	—	—
MWM—102	75	3	0	—	1.5	3.0	0	—	—
Arka Manik	85	2	0	—	1.6	3.0	0	—	—
Arka Jyoti	88	1	0	—	1.4	2.0	0	—	—
AHW—18	42	14	6.5	76	4.10	5.0	2.75	4.50	7.1
AHW—19	44	14	6.5	78	4.35	4.70	3.75	4.25	7.6

A.2.3 Evaluation and screening of *kachari (Cucumis* sp.)

As a result of survey in collaboration with NBPGR, 182 accessions were collected during 1995. These were evaluated during Kharif 1996 under rainfed condition along with 243 collections made at the Centre earlier. A wide genetic variation was observed in vegetative growth, flowering, fruiting, maturity, fruit yield and quality characters (Fig.1). Variability in fruit shape (oval, round, oblong, oblong round, long, spindle or pear shaped), size (very small, small, medium or large), skin colour (light green to green, light yellow to orange or whitish yellow striped or mottled) and flesh colour (whitish, whitish-green, whitish yellow, light orange, to yellowish-orange) were also recorded. Out of 426 open pollinated collections, about 28 per cent samples were not true to type and were, therefore, considered similar to *Cucumis melo* var. *momordica.*

Thirty three promising lines from a total of 426 lines of *Kachari* were identified on the basis of fruit maturity, quality and yield. These lines were also observed to be free from fruitfly infestation and showed a tendency of resistance to drought. Minimum days required for anthesis of first female flower was recorded in AHK-155 (28.2 DAS) followed by AHK-109 (30.4 DAS). AHK-200 exhibited earliness in maturity (54.8 DAS) whereas AHK-175 was the latest to mature (72.4 DAS). Maximum number of fruit set and fruits per plant were recorded in AHK-28 (140.0 and 102.4) and the minimum in AHK-127 (14.4 and 11.2). Fruit weight was maximum in AHK-19 (150.1g) and minimum (10.5g) in AHK-356. Highest length of fruit was in AHK-109 (9.45cm) and the shortest fruits were in

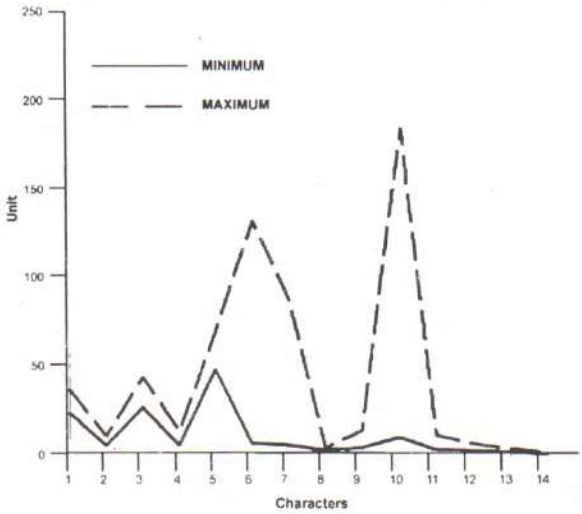

Fig. 1 Variability in characters of *Kachari*
[1= Days to open first male flower (DAS), 2=Days to open first female flower (DAS), 3=Node number of first female flower, Fruit set/plant, 5=Days to first harvest, 6=Harvested fruits/plant, 7=Vine length(m), 8=Branches/plant, 9=Fruit weight(g), 10=Fruit length (cm), 11=Fruit diameter(cm), 12=Fruit cavity (cm), 13=Flesh thickness(cm)]

Variability in fruits of *mateera*

Promising line of *mateera*

Promising lines of snapmelon ASH-10 and ASH-54

AHK-43 (2.30cm). The maximum diameter of fruit was in AHK-44 (5.72cm) and minimum (2.21cm) in AHK-43. Flesh thickness was maximum in AHK-127 (1.64 cm) followed by AHK- 99 (1.02 cm). The maximum vine length was recorded in AHK-109 (2.50m) and the minimum (1.15m) in AHK-40. The maximum number of branches per plant (11.4) was observed in AHK-5 followed by AHK-152 (10.5). The genotypes AHK-5, AHK-26, AHK-99, AHK-109, AHK- 155, AHK-200 and AHK-202 were found to be the most promising (Table 9).

A.2.4 Evaluation and screening of snapmelon *(Cucumis melo* var. *momordica)*

Seventy four lines of snapmelon were evaluated during kharif season of 1996 under rainfed conditions of NRCAH Farm. Twenty five parameters of growth, flowering and fruiting, fruit quality and yield attributes were taken into consideration for screening and evaluation.

A wide variability was recorded in vegetative growth, flowering, maturity, fruiting, fruit quality, yield and in fruit characters, i.e. fruit size and shape, skin colour, flesh colour, flesh texture and taste and seed content (Fig. 2).

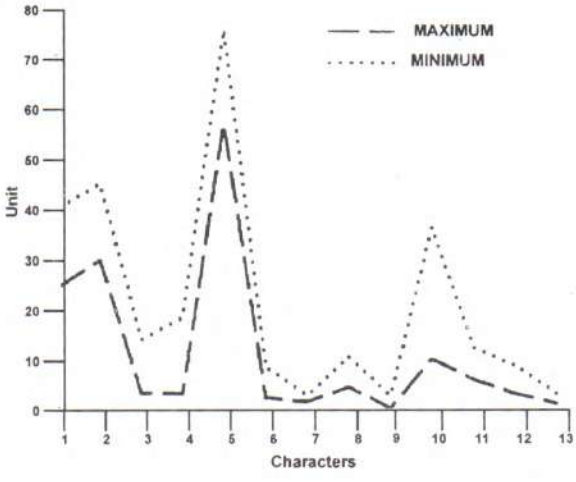

Fig. 2 Variability in characters of snapmelon
[1=Days to open first male flower(DAS), 2=Days to first open female flower(DAS), 3=Node number of first female flower, 4=Fruit set/plant, 5=Days to first harvest, 6=Harvested fruits/plant, 7=Vine length(m), 8=Branches/plant, 9=Fruit weight(g), 10=Fruit length(cm), 11=Fruit diameter(cm), 12=Fruit cavity(cm), 13=Flesh thickness(cm)]

Twenty two promising genotypes were identified and screened on the basis of fruit quality and yield attributing characters. Likewise, the characters like maturity, resistance to fruitfly, powdery mildew and hardiness to drought were also taken into consideration.

The genotype AHS-57 (24.4 DAS) closely followed by AHS-50 (24.7 DAS) showed early anthesis of first male flower.

Anthesis of first female flower was earliest (29.6 DAS) in genotype AHS-64-1 followed by AHS-50 (29.8 DAS) and latest in AHS-8(44.1 DAS). Maximum number of branches per plant was recorded in AHS-70 (9.4) followed by AHS-10 (8.6). The highest length of vine was recorded in AHS-70 (2.83 m) and the lowest in AHS-8(1.51 m). Maximum fruit set per plant was recorded in AHS-70(15.0). However, the maximum number of harvested fruits per plant (6.2) were recorded in genotypes AHS-14, AHS-54, AHS-64-1 and AHS-70. The highest fruit weight was recorded in AHS-50 (1.61 kg) followed by 1.52 kg in AHS-64-1. The highest length of fruit (30.1 cm) was recorded in AHS-54 while the maximum fruit diameter (11.84 cm) was recorded in AHS-14. The largest fruit cavity was observed in AHS-10 (7.12 cm). The maximum flesh thickness was recorded in AHS-54 (2.57 cm) followed by AHS-64-1 (2.49 cm). The genotypes AHS-6, AHS-10, AHS- 14, AHS-19, AHS-50, AHS-54 and AHS-64 were found to be promising (Table 10).

Table 9 : Growth, maturity, fruit yield and quality attributes of some promising selections of *kachari.*

Genotypes	Days to first open male flower	Node to first male flower	Days to first open female flower	Node to first female flower	Days to first harvest	Fruit set/ plant	Harvested fruits per plant	Vine length (m)	Branches per plant	Fruit weight (g)	Fruit length (cm)	Fruit dia-meter (cm)	Fruit cavity (cm)	Flesh thick-ness (cm)
AHK-5	29.5	2.7	31.4	4.8	56.8	64.7	39.4	2.14	11.4	33.4	3.51	3.65	2.81	0.22
AHK-26	25.9	3.4	34.5	5.6	64.5	38.5	22.4	2.10	5.3	95.8	7.10	4.61	3.01	0.94
AHK-99	25.2	3.1	31.4	6.7	55.5	27.4	17.2	2.10	8.5	75.4	5.81	3.92	3.05	1.02
AHK-109	25.7	3.4	30.4	5.7	58.8	32.5	25.7	2.50	6.4	96.8	9.45	4.38	2.51	0.95
AHK-155	25.9	3.0	28.2	5.4	60.5	40.2	28.7	1.75	5.4	50.5	4.55	4.10	3.01	0.37
AHK-200	26.4	3.2	32.7	7.2	54.8	22.1	17.8	1.70	5.2	124.5	8.12	5.14	3.52	1.01
AHK-202	32.4	3.0	41.4	7.1	65.9	29.2	23.4	2.00	8.4	25.5	4.51	3.71	2.02	0.41

Table 10: Growth, maturity, fruit yield and quality attributes of some promising lines of snapmelon under arid situation.

Genotypes	Days to first open male flower	Node to first male flower	Days to first open female flower	Node to first female flower	Fruit set/ plant	Days to first harvest	Fruits per plant	Vine length (m)	Branches per plant	Fruit weight (kg)	Fruit length (cm)	Fruit dia-meter (cm)	Fruit cavity (cm)	Flesh thick-ness (cm)
AHS—6	39.1	4.1	43.4	9.4	8.1	74.1	3.8	2.14	5.9	0.650	10.9	8.42	6.02	1.74
AHS-10	26.9	3.9	36.2	6.9	9.1	74.0	4.7	2.25	8.6	0.850	15.2	9.87	7.12	2.14
AHS-14	25.6	3.9	32.4	13.5	9.4	75.1	6.2	2.51	6.8	1.250	20.7	11.84	7.10	2.34
AHS-19	26.3	3.0	32.1	12.2	9.0	65.1	5.1	2.15	5.1	1.230	21.2	9.87	5.54	2.37
AHS-50	24.7	3.4	29.8	7.2	5.9	69.7	3.2	2.50	5.9	1.610	28.6	11.04	5.17	2.43
AHS-54	26.8	3.4	32.2	3.7	9.4	62.5	6.2	2.14	5.2	1.250	30.1	9.87	4.52	2.57
AHS-64	25.2	3.1	29.6	5.4	9.9	61.4	6.2	2.15	6.1	1.520	22.8	10.42	6.42	2.49

VEGETATIVE PROPAGATION

Mission C. Rapid multiplication of propagules of fruit crops.

C.1 Vegetative propagation of *Capparis decidua* and *Prosopis cineraria.*

Capparis decidua

Vegetative propagation in *Capparis decidua* was attempted using plant growth regulators. The treatments tried are shown in Table 11. The cuttings were planted in polythene tubes and kept in nursery at ambient temperature. The experiment was replicated twice with 12 cuttings in each replication. The results revealed that the sprouting occurred only in three treatments, viz. IBA + thiamine (1000 + 1000 ppm) quick and 3 minutes dip and distilled water dip+ 5000 ppm IBA treatment. However, these sprouted cuttings failed to survive because of poor root growth.

Table 11: Effect of PGR application on sprouting of *Capparis* cuttings.

Treatment	Cuttings sprouted	
	15 DAP	25 DAP
IBA (3000 ppm)	—	—
IBA (5000 ppm)	—	—
IBA (7000 ppm)	—	—
IBA + thiamine (1000 + 1000 ppm quick dip)	—	1(8.3)
IBA + thiamine (1000 + 1000 ppm 3 mts)	—	1(8.3)
IBA + thiamine (1000 + 1000 ppm 5 mts)	—	—
Distilled water dip + 5000 ppm IBA	3 (25)	3(25)
Distilled water dip + Seradex	—	—
Control	—	—

DAP—Days after planting; Figures in parenthesis are percentage

Prosopis cineraria

Vegetative propagation in *Prosopis cineraria* was attempted using plant growth regulators. The treatments comprised 3000, 5000 and 7000 ppm IBA alone and in combination with 1000 ppm thiamine (Table 12). Observation on number of cuttings sprouted was recorded after 15 days of treatment. The results reveal that sprouting occurred in all the treatments except in cuttings treated with IBA 7000 ppm. Maximum sprouting (25%) was observed in cuttings treated with 5000 ppm of IBA and IBA + thiamine (1000 + 1000 ppm). The sprouted cuttings failed to survive due to poor root growth.

Table 12: Effect of PGR application on sprouting of *Prosopis cineraria* cuttings.

Treatment	Cutting sprouted 15 DAP
IBA 7000 ppm	— (0)
IBA 5000 ppm	3 (25)
IBA 3000 ppm	2 (16.67)
IBA + Thiamine (1000 + 1000 1 mts.)	3 (25)
IBA + Thiamine (1000 + 1000 5 mts.)	1 (8.33)
Seradex	1 (8.33)
Control	— (0)

DAP—Days after planting; Figures in parenthesis are percentage

Growth inhibiting factor in *Capparis decidua*

Presence of some growth inhibiting substance was suspected as the cuttings dipped in distilled water sprouted earlier than controls. In order to confirm the same following experiments were conducted:

(a) Aqueous extract of the cuttings of *Capparis* was prepared. This was tested on the rooting potential of *Nerium* (an easy to root plant) by applying the extract to one set. The results demonstrate that the set treated with the extract had fewer roots (2/cuttings) as compared to control (16 roots / cutting). Similarly the average root length in the treated and control groups was 5.5 and 26.5 mm respectively.

Air layering in *Prosopis cineraria*

Three concentrations of IBA (10000, 5000 and 3000 ppm) alone and in combination with same concentration of thiamine along with a control were tried during February, August, September and October, 1996 for air layering in *Prosopis cineraria*. The results revealed that best rooting occurred when the air layering was done in August (60%) followed by September. These rooted layers were then planted in

pots for survival. Data on per cent survival also indicate that air layering should be done in August for vegetative propagation of this species.

WATER MANAGEMENT

Mission E. Water management in arid horticultural crops

E.1. Effect of moisture conservation techniques and nutrients on the establishment and vigour of fruit plants in arid region.

Under this project, a field experiment "Effect of pit size and filling mixture combinations on survival and growth of pomegranate cv. "Jalore Seedless" was conducted. Three pit sizes (0, 45, 60 cm) with three filling mixture combinations were tried with three replications. Pomegranate plants were planted at 6 × 4m spacing during monsoon planting in 45 × 45 × 45 cm size pits filled with 10 kg manure recorded cent per cent survival. However, the maximum plant height was recorded in 60 × 60 × 60 cm size pits filled with 10 kg of manure.

EXTENSION

Progeny orchard and nursery management

Two hectare area under progeny block has been developed to maintain cultivars of fruits to serve as mother trees for multiplication. For this 2 cultivars of *bael*, 3 of guava, 12 of *karonda*, one each of *phalsa*, lemon and *khirni* have been collected besides the already available varieties of *ber, aonla* and pomegranate.

Two structures of 13 × 4.5 × 2.5m size having 6 beds of 6 × 1 × 0.3m size have been constructed and covered with polynet to make provision to raise about 10,000 plants. Facility of misting in the structures is being provided.

Radio talks and lectures

Samadia, D.K. provided technical knowhow through lectures to the farmers, agricultural workers/officers on production and postharvest technology of vegetable and fruit crops under arid situations at various training programmes organised by KVK's at Bikaner (1), Sardarshahar (4) and Nagaur (2) and Watershed Development training, CAZRI, Bikaner (1).

Dr. Sharma, B.D gave following talks:

Integrated nutrient management in watershed areas. In: Watershed development training programme of DRDA, organised by CAZRI, Bikaner on 11.10.1996.

Sand dune stabilization In: Watershed development training programme of DRDA, organised by CAZRI, Bikaner on 13.10.1996.

Pasture development in watershed areas. In: Watershed development training programme of Govt. of Rajasthan at KVK, Bikaner. Dec., 1996.

Use of plastic mulch in horticultural crops. In: Use of plastic for horticultural crops. Training-cum-workshop of Ministry of Agric. and Cooperation and PDC, organised by KVK, RAU, Bikaner, 22.3.1997.

उद्यानिकी फसलों में प्लास्टिक पलवार

को कैसे बिछायें व हटायें – प्रयोगिक कार्य: ट्रेनिंग–कम–वर्कशाप, कृषि एवं सहकारिता मंत्रालय के सौजन्य से पी०डी०सी०ए,रा०कृ०वि० बीकानेर, दिनांक 24.3.97.

किसान भाइयों के पत्रों के उत्तर, दिनांक 11.12.96, आकाशवाणी, बीकानेर।

अनाज की कटाई का उचित समय, सावधानियां और भण्डारण, दिनांक 21.3.97, आकाशवाणी, बीकानेर।

Dr. Vishal Nath delivered following talks:

Shushka Bagwani ke Liye Uddyaniki Phaslon ka Chunav va shasya Kriyayen. Uddyan Sakha Training programme at KVK, Sardarshahar, Churu on 24.4.96.

"Anjeer ki Kheti ki Unnat Shasya Kriyayen". Uddyan Sakha Training Programme at KVK, Sardarshahar, Churu on 24.4.96.

"Karonda ki Kheti Kaise Karen". Uddyan Sakha Training Programme at KVK, Sardarshahar, Churu on 24.4.96.

Post harvest handling and preservation of horticultural produce. Watershed Development Training (WDT) programme at CAZRI, Regional Station, Bikaner on 11.10.96.

"Phal Sabji Pariarkshan ke Siddhant evam Savdhaniya". Uddyan Sakha Training Programme at KVK, Nagaur on 24.2.97.

"Phalon se Jam, Squash, Jelly, Murabba, Candy, Sarbat, Cordial evam Aachar tayar karna tatha Unka Pariraksshan. Uddyan Sakha Training programme at KVK, Nagaur on 3.3.97.

Greenhouse management. In: training programme of Agriculture Officer's of State Govt. on Use of plastic in Horticulture at KVK, Bikaner on 22.3.97.

"Harit Grih:. In: training programme of farmers on Use of plastic in Horticulture at KVK, Bikaner on 27.3.97.

"Fruit cultivation in watershed areas' in training programme for State officers/Tech. officials of Soil & Water conservation Dept. held at CAD., Bikaner on 30.5.96.

Singh, R.S. delivered following lectures:

'Arid Fruits cultivation' organized by NABARD and Bikaner Kshetriya Gramin

Bank, Kakadwala village, Lunkaransar on 17.7.96.

'Nursery techniques for raising fruit plants' in WDT of DRDA organized by CAZRI, Bikaner on 11.10.96.

'Shrubbery border and Hedge plants' Udyan Sakha training programme at KVK, Nagaur on 18.2.97.

Crop production with drip and sprinkler system in Farmers Training Programme of IFFCO, held at KVK., Beechwal, Bikaner on 24.2.97.

"Ber and Pomegranate cultivation and propagation techniques" in Horticulture Training Course at KVK., Bikaner on 13.3.97.

Drip System in Horticulture in Training programme on Use of Plastic in Horticulture at KVK., Bikaner on 21.3.97.

Participation in Kisan Melas

NRCAH participated in Krishi Vigyan Mela at Pemasar Village (Bikaner) organised by KVK., Bikaner on 5.3.97.

NRCAH in Krishi Vigyan Mela at Pemasar (Bikaner)

FARM AND CAMPUS DEVELOPMENT

Farm development

About 15 hectare land area was developed under the reported period. This area covers the sites of *aonla*, date palm, nursery block and also farm approach road. As a shelter belt plantation a total 894 plants have been maintained along the farm fence. A total Rs. 30,000 were generated as farm revenue through sale of farm produce. To operate irrigation systems at NRCAH Farm, 800m long 4" PVC main pipe line has been installed.

INFORMATION AND DOCUMENTATION

During 1996-97, a total 103 books were procured while 5 international and 11 Indian journals and periodicals were subscribed. The library also subscribed "CAPS CONTENTS" of 30 international and national journals from INSDOC, New Delhi. At present the library has a collection of 320 books and subscribes 5 international and 18 national journals.

HUMAN RESOURCE DEVELOPMENT

Shri M.K. Jain, Sr. Computer (T-II-3) and Shri V.K. Pandey, Assistant, attended training cum workshop at NAARM on Computerization of accounts & Pay Package during 21.4.96 to 23.4.96.

Shri M.K. Jain, Sr. Computer (T-II-3) and Shri Rajesh Daiya, Jr. Clerk attended fortnight computer training at M/s PRS Comptech, Ajmer during 24.7.96 to 4.8.96.

Shri Ayaz Ahmed, Shri V.K. Pandey and Shri M.K. Jain attended training cum workshop at CAZRI, Jodhpur on "GPF & Pay Package" during 23.9.96 to 24.4.96.

Shri R.P. Singh, Asstt. Admn. Officer attended training for Head of Office & DDO, organised by Govt. of India, Ministry of Home Affairs at New Delhi during 22.9.96 to 4.10.96.

Shri R.S. Singh, Scientist SS (Horticulture) was deputed for participation in 7th International course on "Crops for Arid and Semi-arid zones: Advanced Agrotechnologies", organized by Ministry of Foreign Affairs, Centre for International Cooperation (MASHAV) and The Institutes for Applied Research, Ben-Gurion University of the Negev, at Beer-Sheva, Israel during 21.10.96 to 13.12.96.

Dr. R. Bhargava, Scientist SS (Plant Physiology) attended training programme on Statistical Softwares for Data Analysis at NAARM during 19.11.96 to 29.11.96.

Shri M.K. Jain, Sr. Computer (T-II-3) attended Re-orientation programme on NICNET at New Delhi during 28.11.96 to 29.11.96.

श्री प्रेम प्रकाश पारीक, हिन्दी अनुवादक ने नार्म, हैदराबाद में "राजभाषा कार्यान्वयन व प्रबन्ध की समस्याएं" विषय पर आयोजित त्रिदिवसीय सेमीनार में दिनांक 17.12.96 से 19.12.96 तक भाग लिया।

Shri Ayaz Ahmed, AF & Ac O and Shri V.K. Pandey, Assistant attended training on GPF and Pay Package at NAARM during 2.1.97 to 9.1.97.

MEETINGS/SEMINARS/SYMPOSIA

Meetings

Dr. O.P. Pareek, Director, NRCAH attended following Meetings:

(a) Sub-working group meeting at ICAR, New Delhi during 6-7 April, 96

(b) Meeting of Seed Policy held at NCDC Hall, New Delhi on 17.5.96

(c) Perspective Planning Meeting held at ICAR, New Delhi on 2.8.96

(d) Project Coordinators meeting held at ICAR, New Delhi on 6.8.96

(e) Mid year review meeting of Directors of ICAR Institute held at ICAR, New Delhi during 14-15 Oct., 1996

Seminar/Symposia/Conference

Dr. O.P. Pareek attended National Symposium on Horticultural Biotechnology at IIHR, Bangalore during 28-30 Oct., 1996

Dr. O.P. Pareek (1996). Prospects of Horticulture development in arid region. National Seminar on Strategies for Horticultural Development, New Delhi, 4-5 December, 1996

Chandra, A. Sharma, B.D. and Chaudhary, N.L. (1996). Preliminary study on mineral nutrient status of date palm leaves. In: Silver Jubilee National Symposium on Arid Horticulture, organised by Horticultural Society of Haryana at CCS HAU, Hisar during 5-6 December, 1996.

Pareek, O.P.; Vishal Nath; Singh, R.S. and Sharma, B.D. (1996). Regeneration of *Prosopis cineraria* through cuttings. National Seminar on Propagation and Nursery Management, organised by Horticultural Society of Gujarat, at BA College of Agriculture, GAU Anand Campus, Anand during 4-5 October, 1996.

Vishal Nath; Sharma, B.D. and Pareek O.P. (1997). Variability in growth and fruiting of *Khejri (Prosopis cineraria* (L) Druce) in *thar* desert. National Symposium on Conservation of Biodiversity organised by Bioved Research Society and Ministry of Sci. & Tech., Govt. of India at Allahabad during 22-23 Feburary, 1997.

Samadia, D.K. and Pareek, O.P. (1996). Variability in drought hardy watermelon type *mateera* in arid eco-system (Abstract and Poster Presentation). 2nd International Crop Science Congress; 17-24 Nov., 1996, New Delhi, India. P9-015 : 278.

VISITORS

1. Dr. R.S. Paroda, Secretary, DARE, Govt. of India and Director General, ICAR, New Delhi on 25 January, 1997.

2. Dr. S.P. Ghosh, Dy. Director General (Hort.), ICAR, New Delhi on 20 Dec., 1996 and 25 January, 1997.

3. Dr. Gajendra Singh, Dy. Director General (Engg.), ICAR, New Delhi on 25 January, 1997.

4. Dr. S.L. Mehta, Dy. Director General (Edu.), ICAR, New Delhi on 25 January, 1997.

5. Dr. P.V.Dehadri, Dy. Director General (Fisheries), ICAR, New Delhi on 25 January, 1997.

6. Dr. E.A. Siddiqui, Dy. Director General (Crop Science), ICAR, New Delhi on 25 January, 1997.

7. Dr. G.B. Singh, Dy. Director General (SA&AF), ICAR, New Delhi on 25 January, 1997.

8. Dr. R.K. Patel, Vice Chancellor, Rajasthan Agricultural University, Bikaner on 25 January, 1997.

9. Dr. C.H. Rana, Vice Chancellor, Gujarat Agricultural University, Gujarat on 25 January, 1997.

10. Dr. A.S. Faroda, Director, Central Arid Zone Research Institute, Jodhpur on 25 January, 1997.

11. Dr. Peter Felker, Professor, Texas A & M University, Kingsville, Texas (USA) on 12 August, 1996.

Dr. R.S. Paroda, DG, ICAR and Secretary, DARE visits NRCAH.

Dr. R.S. Paroda, DG, ICAR and Secretary, DARE releases NRCAH publications.

PUBLICATIONS

Research papers/book reviews/ bulletins/books:

Pareek O.P., Vishal Nath, Singh, R.S. and Sharma, B.D. (1997). Regeneration of *Khejri (Prosopis cineraria)* through cuttings. J. *Applied Hort.* Vol. II (In Press).

Vishal Nath and Pandey, A.K. (1996). Storage stability of *aonla* products at ambient temperature. *New Agriculturist,* 7(1): 1-7.

Vishal Nath; Singh, R.S. and Pareek, O.P. (1996). Variability of *boardi* in western Rajasthan. *Current Agriculture,* 20:83-86.

Pareek O.P. and Vishal Nath (1996). *Coordinated Fruit Research In Indian Arid Zone—A two decades (1976-1995)* profile. National Research Centre for Arid Horticulture, pp 1-104.

Pareek, O.P. and Vishal Nath (1997). Latest advances in propagation of *ber, aonla* and date palm. *Agri-Horticultural Society* Newsletter, Public Garden, Hyderabad vol. III. (3) 4–7

Popular articles

Singh, R.S, Vishal Nath and Tewari J.C. (1996). Lasora: A promising fruit tree for arid ecosystem. *DECO MIRROR*, 3 (2) :5- 11.

Singh, R.S. and Vishal Nath (1997). Fruits for Arid region. *Intensive Agric.*, 34:14-17.

Reports/Manuals

Annual Reports NRCAH, 1995-96, pp. 23

Annual Report AICRP on Arid Zone Fruits, 1995-96 pp. 1-36.

Pareek, O.P.; Verma, U. and Vishal Nath (1996). Experimental Records Manual, AICRP on Arid Zone Fruits. National Research Centre for Arid Horticulture, Bikaner. pp. 1-146.

STAFF

(as on 31.03.1997)

Scientific

Dr. O.P. Pareek	Director
Dr. B.D. Sharma	Scientist (Sr. Scale) Soil Science
Dr. R. Bhargava	Scientist (Sr. Scale) Plant Physiology
Sh. R.S. Singh	Scientist (Sr. Scale) Horticulture
Dr. Vishal Nath	Scientist Horticulture
Sh. D.K. Samadia	Scientist Horticulture

Administrative

Sh. Ayaz Ahmed	Asstt. Fin. & Acc. Officer
Sh. V.K. Pandey	Assistant
Sh. Shaji C.P.	Steno
Sh. Rajesh Daiya	Jr. Clerk
Sh. Kuldeep Pandey	Jr. Clerk

Technical

Sh. M.K. Jain	Sr. Computer (T-II-3)
Sh. Udai Vir Singh	Field Tech. (T-II-3)
Sh. Sanjay Patil	Artist-cum-Photographer (T-II-3)
Sh. B.R. Khatri	Computer (T-1)
Sh. Vinod Kumar	Field Tech. (T-1)
Sh. P.R. Singh	Field Tech. (T-1)

Auxiliary

Sh. P.P. Pareek	Hindi Translator
Sh. Satpal	Gypsy Driver
Sh. Ashok Kumar	Tractor Driver

Supporting

Sh. Shiv Dayal	SSG-II
Sh. Ghan Shyam	Messenger
Sh. Rawat Singh	Mali

Sh. Sua Lal	Mali
Sh. Birdhi	Mali
Sh. Gulla Ram	Mali
Sh. Shiv Lal	Mali
Sh. Mohan Lal	Mali

Transfers

Dr. Rakesh Bhargava, Scientist S.S. (Plant Physiology) joined NRCAH on 24 June, 1996 on transfer from CPRI, Shimla.

Shri R.P. Singh, Asstt. Administrative Officer left on 31st Marth 1997 on transfer to NBAGR, Karnal.

Promotions

Shri. R.P. Singh, Asstt. Administrative Officer was promoted to Administrative Officer.

Shri Shiv Dayal, SSG-1 (Mazdoor) was promoted to SSG-II (Mazdoor).

Appointments

Shri D.L. Mourya, T-II-3 (F.T.)
Shri Udai Vir Singh, T-II-3 (F.T.)
Shri Sanjay Patil, T-II-3 (Artist-cum-Photographer)

Shri Shaji C.P.,	Stenographer
Shri Rawat Singh,	Mali
Sh. Sua Lal,	Mali
Sh. Birdhi Chand,	Mali
Sh. Gulla Ram,	Mali
Sh. Shiv Lal,	Mali
Sh. Mohan Lal,	Mali

Resignations

Shri R.K. Pratap, T-I (Lab. Tech.) resigned during February, 1997.

Shri D.L. Mourya, T-II-3 (F.T.) resigned during March, 1997.

FINANCE

The total approved outlay for the VIII Plan period and budget estimates and expenditure incurred during 1996-97 are given in Table 13 and 14.

Table 13: VIII Plan Outlay for NRCAH, Bikaner.

Head	Rs. (In Lakh)		Head	Rs. (in Lakh)
1. Recurring contingency			**2.** Non–recurring contingency	
(a) Pay and allowances	35.00		(a) Equipments	36.50
(b) TA	2.50		(b) Works	248.00
(c) Contingencies	15.00		(c) Library	6.00
			(d) Vehicle	7.00
Total (A)	52.50		Total (B)	297.50
Grant Total (A + B)		350.00		

Table 14: Budget estimate (BE), revised estimate (RE) and expenditure incurred during 1996-97 (Rs in Lakhs)

Head	BE	RE	Expenditure
Pay and allowances	7.00	13.00	13.13
T A	0.40	0.70	0.70
Other charges including equipments	20.00	19.30	26.57
Works	42.60	62.00	54.59
Total	70.00	95.00	94.99

ALL INDIA CO-ORDINATED RESEARCH PROJECT ON ARID ZONE FRUITS

Explorations to identify elite plant types were done by Aruppukottai, Bawal, Faizabad, Jobner and Sardarkrushinagar centres. The important collections in *ber* were one fruitfly tolerant type, one fruitfly resistant type, one powdery mildew resistant type besides two types having high dessert quality, one having good dehydration quality and one giving high yield. In *aonla,* four high yielding and one rust free and early maturing types have been identified. Thirteen *bael* types, forty tamarind types, one thornless woodapple and forty five *lasora* types have also been collected.

Kaithali proved the best cultivar in vertisols of Tamil Nadu while Umran produced the maximum fruit weight at Bawal. Illaichi Jhajjar and Govindgarh Selection recorded the maximum pulp:stone ratio and Akhrota the maximum TSS at Bawal. Gola cultivar at Faizabad and Umran at Jobner were found promising. Ganesh recorded the maximum fruit number and Jyoti the maximum fruit weight per plant in pomegranate. Open pollinated selection No. 61 recorded the maximum fruit yield at Rahuri. *Aonla* cultivar NA 7 had the maximum fruit size, fruit weight and ascorbic acid while Kanchan recorded the maximum yield at Faizabad. Kanchan cultivar also produced the maximum yield (27.3 kg/plant) at Rahuri. Medjool date palm recorded the maximum fruit weight at Abohar and Bikaner while Zagloul recorded the maximum berry weight at Jodhpur. Sedami, Medjool, Bint Aisha and Khuneizi recorded more than 32^{0}Brix TSS at *doka* stage at Bikaner. Selection 9 of custard apple produced the maximum fruit number (188) and weight (21.9 kg) per plant at Sardarkrushinagar. Ten lines of tamarind started fruiting at Aruppukottai. NB 4 recorded the maximum vegetative growth at Aruppukottai while NB 5 registered the maximum yield at Faizabad.

Ziziphus nummularia rootstock produced less vigorous scion of Gola and Umran *ber* whereas *Z. mauritiana* var. rotundifolia and *Z. mauritiana* cv. Tikdi induced more vigour in the scion. *In situ*

water harvesting by providing 5% slope improved vegetative growth and fruit yield in *ber*. Drip irrigation at 40 and 60 per cent evaporation replenishment improved growth in Ganesh pomegranate at Jobner whereas irrigation on 20 per cent wetted area basis on alternate days gave higher water use efficiently and maximum yield in pomegranate at Rahuri.

Nurititional studies were conducted at different centers in various fruits. At Faizabad, application of 150:50:50g NPK per plant gave the maximum fruit yield in Gola *ber* while in sandy soils of Jobner 500:500:100g NPK per plant proved to be the best. Application of 250g N per plant significantly increased fruit yield in Ganesh pomegranate at Bangalore while 100:50:50g NPK proved the best in *aonla* culivar Chakaiya at Faizabad.

Fruitfly, white grub, bark eating caterpillar, gray weevil and leaf mite in Haryana; fruitfly and mites in Rajasthan; fruitfly, fruit borer and spittle bug in Gujarat were the important pests of *ber*. In pomegranate fruitfly, aphid and birds in Rajasthan and shot hole borer and stem borer in Maharashtra were the major pests. Scales and red palm weevil were serious on date palm in Kachchh while leaf gall midge was a major pest of *aonla* at Jobner. Maximum population of *ber* fruitfly was observed between November and February at Bawal. Chafer beetle population was maximum between 23rd to 29th meteorological weeks. High humidity due to early monsoon rains coupled with high temperature seems to favour the pest build up. Sanaur 3, Banarsi Karaka, Illaichi and Mehrun were tolerant to fruitfly at Bawal.

Three sprays of 0.01 per cent fenvalerate effectively controlled the fruitfly and fruit borer at Sardarkrushinagar. Carbaryl (0.1%) was the most effective against *ber* stone weevil at Rahuri. Monocrotophos (0.05%) and carbaryl (0.1%) were the most effective pesticides against white grub beetle at Bawal. One spray of endosulfan (0.05%) and (0.005%) during first week of July effectively controlled *aonla* stem capsule caterpillar at Jobner.

Black leaf spot was a serious disease of *ber* in southern India while powdery mildew was serious in the north. Leaf and fruit spots were the major diseases of pomegranate while rust in *aonla* and *Graphiola* and *Alternaria* leaf spots in date palm caused severe losses. Epidemiological studies on powdery mildew of *ber*, leaf and fruit spots of pomegranate, *aonla* rust,

Graphiola leaf spot of date palm and fig rust were done. In *ber* cultivar Katha Phal, Kishmish and Sanaur 3 were moderately susceptible to powdery mildew at Bawal while Sev at Jobner and Seo at Sardarkrushinagar were completely free from the disease. Cultivar Jallandhari was found to be resistant to black leaf spot at Faizabad. Pomegranate cultivar Jalore Seedless and P 26 were resistant to leaf blight while selection 303, 130, 69, 212 and 219 were resistant to leaf spotting fungi. Francis, NA 6 and NA 8 cultivars of *aonla* were moderately susceptible to rust while NA 9 and Francis were severely affected by necrosis.

Two sprays with 0.1 per cent bayleton and karathane and 0.2 per cent sulfex were found effective for the control of powdery mildew in *ber*. A spray schedule after pruning consisting 4 sprays at monthly interval and then 7 sprays at 10 days interval with 0.2 per cent wettable sulphur was adjudged the best at Rahuri. Carbendazim (0.1%) was the most effective fungicide against *Isariopsis* leaf spot whereas bavistin (0.1%) was the most effective against *Graphiola*. 5 sprays at 20 days interval with 0.4 per cent copper oxychloride against leaf spot and 0.1 per cent carbendazim and 1 per cent Bordeaux mixture against fruit spot of pomegranate proved effective. Three sprays at 15 days interval with 0.3 per cent mancozeb or 4 sprays at 10 days interval with 0.2 per cent chlorothalonil proved the best in controlling *aonla* rust. Two combined sprays of monocrotophos (0.04%) + sulfex (0.2%) successfully controlled both powdery mildew and fruitfly in *ber*. Application of monocrotophos (0.04%) alongwith carbendazim (0.1%) controlled the black leaf spot and fruit borer at Aruppukottai.

Aspergillus, Penicillium, Rhizopus, Alternaria, Colletotrichum, Phoma, Cladosporium and *Fusarium* fungi were found associated with postharvest rotting of *ber* fruits.

APPENDIX-I

Sanctioned staff strength as on 31.3.1997

Cadre	Strength	Filled	Vacant
Scientific	21	6	15
Administrative	12	5	7
Technical	09	6	3
Auxillary	03	3	NIL
Supporting	10	8	2
Total	55	28	27

वार्षिक प्रतिवेदन सारांश

शुष्क क्षेत्र भारत के कुल क्षेत्रफल के लगभग 12 प्रतिशत भूभाग में फैला है। यह क्षेत्र राजस्थान, हरियाणा, पंजाब, गुजरात, महाराष्ट्र आन्ध्रप्रदेश तथा कर्नाटक राज्यों में है। विपरीत कृषि जलवायु एवं भू–भौतिकी परिवेश के कारण इस क्षेत्र में उद्यानिकी उत्पादन नगण्य है। उपलब्ध प्राकृतिक संसाधनों के उचित उपयोग एवं पादपो की सूखा सहिष्णु किस्मों का समुचित विकास करके इस क्षेत्र में उद्यानिकी उत्पादन की विपुल संभावनाएँ है। इस क्षेत्र में उद्यानिकी उत्पादन क्षमता बढ़ने से यहाँ के निवासियों की आर्थिक एवं सामाजिक परिस्थिति में सुधार लाया जा सकेगा। इन सब तथ्यों को दृष्टिगत रखते हुए भारतीय कृषि अनुसंधान परिषद, नई दिल्ली ने राष्ट्रीय शुष्क क्षेत्रीय उद्यानिकी अनुसंधान केन्द्र की विधिवत स्थापना अप्रेल, 1993 में की है।

मुख्य ध्येय

शुष्क परिस्थितिकी में उद्यानिकी फसलों का उत्पादन बढ़ाने के लिए योजनाबद्ध अनुसंधान कार्य करना तथा शुष्क क्षेत्र उद्यानिकी से संबद्ध सूचनाओं के प्रमुख केन्द्र के रूप में कार्य करना।

वर्ष 1996–97 के मध्य किए गये महत्वपूर्ण अनुसंधानों का संक्षिप्त विवरण।

(i) मतीरा (सिट्रुलस लेनेटस) के जीन प्रारूप की 5 प्रमुख संतति AHW 18, AHW 19, AHW 108, तथा AHW 118, काचरी (कूकूमिस स्पीशीज) की 7 संतति AHK 5, AHK 26, AHK 99, AHK 109, AHK 155, AHK 200, एवं AHK 202, को सर्वाधिक उपयुक्त पाया गया।

(ii) फूटकाकड़ी (स्नेप मेलन) में AHS 6, AHS 10, AHS 14, AHS 19, AHS 50, AHS 54, तथा AHS 64 नामक संततियों को इस क्षेत्र हेतु सर्वाधिक उपयुक्त पाया गया।

(iii) बेर के 124, अनार के 92, नागफनी (केक्टस पीअर) के 60, आंवला के 7, करौंदा के 3, अमरूद के 3, एवं जामुन, खिरनी, चीकू, नींबू के एक–एक आम, फालसा व ग्वारपाठा के दो–दो वंश प्रारूपों को देश–विदेश से संग्रहित कर मूल्यांकन कार्य आरम्भ किया गया है।

(iv) राजस्थान के शेखावाटी एवं भरतपुर तथा बीकानेर के आसपास के क्षेत्रों में बेर एवं खेजड़ी का वृहत सर्वेक्षण किया गया। फलस्वरूप बेर के 14 (जीजीफस मौरिशियाना के 11 व जीजीफस रोटण्डीफोलिया के 3) तथा खेजड़ी (प्रोसोपिस सिनेरेरिया) के 10 वंश प्रारूपों को चिन्हित किया गया।

(v) कैर (केपरिस डेसिडुआ) की कलमों में वृद्धि तत्वों की उपस्थिति का पता लगाया जो पुनरोत्पादन में सहायक हो सकते है।

(vi) खेजड़ी (प्रोसोपिस सिनेरेरिया) के चयनित पेड़ों में खनिज लवणों का विस्तृत विवरण तैयार किया गया।

इसके अतिरिक्त केन्द्र ने अन्य गतिविधियाँ, जैसे मानव संसाधन विकास के अन्तर्गत प्रशिक्षण आदि, कार्यक्रमों में समय–समय पर भाग लिया। केन्द्र के कई कर्मचारी/अधिकारियों ने प्रशिक्षण, सेमीनार, कार्यशालाओं आदि में भाग लिया। इस अवधि में केन्द्र के वैज्ञानिकों द्वारा लगभग 10 विभिन्न वैज्ञानिक लेखो का विभिन्न पत्र–पत्रिकाओं में प्रकाशन किया गया तथा उन्होंने किसानोपयोगी मेलो के आयोजनों आदि में भाग लिया।