

so that the vegetable used as salad should be free from contamination. Moreover, a complete change in the consumer acceptance and delivery system like assured marketing and contract farming should be proposed. Considering these factors, private and public sectors should work together to fill each others gap for better understanding. There should be close coordination between public and private sector in effective mode to obtain the maximum benefit.

Dr. Pandey emphasized that public sector should concentrate on the basic research having national problem of different vegetable crops on priority basis.



FIGURE 05 : Okra (Ladyfinger)

Dr. Mathura Rai, Director, IIVR has prioritized the national biotic and abiotic problems of different vegetable crops and accordingly the basic researches are being carried out.

Dr. H.P. Singh, DDG (Hort.) in his deliberations mentioned that the ultimate aim of private and public sectors is to serve the farming community to increase the productivity and for this private sectors should think how to work together and explore the areas where the close linkage may be tied up.

Dr. M.L. Chadha, Director, AVRDC Regional Centre, Hyderabad expressed his desire to make close linkage with the international organizations also. He added that the contribution of the private sector may be more in protected cultivation and transportation in cool chain on a complimentary basis.

## XXVI-Workshop

**Venue** : OUA&T, Bhubaneswar

**Date** : 23<sup>rd</sup> - 27<sup>th</sup> Feb., 2008

### General Session

The Chairman expressed his satisfaction on the action taken on report in general, and reporting of trials in particular. He suggested to adopt the coding and decoding of entries under multilocation testing to avoid any biasedness for more accurate reporting.

Dr. Mathura Rai asked the centres to send their respective entries as per cut off dates mentioned below:

**30<sup>th</sup> May** - For Kharif season : Tomato, brinjal, chilli, capsicum, okra, cowpea, sponge gourd, ash gourd, ridge gourd, dolichos bean and early cauliflower.

**30<sup>th</sup> June** - For Rabi : Pea, French bean and late group cauliflower.

**30<sup>th</sup> October** - For Summer season : Pumpkin, bottle gourd, bitter gourd, cucumber, watermelon, muskmelon.

The seeds of onion & garlic to be sent to the Director, NRC(O&G), Pune so as to reach by following cut off dates:

**30<sup>th</sup> May** : For Kharif onion

**30<sup>th</sup> September** : For Rabi onion and garlic

## Collection, Evaluation and Conservation of Germplasm

**Table 1: List of promising germplasm available with different centres (2006-07)**

Crops	Source	Notable/ Promising germplasm
Amaranth	Vellanikkara	Yield (g/plant)-VKA-119 (287.50), VKA-120(230.00) VKA-118 (210.00)
	Jorhat	Leaf and vein both red- AAU1 Leaf and vein both green- AAU4 Green Leaf with red vein- AAU2 Reddish green leaf with red vein- AAU3
Bottle gourd	Faizabad	Earliest line- NDBG-5026
	Rahuri	Fruit length (below 30 cm)-RHRBG-2(26), RHRBG-4 (30) and RHRBG-12 (29.00), RHRBG-5(29) and RHRBG-13 (30.00), RHRBG-33 (30.00) Powdery mildew (Res.)- RHRBG-25, RHRBG-30 Downy mildew (Res.)- RHRBG-10, 12, 13, 14, 17, 19, 31
Cucumber	Rahuri	Yield (q/ha.)-RHRCUCU-14 (179.27), RHRCUCU-5(164.27)
Pointed gourd	Kalyani	Earliest fruiting lines (Days to 1st flowering-BCPG-1 (90), BCPG-7 (102) BCPG-1(102) Downy mildew (Mini. Intensity%)- BCPG-12 (21.6) BCPG-9 (24.5) Vine & fruit rot (Mini. Intensity%)- BCPG-11(24.6) BCPG-2 (28.2)
	Sabour	Yield (q/ha)-Rajendra P - 1 (185.35), Rajendra P - 2 (178.0)
	Jorhat	Yield (q/ha)- Line-1(65.0), Line-5 (60.3)
Muskmelon	Durgapura	T.S.S. (%)- GP-4 (12) and GP-1 and GP-3 (11.00) Fruit Weight (g)- GP-1 (1500) and GP-2 (800)
	Ludhiana	Golden Melon- Fruits are yellow, weighing 850g with average TSS of 13%. Market Collection Udaipur- Fruits are light brown, weighing 350 g. Market Collection 2007-2 (Melon 1)- 850 g, TSS 7.0%, Market Collection 2007-3 (Melon 2)- Round, 900 g, TSS 8%,
	Rahuri	Yield (q/ha)-GMM-3 (195.73), Ambegaon Round (190.73) High TSS (brix) - VRM-42-4 (12.0), Sel.-5 (11.5)
Pumpkin	Faizabad	Fruit yield (q/ha)-NDPK-5029-2 (More than 600.0), Shining fruits
Water melon	Durgapura	Earliest lines (Days to 1st female flower initiation)-GP-1 (44), GP-3 (45), High TSS (%)-GP-1, GP-2 and GP-3 (10.0)
Cho-cho ( <i>Sechium edule</i> )	Jorhat	Yield/plant (kg)-Line-1 (65.0), Line-5 (60.3) Fruits/plant-Line-4 (161) Line-5 (155)
Brinjal	Vellanikkara	Resistant to Bacterial wilt-VKBr-28, VKBr-17, Swetha, Surya, Haritha, IC090141, IC090146, IC090982, IC099736 and IC249349.
Chillies	Jorhat	Earliness (50% flowering)-Line No. 10 (53.3) and Line No. 19 (58.1)
	Dharwad	Earliness (50% flowering)-EC405281 (32), IC526852 (32.66) Longest Fruit EC399574 (10.23cm) Yield (g/plant) IC413702 (75.0) Dry Yield (t/ha) EC399550 (2.137)

Crops	Source	Notable/ Promising germplasm
Paprika	Dharwad	Yield (t/ha)-BD-26 (3.23),BD-29 (3.13) and BK-7 (2.70) Yield (green and Dry t/ha)- 0107-7011 (10.25G, 2.02 D ) Only Dry -Byadgi Dabbi (2.07)-BD-26 (3.23), BD-29 (3.13)
Pea	Ludhiana	Early line (50% Flowering) - Burpeena (40Days) Pods/ plant - PSM-3 (10-11)
	Solan	Yield(q/ha)-IC-469155 (70.00) and IC-469153
	Kalyanpur	Earliness- AP-3 (35-37) AP-4, AP-5 and KS-206 (30-35) Powdery Mildew (Res.)- AP-2, 4, 5, PRS-15, 6,11
	Jammu	Yield/ plant (g)-CPS-05-01 (219.0), CPS-05-06 (121.0) Pods/ plant -CPS-05-01 (126), CPS-05-06 (76.8)
French bean	Dharwad	Green pod Yield (t/ha)- DWD-FEB-57 (8.53), DWD-FEB-53 (8.44)
	Pantnagar	Green pod Yield / plant (g)-AC-14 (94.4), AC-6 (91.2) Pods/ plant-AC-14 (15.4), AC-6 (15.0) Earliness (Days to 50% flowering)-AC-4, AC-11, AC-12, AC-13, AC-15 (57)
<i>Momordica dioica</i> and <i>M. cochinchinensis</i>	Bhubaneshwar	Yield/ plant (kg)-BSG-3 (0.710), BSG-1 (0.635) Edible maturity (Days)-BSG-4 (70), BSG-3 and BSG- 5 (74)
	Kalyani	Yield (q/ha.)-BCSG-1 (85.63), BCSG-5 (84.38) Fruits/plant-BCSG-1 (39.5), BCSG-5 (37.83)

**Table 2: List of promising germplasms available with different centres (2007-08)**

Crops	Source	Notable/ Promising germplasms
Amaranth	HARP	Green leaf- HAAMTH-25(2.33 kg /0.9m2)
	Jorhat	Red leaf- HAAMTH-27 (1.30kg)
	Coimbatore	Green Leaf & Red Vein -AAU-2 (Pl.wt.63 g and leaf wt.31.3g)
	Vellanikkara	Leaf & Vein both Red- AAU-1 (Pl.wt.54g and leaf wt.24.3g)
	IIHR	Yield-A-29,77, 145,196, JJK-2000-1/96 (More than 100-110 g)
Bitter gourd	IIVR	Dark Green- VR/07/4 (0.910 kg/plant), VR/07/4 (0.910 kg/plant) and VR/07/1 (0.870 kg/plant)
Bottle gourd	IIVR	Yield- VR/07/5 (9.210 kg/plant) & VR/07/6 (8.470 kg/plant)
	Rahuri	Indv. Fruit wt. VR/07/3 (0.924 kg)
	NBPGR	Early-RHRBG-23 & 17 (Flowering-53 & 54 days, respectively)
	Faizabad	Small- RHRBG-2 (25.0 cm)
Cucumber	Rahuri	Yield (Q/ha.)- LC-27 (270.25 within 64 days)
	Ranchi	Fruits/plant -LC-26 (Av. 5.25 days)
Pointed gourd	IIVR	Yield (Q/ha)- VRPG-149 (192.00) &
	Faizabad	VRPG-144 (184.00)
	Sabour	Fruit length (4.5 to 6.5 cm) -VRPG-144, VRPG-150 and VRPG-153
	Kalyani	Yield (Q/ha)-HAP-102 (287.00), HAP-5(286)
	Navsari	Fruit length- HAP-5 (10.77 cm), HAP-102 (10.40)
Ivy gourd	IIVR	Yield-VRK-07-3, VRK-07- 4, VRK-07- 7, VRK-07- 13(3.62-5.20 kg/plant)
	Vellanikkara	Yield (kg/plant)- CG-23 (12.50kg), CG-27 (11.25 kg) Resistance to mosaic (bitter fruit)- CG-84
Tomato	Solan	Yield (kg/plant)-UHF-55 (1.573), EC015998 (1.371)
	Coimbatore	TSS (Brix.)-UC-82B (4.77), EC015998 (4.74)
	Jammu	Earliness-EC521068 & EC521078 (50% flowering in 99 days)
Brinjal	Raipur	White flower- IGB-43 & 44 (milky white fruit) Variegated fruits- IGB-51,IGB-12 & IGB-22
	NBPGR	Yield/ plant (kg)-IC099703 (0.67), IC090965 (0.62) Earliness(50% flowering)-IC099656(65.5 days), IC090842 (69.5 days)

FOUR DECADES... ACCOMPLISHMENT OF AICRP ON VEGETABLE CROPS

Crops	Source	Notable/ Promising germplasms
Chillies	Lam	Capsaicin (%)-GP276(0.581), GP148 (0.571) Oleoresin (%)-GP89 (14.51), GP82 (14.31) Capsanthin (EOA)- GP299 (53375) GP132 (47672)
	Coimbatore	OleYield (g)- PKM-1 (362.8), CA-25 (320.45), CA166 (310.45) Fruits/plant- ALS98-8 (145.1), CA 141 (88.8), CA121 (88.6)
	SKUAS T (S)	Fruit yield/plant - SH-KC-46 (1004 g), SH-KC-55 (780g), SH-KC-48 (656g) and SH-KC-49 (581 g)
	HARP	Yield (kg/plant)- IIVR Local Super (1.56), LCA3531 (1.25) Earliness- KA2, LCA235 and Pusa Jwala (50% flowering in 32 days)
	IIHR	Yield (Green g/plant)-MKR -7(246 g), MKR-1 (182 g) Parrot Green- MKR -1, MKR -4 and MKR -22 Fruits/plant- MKR -8 and MKR -19 (375)
Capsicum	Srinagar	Yield (g)-SH-SP-32 (1000) SH-SP-31 (880)
	Solan	Fruits/plant- SH-SP-32 (20) SH-SP-31 (17)
	Katrain	Yield (g)- IC537599 (941.67), IC537578 (900)
Paprika		Red Ripe Fruit Weight-
	Srinagar (K)	SH-P-34 (325) and SH-P-33 (227.7)
	Dharwad Katrain	Fruit Weight (g)-DP-2 (605.0), Holiday Cheer (396.0) Fruits/plant- Byadgi Dabbi (59)
French bean	Rahuri	Pods/plant- RHRFB-8 (76), RHRFB-44 (76) AND RHRFB-8 (75) Pod Length (cm)- RHRFB-1 and RHRFB-22 (14) Earliness (50% flowering)- RHRFB-28 (38), RHRFB-29(40) and RHRFB-13 (41)
Lab lab bean	Raipur	Earliness (Ist harvest)-IS-21(49 Days) Pod Length (cm)-IS2-(14.5)
Okra	IIVR	YVMV Free (field condition)- IIVR-402, 198, AC-108, EVC305616, IIVR-326, 439, IIVR-1A
	Bhubaneshwar	Thin Pods- No. 136 (0.9 cm Dia.)
	NBPGR	Longest Fruit- No. 136 (27.0 cm)
	Dharwad	Smallest fruit- SB2 (10.2 cm )
	Rahuri	Dark Green Fruits- SB6, SB9 and SB4
	IIHR	YVMV Free- IC090171, IC282246, IC099780
Carrot (Temperate)	Katrain	Root Length (cm)-NK-9 (18.8), Improved-5 (18.5)
Cauliflower (Early)	IIVR	Early & heat tol.- Kuwari23/42 (CW 490 g), JBT-23/57 (CW 420 g), Kuwari23/37 (CW 450 g) Kataki Early- 23/95 (600 g), 23/94 (500 g), Kataki 23/92 (570 g), KatakiII-ND-(520 g)
Cauliflower (Mid)	IIVR	Aghani Awasthi Seed (1225 g), Aghani Prem Seed (1050 g) Pusi Prem Seed (1650 g), Pusi Hazipur (1750 g)
Cauliflower (Late)	Katrain	Yield (t/ha.)-SR-05 (48.4), KT-20 (36.52) 1-Res. To Downy Mildew- RSK-1301 2-Mod. Res. To Black Rot + Downy mildew- SR-05 Days to 50% Curd Maturity-Agrotech-41(99 day), RS-119 (110 days)
Cabbage	Katrain	Earliness (days)- India Market (79) and Express Mail (84.5) Resistance to Black Rot- Ac-208, Ac-204, 83-6, Red cabbage Cuba Tropical
Cowpea	IIVR	Earliness (Days)- IT-03K-1197 (34.7) Maximum Pod/plant- Jaipur Collection (57.5)
	Raipur	Green pod weight (g)-ICP-10(14.24 ), ICP-4 (12.03)

## Vegetable Agronomy

### Use of Biofertilizers

#### Tomato

- The maximum mean yield (238.01q/ha) along with highest C:B ratio (1:2.48) of tomato cv. Utkal Kumari (BT-10) was obtained with recommended dose of NPK (125:50:100kg/ha) along with root dip of seedlings in *Azospirillum*. Hence, it is recommended for bacterial wilt affected areas under Bhubaneshwar conditions of Orissa.
- At Durgapura, the maximum yield (375.03q/ha) with highest C:B ratio (1:1.62) of tomato Pusa hybrid -2 was obtained with application of 75% recommended dose of Nitrogen + seedling treatment with *Azospirillum*. Hence, it is recommended for Jaipur conditions of Rajasthan.



**Biofertilizer use in tomato at Bhubaneshwar**

#### Chilli

- At Bhubaneshwar, the maximum mean yield (63.26q/ha) along with highest C:B ratio (1:2.68) of red ripe chilli cv. Utkal Rasmi was obtained with recommended dose of NPK (125:50:90kg/ha) + seed treatment and seedling dip in *Azospirillum*. Hence it is recommended for chilli cultivation in Orissa.
- At Karaikkal, the maximum mean yield (30.90q/ha) along with highest C:B ratio (1:3.5) of dry chilli (cv. Pant C-1) was obtained with recommended dose of N (150kg/ha) + seed treatment and seedling dip in *Azospirillum*. Hence, it is recommended for chilli cultivation in Pondicherry.

### Integrated Nutrient Management

#### Tomato

- The maximum mean yield (341.45 q/ha) and C: B ratio (1:2.66) of tomato cultivar Jawahar -99 was obtained with application of recommended dose of NPK (120:60:80kg/ha) + FYM @ 10 t/ha + S @ 25 kg/ha + Mixture of all micronutrients (Zn, B, Mo, Fe, Cu, Mn) + *Azotobactor*. Hence, it is recommended for Kymore plateau and Satpura hills of Madhya Pradesh.

#### Cucumber

- The maximum mean yield (501.17 q/ha) along with the highest C: B ratio 1:2.48 of cucumber hybrid SH-CH-1 was recorded with the application of half recommended dose of NPK (35:15:15kg/ha) + FYM @ 10t/ha + *Azospirillum* application. Hence, it is recommended for Kashmir Valley conditions of Jammu and Kashmir.

#### Bottle gourd

- At Durgapura, the maximum mean yield (487.77 q/ha) and C: B ratio (1:2.02) of bottle gourd cultivar, Pusa Naveen was obtained with application of poultry manure @ 2.5t/ha + Half recommended dose of NPK (50:25:25kg/ha). Hence, it is recommended for Jaipur conditions of Rajasthan.
- The maximum mean yield (522.50 q/ha) and C: B ratio (1:2.39) of bottle gourd cultivar, Punjab Komal was obtained with application of vermi compost @ 2.5t/ha + Half recommended dose of NPK (50:25:20kg/ha). Hence, it is recommended for Jammu conditions.



## Broccoli

- At IIVR, the maximum mean yield (358.07 q/ha) along with highest C: B ratio (1:3.59) of broccoli hybrid Fiesta was obtained with application of poultry manure @ 2.5t/ha + Half recommended dose of NPK (60:30:30kg/ha). Hence, recommended for Varanasi conditions of Uttar Pradesh.
- At Pantnagar, the maximum mean yield (163.5 q/ha) with highest C: B ratio (1:4.58) of broccoli hybrid Fiesta was obtained with application of poultry manure @ 2.5t/ha + Half recommended dose of NPK. Hence, recommended for Tarai conditions of Uttarakhand.
- At Jammu, the maximum mean yield (183.93 q/ha) along with highest C: B ratio (1:4.97) of broccoli cv.KTS-1 was obtained with application of vermi-compost @ 2.5t/ha + Half recommended dose of NPK (0:25:20kg/ha). Hence, recommended for Jammu conditions.

## Cowpea

- At IIVR, the maximum mean yield (133.25q/ha) along with highest C: B ratio (1:2.50) of cowpea cv.IVRCP-4 was obtained with application of vermi-compost @ 2.5t/ha +Half recommended dose of NPK. Hence, recommended for Varanasi conditions of Uttar Pradesh.



IPNM in cowpea at IIVR



Sprinkler irrigation in broccoli

## Water soluble fertilizer

### Brinjal

- At Karaikkal, the highest mean fruit yield (410.18 q/ha) and the maximum C: B ratio (1: 3.38) were recorded in hybrid brinjal with five foliar sprays of NPK (19:19:19). Hence, recommended for Pondicherry conditions.

### Okra

- At Karaikkal, the highest mean fruit yield (216.30 q/ha) and the maximum C: B ratio (1: 3.32) were recorded in hybrid okra No.10 with five foliar sprays of NPK (19:19:19). Hence, recommended for Pondicherry conditions.

## Studies on micronutrient

### Bitter gourd

- The maximum mean yield (136.79 q/ha) along with highest C:B ratio (1:3.1) of bitter gourd cv. Preethi was obtained with the application of three foliar sprays of Ferrous sulphate @ 100 ppm at interval of 10 days at 40 DAS. Hence, recommended for Vellanikkara conditions of Kerala.

## Cropping System

- In brinjal – okra cropping sequence, application of FYM @ 10 t/ha + remaining dose of NPK through

chemical fertilizer gave higher yield and expressed maximum C:B ratio (1:2.8). This cropping sequence may be followed in Vellanikkara conditions of Kerala.

## National Seed Project Review

The breeder seed price of all other crops were approved by the house as they were during last year. Incorporating the suggestions of the house, the revised breeder seeds prices were finalized as given in table.

**Table 3: Revised price list of breeder seeds of vegetables**

S.No.	Name of vegetable	Rate (Rs./kg)	S.No.	Name of vegetable	Rate (Rs./kg)
1.	Palak	90	17.	Radish	300
2.	Methi	100	18.	Carrot	400
3.	Okra	200	19.	Turnip	250
4.	Tomato	1200	20.	Onion	600
5.	Brinjal	650	21.	Bottle gourd	350
6.	Chilli	700	22.	Bitter gourd	450
7.	Capsicum/Paprika	2000	23.	Sponge gourd	350
8.	Cowpea	100	24.	Ridge gourd	350
9.	Cluster bean	100	25.	Cucumber	800
10.	French bean	150	26.	Tinda (Round melon)	200
11.	Dolichos bean	125	27.	Pumpkin	450
12.	Garden pea	90	28.	Muskmelon	450
13.	Early/Mid-early/Mid Cauliflower	1000	29.	Water melon	550
14.	Late Cauliflower	2500	30.	Coriander	100
15.	Cabbage	650	31.	Amaranthus	200
16.	Knol Kohl	400			

**Note:** The revised prices after approval of the Council will be circulated by Director, IIVR, Varanasi to all the centres who are producing breeder seeds under the national seed chain. The following recommendations emerged out of the above noted deliberations:

- The basic seed may be procured from NBPGR where the centres could not undertake the production due to non availability of nucleus seed.
- The Directors of State Departments of Horticulture / Agriculture to be informed to stop the indents of obsolete varieties and start indenting for the new improved ones.
- The breeder seed prices of Pumpkin may be revised from existing Rs. 400/- per kg to Rs. 450/- per kg; Radish from existing Rs. 250/- per kg to Rs. 300/- per kg, Carrot from existing Rs. 350/- per kg to Rs.400/- per kg and cabbage from existing Rs. 600/- per kg to Rs. 650/- per kg.

## Physiology, Biochemistry and Processing

- The toxic constituents of vegetables grown in the peri-urban areas should be analysed.
- Considering the nutritional and medicinal importance of vegetables, the quality estimation work should be strengthened and a concerted effort is required including plant physiologists and biochemists in association with vegetable breeders to evaluate all the promising varieties for commercially important quality parameters.
- Considering the large number of vegetable crops, the quality estimation work can be taken up at some more centres under AICRP (VC) programme.

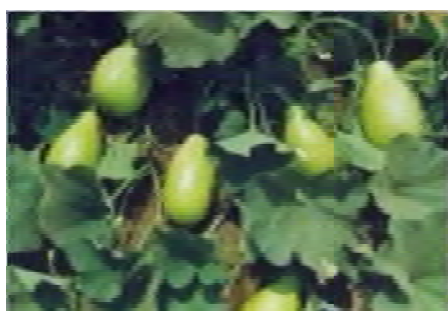
- The quality parameters of organically grown vegetables should be estimated and compared with conventionally grown vegetables.

### Varietal Trials

Yield data for the year 2004-05, 2005-06, 2006-07 and 2007-08 was thoroughly scrutinized by the committee and the following 6 entries of 4 crops were identified for recommendation and release.

**Table 4: List of varieties identified for release**

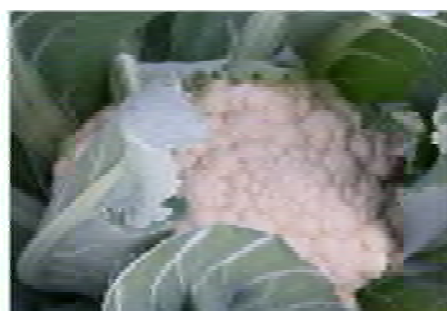
Crops	Entries	Source	Recommended Zones
Bottle gourd	Sel-P-6	IARI, New Delhi	IV & VII
Cauliflower (mid group)	IIVRMC-12	IIVR, Varanasi	IV
	DC-76	IARI, New Delhi	I & VI
Cowpea	VR-5	IIVR, Varanasi	IV, V & VII
	Swarna Harita	HARP, Ranchi	II, IV, V & VIII
Muskmelon	GMM-3	GAU, Anand	IV & VII



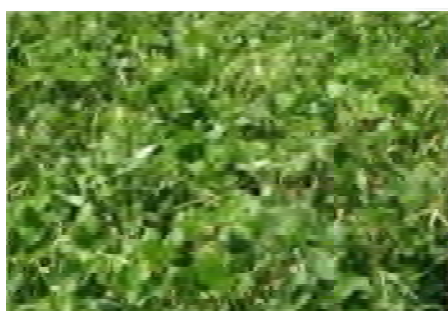
Sel P-6 (Pusa Santushti)



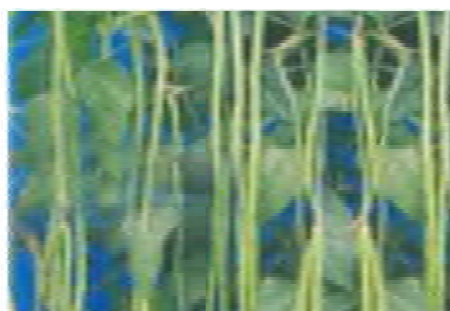
IIVRMC-12 (Kashi Aghahani)



DC-76 (Pusa Paushja)



VR-5 (Kashi Sudha)



Swarna Harita



GMM-3

### Seed Production

- A minimum isolation distance of 800 m for quality seed production of bottle gourd and 200 m for chilli is recommended based on trials conducted at Ludhiana.
- Hot water treatment of okra seeds at 50°C for 30 minutes or treatment with 0.5% Citric acid for 45 minutes is recommended for improved seed germination and reduced hard seeds based on trials at NHRDF and Varanasi.
- Retention of first 10-12 fruits per plant in okra is recommended for higher yield of good quality seeds under Jorhat and Hisar conditions.



- Based on two years data and economics provided by the centres Lam and IIHR, it is recommended that hybrid seed production of chillies using male sterility is not commercially viable without suitable supplementary pollination.
- Seed treatment with black pepper powder @ 30g/kg seed (3%) is recommended for effective control of bruchids in garden pea and French bean based on trials at Jorhat.
- Sprays of NAA 100 ppm at 30 and 50 DAS is recommended for higher seed yield, germination percentage and seed vigour of okra based on trials at Srinagar, Rahuri and Anand whereas NAA 50 ppm is recommended under Dharwad and Vellanikkara conditions.
- Based on three years study at HARP, Ranchi, treatment of chilli seeds with  $10^{-4}M$   $CaCl_2$  or  $10^{-4}M$   $NaCl$  before storing them in cloth bags at ambient temperature, is recommended to retain maximum germination upto 16 months under Jharkhand conditions.
- Scooping or application of  $GA_3$  (100 ppm) during curd maturity is recommended under Punjab conditions for increasing the yield of quality seeds in cauliflower based on trials conducted for four years at Ludhiana.
- On the basis of three years studies at Vellanikkara, seed treatment of chilli pepper with *Trichoderma* (5g/kg seed) is recommended for better seed quality without seed borne diseases under Kerala conditions.
- Foliar application of Ferrous Sulphate (100ppm) thrice at 10 days interval starting from flowering is recommended for higher yield of good quality chilli seed under Karnataka conditions based on trials at Dharwad.
- Based on four years' trial at Kalyani, sowing of okra in 2nd fortnight of February is recommended for higher yield and better quality of seeds under Gangetic alluvium of West Bengal.

## Hybrid Trials

After thoroughly examining the yield data of the year 2004-05, 2005-06, 2006-07 and 2007-08 under various trials, the following four  $F_1$  hybrids in different crops have been identified and recommended for release and notification during the year 2007-08.

**Table 5: List of hybrids identified**

Crops	$F_1$ hybrids	Source	Recommended Zones
Okra	JNDOH-02-2	Junagarh	II, V, VI, VII, VIII
Tomato (Indet.)	ARTH-734	Ankur Seeds	VIII
Tomato (Det.)	HATH-5	HARP, Ranchi	I
Bitter gourd	Vivek	Sungro Seeds	VIII



## Onion and Garlic

1. In onion germplasm, promising lines were NRCOG-769, NRCOG-1075 and NRCOG-747 in red onion and NRCOGW-501, NRCOGW-504, NRCOGW-506 and NRCOGW-507 in white onion at NRCOG, Rajgurunagar, Line JRO-0615 and JRO-0604 (red onion) at Junagarh & three entries viz; Line 355, 402 and 574 were found free from *Stemphylium* blight disease and thrips at NHRDF.
2. For increasing the seed viability and vigour in onion seeds, storage of seeds in desiccators with silica gel helps in maintaining viability and vigour of seed for more than one and a half year.
3. For getting highest germination and viability of onion seeds, packing of seeds in aluminum-laminated bags with vacuum at 5% seed moisture level was found suitable.
4. Seed treatment with  $\text{CaCl}_2$   $10^{-6}$  followed by PBA  $10^{-4}$  M enhanced storage life with highest seed germination in onion under Ranchi conditions.

## Disease Management

Recommendations made during the Disease Management session are given under the following sub heads

### A. Survey and surveillance

1. Junagarh centre has concluded that damping off, *Stemphylium* leaf spot, early blight, root rot and tomato leaf curl were found as major disease in tomato on the basis of five years Survey and surveillance. *Stemphylium* leaf spot is reported as the most serious disease of tomato at seedling stages.
2. In the brinjal, little leaf was most severe in seed production crop with an average incidence of 29 %.
3. In chilli, leaf curl was most severe with an average incidence of 78%. In onion, purple blotch in seed crop was most severe with an average intensity of 74%.
4. In cucurbits, downy mildew was severe during August to October with an average disease intensity of 76%.
5. In garlic, *Stemphylium* leaf blight was most severe with an average incidence of 43%. Suitable recommendations should be adopted in the region.

### B. Integrated diseases management

6. Coimbatore centre has concluded on the basis of four years pooled data and recommended that integrated treatment combination of green manuring (Daincha 20t/ha) + neem cake (10 q/ha) + antagonist (*Pseudomonas fluorescens*, @10 g/kg of seed, seedling dip 0.2% and soil application 2.5 kg/ha mixed with 50 kg FYM / ha gave significantly higher disease control with highest tomato yield of 229.1 q/ha as against 180.4 q/ha in untreated control with a CB ratio of 2.37. The recommendation should be adopted in the region.
7. Ludhiana centre reported that seed treatment with *T. viride* @ 0.5%, application of *Trichoderma* @ 10 g/kg FYM/m<sup>2</sup> area + application of cow dung (5%) + cow urine (5%) slurry at 15 days interval starting from 7 DAS gave best result (PDI=8.8) against *Rhizoctonia* root rot in chilli. Similar result (PDI=16.7) was also reported in Junagarh against *Rhizoctonia* root rot in Okra. However in Bhubaneswar, seed treatment with carbendazim @ 0.25% and 2 need based sprays of validamycin @ 0.1% was reported best (PDI=1.7) against *Rhizoctonia* root rot in cowpea and seed treatment with

carbendazim @ 0.25%, raising crop in green manure + neem cake + antagonist (*T. viride*) applied in field gave best result (PDI=10.7) in cauliflower in Kalyanpur.

8. Seed treatment with Ridomil MZ 0.25% + 3 times removal of lower infected leaves in the morning and spray of mancozeb @ 0.25% in the afternoon in bower system gave best control of downy mildew in sponge gourd (PDI=3.6) in Sabour and bitter gourd (PDI=12.7) in Coimbatore. However, seed treatment with Ridomil MZ @ 0.25% + one need based foliar spray within 40-50 days of Alliete 0.25% in bower system reported best performance in Kalyanpur on cucumber (PDI=12.2) and in Hyderabad on bottle gourd (PDI=8.7).
9. IIHR, Bangalore recommended that bacterial wilt incidence appeared lowest (6.75%) with the combined treatments of FYM + GM + soil application of Pf (*Pseudomonas fluorescens*) + seedling root dip of Pf + drenching of Pf with significantly higher fruit yield of tomato (25.5 t/ha).

### C. Epidemiology

10. IIHR, Bangalore centre has reported a significantly negative correlation on max. temp. and RH on the incidence and spread of Tobacco Streak Virus (TSV) in okra. Wind velocity and min. temp. has not influenced the TSV spread. Using weather parameters multiple regression models have been developed for susceptible and tolerant varieties of okra. The rate of disease spread is low in Arka Anamika compared to S51, Thrisha, Ankur 40 and NS98.
11. At Rahuri it was observed that in tomato early blight, buck eye rot disease intensity and TSWV disease incidence was significantly and negatively correlated with morning humidity. However, the leaf curl disease incidence was significantly and negatively correlated with minimum temperature. While in chilli, powdery mildew and die-back disease intensity and mosaic disease incidence was significantly and negatively correlated with minimum temperature and morning humidity.
12. Studies of Hyderabad centre revealed that the independent variable minimum temperature contributed significantly for variation in the development of powdery mildew of okra. Whereas relative humidity was positively correlated with the disease incidence. The independent variable maximum temperature was positively correlated. Whereas minimum temperature, relative humidity (evening) and rainfall were negatively correlated with the incidence of YVMV disease of okra.
13. Kalyanpur centre has concluded that Alternaria leaf spot of chilli appeared at the age of 60-70 days after transplanting in October when temperature ranged 31.9 - 32.6 °C (max) and 19.3 - 29.0 °C (min), RH ranged 73.5 - 80.3% respectively. Whereas Die-back of chilli started at the age of 45-49 days after transplanting in September when temperature ranged 33.8°C - 36.2°C (max) and 21.8°C to 26.0°C (min), RH 68.0 - 78.3% respectively. The recommendation should be adopted in the region.

### D. Seed Pathology

- 14 Bhubaneswar, Coimbatore, Junagarh and Kalyanpur recommended that most common seed borne mycoflora of tomato can be effectively managed by seed treatment with carbendazim @ 1 g + thiram @ 2 g per kg or carbendazim @ 1 g/kg + captan @ 2 g/kg of seed or by carbendazim @ 2.5 g/kg alone. Carbendazim + thiram recorded maximum seed germination (97.8%) followed by carbendazim alone (92.9%). The recommendations should be adopted in the respective regions.
  - As akomine is not available in many areas it was suggested to replace with amister or curzate M 8 or any other suitable chemical for programme code Veg 8.6.
  - CARI, Port Blair has been included in the programme Veg 8.1 as a volunteer centre w.e.f. 2008 as per the request received.

- Four new programmes were added with the existing programmes against the following four concluded the programmes.
- Junagarh centre has concluded the programme Veg 8.1.
- Coimbatore centre has concluded the programme Veg 8.2
- Kalyanpur centre has concluded the programme Veg 8.3.
- Bhubaneswar, Junagarh, Coimbatore and Kalyanpur centre have concluded the programme Veg.8.4.

### **Insect Pest Management**

- The seed treatment of okra with thiamethoxam 70 WS @ 3 g/kg was found most effective for management of jassid and favourable plant growth and yield attributing character with highest net additional benefit. This technology is recommended under Varanasi, Sabour, Anand and Solan conditions.
- In Ludhiana and Kalyanpur on the basis of net cost benefit ratio, seed treatment of okra with imidacloprid 70 WS @ 3 g/kg is recommended for reducing the jassid infestation and maximum yield.
- In Sabour, the economic damage threshold for thrips management was determined to be 2 thrips/leaf. Initiation of spraying after attainment of thrips population of 2 thrips/leaf with acephate (0.06%) at 10 days interval is recommended for management of thrips in chilli with maximum addition benefit and C:B ratio.

### **Resistant Varietal Trials**

- 1) The committee reviewed the data of 2007-08 trials, and as none of them completed three years of experimentation as some of the trials of AVT-II were under progress, thus no entry was recommended for identification and release. However, it was suggested the trials will be reviewed and considered for identification during the next group meeting.
- 2) The committee felt that, while providing the summary report to the committee, apart from yield data it must include the disease reaction of the entries in comparison with susceptible check for better conclusions.
- 3) The existing trials under IET were promoted to AVT-I and AVT-I to AVT-II for the next years' technical programme.

### **Public Private Interface**

At the outset, Chairman, Dr. G Kalloo, highlighted the importance of public private partnership in the development of vegetable sector in the country and invited Dr. Harihar Ram for his view. Dr. Harihar Ram stressed upon the mutual understanding and synergy between public and private for the better development of vegetable sector in the country. He emphasized that National Agricultural Research System has very strong base in the Research and private sector has its strength in marketing and extension while R&D is still in nascent stage and improving slowly in private sector. Thus, a kind of arrangement may be made so that both the sectors may contribute for the development of vegetable production in the country. He was of the view that private sector should have the access of research output of public sector like hybrid either on non-exclusive basis or on royalty basis. Private companies are earning profit from seed sale and they should share their profit with the public research institution that has developed the hybrid/varieties.

Dr. S.U. Baig emphasized the role of private sector in seed production and desired that there should be no differentiation between public and private sector. Requirement of consumer should be taken into account while developing a variety/hybrid and he cited some examples of failed varieties. He sought a meeting of private seed companies and NARS, officials to decide on the modality of research sharing. He highlighted the ICRISAT model of consortium mode on non-exclusive basis rather than royalty system.

Dr. R. Gowri Shankar Rao of Venntura Crop Sciences, Hyderabad, appreciated the role of public sector in vegetable production and advocated the partnership between private and public sector for which mutual trust is must. He was of the view that not only Hybrid but full package of practices should be transferred to the private companies on a long-term basis either on CGIAR model like ICRISAT/IRRI/IARI model whichever is mutually agreed for sharing research benefit with private companies.

Dr. A. A. Deshpande advocated the IIHR, 1997 model and also advocated that ICAR is strong in research and it should come out with a problem that can be financed by private parties like AVRDC& ASPA model.

Dr. J.P. Sharma of Jammu expressed his feeling that private companies are charging very high price for the hybrid which a poor farmer can not afford and hence while forming any agreement of research sharing with private parties price fixation should also be taken into care to safeguard the interest of small and marginal farmers. Dr. SP Singh, Professor, NDU&T, Faizabad also supported the point of Dr. Sharma and requested that farmers' interest must be protected.

Dr. N.C. Gautam Ex Vice-Chancellor of VBSP University, Jaunpur also supported the point and said that there should be complete transparency in any agreement and research benefit should be shared on MoU basis.

Dr. G Kallou, Chairman of the session concluded that public sector has more number of open pollinated varieties and hybrids. The ICAR has supported several projects for the development of OP variety and hybrids which have delivered the results that should be utilized properly to increase production and productivity of vegetables in the country. He informed the house that Dr. S. Mourya ADG (IPR), ICAR, New Delhi has already developed a national MoU for the sharing of research benefit but benefit sharing is most difficult part. MoU should be framed keeping in mind that Hybrid should reach the farmers at affordable price, scientist should get the full credit and private parties should also get profit out of it. ICAR, SAU and Govt. are very much interested that any technologies developed should reach to the farmers and in this venture private companies can play a vital role. Public Private Partnership is a continuous process and we will be able to continue to talk and frame some arrangement for sharing the research and benefit with each other for the benefit of farmers and the country.

At the end, Dr. Mathura Rai, Director, IIVR, Varanasi, emphasized that private sector should continue with vision and mission so that seed should reach to the farmers through private sectors and for achieving the purpose. He suggested that i) system of working together should be developed, ii) sharing of materials based on ICRISAT or IARI or non-exclusive basis, iii) system of profit sharing adopted by IARI or ICRISAT, and iv) IPR issues should be resolved amicably. The session was ended with a vote of thanks to the Chair.