

under Kanpur conditions and 100 ppm of commercial formulation of micronutrients (multiplex) on chilli under Varanasi and Lam conditions is recommended for higher yield of better quality seeds.

6. For best quality okra seed, its harvesting after 35 days of anthesis under Bhubaneswar condition is recommended based on three years data.
7. Retention of first eight fruits per plant in okra is recommended for higher seed yield and quality under Solan conditions whereas retention of 12 fruits per plant is recommended under Bhubaneswar conditions.

## XXV-Workshop

**Venue** : CCS HAU, Hisar  
**Date** : 3<sup>rd</sup> - 6<sup>th</sup> May, 2007

### Collection, Evaluation and Conservation of Germplasm

**Table 1: List of promising germplasm available with different centres (2005-06)**

Crops	Source	Notable/ Promising germplasm
Amaranths	Vellanikkara	<b>Yield (g/plant)</b> -VKA-3 (275.00), Mohini (255.00) VKA-49 (240.00)
Spinach	Jammu	<b>Leaf yield (q/ha)</b> -IC 371724 (426.30), IC 332451 (415.00) and IC 382255 (411.60)
Bottle gourd	Faizabad	<b>Fruit yield (q/ha)</b> -NDBG-625 (251.07), NDBG- ] 29 (237.75)
	Rahuri	<b>Fruit length (below 30 cm)</b> -RHRBG-2 (25.00), RHRBG-4 and RHRBG-12 (27.00), RHRBG-5 and RHRBG-13 (28.00), RHRBG-33 (29.00), RHRBG-6, RHRBG-17, RHRBG-32 and RHRBG-7 (30.00)
Cucumber	IIHR	<b>Fruit yield /plant (kg)</b> -Ace. 299 (2.56), Acc.296 (2.38), Ace. 274 (2.10), Ace. 264 (2.06), Ace. 291 (2.04) Ace. 36 (2.00) <b>No. of fruit/plant</b> -Ace. 384 (14.00), Ace. 386 (10.00)
	Rahuri	<b>Yield per plant (kg)</b> -MLKP-1 (1.44), SNG-1 (1.39) <b>No. of fruits per plant</b> -SNG-2 (10.36) <b>Earliest fruiting lines</b> -SNG-3 (45.48), SNG-4 (48.79), RTNG-1 (49.26)
	Solan	<b>Yield (q/ha)</b> -LC-1 (510.00) LC-4 (373.00) <b>Earliest fruiting lines</b> -LC-6 (48.50) and LC-4 (49.17)
Pointed gourd	Kalyani	<b>Earliest fruiting lines (Days to 1<sup>st</sup> harvest)</b> -BCPG-7 (112), BCPG-12 (115) <b>Fruit yield (q/ha)</b> -BCPG-13 (331.25), BCPG-I (318.75) <b>Fruit number/plant</b> -BCPG-IO (23.20), BCPG-6 (23.00) and BCPG-8 (22.80)\
	Sabour	<b>Yield (q/ha)</b> -Rajendra P-1 (176.55), Rajendra P-2 (158.10) <b>Fruit shape 2000 - 01-Cylindrical</b> - Nimia, 2000 - 01 and Rajendra P-1 <b>Oblong</b> -Rajendra P-2, 94 - 2 (Sultangnaj - 2), Mirdangia, 2002 -02 <b>Oval</b> - 2001 - 01
	Faizabad	<b>Yield (q/ha) and quality</b> -NP-801 (217.00)
Ivy gourd	Vellanikkara	<b>Yield/plant (kg)</b> -CG-23 (12.50, Light green), CG-27 (10.50, Green)
Muskmelon	Durgapura	<b>T.S.S. (%)</b> -Acc.1 and Acc.2 (12.00 brix)
	Ludhiana	<b>Fruit wt - Golden Melon</b> (1250g with average TSS of 8%), <b>Silver Melon-</b> (1100 g with TSS of 6%). <b>Market Collection Udaipur-</b> (400 g with TSS of 4%).
	Rahuri	<b>Yield (q/ha)</b> -Sweet melon yellow (111.11), <b>High TSS-</b> IVMM-3 (12.0 brix)

Crops	Source	Notable/Promising germplasm
Pumpkin	Faizabad	<b>Fruit yield (q/ha)</b> -NDPK-5012 (563.83), NDPK-3033 (441.62) <b>Earliest fruiting lines (Days to 1<sup>st</sup> harvest)</b> -NDPK-5017 (55)
Water melon	Durgapura	<b>Earliest fruiting lines (Days to 1<sup>st</sup> harvest)</b> -Ace. 2,3,4 and 5 (73.00) <b>High TSS (%)</b> -Acc. 5 (10.5) <b>Flesh Colour</b> -Red, Red pink and light red
	Ludhiana	<b>Market Collection 2004-1</b> - Fruit is oblong, dark green striped weighing about 3.0 kg and high TSS AI-2 (9%). <b>Market Collection 2005-1</b> - Fruit is oblong, dark green striped, weighing about 2.5 kg and low TSS (5%) <b>Market Collection 2005-2</b> - Fruit is oblong dark green striped weighing about 5.0 kg and low TSS (6%)
Tomato	Ludhiana	AI-2- fruit weight of 75g. UHF 656- fruit weight 80g
	Jammu	<b>Yield/plant (g)</b> -EC-531803 (528.33), EC-251646 (494.30)
	Solan	<b>Yield (q/ha)</b> ,EC 12%04 (510.00) and EC 114375 (4%.00) <b>Highest TSS (%)</b> ,EC- 5216061 and EC- 114375 (5.00)
	IIVR	<b>Fruit yield per plant (kg)</b> - EC- 416543 (2.80), EC- 416582 (2.8), EC- 416557 (2.4), EC- 538156 (2.3 kg) <b>Number of fruits/plant</b> - EC-859I (308), EC- 440304 (289), EC- 32311 (280), EC- 416548 (272)
Brinjal	Vellanikkara	<b>Resistant to Bacterial wilt</b> -IC 090141, IC 090146, IC 090982, IC 099736, IC 249349, Swetha, Surya, VKBr-2 and Haritha <b>High yielding lines (kg)</b> -IC 90882 (2.78) and IC 249297 (2.474)
Pea	Ludhiana	<b>Resistant to powdery mildew</b> -Kinnaulri
	Solan	<b>High yielding lines (kg)</b> -IC-469155 (72.00) <b>Resistant to powdery mildew</b> -IC-311061, IC-288264, IC60950, IC 342033 and IC-469153
	Palampur	<b>Resistant to powdery mildew and highest selling percentage</b> DPP-3, DPP-25G AND DPP-11\
Onion	NHRDF, Nasik	<b>Better in bulb development</b> -Ace. 687 (Red) <b>TSS (%)</b> -Acc. 355,388,564,628 and 705 (13.0)
	Junagarh	<b>Bulb yield (q/ha)</b> -JWO-0508 (468.1), JWO-0517 (454.8), JWO-0513 (448.1) and JWO-0501(426.7)
Garlic	NHRDF, Nasik	<b>Bulb Development</b> -G-47 and G-71 <b>TSS (%)</b> -G-60 (40.30) G-11 (39.50)
	Junagarh	<b>Yield (q/ha)</b> -JG-0508 (110.56) JG-0506 (107.59) <b>TSS (%)</b> -JG-0517 (42.87), JG-0503 (42.86)

**Table 2: List of promising germplasms available with different centres (2006-07)**

Crops	Source	Notable / Promising germplasm
Amaranths	IIHR	<b>Fruit yield (Kg/plant)</b> -IIHR-60 (19.0), IIHR-68 (16.0), IIHR-66 (15.0)
	HARP, Ranchi Coimbatore	<b>Yield</b> -HAAMTH-12 (5.06 kg/plot of 0.9 m <sup>2</sup> ), HAAMTH-1 (4.56 kg/plot of 0.9 m <sup>2</sup> ) <b>Green colour</b> - A-77 (yield 69 g / plant) and A-99 (56 g/plant) <b>Red colour</b> - A-29 (yield 56g / plant)
Bitter gourd	Jabalpur	<b>Dark Green and spiny</b> -JMC-30 Fruits/ plant (20), Marketable yield/ plant (525 g) <b>Green and spiny</b> -JMC-29 Fruits/ plant (25), Marketable yield/ plant (510 g)
	Vellanikkara	<b>Green and Deep Tubercle</b> (Susceptible to mosaic and powdery mildew)-VKB 176 yield/ plant (2.56k g) Fruit length (23.7 cm) VKB 169-Marketable yield/ plant (1.35k g),Fruit length (13.8cm)
	HARP, Ranchi	<b>Green and Deep Tubercle</b> -HABG-17 <b>Light green, oblong and Deep Tubercle</b> -HABG-16
Bottle gourd	Rahuri	<b>Earliness (Days to first female flower initiation) and Cylindrical fruit shape</b> -RHRBG-17 (54 days), RHRBG-5 (57 days) RHRBG-4 (58 days) <b>Fruit length</b> -RHRBG-2 (25 cm), RHRBG-4 and RHRBG-12 (27 cm)
Cucumber	Solan	<b>Earliness (Days to first picking)</b> -LC-6 (48.50 days), LC-I(49.17 days) <b>Fruit weight (g)</b> -LC-5 (204.83), LC-8 (204.83) <b>Yield (q/ha)</b> -LC-I (510.00), LC-4 (373.00)
	HARP, Ranchi	<b>Yield (q/ha)</b> -HAC-155 and HAC-157 (300.00) <b>Fruit weight (g)</b> -HAC-152 (90.0), HAC-153 (150.0), HAC-154 (200.0) <b>Fruit length (cm)</b> -HAC-152 (9.0), HAC-154 (14.5), HAC-117 (12.0)
Pointed gourd	HARP, Ranchi	<b>Yield (q/ha)</b> -Swama Alaukik (277.00) and Swama Rekha (330.00), HAP-102 (287.00) HAP-5 (286.00) <b>Fruit weight (g)</b> -HAP-102 (47.40), HAP-23 (52.00), HAP-75 (55.80)
Ivy gourd	HARP, Ranchi	<b>Yield/plant (kg)</b> -HAIVG-I (7.86) and HAIVG-2 (7.33) <b>Fruit shape</b> -Spindle - HAIVG-1,Cylindrical- HAIVG-2
	Vellanikkara	<b>Yield / plant (kg)</b> -CG-27 (12.450), CG-84 (12.300), CG- 23-Sulabha (10.500)
Muskmelon	IIHR	<b>Exotic Collection</b> <b>Fruit yield (Kg/pt)</b> -EC-564749 (1.6 Round, salmon), EC-564752 (1.4 Oblong, light yellow) and EC-564758 (1.00 Round with yellow)
Pumpkin	IIHR	<b>Fruit yield (Kg/pt)</b> -IIHR-60 (19.0), IIHR-68 (16.0) ,IIHR-66 (15.0) <b>No. of fruits per plant</b> -IIHR-69 (6.00), IIHR-65 (6.00), IIHR-66 (5.0 ) <b>T.S.S (%)</b> -IIHR-60 (19.50), IIHR-69 (20.00 ) and IIHR-65 (11.0)
Tomato	Solan	<b>Fruit yield (q/ha)</b> -EC-129604 (510.00), EC-114375 (496.00), EC-521076 (441.00)
	Coimbatore	<b>Fruit yield (g/plant)</b> -EC002977 (13729.36), EC362958 (9772.36), EC521038 (9689.36)
Brinjal	NBPGR	Fruit oblong-IC-90I46 (Green bottle), IC-99658, (Green purple) IC-99703 (Light purple greenish), IC-90923 (Light purple), IC-111005 (Bottle green), IC-343008 (Purple green)
	Kalyani	<b>Fruit shape and colour</b> -Oblong- BCB-2, BCB-4, BCB-6, BCB-9, BCB-10, BCB-11, BCB-12, BCB-14, BCB-16 <b>Fruit yield/plant (g)</b> -BCB-11 (880.00), BCB-14 ( 865.00), BCB-2(836.00)
	Bhubaneswar	<b>Green fruited type</b> -IC90113, IC 90126, IC 90141 <b>Tolerant to bacterial wilt</b> -IC 90130
	IIHR	<b>Yield (kg/plant)</b> -IC-249306 (4.03), IC-089847 (3.99), IC-249297 (3.23)
	HARP, Ranchi	<b>Yield (kg/plant)</b> -IC 126903 (10.67), IC 112741 (10.25), IC 144139 (9.52)
	ICAR Res. Complex-Tripura	<b>Yield (kg/plant)</b> -TRB2 ( 34.55) TRB-3 (29.86) <b>Tolerant to bacterial wilt</b> -TRB-I (Infection intensity-5.50%)

Crops	Source	Notable / Promising germplasm
Chillies	SKUAST (K), Srinagar	<b>Red ripe fruit yield/plant (g)</b> -SH-KC-44 (900), SH-KC-31 and SH-KC-43 (800)
	Kalyani	<b>Very early fruiting lines</b> Range-BCC-46 (32 days), BCC-30 (33 days), BCC-31 (33 days) <b>Fruit yield/plant (g)</b> -BCC-41 (241.00), BCC-24 (238.22), BCC-1 (180.26), BCC-23 (148.59), BCC-18 (1480.23)
	Coimbatore	<b>Tolerance to fruit rot disease</b> -CA 20, CA 110, CAPB 4 and CA 82 <b>Yield red ripe fruit plant / (g)</b> -CA 25 (318.06), CA 166 (308.65) and CA 75 (252.98) <b>Number of fruits per plant</b> -ALS-98-9 (143.20), CA 121 (88.60) and CA 141 (87.30)
	Lam	<b>Oleoresin</b> - Range 4.00 to 16.72% (Highest GP 125-16.72%) <b>Capsantbin</b> - Range 0 to 88450 EOA colour value (Highest GP 159-88450 EOA) <b>Capsaicin</b> - Range-0.094 to 0.990%. (Highest GP 186-0.990%)
	IIHR	<b>Yield/ plant (g)</b> - <b>Fresh fruit</b> - Kodali Local 8 (309.00), RAP 24 (285.00) and Kodali Local (244.00)
	HARP, Ranchi	<b>Yield (q/ha)</b> -R-Line (490.64), HC-54 (407.32) and HC-62 (396.21)
Capsicum	SKUAS&T (K)	<b>Fruit yield/ plant (g)</b> -SH-SP-29 (800), SH-SP-20 (725) and SH-SP-23 (720) <b>No. of fruits/ plant</b> -SH-SP-29 (18), SH-SP-23 and SH-SP-17 (17)
	Solan	<b>Yield (q/ha)</b> -EC 580000 (346.00) EC-579994 (294.00)
	Palampur	<b>Three bacterial wilt resistant</b> -PCWR-1, PCWR-2 and PCWR-3 <b>Fruit colour at immature stage</b> -PCWR-1 and PCWR-2 (light green) PCWR-3 (Dark green)
	Katrain	<b>Resistant to Disease P (W)</b> -6A (475.00) and 22A (307.00) <b>High TSS-4A</b> (53%) <b>Number of fruits / plant</b> -7A (10.5) and 6A (9.25)
Paprika	SKUAS&T (K)	<b>Fruit yield/ plant (g)</b> -SH-P-24 (370.00), SH-P-28 (360.00) and SH-P-39 (325.00) <b>No. of fruits/ plant</b> -SH-P-21 (15), SH-P-22 (14) and SH-P-25 (14)
	Katrain	<b>Fruit yield/plant (g)</b> -SP-1 (148.00, Mild pungent), Lt-9 (140.00 Mild pungent)
	IIHR	<b>No. of fruits/ plant</b> -JSR 71-3/9 (27) and JSR 136 (27) <b>Fresh and dry fruit yield/ plant (g)</b> -JSR 71-3/9 (280.00) and (81.2)- Light Yellow, Non pungent
Pea	IIVR	<b>Pod length (cm)</b> -PC-531 (10.24) <b>Number of pod/plant</b> -Vega (38.40)
	Palampur	DPP-KS-6 (better for) No. of pods/plant- 15-20, Shelling percentage- (40.83), Resistant- Powdery mildew
French bean	Rahuri	<b>Days to 50% flowering</b> -RHRFB-28, (36), RHRFB-29 (38) and RHRFB-13 (39) <b>Pod Length (cm)</b> -RHRFB-30 (14.90) and RHRFB-28 (13.80)
	IIVR	<b>No. of pods/plants</b> -IIVRFBP-22 (78.00) and IIVRFBP-7 (68.00) <b>Pod length (cm)</b> -IIVRFBP-5 (13.4, Dark green) and IIVRFBP-8 (13.1 Light green)
Lablab bean	Jabalpur	<b>Pod yield / plant (g)</b> -JDL - 6 (685.00), JDL - 9 (675.00) <b>Pod length (cm)</b> -JDL-1 (18.91)
	Raipur	<b>Resistance to golden yellow virus</b> -IS-1, IS-2, IS-3, IS-4, IS-5, IS-7, IS-8, IS-10, IS-11 <b>Pod length (cm)</b> -IS -15 (13.00) and IS-2 (12.00)
	HARP, Ranchi	<b>Pod yield/ plant (kg)</b> -DB-I02 (1.69), DB-16 (1.61), DB-I03 (1.61) <b>Pod length (cm)</b> -DB-109 (14.82), DB-112 (13.65) <b>No. of pod/plant</b> -DB-16 (198.00) and DB- 111 (178.0)
	Tripura	<b>Yield / plant (Kg)</b> -TRC-D-1 (10.30), TRC-D-9 (10.20) <b>Pod length (cm)</b> -TRC-D-4 (15.57) TRC-D-3 (14.57)
Okra	Dharwad	<b>Yield /plant (kg)</b> -Bhendi 06-8 (4.75), Bhendi 06 -6 (4.75) <b>Fruits/plant</b> -Bhendi 06 -6 (27.08) and KAO-25 (IC90273) (26.66)

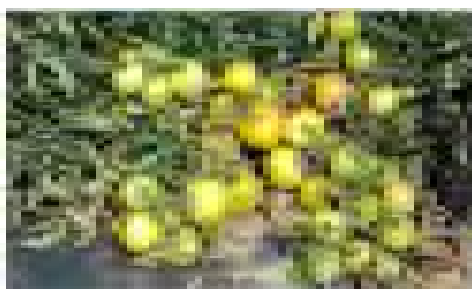
Crops	Source	Notable / Promising germplasm
	Bhubaneswar	<b>Yield/plant (g)</b> -Acc. 63 (122.82), Acc. 66 (115.65) <b>No. of fruits / plant</b> -Acc. 63 (8.9) and Acc. 66 (7.77)
	IIHR	<b>Yield / plant (kg)</b> -IIHR 269 (00.49), IIHR 262 (0.48) <b>Fruit length (cm)</b> -IIHR 256 (18.5 Dark Green), IIHR 258 (17.5 Green)
	NBPGR	<b>Resistance to Yellow mosaic virus</b> -IC 033315, IC 043746, IC 045816, IC 043732, IC 045806, IC 045802, IC 043735, IC 045815, IC 043742, IC 069237, IC 085595, IC 069242
	IIVR	<b>Resistance to Yellow mosaic virus</b> -IIVR-401, 198, AC-108 at IIVR-3, SA-2, EVC-305616, IIVR-332, IIVR-1, IIVR-439, EC-305635, SA-29, IIVR-49
Onion	NRC (O & G)	<b>White onion-Marketable Yield (q/ha)</b> W-421 (208), W-448 (233), W-056 (182.00), W-009 (156.00) W-024 (156.00)
Garlic	NRC (O & G)	<b>Yield (q/ha)</b> -NBG-58 (64.00), NBG-11 (64.00), NBG-17 (59.00) <b>Weight of 50 cloves</b> -DGR-63, NBG-77, NBG-17, DGR-78 and NBG-3 (56.0 to 61.5 gm)
Carrot (Tropical)	Hisar	<b>Red Carrot- Root weight (g)</b> -HC-160 (145.00), HC-6 (145.00) <b>Purple carrot-Root weight (g)</b> -HCP-183 (140.00) HCP-1 (140.00), HCP-470 (130.00) <b>Yellow carrot-Root weight (g)</b> -HCY-235 (97.9) HCY-183 (90.00) <b>Black carrot- Root weight (g)</b> -HCB-1 (130.0) HCB-22-1 (99.90) <b>Orange carrot-Root weight (g) - HCO-4 (100.90)and HCW-298 (100.00)</b>
	IIVR	<b>Root length (cm)</b> -IIVR-C-12 (21.80) and IIVR-C-15 (22.50) <b>Root weight (g)</b> -IIVR-C-12 and IIVR-C-20
Carrot (Temperate)	SKUAS&T (K)	<b>Root yield (q/ha)</b> -SH-C-22 (294.81), SH-C-39(283.73), SH-C-135 (274.85), SH-C-18 (270.42) and SH-C-5 (257.56) <b>Root length (cm)</b> -SH-C-131 (16.63) and SH-C-137 (16.06)
	Katrain	<b>Root yield/plot of 2.7 m<sup>2</sup> (kg)</b> -Shinkuroda (7.500) and Acc 306 (7.000) <b>Root length (cm)</b> -Sumarai Hindustan (20.00) <b>Girth of root (cm)</b> -Chamman and Jony (13.1 cm)
Cauliflower (Early)	Sabour	<b>Weight of curd (g)</b> -Acc. 2002-1 (445.00 Creamy white curd) and Acc. 95-3 (440.00 Creamy white curd)
	IIVR (Kuwari group and Katakai group)	<b>Early and heat tolerant lines with yield</b> -Kuwari 23/42 (475 g), JBT-23/57 (400 g), Kuwari 8 (430g), Early Kuwari Chandradev (410 g)
Cauliflower (Mid)	Sabour	<b>Weight of curd (g)</b> -Acc. 96-5M (530.00 White curd),Acc. 94-2M (525.00 White),Acc. 96-3M (520.00 Creamy white) <b>Curd size (cm)</b> -94-2M, 96-3M, 96-5M, 97-1M and 98-3M
	IIVR (Agahani group, Pusi and Maghi group)	<b>Marketable curd weight (g)</b> -Agahani Awasthi Seed (1100 g), followed by Agahani Prem Seed (900 g), Agahani Prayas Seed (880 g), Agahani 23/74 (920g) and Agahani Small Seed (800 g) <b>Curd size (cm)</b> -Late Agahani Awasthi seed (19.00 x 18.00), Agahani Prem Seed (16.5 x 15.00)
Cauliflower (Late)	Katrain	<b>Marketable curd weight (g)</b> -KT-9 (900.00), KT-9 (900.00) KT-2 (800.00 Compact)
	Solan	<b>Yield (Q/ha)</b> -Poonam (329.00), Champion (372) <b>Net curd weight (g)</b> -Poonam (658.30), Champion (543.00) <b>Earliness</b> - White Impress (543.3)and EC-240613 (1.33)
Cabbage	Katrain	<b>Net head weight (kg)</b> -EC-490186 (1.50) EC-490192 (1.43), EC-240613 (1.43) <b>Early head maturity</b> -EC-490199 (81.00), EC-490192 (82.00), EC-490186 (95.00)
	Solan	<b>Yield (Q/ha)</b> -Golden Are Sel Baseball (332.00), Express (302.00) <b>Net head weight (Kg)</b> -Kelpie (0.41), Utility cabbage (0.43) <b>Days to marketable maturity</b> -81.74 days (Express) to First of June (105.98)

Crops	Source	Notable / Promising germplasm
Cowpea	IIVR	<b>Yield (Q/ha)</b> -IC-58905 (228.33 Dark Green), IC-202790 (223.00 Dark Green), IC-390287 (217.9 Light green)
	Raipur	<b>Pole Type</b> -ICP-1, ICP-3, ICP-4, ICP-6 <b>Bush Type</b> -ICP-5, ICP-13, ICP-15 and ICP-18 <b>Semi pole Type</b> -ICP-2, ICP-10, ICP-12 <b>Pod length (cm)</b> -ICP-1 (33.30), ICP-17 and ICP-19 (31.30)
	IIHR	<b>Anthracnose &amp; Rust Free</b> (i) Bushy genotypes (Vegetable type) - IC 202797 (ii) Pole type genotypes (Vegetable type) - IC 202789, IC 202790, EC 367718 <b>Anthracnose Free bushy genotypes</b> -IC 91458, IC 201075, IC 201097 <b>Pod Yield/plant (g)</b> -IC 202789 (197.5), IC 202790 (185.5)
	NBPGR	<b>Green pod yield/plant (g)</b> -IC-390257 (73.15), IC-390261 (65.09), IC-202762 (1622.50) IC-390257 and (1465.00)
<i>Momordica dioica</i>	Bhubaneswar	<b>Av. Yield / plant (g)</b> -BSG-3 (710.00), BSG-1 (635.00) <b>Early maturing genotypes</b> -BSG-4 (70 days), BSG-3 and BSG-5 (74 days)

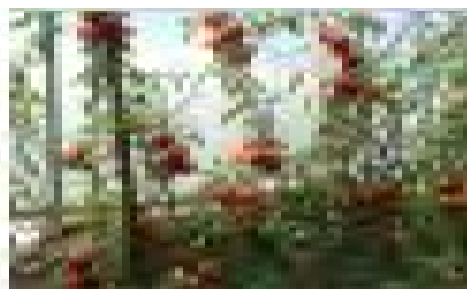
## Vegetable Agronomy

### Protected cultivation

- Under polyhouse production of capsicum hybrid Indra, based on highest yield (9.64 kg/m<sup>2</sup>) and cost: benefit ratio (1:6.56); spacing of 60 x 30 cm without training is recommended under naturally ventilated polyhouse under terai conditions of Pantnagar.
- In naturally ventilated polyhouse, maximum yield (1399.64 q/ha) along with highest C:B ratio 1:3.92 in hybrid tomato cv. Tolstoy was obtained with double stem training at 50 x 20 cm spacing. Hence it is recommended for Varanasi conditions.



A good tomato crop in polyhouse



Staking of tomato in polyhouse

- In naturally ventilated polyhouse, the maximum C:B ratio 1:2.27 along with higher yield 451.55 q/ha was recorded in capsicum hybrid Indra with the treatment combination of 60 x 30 cm plant spacing without pruning. Hence, it is recommended for Varanasi conditions.

### Weed Control

- For weed management in onion, application of oxyfluorfen @ 0.15 kg a./ha as PE resulted in highest yield (11.26 t/ha) and C:B ratio (1:3.40). Hence, it is recommended for Coimbatore conditions.

### Use of Biofertilizer

- Root dipping of tomato seedlings with Azotobactor along with 75% N + 100% PK recorded highest fruit yield (635.38 q/ha) and C:B ratio (1:3:26). Hence it is recommended for Srinagar conditions.

6. Under Coimbatore conditions, seedling root dip with the *Azospirillum* in addition to 75% N + 100% PK recommended resulted in highest yield 427.2 q/ha along with the maximum C:B ratio of 1:4:11 in tomato. Hence, it is recommended for Coimbatore conditions.

## Integrated Nutrient Management

### Tomato

7. At Hisar, the maximum mean yield (432.3 q/ha) and C: B ratio (1:2.66) were obtained in tomato on application of recommended NPK + FYM @ 10 t/ha + S @25 kg/ha + Mixture of all micronutrients (Zn, B, Mo, Fe, Cu, Mn) + *Azotobactor*. Hence, it is recommended for Hisar conditions of Haryana. The same treatment also recorded the highest yield (336.20 q/ha) along with the maximum C: B ratio of 1:2.63. Hence, it is recommended for Kalyanpur conditions.
8. At Faizabad, the highest mean yield (368.35 q/ha) along with highest, C.B. ratio 1:3.02 was recorded in tomato var. Narendra Tomato-6 with the application of NPK @ 120:60:60 kg / ha + FYM 10 t/ha + Sulphur 25 kg/ha + *Azotobactor* + MM (mixture of all micronutrients, Zn, B, Mo,Fe, Cu, & Mn). Hence, it is recommended for Faizabad conditions.

### Garden pea

9. At Bhubaneswar, the integrated application of poultry manure @ 2.5 t/ha + half recommended NPK (25:37.5:25 kg/ha) resulted in 44.16 quintal per hectare pod yield and C:B ratio of 1:1.49. Hence, it is recommended for Bhubaneswar conditions of Orissa.

### Cucumber

10. At Kalyanpur, the maximum mean yield (223.18 q/ha) along with the highest C: B ratio 1:3.68 was recorded in cucumber with the application of half recommended NPK + FYM @ 10t/ha + biofertilizer. Hence, it is recommended for Kanpur conditions of U.P.
11. At Hyderabad, the maximum yield of fruit (111 q/ha) and C:B ratio (1:2.10) were obtained in cucumber cv. Poinsette with the application of FYM @ 10 t/ha + biofertilizers in addition to recommended dose of NPK (100:50:50 kg/ha). Hence, it is recommended for Hyderabad conditions.

### Broccoli

12. At Srinagar, application of vermi compost @ 5t/ha recorded the maximum C:B ratio 1:4.7 with higher mean yield of 156.61 q/ha in broccoli. Hence, it is recommended for Srinagar conditions of J&K.

### Water Soluble fertilizer

13. At Coimbatore, the highest mean fruit yield 712.50 q/ha and the maximum C: B ratio 1: 4.78 were recorded in hybrid tomato with five foliar sprays of NPK (19:19:19). Hence, it is recommended for Coimbatore conditions of Tamil Nadu.

### Studies on micronutrient:

#### Bitter gourd

14. At Kalyanpur, the maximum mean yield (161.25 q/ha) of bitter gourd cv. Summer Green and highest C: B ratio 1:2.13 were recorded with the foliar application of mixture of micronutrients (Zn, B, Mo, Cu, Fe, Mn). Hence, it is recommended for Kalyanpur (Kanpur) conditions.

## Cauliflower

15. At Bhubaneswar, the higher mean yield of cauliflower (166.6 q/ha) along with maximum C:B ratio 1:4.09 were obtained with the foliar sprays of boron @ 100 ppm in addition to recommended NPK. Hence, it is recommended for Bhubaneswar conditions of Orissa.
16. At Kalyanpur, the higher curd yield of cauliflower (317.09 q/ha) along with the maximum C: B ratio 1:3.17 were recorded with the soil application of borax @ 10 kg/ha + Ammonium Molybdate @ 2.0 kg/ha. Hence, it is recommended for Kanpur conditions.

## Cabbage

17. The highest mean yield (400.7 q/ha) along with the maximum C:B ratio (1:2.92) were obtained in cabbage hybrid cv. Meenakshi with the application of Ferrous sulphate @ 100 ppm in addition to recommended dose of NPK (180:60:60 kg/ha). Hence, it is recommended for Hyderabad conditions.

## Heterosis Breeding (Hybrid Trials)

- After thoroughly examining the yield data of the year 2004-05, 2005-06 and 2006-07 under various trials, the following five F<sub>1</sub> hybrids in different crops have been identified for recommendation and release during the year 2006-07.

**Table 3: List of the hybrids identified**

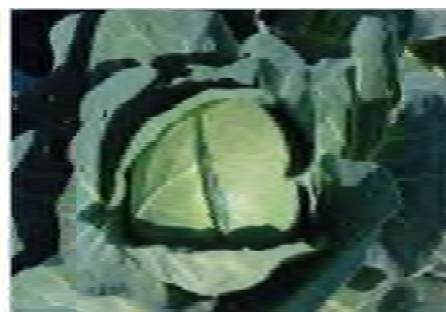
Crops	F <sub>1</sub> hybrids	Source	Recommended zones
Brinjal (Long)	Navina	VNR Seeds	IV
Brinjal (Round)	HABH-17	HARP, Ranchi	IV
Cabbage	Green Emperor	Tokita Seeds	I
Okra	SOH-1016	Syngenta	IV,VII
	NBH-180	Nuzi Vedu Seeds	VII



Navina



HABH-17(Swarn Neelima)



Green Emperor



SOH-1016



NBH-180



## Physiology, Biochemistry and Processing

### Physiology

Under Plant Physiology Section, there were two trials to be conducted at IIHR, Bangalore. The center conducted the trials as per the approved technical programme for 2006-07.

- The first trial on morpho-physiological response of capsicum in different seasons showed that higher rate of photosynthesis and higher accumulation of total biomass was observed in cv. Indra during Kharif planting. Higher harvest index and maximum per plant yield was also observed in cv. Indira. During summer season, cv. Arka Gaurav had the maximum photosynthetic rate and stomatal conductance during the flowering and the fruiting stage.
- In the second trial, the effect of Cycocel on drought tolerance in tomato was studied. It was observed that after three weeks of water stress during the vegetative stage, photosynthetic rate was highest in cv. Arka Saurabh sprayed with 1000 ppm CCC. Stomatal conductance and transpiration rate was also higher in 1000 ppm sprayed plants. During the reproductive phase, higher stomatal conductance and photosynthetic rate was observed in Arka Saurabh sprayed with 1000 ppm CCA. Osmotic adjustment was higher in plants sprayed with 1000 ppm CCC.

### Biochemistry

There were three trials allotted to IIVR, Varanasi & PAU, Ludhiana and one trial each to NHRDF, Nasik and NRC O&G, Pune. IIVR, Varanasi and PAU, Ludhiana conducted all the three trials and presented the results.

- At IIVR Varanasi, 40 genotypes of tomato were analyzed for TSS, acidity, pH, Vitamin C, carotenoids and lycopene content. TSS ranged between 3.06-6.13°Brix, pH of the juice ranged from 3.76 to 4.93 and acidity expressed in terms of % anhydrous citric acid ranged from 0.202 to 0.71 %. Maximum acidity was recorded in DVRT-1. The vitamin C content ranged from 16.03 to 47.56 mg/100g. Maximum vitamin C was recorded in NDTVR-1. Total carotenoids ranged between 1.00-9.47 mg/100g. Lycopene, an important antioxidant was also estimated in the tomato fruits at edible maturity stage, which ranged from 0.102 to 6.60 mg/100g. Maximum lycopene was recorded in F-7028.
- Forty five collections of *Dolichos* bean were analyzed for dry matter, vitamin C and total carotenoids. The ascorbic acid content ranged between 3.75-12.5 mg/100g. Maximum vitamin C was recorded in line IIVR Sem-18. Total carotenoids ranged between 0.317-5.39 mg/100g. Maximum carotenoid content was recorded in IIVR Sem-809.
- The anti-nutritional factors viz., nitrate and nitrite content were estimated in some of the fresh samples of leafy vegetables and cole crops. Wide variation in the nitrate content was recorded amongst the different vegetables, whereas comparatively there was less variation for the nitrite content. The nitrate content varied from 177.5 to 1085.7 mg/kg fresh weight. Maximum nitrate content was recorded in lettuce and Palak, whereas minimum nitrate content was recorded in broccoli cv. Solan Green. The nitrite content varied from 0.38 to 1.68 mg/kg fresh weight.
- Seventeen lines of chilli were analyzed for their quality characters. Wide variation in the chilli genotypes were recorded for ascorbic acid content, which varied from 16.60 to 149.40 mg/100g. In the red ripe chilli, the capsaicin content varied from 0.10 to 0.67%. The maximum capsaicin content was recorded in EC-345639. The colour values ranged from 69.70 to 361.01 ASTA. The maximum colouring matter was recorded in genotype 9852-190. The Oleoresin content, which is an important constituent for industry purposes was also estimated, which ranged from 9.40 to 17.4%. Maximum oleoresin content was recorded in IR-8 and minimum in DC-5.

- At PAU Ludhiana, 54 genotypes of tomato were analyzed. Dry matter was in the range 3.8-6.00. TSS varied from 3.0(Arth-1623) to 5.5° Brix ( Sel KK3-3-2). Acidity and vitamin C showed ranges 0.29-0.62 mg/100 ml and 10.01-38.07 mg/100 ml. respectively. The best genotypes with respect to ascorbic acid were Annapurna and T<sub>0</sub>1458 followed by TH-1. Lycopene and carotenoids were found to vary between 0.98-4.70 mg/100g and 2.13-11.99 mg/100 g respectively; the best genotype for lycopene was NTH-449, whereas highest carotenoids were recorded in T<sub>0</sub>1458.
- Fifteen genotypes of capsicum were analyzed for dry matter, chlorophyll, capsaicin and ascorbic acid content. Dry matter varied between 3.29-8.12 % while capsaicin content was in the range of 0.18-0.33%. The ascorbic acid ranged between 88.2-155.2 mg/100g respectively.
- Oxalate content was analyzed in 57 genotypes of tomato and was recorded in the range 4.10 -14.87 mg/100g. Some genotypes identified for low oxalate content are 603, TH-1 and Arth-1001.
- Thirty-two genotypes of green chilli were analyzed. Dry matter content was in the range 8.92-24.92%, being maximum in BCH-38. Ascorbic acid varied from 80.5 to 150.4 mg/100 g and was found maximum in CH-4. The capsaicin content of green chilli was in the range 0.11-0.29 %, being maximum in H-41.
- Twenty-one genotypes of red chilli were analyzed for the quality parameters. Dry matter was in the range 20.18-33.77 %, being maximum in Selection-14. Coloring matter in red chilli powder was in the range 88.8-260.4 ASTA units and was maximum in Selection-1. Capsaicin ranged between 0.43- 0.70 %. A number of genotypes having high capsaicin content (Sel-1, Sel-36, Selection-28.) were identified. The oleoresin yield in dry powder was in the range 8.74-21.87 %. Some promising lines with respect to oleoresin yield are Selection-41(21.87 %.), Selection-36(21.32 %.) and Selection-1(21.41 %). Based upon overall performance with respect to quality, Selection-1 and Selection-21 hold good promise as they have high color, high capsaicin and high oleoresin yield.

## Varietal Trials

Yield data for the year 2004-05, 2005-06 and 2006-07 was thoroughly scrutinized by the committee and the following 9 entries of 8 crops were identified for recommendation and release.

**Table 4: List of the vegetable varieties identified**

Crops	Entries	Source	Recommended zones
Brinjal	PB-66	GBPUA&T, Pantnagar	VII, IV
Chilli	LCA-353	RARS, Lam	V, VIII, IV
	BC-25	OUA&T, Bhubaneshwar	VI, VII, V
Sponge gourd	PSG-40	GBPUA&T, Pantnagar	VII, I
Ash gourd	Pusa Ujwal	IARI, New Delhi	VIII
Pea (early)	VP-101	VPKAS, Almora	IV, I
Pea (mid)	PC-531	PAU, Ludhiana	VI, VII, I
Cowpea	IIVR CP-4	IIVR, Varanasi	IV, V, VII
Onion	B-780-5-2-2	NRC (O&G), Pune	VI



PB-66



LCA-353

HABL-1  
(Swarna Abhilamb)PSG-40  
(Pant Chikni Torai-1)

Pusa Ujjawal



VP-101 (Vivek Matar-10)



PC-531 (Punjab-89)



IIVRCP-4 (Kashi Kanchan)



B-780-5-2

## Insect Pest Management

- At Ludhiana, application of FYM @ 10 t/ha and azotobacter @ 1.25 kg/ha followed by need based NSKE (4%) spray at 10 days interval is recommended for the management of pest complex on brinjal with highest C:B ratio
- At Rahuri, application of NPK @ 100:50:50 along with 4 sprays NSKE (4%) was best in managing brinjal shoot and fruit borer with maximum C:B ratio (1 :4) followed by application of FYM 10 t/ha + Azospirillum @ 1.25 kg/ha along with 4 sprays of NSKE (4%) are recommended for BSFB management with the C:B ratio of 1:1.8.
- For effective and economical management of leaf miner in cucumber, erection of yellow sticky trap @ 1/hill, clipping of lower 2-3 infested leaves followed by application of neem soap @ 109/lit or NSKE (4%) at cotyledonary leaf stage and two foliar sprays of deltamethrin (0.005%) along with jaggery (2%) at 50% flowering stage is recommended under Anand and Rahuri condition with maximum C:B ratio.

## Disease Management

### Survey and surveillance

1. Based on 3 years pooled data it has been concluded that average incidence of grey leaf spot (*Stemphyllium solani*) and early blight (*Alternaria solani*) in tomato was 66 and 39.7% respectively during November to February; in brinjal Phomopsis blight (*Phomopsis vexans*) accounted for 36%; with the incidence of 37.4% in powdery mildew (*Erysiphe polygonii*) in pea. *Alternaria brassicae* and *A. brassicicola* with predominance in cauliflower were severe and recommended to take control measures in the region.

### Brinjal Phomopsis

2. In tomato, *Alternaria* blight (*A. solani*) and buckeye rot (*Phytophthora parasitica*) were graded serious having varied incidence of 28-39.4% and 21.6-29.2%. Fruit rot of capsicum (*Phytophthora capsici*) was predominantly serious over the years at Solan valley with 18.9-23.4% incidence. Suitable recommendations should be adopted in the region.



Brinjal Phomopsis blight

### Integrated Disease Management

1. Green manuring along with *Trichoderma viride* @ 5 kg/ha alone or in combination with neem cake @ 10 q/ha has been found effective in minimizing tomato diseases viz. *Rhizoctonia solani*, *Sclerotium rolfsii*, *Pythium* and *Phytophthora* spp. upto 50%. The treatment combination of green manuring + neem cake + bioagent was adjudged best in reducing *Rhizoctonia*/*Fusarium* root rot/wilt incidence thereby increasing the pea yield considerably and is recommended for Varanasi region.
2. Green manuring + neem cake @ 10 q/ha + antagonists (*Trichoderma viride*) 6 kg/ha recorded the minimum *Fusarium* wilt incidence and increased yield in chilli and okra. The highest C:B ratio 1.03 in chilli and 3.03 in okra was obtained in the treatment. This treatment combination is recommended for effective control of *Fusarium* wilt in chilli and okra in Rahuri conditions.
3. For the management of collar rot in cowpea in Vellanikkara region and tomato wilt in Junagadh region, application of green manuring (Sunhemp) and antagonists either with neem cake or without neem cake is recommended as the best treatment combination.
4. Green manuring (*Sesbania aculeata*) alone was found to be the most cost effective (C:B 1:6) in limiting the bean root rot and okra at Solan and Hessaraghatta, respectively apart from increasing yield.
5. Green manure + neem cake + *Trichoderma viride* lowered the wilt incidence and increased the yield in chilli at Hyderabad and seed treatment of pea gave excellent result against pea diseases at Kanpur.

### Epidemiology

6. It was found that the incidence of buckeye rot of tomato in Solan region was positively correlated with rainfall and humidity. The multiple regression analysis revealed the significant effect of temp., rainfall and humidity.
7. It has been observed that the downy mildew in bitter melon at Vellanikkara was positively correlated with RH, rainfall and no. of rainy days. The linear function so obtained is recommended for disease prediction.

## Seed Pathology

1. Seed treatment with *T. viride* @ 5 g/kg was found effective to control seed borne fungi and increasing seed germination (91.3 %) in tomato as compared to control (54.3%) at Rahuri.
2. The increased germination (90.8%) and suppression of mycoflora over control was recorded in carbendazim (0.25%) at Parbhani.

## Seed Production

- It is recommended that Brinjal fruits under Karnataka conditions and Okra fruits under Haryana conditions should be harvested at 54-57 days after anthesis to obtain good quality seeds.
- Seed production of okra in Kharif season is recommended for higher yield of good quality seeds in Maharashtra, U.P. & Punjab.
- Based on three years study at Katrain using pollinators *Apis mellifera* and *Apis cerana indica*, Carrot pollination in open conditions is recommended for higher seed yield compared to pollination by honey bees in cages.
- Based on two years' study at IIHR, Bangalore on tomato hybrid Arka Abhijit, retention of 2 or 3 flowers/truss, emasculation and simultaneous pollination on the day or a day before the anther dehiscence and a 4:1 female and male flower ratio is recommended for good fruit set whereas staggered sowing of male parent at one week before and one week after female parent, in addition to sowing of both the parental lines at the same time, is recommended for better availability of pollen grain. Similarly, in capsicum hybrid Pusa Deepti, a female : male ratio of 20:1, retaining 6 fruits/plant and emasculation a day before anthesis followed by pollination in the forenoon next day is recommended for higher yield of good quality seed, based on trials at Katrain.
- The brinjal seed treatment with *Trichoderma* (5g/kg seed) is recommended to have maximum seed yield, germination percentage and diseases free seed under Maharashtra & M.P. conditions. Similarly, in okra, seed treatment with *Trichoderma* (5g/kg seed) is recommended for M.P., whereas seed treatment with imidacloprid (2.5g/kg seed) is recommended for Karnataka conditions.
- Foliar application of a mixture of micronutrients (i.e. 100 ppm each of zinc sulphate, manganese sulphate, copper sulphate, ferrous sulphate, boric acid and 50 ppm ammonium molybdate) is recommended for higher seed yield of Brinjal and Okra in Maharashtra and Chilli in Karnataka whereas foliar application of water soluble fertilizer 19:19:19 at 0.5% concentration is recommended for higher seed yield of Cabbage in Himachal Pradesh.
- Treatment of seeds with 0.5% citric acid for 45 minutes is recommended for improved seed germination and reduced percentage of hard seeds in Okra whereas seed treatment with black pepper (5%) is recommended for effective control of *Callosobruchus chinensis* in garden pea and *Callosobruchus maculatus* in French bean, based on trials at Solan. Similarly, brinjal seed treatment with hot water (50°C for 30 min.) and Sodium hypochlorite (0.5% for 30 min.) is recommended for significantly improved seed germination, based on trials at Ludhiana.
- Retention of first 10-12 fruits per plant in okra is recommended for higher yield of good quality seed under Srinagar and Chhatisgarh conditions.
- Two sprays of 150 ppm NAA at 30 and 50 days after sowing of okra are recommended for higher yield of good quality seed in Himachal Pradesh.

## National Seed Project Review

**Table 5: List of the breeder seed price of vegetables**

S.No.	Vegetable	Rate (Rs./kg)	S.No.	Vegetable	Rate (Rs./kg)
1.	Palak	90	17.	Radish	250
2.	Methi	100	18.	Carrot	350
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	400
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	600	31.	Amaranthus	200
16.	Knol Khol	400			

- The excess/less in targeted production may be indicated in percentage to make it more comprehensible.
- The basic seed may be procured from NBPGR where the centres could not undertake the production due to non availability of nucleus seed.
- Monitoring of conversion/multiplication of breeder seed down to foundation & certified seeds need to be done and a suitable mechanism for it need to be evolved.
- If a centre is unable to produce the entire indented quantity, part of it may be got produced at some other centre taking the nucleus seed from the originating centre.
- Rigorous rouging should be attended since there are no standards for breeder seed and maintaining its quality is of utmost importance.
- The old and obsolete varieties should be replaced by the new improved ones. For this, the Directors of State Departments of Horticulture / Agriculture may be informed about the new varieties and may be asked to give the indents of latest varieties.
- The breeder seed prices of late cauliflower may be revised from existing Rs. 2000/- per kg to Rs.2500/- per kg and of garden pea from existing Rs.80/- per kg to Rs.90/- per kg.

## Resistant Varietal trials

The committee recommended the following varieties identified for release.

**Table 6: List of the resistant variety identified**

Crop	Name of entry	Source centre	Recommended zones
Okra	JNDOL-03-1	Junagarh	VII and VIII

## Public Private Interface

Dr H. P. Singh DDG (Horticulture) Chairman of the session in his opening remarks said that the demand of the vegetable under changing food pattern has increased. He emphasized on safe cultivation