Plant Genetic Resources Management of Horticultural Crops in Eastern India

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The eastern part of India is endowed with rich gene pool of major horticultural crops. Plant genetic resources activities were carried out by Horticultural and Agro-Forestry Research Programme (HARP), Ranchi. Consequenty, a total of 2001 germplasm including fruits (569), vegetables (1125) and ornamental plants (207) have been augmented, characterised, evaluated and judiciously utilised in the breeding programmes to develop varieties of different crops. As a result, Swarna Roopa in litchi; Swarna Shree, Swarna Mani, Swarna Shyamali and Swarna Pratibha in brinjal; Swarna Poorna, Swarna Ageti and Swarna Sheetal in cucumber, Swarna Rekha and Swarna Alaukik in parwal; Swarna manjari and Swarna Uphar in ridge gourd; Swarna Lata in French bean (pole type); Swarna Priya in French bean (bush type) and Swarna Lalima (determinate) and Swarna Naveen (indeterminate) in tomato have been released by Central/Institute Veriety Release Committee. A total of 18 lines in different vegetable crops including brinjal (6), tomato (5), sponge gourd (2), dolichos bean (3), garden pea (1) and vegetable cowpea (1) have been developed and are being tested under AICVIP at various locations spread over the country. In addition, elite lines in litchi (CHES-2) and jackfruit (CHES-1 & CHES-2) have also been developed and are in the pipeline for release.

Key words : Brinjal, Cucumber, Dolichos Bean, Garden Pea, Germplasm, Parwal, PGR, Ridge Gourd, Sponge Gourd, Tomato, Varietal Improvement, Vegetable Cowpea

Plant genetic resources are the basic raw materials required for developing new varieties in crop improvement programmes. The eastern region of India is endowed with most ideal climatic condition and vast geographical area for cultivation of a number of horticultural crops. The sexual method of propagation have resulted in generation of rich genetic variability in horticultural crops which need to be conserved and utilised in crop improvement programmes. Several factors such as population pressure, deforestation, changing cropping pattern and introduction of new varieties/hybrids contribute for considerable amount of genetic erosion in this region. Hence, collection, characterisation, evaluation, documentation, conservation and judicious utilisation of plant genetic resources of horticultural crops in crop improvement have attracted the attention of scientists and policy makers at national and international level. In this regard, the Horticulture and Agro-Forestry Research Programme (HARP), Ranchi is entrusted with the responsibility of management of plant genetic resources of horticultural crops in eastern India.

Materials and Methods

Efforts were made for augmentation of germplasm of fruits, vegetables and ornamental crops through exploration in different parts of the country and collection from Agricultrual Institutions/Universities and introduction from exotic sources through National Bureau of Plant Genetic Resources. Consequently, a total of 2001 germplasm inlcuding mango (248), guava (48), aonla (10), sapota (12), custard apple (25), bael (10), lime (2), lemon(1), litchi (51), pomegranate (8), jackfruit (111), peach (5), pear (1), tamarind (30) and jamun (7) in fruits; brinjal (280), French bean bush type (150), French bean pole type (131), tomato (202), peas (175), dolichos bean (30), vegetable soybean (12), winged bean (9), pointed gourd (65), sponge gourd (30), cucumber (80), ridge gourd (35), cowpea (20), lima bean (1), velvet bean (1), pumpkin (2), sword bean (1) and bitter gourd (1) in vegetables; rose (150), chrysanthemum (12), gladiolus (15), Hibiscus (6), croton (8), bougainvillea (8) and dahlia (8) in ornamental plants were augmented. These germplasm lines were characterised, evaluated for a set of descriptors developed by this Station for each crop. Promising lines for various traits in different horticultural crops were identified for direct utilisation and use in breeding programme. Systematic breeding was also undertaken to develop suitable varieties resistant to biotic stresses and having quality traits. This has resulted in development of 16 varieties in different fruit and vegetable crops which have already been released by Central Variety Release Committee/Institute Variety Release Committee and have been discussed in the text. Additionally, a total of 18 lines have also been developed in vegetables and 3 in fruit crops which are being tested at different locations spread all over the country. Among these, a number of lines have been

Table 1. Important horticultural crops developed at HARP, Ranchi

Crop	Botanical name	Name of Variety	Pedigree	Important Characters	Yield Potential	Area and Period Recommended for Cultivation
Litchi	*Litchi chinensis*	Swarna Roopa	Developed through clonal selection from seedling population	High yielder, fruits borne in cluster (25-30), cracking resistant, mid season maturing (May end) with attrative deep pink skin colour having high TSS (19°B), sugar (12.5 g/100 g), edible portion (75%) and less acidity (0.39%).	70-80 kg/tree	Released by Institute Varietal Release Committee during 1995 and recommended for all the litchi growing states namely Bihar, Jharkhand, Uttaranchal, West Bengal, etc.
		Elite line CHES-2	Developed through clonal selection from seedling population	Regular bearer; fruits borne at the periphery as well as inside the canopy, crimson red in colour with high TSS (25° brix) and low acidity (0.37%) having high pulp (aril) content (75%).	70-80 kg/tree	Suitable for cultivation in Jharkhand, Bihar and other litchi growing states.
Jackfruit	*Artocarpus heterophyllus*	Elite line CHES-1	Developed through clonal selection from seedling population	A table purpose variety; fruits oblong, weighing 15-20 kg, with high percentage of flakes and small seed, high TSS and low acidity.	700-750 kg/tree	Suitable for cultivation in Jharkhand, eastern Uttar Pradesh, Bihar, Orissa, West Bengal and North eastern states.
		Elite line CHES-2	Developed through clonal selection from seedling population	A vegetable type; fruits round, weighing about 4-5 kg, with dark green surface colour; flakes-compactly arranged, less fibrous containing small seeds with very high thin seed coat having very good cooking quality.	300-400 kg/tree	Suitable for cultivation in Jharkhand, Bihar, eastern Uttar Pradesh, West Bengal and parts of North eastern states
Brinjal	*Solanum melongena*	Swarna Shree	Developed through pure line selection from local land races of Ranchi district.	Fruits cream coloured, round, soft and highly suitable for 'Bharta' preparation; moderately resistant to bacterial wilt; foliage light green in colour.	550-600 q/ha	Released by Insitute Variety Release Committee during 1995 and recommended for the growers of Jharkhand, Bihar (Maurya, 1999), Orissa, Uttar Pradesh, Andhra Pradesh, Madhya Pradesh, Harayana, Delhi, Punjab, Gujarat, Maharashtra, Kerala and Karnataka.
		Swarna Mani	Developed by crossing elite germplasm lines CH-26 and CH-82 followed by pedigree selection and back cross method of breeding.	Fruits round and attrative, shiny purple in colour; moderately resistant to bacterial wilt.	600-650 q/ha	Identified for release by AICVIP Workshop during 1999 and recommended for cultivation in Jharkhand, Bihar, Uttar Pradesh, Uttaranchal and Punjab (Anon., 2000).
		Swarna Shyamli	Developed through pure line selection from the local germplasm of Irba village of Ranchi district.	Resistant to bacterial wilt; fruits medium sized (250 g), less seeded, round; the cooked flesh very sweet in taste.	500 q/ ha	Released by the Institute Variety Release Committee during 2001 and recommended for cultivation round the year in Jharkhand, Bihar and adjoining areas where bacterial wilt is a serious problem in brinjal cultivation.
		Swarna Pratibha	Developed through pure line selection from the local germplasm line collected from Simdega area of Jharkhand.	Resistant to bacterial wilt; fruits long, (average weight 200 g), shiny purple in colour, having good cooking quality.	500 q/ ha	Released by the Institute Variety Release Committee during 2001 and recommended for cultivation round the year in Jharkhand, Bihar and adjoining areas where bacterial wilt is a serious problem in brinjal cultivation.

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Crop	Botanical name	Name of Variety	Pedigree	Important Characters	Yield Potential	Area and Period Recommended for Cultivation
		Elite line CHGR-1	Developed through hybridisation and back crossing utilising the germplasm lines CH-249 (bacterial wilt resistant) and Arka Sirish (susceptible).	Fruits round, green with non spiny calyx.	450-500 q/ha	Suitable for cultivation round the year in Jharkhand, Bihar and adjoining areas where bacterial wilt is a serious problem in brinjal cultivation.
		CHGR-2	Developed through hybridisation and back crossing utilising CH-249 and Arka Sirish.	Fruits round, striped green with spiny calyx.	450-500 q/ha	Suitable for cultivation round the year in Jharkhand, Bihar and adjoining areas where bacterial wilt is a serious problem in brinjal cultivation.
		CHBR-2	Developed through crossing between germplasm lines Ch-82 and Ch-4 and followed by selection in segregating generations.	Fruits round, shiny purple in colour and preferred by consumers.	600 q/ha	Suitable for cultivation round the year in Jharkhand, Bihar and adjoining areas where bacterial wilt is a serious problem in brinjal cultivation.
		CHBR-3	Developed through back cross breeding method utilising the germplasm lines Ch-82 and Ch-4.	Fruits round, shiny purple in colour.	600 q/ha	Suitable for cultivation round the year in Jharkhand, Bihar and adjoining areas where bacterial wilt is a serious problem in brinjal cultivation.
		CHRBH-1	This hybrid is the cross between Ch-26 and Ch-27.	Fruits round, shiny purple in colour.	700 q/ha	Suitable for cultivation round the year in Jharkhand, Bihar and adjoining areas where bacterial wilt is a serious problem in brinjal cultivation.
		CHRBH-2	This hybrid is the cross between Ch-26 and Swarna Shree.	Fruits round, purple in colour.	750-800 q/ha	Suitable for cultivation round the year in Jharkhand, Bihar and adjoining areas where bacterial wilt is a serious problem in brinjal cultivation.
Cucumber	*Cucumis sativus*	Swarna Poorna	Developed through pure line selection from indigenous land races collected from Bhubaneswar district of Orissa.	Fruits medium sized, light green in colour having no placental hollowness; tolerant to powdery mildew.	300-350 q/ha	Released by the Institute Variety Release Committee during 1995 and recommended for cultivation in Jharkhand, Bihar, Orissa, Uttar Pradesh and Madhya Pradesh; also identified for release in Sub-humid Sutlej Ganga alluvial plain by AICRP (VC) Group Meeting during 2002.
		Swarna Ageti	Developed through mutation breeding and selection pressure exercised in M5 generation for individual plant with high yield and disease resistance.	Fruits medium sized, green in colour having no placental hollowness; tolerant to powdery mildew.	300-325 q/ha.	Released by the Institute Variety Release Committee during 1999 and recommended for cultivation in Jharkhand, Bihar, Uttar Pradesh, Andhra Pradesh, Delhi and Himachal Pradesh; also identified for release in Sub humid Sutlej-Ganga alluvial plain by AICRP (VC) Group Meeting during 2001.
		Swarna Sheetal	Developed by crossing the elite germplasm lines Hot Season and Long Green	Fruits medium sized, greenish white without any placental hollowness; early maturing and	250-300 q/ha	Released by the Institute Variety Release Committee during 1999 and recommended for cultivation

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Crop	Botanical name	Name of Variety	Pedigree	Important Characters	Yield Potential	Area and Period Recommended for Cultivation
			follwed by pedigree and recurrent selection.	tolerant to powdery mildew.		in Jharkhand, Bihar, Uttar Pradesh, Maharashtra, Delhi, Andhra Pradesh, Himachal Pradesh and Kerala.
Ridge gourd	*Luffa acutangula*	Swarna Manjari	Developed by crossing the germplasm lines CH-15 and CH-4 followed by selection in segregating generations.	Fruits medium-long, highly ridged, green, fibreless, soft; tolerant to powdery mildew.	180-200 q/ha.	Released by the Institute Variety Release Committee during 1999 and recommended for cultivation in Jharkhand, Bihar,Orissa, Tamil Nadu, Maharashtra and Andhra Pradesh; also identified for release in Sub humid Sutlej-Ganga alluvial plain by AICRP (VC) Group Meeting during 2001.
		Swarna Uphar	Developed through hybridisation between CH-5 (Jaipuri-a Rajasthan collection and CH-3 (a local collection from Andhra Pradesh) followed by pedigree selection in segregating generation.	Fruits medium sized (200 g), low ridged and fibreless at edible stage; suitable for growing during summer and rainy season.	200-300 q/ha.	Released by the Institute Variety Release Committee during 2001 and recommended for cultivation in Jharkhand, Bihar and adjoining areas.
Parwal	*Trichosanthes diocia*	Swarna Rekha	Developed through clonal selection from germplasm of Champaran district of Bihar.	Fruits elongated, striped green and soft seeded.	150-200 q/ha.	Released by the Institute Variety Release Committee during 1995 and recommended for cultivation in Jharkhand, Bihar, Orissa, West Bengal and parts of Eastern Uttar Pradesh.
		Swarna Alaukik	Developed through clonal selection from germplasm collected from Bhagalpur district of Bihar.	Fruits elongated having long shelf life; suitable for sweet preparation.	200-250 q/ha.	Released by the Institute Variety Release Committee during 1995 and recommended for cultivation in Jharkhand, Bihar, Orissa, West Bengal and parts of Eastern Uttar Pradesh.
French bean (Bush type)	*Phaseolus vulagris*	Swarna Priya	Developed through pure line selection from the NBPGR germplasm line EC-76402.	Plant growth vigorous; pods fleshy, flat green having good cooking quality; maroon coloured dried bold seeds are highly suitable for Rajma preparation.	120-140 q/ha.	Identified for release at 19th AICVIP workshop during 2001 for the regions of Sikkim, Meghalaya, Manipur, Nagaland, Mizorum, Tripura, Arunachal Pradesh, Western Madhya Pradesh, Maharashtra and Andaman and Nicobar islands (Anon.,2001 b).
French bean (Pole type)	*Phaseohlus vulgaris*	Swarna Lata	Developed through pure line selection from NBPGR germplasm line EC-94498.	Pods fleshy, round and stringless having good cooking quality and preferred by local consumers.	120-140 q/ha.	Identified for release at 19th AICVIP workshop during 2001 for Jammu Kashmir, Himachal Pradesh and hills of Uttar Pradesh (Anon.,2001 b).
Tomato	*Lycopersicon esculentum*	Swarna Lalima	Determinate variety developed through pure line selection from NBPGR germplam line EC-339074.	Resistant to bacterial wilt and bears deep red, round fruits (125 g) having TSS 4° brix.	500-550 q/ha.	Released by the Institute Variety Release Committee during 2001 and recommended for cultivation round the year in Jharkhand, Bihar and adjoining, areas where bacterial wilt is a serious problem in tomato cultivation.

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Crop	Botanical name	Name of Variety	Pedigree	Important Characters	Yield Potential	Area and Period Recommended for Cultivation
		Swarna Naveen	Indeterminate variety developed through pure line selection from NBPGR germplam line EC-386019.	Resistant to bacterial wilt; fruits medium sized, oblong, deep red (60 g) having TSS (5° brix) and longer shelf life.	600 q/ha.	Released by the Institute Variety Release Committee during 2001 and recommended for cultivation round the year in Jharkhand, Bihar and adjoining, areas where bacterial wilt is a serious problem in tomato cultivation.
		Elite line CHRT-4	Determinate fresh market variety developed through selection in segregating generation of an Australian hybrid variety.	Fruits very firm, round, rich in red colour pigment lycopene; having high pulp content;suitable for long distance transportation.	450-500 q/ha.	Suitable for cultivation during autumn-winter season in Jharkhand, Bihar and adjoining areas.
		CHTH-1	Determine fresh market hybrid is the cross between the germplasm lines Ch-3 and CHRT-4.	Fruits deep red coloured, round, firm with very high pulp content; highly suitable for transportation to distant markets.	700-800 q/ha.	Indentified for release at 20th AICRP (VC) Group Meeting during 2002 for Punjab, Tarai region of U.P, Bihar and Jharkhand.
		Elite line CHDT-1	Determinate variety developed through pure line selection from exotic germplasm.	Fruits red, round with pointed tip at blossom end; suitable for fresh market use.	600-700 q/ha.	Suitable for cultivation in Jharkhand, Bihar and adjoining states.
		Elite line CHDT-2	Determinate variety developed through pure line selection from exotic germplasm.	Fruits bigger sized, pear shaped, deep red coloured on ripening having high TSS and pulp content; suitable for processing purpose; better than the old processing variety Roma.	700-750 q/ha.	Suitable for cultivation in Jharkhand, Bihar and adjoining states.
		Elite line CHIDT-1	Indeterminate variety developed through pure line selection from exotic germplasm.	Fruits oval shaped, medium sized, red coloured; duration of harvest is more.	650-700 q/ha.	Suitable for cultivation in Jharkhand, Bihar and adjoining states.
Sponge Gourd	*Luffa cylindrica*	CHSG-1	Developed through pure line selection from locally collected germplasm.	Fruits medium round and whitish green in colour.	200-250 q/ha.	Suitable for cultivation in Jharkhand, Bihar and adjoining states.
		CHSG-2	Developed through pure line selection from locally collected germplasm.	Fruits medium long, dark green in colour and soft at edible stage.	250-300 q/ha.	Suitable for cultivation in Jharkhand, Bihar and adjoining states.
Dolichos bean	*Lablab purpureus*	Elite line CHDB-15	Photoinsensitive variety developed through selection from locally collected germplasm.	Pods bold, flat and green coloured suitable for off-season cultivation during summer and rainy season.	140-180 q/ha.	Suitable for cultivation in Jharkhand, Bihar and adjoining states.
		Elite line CHDB-1	Photosensitive variety developed through pure line selection from locally collected germplasm.	Pods flat, green fleshy in clusters in long inflorescence profusely; suitable for growing during autumn-winter season.	250-300 q/ha.	Suitable for cultivation in Jharkhand, Bihar and adjoining states.
		Elite line CHDB-2	Photosensitive variety developed through pure line selection from locally collected germplasm.	Pods bold, flat, fleshy green having light violet margins in long inflorescence profusely; suitable for growing during autumn-winter season.	250-300 q/ha.	Suitable for cultivation in Jharkhand, Bihar and adjoining states.

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Crop	Botanical name	Name of Variety	Pedigree	Important Characters	Yield Potential	Area and Period Recommended for Cultivation
Garden pea	*Pisum sativum*	Elite line CHPMR-1	Mid season variety developed through pure line selection from germplasm collected from IIHR, Bangalore.	Pods and seeds dark green in colour with high shelling percentage (more than 50 per cent); highly resistant to powdery mildew.	120-140 q/ha.	Suitable for cultivation in Jharkhand, Bihar and adjoining states.
Vegetable Cowpea	*Vigna unguiculata*	Elite line CHCP-1	Developed through pure line selection from locally collected germplasm.	Pole type in growth habit; pods straight, long (30 cm), smooth, fleshy and whitish green in colour.	300-350 q/ha.	Suitable for cultivation in Jharkhand, Bihar and adjoining states.

found to be very promising at different testing centres (Anon., 2001 a).

Results and Discussion

A total of 16 varieties including Swarna Roopa in litchi; Swarna Mani, Swarna Shree, Swarna Shyamli and Swarna Pratibha in brinjal; Swarna Poorna, Swarna Ageti and Swarna Sheetal in cucumber; Swarna Manjari and Swarna Uphar in ridge gourd; Swarna Rekha and Swarna Alaukik in parwal; Swarna Priya in bush bean, Swarana Lata in pole bean and Swarna Lalima and Swarna Naveen in tomato have been developed through selection, hybridisation and mutation breeding. In addition, 3 elite lines in fruits and 18 in vegetable crops have also been evolved which are being evaluated under AICRP (vegetables and fruits) spread all over the country and the same have been discussed in Table 1 (Rai *et al.*, 1997 a & b; Rai *et al.*, 1998 and Rai, 2001).

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