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Short Communication

LONG TERM CONSERVATION OF RELEASED VEGETABLE VARIETIES

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The released varieties are expected to possess desirable combination attributes out of a wide range of diversity in the available germplasm. These also provide genetic base for further improvement by incorporating other desired attributes. The Bureau attempts to conserve the seeds of all the released varieties of vegetable crops in the National Genebank as per preferred standards and specified seed storage at –18°C or less, in air tight containers, at a seed moisture content of 5 ± 1 per cent as recommended by FAO panel of experts on Plant Exploration and Introduction (Cromarty *et al.*, 1982) for the long term conservation of orthodox seeds.

The NBPGR Genebank has all the essential facilities required for the processing and storage of seed for long term conservation. The facilities include four cold storage vaults capable of maintaining the storage temperature of –20°C and storing about 2,00,000 accessions of germplasm and varieties. The Bureau has other ancilliary facilities such as fully equipped seed testing laboratories; a seed dryer, operating at 15°C and maintaining 15 per cent RH; and a computerised data processing unit, for an efficient management of germplasm holdings under longterm conservation. In order to maintain viability of accessions in the long term the seed moisture content must be maintained after seed drying, in hermatic containers. At the NBPGR, three layered laminated aluminium foil pouches are used for keeping the seed for long term storage of vegetable seeds. So far, only 42 released vegetable varieties were conserved in the National Gene Bank at the NBPGR (Table 1).

The technique of vegetable crops seed increase for long term conservation should aim at preserving intra-varietal variability and should avoid seed and pollen contamination from adjecent plots and varieties. Techniques of seed production/extraction for important catagoeries of vegetable crops are summarised below:

Cole Crops : Important crops are cabbage, cauliflower and knol khol. Seed to seed and head to seed methods are practices for seed production of these crops. All these crops are highly cross pollinated and isolation distance of 1600 m is prescribed for foundation seed and 1000 m for certified seed production. The crops are harvested when 60-70 per cent pods turn yellow to brown in colour and stacked for a few days for curing before threshing (Singh and Gill, 1993).

Table 1 : Released varieties of vegetable crops stored for Long term conservation in the NBPGR Gene Bank upto December 31, 1992

Crop (Botanical Name)	Source	Variety	IC No.
Spinach (*Spinacia oleracea* L.)	IARI, Regional Station, Katrain, Himachal Pradesh	Virginia Savoy	75028
Methi (*Trigonella foenum graecum* L.)	SKN College of Agriculture, Jobner, Rajasthan	CO1	78380
Lettuce (*Lactuca sativa* L.)	IARI Regional Station Katrain, Himachal Pradesh	Chinese Yellow	76300
Long melon (*Cucumis melo* L. var utilissimus Dutch)	IIHR, Bangalore, Karnataka	Arka Sheetal	76262
Muskmelon (*Cucumis melo* L.)	IIHR, Bangalore, Karnataka	Arka Jeet	76259
	ARS, Durgapura, Rajasthan	Durgapura Meetha	113138
Watermelon (*Citrulus vulgaris* Schrad.)	ARS, Durgapura, Rajasthan	Durgapura Keshar	113139
	IARI, Regional Station, Katrain, Himachal Pradesh	Asahi Ramato	76317
Red pumpkin (*Cucurbita moschata Poir* Dutch.)	IIHR Bangalore, Karnataka	Arka Chandan	76256
Summer squash (*Cucurbita pepo* L.)	IARI, Regional Station, Katrain Himachal Pradesh	Australian Green Pusa Alankar	76308 76309
Winter squash (*Cucurbita maxima* L.)	IIHR, Bangalore, Karnataka	Arka Suryamukhi	75257
Bitter gourd (*Momordica charantia* L.)	IIHR, Bangalore, Karnataka	ARKA Harit	75263
Cucumber (*Cucumis sativus* L.)	IARI, Regional Station, Katrain, Himachal Pradesh	Pusa Sanyog Japanese Long Green	76296 76297
Brinjal (*Solanum melongena* L.)	IARI, Regional Station, Katrain, Himachal Pradesh	Pusa Purple Long Pusa Purple Cluster Pusa Anupam	76286 76287 118806

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Crop (Botanical Name)	Source	Variety	IC No.
	TNAU, VRS, Palur, Tamil Nadu	PLR 1	113889
Okra (*Abelmoschus esculentus* L. Monech)	IARI, Regional Station Katrain, Himachal Pradesh	Pusa Makhmali	76282
		Perkin's Long Green	76283
Sweet pepper (*Capsicum annuum* L)	IARI, Regional Station, Katrain, Himachal Pradesh	California Wonder 1	76290
		Yolo Wonder	76291
Hot pepper (*Capsicum frutescens* L.)	RRS, Lam, Andhra Predesh	Sindhur	73158
	GAU, Anand, Gujarat	Jwala	77004
Tomato (*Lycopersicon esculentum* Mill.)	IARI, Regional Station, Katrain, Himachal Pradesh	Roma	76310
		Rest of All	76311
		Marglobe	76312
		Sious	76313
	GAU, Anand, Gujarat.	S-120	76997
	TNAU, Regional Station, Paiyur, Tamil Nadu	Paiyur 1	13891
Cabbage (*Brassica oleracea* L. var. *capitata* L.)	IARI, Regional Station, Katrain, Himachal Pradesh	Golden Acre	76238
		Pusa Drumhead	76289
Knol khol (*B. oleracea* L. var. *gongyloides* L.)	IARI, Regional Station, Katrain, Himachal Pradesh	White Vienna	76318
Cauliflower (*B. oleracea*, var. *botrytis* L.)	IARI, Regional Station, Katrain, Himachal Pradesh	Pusa Snow Ball-1	76293
Garden beet (*Beta vulgaris* L.)	IARI, Regional Station, Katrain, Himachal Pradesh	Dectroit Dark Red	76285
		Crimson Global	76284
Turnip (*Brassica rapa* L.)	IARI, Regional Station, Katrain, Himachal Pradesh	Pusa Chandrima	76314
		Purple Top White Globe	76316
Radish (*Raphanus sativus* L.)	IARI, Regional Station, Katrain, Himachal Pradesh	Pusa Himani	76305
		Japanese White	76306

Root crops : Carrot, radish and turnips are the main crops in this catagory. Isolation distance of 800m and 1000m are recommended for certified and foundation seed plots in these crops (Anon. 1988).

Onion : Bulb-to-seed or seed-to-seed method may be practiced.All the umbels do not mature at the same time. Therefore, the harvesting of umbels may be done in two to three pickings. The umbles are ready for pickings when about 20 per cent black seed becomes visible.

Okra : The outcrossing in okra various from 0-60 per cent depending upon the variety. For large plot seed multiplication, isolation distance of 400m and 200m is recommended for foundation and certified seeds, respectively.

Leguminous vegetables : Garden pea, french bean, cluster bean, winged bean, field bean and broad beans are important in India. Fully ripen pods should be harvested, cured, threshed and cleaned for seed purpose. Seeds may be properly graded to remove shrivelled and imature seeds before sending them for long-term conservation.

Tomato : This is predominantly a self-pollinated crop but outcrossing does take place to a negligible extent. Isolation distance of 50 and 25 m is recommended for foundation and certified seed, respectively Seed can be extracted manually using acid or fermentation methods or mechanically using axil - flow vegetable seed extracting machine (Singh & Gill, 1993).

Brinjal and chillies : Isolation distance of 200 and 100m for brinjal and 400 and 200m for chillies for foundation and certified seeds, respectively is recommended. The fruits should be allowed to mature beyond the edible stage before harvesting for seed. Mature brinjal fruits are cut and crushed and the seed is extracted by washing and sieving. The seed should be dried soon after extraction else they may start germinating. Chilli fruits are picked at red ripe stage.

Cucurbits : Cucumber, squashes, gourds, pumpkin, watermelon and muskmelon are the important vegetables in this catagory. The isolation distance required for all these crops is 1000m for foundation and 500 m for certified seed plots. Muskmelon fruit is ready for seed harvest with change in rind colour from green to yellow/cream. At maturity, the fruit gets easily detached from the vine. A dull sound while thumping the fruit of watermelon is also indicator of maturity. Fruits of other cucubirous vegetables is also indicator of maturity. Fruits of other cucubritous vegetables are ready for seed extraction when they are riped beyond the edible stage. Riped fruits of most of these vegetables change colour and skin of these become either soft (better gourd) or hard. Seed may be extracted by hand and washed or by fermenting the fruits for 24-48 hrs. The seed of these vegetables can also be extracted with axil - flow vegetable seed extracting machine.

Leafy vegetables : **Palak, methi**, coriander, lettuce and spinach are important in India. The seed crop is harvested when the majority of the fruit balls in case of palak and pods in case of **methi** have changed colour. After

harvesting, stalks are piled and cured for 3-4 days and then threshed gently to remove seed and cleaned.

The fully ripe fruits, not infested by insect-pests, identified from disease free plants, should be harvested. The appropriate seed extraction procedure may be followed to collect the seed from fruits before their decomposition and rotting starts. The seed of vegetable crops which form pods or siliqua, should be collected when the seed have attained physiological maturity and are free from any insect or disease attack. Adequate number of fruits from different plants should be harvested to represent the intravarietal genetic variability, specially in cross-pollinated vegetable crops. The seed and pods obtained, keeping above precautions, should be shade dried to reduce the moisture content to a reasonably low level. Dried seeds need to be stored in a cool and dry place to avoid spoilage due to pathogens and pests. The seed samples of released varieties consisting of atleast 4000 seeds of self-pollinated and 8000 seeds of cross pollinated vegetable crops from the larger seed lots, to represent the variability within the variety, may be sent to NBPGR with the minimum delay after the harvest. Immature, shrivelled and undersized seeds must be discarded and healthy and untreated seed material should be packed preferably in moisture proof pouches or in cloth bags and wrapped in polythene bags to avoid seed quality losses during transit. The seed packets should be neatly and correctly labled and addressed to the Head, Division of Germplasm Conservation, NBPGR, New Delhi - 110 012.

To facilitate retrieval and future utilization of varietal seed accessions stored in the National Genebank, the Passport (Origin, parentage, pedigree etc.), characterisation (distinguishing features for indentification) and evaluation data on desirable attributes such as adaptability to biotic and abiotic stresses, resistance to diseases, pests and stress etc. must be provided alongwith seed. Further, the year of release, zone for which released, actual or estimated area covered, market and consumers preference should also be desirably included.

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