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Short communication

Conservation and exchange of genetic resources in major vegetable crops

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ABSTRACT

Vegetables, with higher productivity compared to other crops, are nutritionally superior apart from containing numerous phytochemicals. Increasing production, productivity and quality of vegetables through breeding programmes to develop high yielding, biotic, abiotic stress tolerant/ resistant and quality is of paramount importance. Plant genetic resources are essential basic raw materials to meet the current and future needs of crop improvement programmes. In India, NBPGR maintains base collections of different vegetables in the Long-Term Storage in National Genebank. A total of 60 germplasm accessions with unique traits have been registered in different vegetable crops. It also introduces trait-specific germplasm from foreign sources meeting the requirement of breeders in National Agricultural Research System. Further efforts are needed to collect and introduce diverse trait-specific germplasm and evaluation for developing core and mini-core for efficient utilization of germplasm to develop climate-resilient varieties.

Key words: Germplasm conservation, germplasm exchange, germplasm utilization, plant genetic resources, vegetables.

The productivity of vegetables is higher compared to other crops. They are nutritionally superior apart from containing numerous phytochemicals, which help to prevent/cure many deadly diseases. In India, the food habit is predominantly cereal-based. However, now the importance of vegetables in daily diet has been well recognized. The total vegetable production has been estimated to be 129.08 million tonnes from 7.98 million ha and it is far short to meet the recommended requirements (Anon, 1). The current production supplies only 200 g vegetables/ head/ day. However, Indian Council of Medical Research, New Delhi and National Institute of Nutrition, Hyderabad recommends consumption of 300 g vegetables/ head/ day. Hence, increasing production, productivity and quality of vegetables is of paramount importance. Planning and execution of breeding programme to develop high yielding, biotic, abiotic stress tolerant/ resistant and quality vegetables largely depends on the availability of diversity in the germplasm pool. Any crop species exhibits maximum range of diversity in their primary centre of origin followed by secondary centre of origin. The primary and secondary centers of origin of different vegetables are presented in Table 1.

The Base Collections made by several ICAR organizations and SAUs are being maintained by NBPGR in the National Genebank (NGB) in form of seeds in seed genebank (where seeds dehydrated to ~5% moisture content and sealed in tri-layered laminated aluminum foil packets and conserved at -18°C), in the form of tissue culture in the *in vitro* genebank and cryobank (-196°C), and in the form of live plants in field genebanks. In addition, a large number of active collections have been maintained in Medium-Term Storage (MTS) at NBPGR, New Delhi (5,081), and its regional stations at Thrissur (6,634**),** Hyderabad (4,310), Akola (2,049), Shimla (392), Cuttack (36), Shillong (102) and Srinagar (23). There are two designated institutes as National Active Germplasm Sites (NAGS), namely, IIVR, Varanasi and IIHR, Bengaluru, which have maintained active collections of vegetable crops germplasm with 6,792 and 2,616 accessions, respectively. However, some of the collections are likely to be in-advertantly duplicates in various centres. Most of these collections have been characterized and evaluated for agronomic potential and other traits. These collections are available for distribution to plant breeders for their experimental use and crop improvement programmes**.**

Landraces, traditional cultivars and other germplasm which have unique traits including tolerance/ resistance to disease(s), pests and other biotic and abiotic stresses but do not qualify for release and notification because of poor agronomic performance. These materials are novel, unique, and distinct with academic, scientific or applied value but do not have a direct commercial value. With the objective of recognizing the contribution of scientists who have developed or identified such promising experimental materials or promising germplasm, and to facilitate flow of valuable germplasm among

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Table 1. Details of registered germplasm with specific traits of different vegetable crops.

S. No.	Crop	No. of accession(s)	Unique trait(s)
1	Tomato	9	High carotene (IC528034), high lycopene (IC52807), high TSS (6.0°B) (IC564448), resistant to root knot nematodes (IC296468,IC565013-14), resistant to tomato leaf curl virus and bacterial wilt (IC395328)
2	Brinjal	4	Resistance to bacterial wilt (IC249349, IC090982, IC526796), intermediate, tall, thornless (IC296759)
3	Chilli/ Sweet pepper	13	Early, high yielding (207.95 q/ha) (IC296760, IC399066), CMS line with good GCA (IC395318-19, IC296664-65, IC296662-63), fertility restorer (IC29666-67, IC526794), resistant to leaf curl virus, thrips, mites & powdery mildew (IC553284, IC565015, IC505489), erect, low pungency and bright colour (IC569194)
4	Okra	2	Dwarf, bushy, short inter node (IC526802), thin (0.9) cm and long fruited (26 cm) (IC565533)
5	Cucumber	2	High yielding and long fruit (IC296699), drought hardy and high temperature insensitive (IC296700)
6	*Kachri*	2	High yielding, drought hardy , medium sized fruits (IC296695), large fruits and suited for pickles (IC299696)
7	*Meetha karela*	1	Spineless large fruit (IC415397)
8	Pointed gourd	1	Seedless fruit, obligate parthenocarpic with long duration fruiting (IC296492)
9	Bottle gourd	3	Andromonoecious sex (IC296733), segmented leaf type (IC296744), spindle shaped and durable rind (IC0571819)
10	Bitter gourd	2	Gynoecious line with high yielding ability and attractive fruits (IC296539), Predominately gynoecious habit (IC 591254)
11	Pumpkin	1	High carotenoid content (IC526803)
12	Sword bean	1	Drought tolerant, alternative source of vegetable (IC427811)
13	Round melon	1	Intermediate, and sparsely pubescent, tolerant to downy mildew (IC296758)
14	Snap melon	3	High yielding drought hardy, suited for salad (IC296697-98), downy mildew resistance (IC553288)
15	Water melon	3	High yielding, drought hardy (IC296694), yellow colour flesh (296816), simple unlobed leaf (296817)
16	Muskmelon	2	Fruit wall round, light brown (IC557426), resistant to Cucumber Green Mottle Mosaic Virus (IC557706)
17	Fenugreek	2	Downy mildew resistant, bold seed (IC296791), powdery mildew and downy mildew tolerant (IC296792)
18	Spinach	1	Terminal flower, thick leaf, big seed mutant of palak (IC565527)
19	Carrot	2	Male sterile line of Asiatic carrot and suitable for development of hybrid (IC0570071, IC0570261)
20	Garlic	2	Compact bulbs with silvery white skin, cream coloured flesh and big cloves (IC296711, IC296712)
21	Potato	5	Resistance to early and late blight, GCA for agronomic traits (IC296790, IC296650), high dry matter and low reducing sugars (IC296651), resistant to potato stem necrosis (IC296661), high starch, low amylase and resistance to late blight (IC445068)

Source: Singh (3); Kak *et al*. (4); Kak and Tyagi (5)

the scientists working in the crop improvement programme, ICAR has developed the mechanism to register such germplasm and NBPGR is entrusted with the responsibility for registration of such germplasm. The registration of germplasm is an initiative that provides soft protection to the germplasm having unique trait(s). A total of 61 germplasm with unique traits are registered so far, details of which are presented in Table 1. Majority of the registered germplasm belongs to solanaceous group. The details of the traits of registered germplasm may be obtained from NBPGR website http://www.nbpgr.ernet.in/IRCG%20Search/index.htm. The registered germplasm is available in public domain and it is obligatory on part of the developer to maintain, multiply and supply the registered germplasm to the *bona-fide* users.

The NBPGR introduces germplasm from foreign sources meeting the requirement of breeders in NARS and *suo moto* through exploiting the availability of trait-specific germplasm documented in literature. Some promising germplasm introduced during 2005-2011, which were distributed to breeders include 658 accessions representing 26 wild species were introduced during 2005-2011, for *Capsicum*, *Lycopersicon* and *Solanum* species.

The seed material of different vegetables crops were distributed to various institutes, coordinated projects, state agricultural universities and other researchers in India. During 2005-2011, a total of 8,374 samples were supplied by the NBPGR under the Material Transfer Agreement (MTA). Although a large number of accessions of vegetable crops have been collected, introduced and conserved in NGB for present and future use in crop improvement programmes.

REFERENCES

1. Anonymous 2009. *Agricultural Statistics at a Glance*, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India.
2. Zeven, C. and Zhukovsky, P.M. 1975. *Dictionary of Cultivated Plants and their Centres of Diversity*, PUDOC, Wageningen, the Netherlands, 219 p.
3. Singh, A.K. 2006. *Plant Germplasm Registration*, National Bureau of Plant Genetic Resources, Indian Council of Agricultural Research, New Delhi.
4. Kak, A., Srinivasan, K. and Sharma, S.K. 2009. *Plant Germplasm Registration*. National Bureau of Plant Genetic Resources, New Delhi.
5. Kak, A. and Tyagi, R.K. 2010. *Inventory of Registered Crop Germplasm*,National Bureau of Plant Genetic Resources, New Delhi 110012, 75 p.

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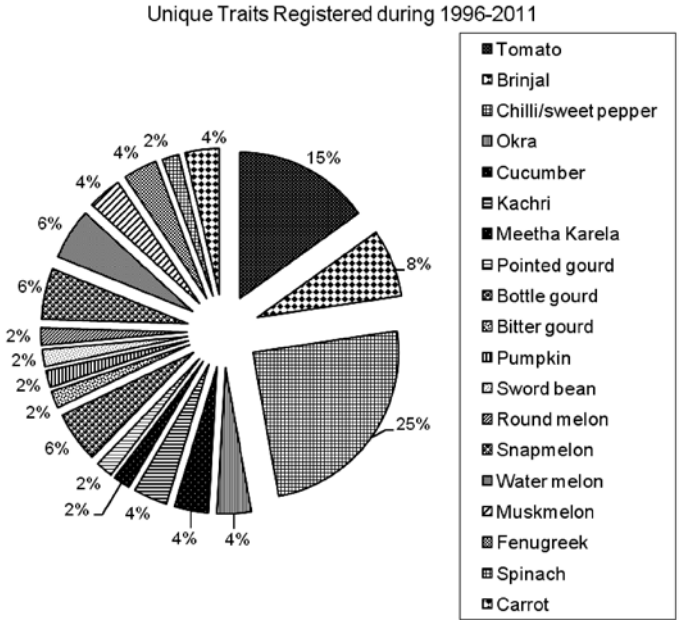

Fig. 1. Registration of trait-specific vegetable crop germplasm during 1996-2011.