

**Short Communication**

**The Role of Genetic Resources in Tuber Crop Improvement**

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Over the years, the Central Tuber Crops Research Institute, Trivandrum (Kerala) has accumulated 3,250 accessions of diverse genetic resources of tropical tuber crops. These include cassava (*Manihot esculenta*), sweet potato (*Ipomoea batatas*), yams (*Dioscorea esculenta*, *D. alata*, *D. rotundata*), aroids (*Colocasia esculenta*, *Xanthosoma sagittifolium*, *Amorphophallus campanulatus*), Coleus (*Coleus parviflorus*), yam bean (*Pachyrrhizus erosus*), winged bean (*Psophocarpus tetragonolobus*), arrow root (*Maranta arundinacea*) etc. The utilisation of this diversity for identifying promising types is discussed. Critical evaluation of the germplasm and grouping of the accessions in various classes based on different morphological and tuber characters resulted in the identification and release of a few clones such as "Sree Latha", "Sree Keerthi", "Sree Roopa", "Sree Priya" and "Sree Subhra" for general cultivation while a few others formed the basic parental materials in developing superior hybrids in cassava and sweet potato. In cassava, "M4" which is an introduction from Malaysia, is the most popular cultivar in Kerala for table purposes.

In any kind of meaningful plant breeding programme, accumulation of genetic diversity in the crop is highly desirable. In recent years, awareness has been generated with regard to germplasm collection, conservation and exchange and CTCRI has taken up a serious attempt in the collection, evaluation and conservation of germplasm materials of different tuber crops. In the past twenty four years, CTCRI has built up a reasonable collection in tropical tuber crops (Table 1).

TABLE 1. GENETIC RESOURCES OF DIFFERENT TUBER CROPS MAINTAINED AT CTCRI

| Crop   | Accessions   |
|--|--------------|
| Cassava  | 1,289        |
| Sweet potato                                   | 733          |
| Toro (sp. <i>Colocasia</i> )                   | 311          |
| Tannia (sp. <i>Xanthosoma</i> )                | 64           |
| Elephant foot yam (sp. <i>Amorphophallus</i> ) | 96           |
| Lesser yam ( <i>Dioscorea esculenta</i> )      | 97           |
| Greater yam ( <i>D. alata</i> )                | 213          |
| White Yam ( <i>D. rotundata</i> )              | 370          |
| Coleus   | 64           |
| Yam bean                                       | 11           |
| Winged bean                                    | 1            |
| Arrow root                                     | 1            |
| <b>Total germplasm assembled</b>               | <b>3,250</b> |

Among these, exotic material is represented from African and South American countries, Japan, USA, Taiwan, Puerto Rico, Russia, Fiji, Nepal, Sri Lanka, China, Philippines, Thailand etc., through critical multiplication evaluation trials over a period of time, promising desirable clones were identified in cassava, aroids, yams and *Coleus*.

#### EVALUATION OF GERMPLASM

##### *Cassava*

The studies have revealed that in cassava, among the exotic collections, 34% clones were spreading while in the indigenous lines, 13% showed spreading habit. Variations were also observed for plant height, flowering habit, pigmentation in stem, leaf, petiole and emerging leaf and in tuber skin, rind and tuber flesh. Similarly, variations occur in pollen fertility and HCN content in tubers. The maximum HCN content recorded in the exotic collection (Ce-461) was 290  $\mu\text{g/g}$  while the content was 220  $\mu\text{g/g}$  in the indigenous line Ci-135. Among the exotics, the high HCN clones represented 7.5% and 0.9% in the indigenous lines. A few of the indigenous and exotic clones have also been identified as field tolerant to the common pests (spider mite) and diseases like cassava leaf spot and mosaic disease. The cultivar M4, introduction from Malayasia, is a well accepted variety for table purposes. The indigenous accession, Ci-856 has been identified as the most promising clone for early harvest with 35-40 t/ha yield at 7th month stage while others with similar yields at 10-11 months maturity. A few other accessions in cassava have been developed through hybridization programme. Among these, H 97, H 165, H 226 and Sree Visakhm (H 1687) have resulted from a single cross while the hybrid Sree Sahya (H 2304) was developed from multiple cross (Magoon *et al.*, 1970; Jos *et al.*, 1980). All these varieties have been reported to yield 30-45 t/ha.

##### *Sweet potato*

A few strains have been used in the hybridization programme for developing new and improved varieties. Three hybrids, viz. H41, H42 and H268 have been developed and released for general cultivation based on their superior yield, quality and acceptability (Magoon *et al.*, 1970; Limaya and Kore, 1978; Nawale, 1981). Two recently recommended varieties in sweet potato, viz, Sree Nandini (76-OP-217) and Sree Vardhini (76-OP-219) are developed from open pollinated seeds (bulk) from elite female clones in the germplasm accessions (Nayar *et al.*, 1984). These have been recommended for early harvest based on their yield potential of 20-25 t/ha at 100-105 days maturity. A few other clones have also been identified from the germplasm material. One such hybrid is noted for its high carotene content of about 7000 IU and 90-100 days maturity.

##### *Aroids*

Wide morphological variation was noticed in the germplasm resources in *Colocasia* while variability was limited in *Xanthosoma* and *Amorphophallus* except for a few

traits, such as pigmentation, tuber size and shape. Two high yielding desirable clones identified in *Colocasia* have been designated as Sree Rashmi (C-149) and Sree Pallavi (C-266). These have been recommended for release in Kerala State and has been recorded 15-20 t/ha yield in these clones.

### Yams

The major yam species under cultivation in India are lesser yam (*D. esculenta*) and greater yam (*D. alata*). White yam (*D. rotundata*) is a new introduction in India from Africa. Among 213 accessions of *D. alata*, 18 were exotic. Of 97 accessions in *D. esculenta*, 89 are indigenous and 8 are exotic, received from Puerto Rico, Africa and Nepal. White yam (*D. rotundata*) ranks first among yams in area and production on global basis. Open pollinated seeds of four varieties of white yam, viz. Iwo, Umdika, Ihopia and Boki were received from the International Institute for Tropical Agriculture, Nigeria in 1976. The evaluation of clonal generations derived from the seedling progenies resulted in the identification of 370 clones of white yam which have been included in the germplasm collection of the Institute. Sustained efforts have resulted in the identification of one selection in lesser yam, Sree Latha (De-11) and two each in greater-yam Sree Keerthi (Da-60) and Sree Roopa (Da-80) and white yam, Sree Subhra (I-146) and Sree Priya (U-195-2) which have been recommended for release in Kerala based on their consistent high yield performance. The yield in Sree Latha ranged from 20-25 t/ha while in Sree Keerthi and Sree Roopa from 25-30 t/ha. The yield range in Sree Subhra and Sree Priya was 34-40 t/ha and the tubers are quite acceptable.

### Minor tubers

Crop like *Coleus*, yam bean, winged bean, arrow root etc, are minor tuber crops because of their limited area of cultivation, production and demand. *Coleus* tubers are aromatic and used as vegetable. Evaluation of 20 germplasm accessions in *Coleus* has resulted in the selection of CP-11 as a promising line. The evaluation of another 44 accessions have indicated the presence of superior clones in the crop, variability, however is limited.

### CONCLUSION

In cassava, S-856 is a recent selection for early harvest from indigenous germplasm and has been recommended for release in Kerala. Two other varieties selected from indigenous germplasm, have been recommended for release in Kerala. Two varieties selected from indigenous germplasm in *Colocasia* for general cultivation are C-149 and C-226. In lesser yam, the cultivar Sree Latha (De-11) is released from the indigenous germplasm collection. Similarly two clones of greater yam viz. Da-60 and Da-80 have also been recommended for release which are superior selections made from indigenous stocks. In cassava, prominent genetic stocks are H 97, H 165, H 266, Sree Visakham

(H 1687) and Sree Sahya (H 2304) which have been released at state and/or national level. H 41 and H 42 strains of sweet potato were developed from single cross while H 268 has resulted from a double cross. 76-OP-217 and 76-OP-219 are two selections made in sweet potato for early harvest, identified from progenies of open pollinated seeds collected from promising female parents in the germplasm collection. It is thus evident that the genetic resources available at CTCRI have significantly contributed in the development of superior cultivars in tropical tuber crops.

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