



Survey and Collection of Tuber Crops from Joida, Uttara Kannada - An Unexplored Biodiversity Hotspot

Tuber crops are the most important subsidiary or subsistence food and nutritional crops in tropical and sub tropical countries that finds an important place in the dietary habits of small and marginal farmers especially in the food security of tribal population. Tuber crops not only enrich the diet of these people but also possess medicinal properties to cure many ailments or check their incidence and are used in the preparation of stimulants, tonics, carminatives and expectorants. India holds a rich genetic diversity of tropical root and tuber crops especially Western Ghats and North Eastern Himalayas. Plant genetic resources are the base materials for any crop improvement programmes. Their *ex-situ* conservation is very much essential for the development of new varieties with requisite quality and tolerance to biotic and abiotic stresses. Genetic diversity is needed to develop improved varieties through different breeding programmes. The ICAR-CTCRI, the national repository of tuber crops is primarily meant to undertake plant genetic resources activities of tuber crops in the country. The Institute, since 1963, has collected considerable genetic variability in these crops and their wild relatives from various agro climatic regions of the country. A sizable number of collections of cassava, sweet potato, yams, aroids, Chinese potato, arrowroot and wild relatives of *Amorphophallus* and *Dioscorea* made from different parts of India are being maintained in the Field Gene Bank. The total germplasm holding of tuber crops is 5618 with the major support of the Jai Vigyan Programme of the National Agricultural Technology Project since 1998-99 and the special efforts by the ICAR's ad-hoc schemes, explorations were carried out in several unexplored regions in Karnataka, Chattisgarh, Jharkhand, Madhya Pradesh, Odisha, Tripura, Mizoram as well as Andaman & Nicobar islands and several unique collections and indigenous technical knowledge were gathered. In future, the unexplored tribal areas of these regions would be surveyed for new germplasm

collections. The available germplasm of these crops and their wild relatives would be further exploited and used to develop new varieties with desirable superior traits through different crop improvement programmes for the sustainable livelihood of the farmers, tribal people and local population in this fast changing agro-climatic scenario. In the Joida Taluk of Uttara Kannada, tuber crops form the major component of the food of the tribal population and many tuber crops are being cultivated, consumed and marketed. Hence, the present study was undertaken to collect, conserve and document the genetic wealth of tropical tuber crops grown by the tribal population of the Joida region of Uttara Kannada district of Karnataka.

The study was carried out in villages of Joida taluk, Uttara Kannada District of Karnataka (Fig. 1). Joida taluk is in the Karwar subdivision of Uttara Kannada district that lies between 15.1688° North latitude and 74.4848° East longitude. The remote Joida taluk inhabiting the local *Kunbi* tribes has been growing an array of tuber crops organically. There is a rich diversity in major and minor tuber crops in the district being a part of areas identified as areas of distribution and variability. All these tuber crops are integrated in the farming system mode of agriculture practiced by the tribal farmers and these crops play an important role in meeting their family nutritional requirement. There is an urgent need to conserve the traditional tuber crops and popularisation of tuber crop based farming system on a larger scale in the state along with the introduction of improved varieties of tuber crops which was found to be very promising under the Joida condition.

Surveys were conducted in the tuber crop growing villages inhabited by the *Kunbi* tribes and different tuber crops and their wild relatives were collected. Also, a workshop cum farmers meet on tuber crops was organized where diverse tuber crops germplasm was



Fig.1. Map showing the study localities

collected to enrich the genebank of ICAR-CTCRI (Table 1). Two surveys were conducted during the period 2014-15 in the tuber crop growing villages in the tribal belts of Uttara Kannada in Karnataka and various tuber crops and their wild relatives were collected. Another visit was conducted during 2017 to the villages of Joida, Sirsi and Siddapur taluk, Uttara Kannada of Karnataka for the collection of *Colocasia* and other tuber crops germplasm. During the survey, 58 accessions of different tuber crops comprising of taro, greater yam, lesser yam, sweet potato, elephant foot yam, tannia, Chinese potato, potato yam, canna, and wild turmeric were collected and conserved

Table 1. Collection of tropical tuber crops from different parts of Uttara Kannada district in Karnataka

Sl. No.	Crop	Botanical name	Total collection
1	Taro	<i>Colocasia esculenta</i>	10
2	Sweet potato	<i>Ipomoea batatas</i>	10
3	Greater yam	<i>Dioscorea alata</i>	9
4	Lesser yam	<i>Dioscorea esculenta</i>	7
5	Chinese potato	<i>Plectranthus rotundifolius</i>	3
6	Tannia	<i>Xanthosoma sagittifolium</i>	2
7	Potato yam	<i>Dioscorea bulbifera</i>	2
8	Canna	<i>Canna</i> sp.	2
9	Costus	<i>Costus</i> sp.	2
10	Elephant foot yam	<i>Amorphophallus paeoniifolius</i>	1
11	Wild yam	<i>Dioscorea</i> sp.	4
12	Wild elephant foot yam	<i>Amorphophallus</i> sp.	2
13	Wild turmeric	<i>Curcuma</i> sp.	3
14	Wild arrow root	<i>Maranta</i> sp.	1

in the field gene bank of ICAR-CTCRI. The two unique taro collections namely the banda type and also the non-itching salad type were identified for registration as unique genotypes (Fig. 2 & 3). The unique germplasm collections as well as the diversity present among the accessions were documented. The culinary preparations were demonstrated which were made from the different tuber crops by the *Kunbis*, especially of taro landraces, greater yam and potato yam. Moreover, the possibilities of growing improved varieties of tuber crops in the area were explored.

The paper describes the richness of the tuber crops germplasm diversity especially of aroids in the Joida taluk, Uttara Kannada District of Karnataka, survey of the area and collections made during the last 2 years along with documentation of food preparations made out of these tuber crops. Joida, a remote district in Karnataka, inhabiting the local *Kunbi* tribals, having joint families, have been growing an array of tuber crops organically, especially taro. There are about 131 *Kunbi* hamlets each having 20-25 families. The average size of each family was around 5-6. These hamlets are spread over Joida taluk and connected by mud road. There is no transportation facility connecting these hamlets and the people have to walk 15-30 km to reach the nearest bus stop. Agriculture is the main occupation of the people with each family having 1½ - 2 acres of paddy land.

Normally, one crop of paddy is cultivated during *kharif* and in around 5% of the area two crops are raised during the remaining period it is left fallow. The *Kunbi* tribe practiced typical homestead farming in the land available for cultivation in and around their homes. Every family had an average land holding of 0.5 to 1.0 acre and tuber crops occupy about 10-15% of this area. They practiced subsistence agriculture in their home garden mainly of tuber crops



Fig. 2: Tuber crops germplasm collected from Joida, Karnataka

without any major commercial crops. These tubers play a very important role in the lives of the *Kunbis*. For welcoming guests, they offer boiled greater yam and jaggery which indicate the importance of tuber crops in their social system. Their main tuber crop, unique in cultivation, is the bunda type long taro (*Colocasia esculenta*), which grows to the average height of a man and is very much distinct and unique in cultivation.

Unlike other tribals who collect wild tubers from the forest, the *Kunbis* cultivate 15 to 20 types of tubers in their home garden. During the period 2014-15 two field visits to the tuber crops growing villages in the tribal belts of Uttara Kannada district in Karnataka was conducted and collected 43 accessions of different tuber crops comprising greater yam-8, lesser yam-6, sweet potato-10, taro-5 including two dasheen types and a salad type non-acrid accession (Fig. 3), elephant foot yam-1, tannia-1, Chinese potato-2, potato yam-2, canna-1, wild yam-4, wild elephant foot yam-2 and wild turmeric-1. Another visit was conducted during 2017 to the villages of Joida, Sirsi and Siddapur Taluk, Uttara Kannada of Karnataka for the collection of *Colocasia* and other tuber crops germplasm and collected 15 accessions of tuber crops comprising taro-5, yam-2, costus-2, wild turmeric-2, Chinese potato-1, tannia-1, canna-1, and wild arrow root-1 (Table 1 & Fig. 2). Taro (dasheen type), greater yam and lesser yam are the important tuber crops grown in this region, whereas, tannia, sweet potato, potato yam, Chinese potato and elephant foot yam are grown to a limited extent by the farmers. The tubers of these have been collected enriched the germplasm holding of the Institute. Velayudhan et al. (1998) collected, conserved, characterised and evaluated a total of 346

yam accessions and provided the information about diversity in the genus in Southern Indian region, their distribution, species wise morphology and species wise key for easy identification. Dwivedi et al. (2013) reported a sizable number of collections of cassava, sweet potato, yams, aroids, Chinese potato, arrowroot and wild relatives of *Amorphophallus* and *Dioscorea* from different parts of Andhra Pradesh, Goa, Karnataka, Kerala, Tamil Nadu, Union Territories of Lakshadweep and Andaman and Nicobar Islands and these are being maintained in the Field Gene Bank (FGB) of ICAR-National Bureau of Plant Genetic Resources, RS, Thrissur.

During the tuber fair organized at Joida by the Sahyadri Wild Life and Forest Conservation Trust Foundation, one hundred and fifty farmers including eighty farm women brought samples of their tubers in which the taro was the main attraction. The other main tubers that are grown in the area includes greater yam and lesser yam. Moreover, few families grow tannia and Chinese potato also. A wide range of preparations like taro cutlets and seven types of curries made from the bunda type taro were exhibited. *Kona payas*, made from *Dioscorea* tubers, is a popular *kheer*-like (sweet) dessert (Fig. 4). Asha and Nair (2002) summarized an overview of the classification of these wild yams and their traditional uses by *Kanikkar*, a group of South Indian tribes found in the extreme southern end of Western Ghats. They use a wide array of wild yams for food as the *Kunbi* tribes in Karnataka. Edison et al. (2006) also documented the indigenous technical knowledge of different tuber crops grown in the Western Ghats. However, Joida was found to be relatively unexplored region in Western Ghats, especially with the tropical tuber crops.

The wild edible tubers utilized by the tribals of Bastar and Chhattisgarh for their sustenance and their utilization pattern was illustrated and documented by Banik et al. (2014). Sankaran et al. (2015) documented the information on tuber crops cultivation at Car Nicobar Island and Little Andaman through key informants, transect walk, group discussion and also from the secondary

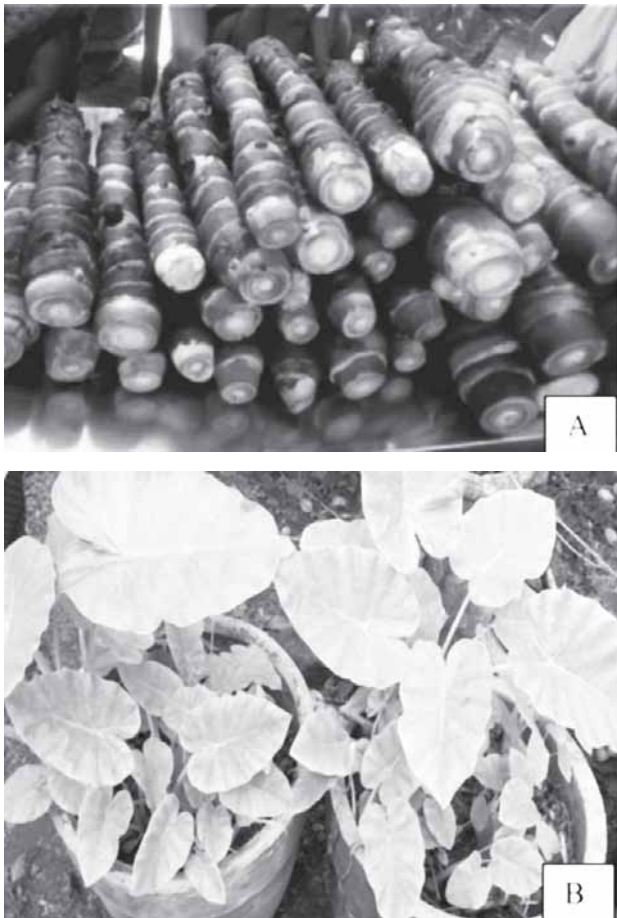


Fig.3. Taro accessions collected from Joida A) Dasheen type and B) Non-acrid, salad type

sources while, Singh et al. (2016) collected and categorized the indigenous traditional knowledge developed over years regarding the method of cultivation, the way of consumption and utilization of tubers during festivals and other social events related to tuber crops that helps in providing information on the importance of tuber crops in the life style of the rural people in Bihar.

A considerable genetic variability in tuber crops and their wild relatives from Joida taluk of Uttara Kannada, Karnataka were explored and collections were made for conservation and utilization at ICAR-CTCRI, Joida, the remote part of Karnataka, inhabited by local *Kunbi* tribals living in joint families had an array of organically grown tuber crops. Taro, greater yam and lesser yam are the important tuber crops grown in this region while tannia, sweet potato, potato yam, Chinese potato and wild yams were also grown to a limited extent which were collected by the exploration team and this has enriched the

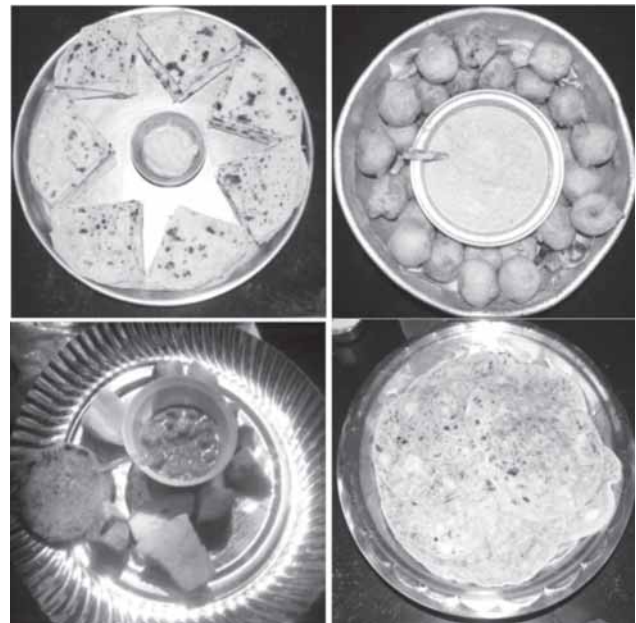


Fig.4. Food prepared from tuber crops

germplasm holding of the National repository of tropical tuber crops. The unique germplasm collections and the diversity present among them were collected, conserved and well documented. The two unique taro collections namely the banda type and also the non-itching salad type *Colocasia* were identified for registration. The germplasm of tuber crops/their wild relatives would be further exploited and used to develop new varieties with desirable superior traits through crop improvement programmes for the sustainable livelihood of the farmers, tribal people and local population in this fast changing agro-climate scenario.

Acknowledgement

The authors are grateful to the former Director Dr. S.K. Chakrabarti, ICAR-CTCRI, Thiruvananthapuram for his support. The assistance provided by ICAR in terms of providing the funding and facilities for carrying out the work is duly acknowledged. Also we would like to acknowledge the assistance provided by Shri. Balachandra Hegde of Sahyadri Foundation.

References

- Banik, A., Nema, S. and Shankar, D. 2014. Wild edible tuber and root plants available in bastar region of Chhattisgarh. A case study. *Int. J. Forestry and Crop Imp.*, 5(2): 85-89.
- Asha, K.I. and Nair, M.C. 2002. Ethnic knowledge system on wild Dioscoreas (yams) by the Kanikkars of Southern Western Ghats, Kerala. *Indian J. Plant Genetic Resources*, 15(2): 146-149.

- Dwivedi, N.K., Asha, K.I., Asokan Nair, R., Indiradevi, A. and Suma, A. 2013. Collection and conservation of genetic resources of tropical root and tuber crops for sustainable livelihood – A status report. *J. Root Crops*, **39**(2): 21-28.
- Edison, S., Unnikrishnan, M., Vimala, B., Pillai, S.V., Sheela, M.N., Sreekumari, M.T. and Abraham, K. 2006. *Biodiversity of Tropical Tuber Crops in India*, National Biodiversity Authority, Chennai. pp.1-60.
- Velayudhan, K.C., Muralidharan, V.K., Amalraj, V.A. and Asha, K.I. 1998. Genetic resources of yams of Western Ghats. *Indian J. Plant Genetic Resources*, **11**(1): 69-80.
- Sankaran, M., James George, Damodaran, V., Zamir Ahmed, S.K. and Dam Roy, S. 2015. Indigenous traditional knowledge (ITK) on tuber crops practiced by Nicobar tribes in Andaman and Nicobar Islands, India. *J. Root Crops*, **41**(1): 65-68.
- Singh, P.P., Narayan, A. and Singh, R.S. 2016. Indigenous traditional knowledge on tuber crops in Bihar. *J. Root Crops*, **42**(2): 185-186.

ICAR-Central Tuber Crops Research Institute,
Thiruvananthapuram 695 017, Kerala, India

Corresponding author: K. I. Asha
e-mail: ashakarthy@gmail.com

Received: 12 June 2017; Accepted: 25 August 2017

K. I. Asha
M. N. Sheela
Vivek Hegde
Archana Mukherjee
N. Krishna Radhika
A. Asha Devi
Shirly Raichal Anil
A.V.V. Koundinya
M.S. Sajeev
S. Ramanathan