Scholars Academic Journal of Biosciences (SAJB) **ISSN 2321-6883**
Sch. Acad. J. Biosci., 2013; 1(5):213-216

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com **DOI:** 10.36347/sajb.2013.v01i05.012

Research Article

Medicinal and edible tubers from fourty two settlements of Tribals from Pechiparai Social forest in Kanyakumari District, India

Sujatha S*[1] and F. Briska Renuga[2]
[1]International Centre for Bioresources Management, Malankara Catholic College, Mariagiri, Kaliakkavilai, 629153, Kanyakumari district, TamilNadu, India,
[2] Professor, Department of Zoology, Holy Cross College, Nagercoil.

Corresponding author
Sujatha S
Email: sujasukumar80@gmail.com

Abstract: The present study documents the traditional knowledge of medicinal plants that are in use in Pechiparai hill ranges in Kanyakumari district, Tamilnadu, India. Tuber crops are cultivated by tribals and resource poor farmers from time immemorial that led to the development of several indigenous cultivated plant protection and processing technologies. The study emphasizes the potentials of the ethnobotanical research and the need for the documentation of traditional knowledge pertaining to the medicinal and edible tubers plant utilization for the greater benefit of mankind. Some of them are already cultivated, but others are grown wild as a neglected group of economic plants. They are often used as food or serve as a source of raw material for the production of alcohol and animal feed. The tuber yield of four accessions ranged from 22-25 t/ha under open conditions. There was no significant difference between the accessions for tuber yield, morphological and biochemical characters. Tuber contains 30.69-31.25% dry matter and 17.20-18.86% starch content.
Keywords: Ethnomedicinal, medicinal plants, edible tubers, Eastern Ghats, tribals

INTRODUCTION

Plants are the basis of life on earth and are central to people's livelihoods. India is well known for significant geographical diversity which has favoured the formation of different habitats and vegetation types. Indian subcontinent is being inhabited by over 53.8 million tribal people, representing one of the greatest emporia of ethno-botanical wealth [1-2]. Traditional healing systems play an important role in maintaining the physical and psychological wellbeing of the vast majority of tribal people in India. Millions of people in many developing countries do not have enough food to meet their daily requirements and many more are deficient in one or more micronutrients[3]. In many cases rural communities depend on wild resources, including wild edible plants, to meet their food needs in periods of food shortage. The diversity in wild species offers variety in the diet and contributes to household food security. India holds rich genetic diversity in tropical root and tuber crops, particularly aroids, yams and several minor tuber crops. Wild edible tuber species are an important source of food in India and have a significant place in the dietary habits of small and marginal[4] farm families and forest-dwelling communities during periods of food scarcity[5]. Very recently, Namrata *et al*.,[4] proposed the edible tubers not only enrich the diet of the people but also possess medicinal properties. Many tropical tuber species are used in the preparation of stimulants, tonics, carminatives and expectorants. These properties need to be documented to validate, quantify and spread this valuable knowledge [6]. Indigenous knowledge on wild tubers is an integral part of the traditional and sociocultural lives of people in India. Historically, tribal and rural people identified and collected wild tubers from the forests and developed a range of processing methods in accordance to their needs. Now, however, this knowledge is being lost as a result of the spread of modern technologies in rural and tribal areas. A harmonious blend of indigenous knowledge with modern science is essential to promote sustainable development and utilization of wild edible tubers.

Roots and tuber crops occupy a remarkable position in the food security of the developing world due to their high calorific value and carbohydrate content. Some of them are already cultivated, but others are grown wild as a neglected group of economic plants. They are often used as food or serve as a source of raw material for the production of alcohol and animal feed. Many wild plants form an important starchy food for the tribals inhabiting near to forest tracts. Some are important due to their medicinal as well as industrial applications. Many of these crops have not spread farther than their native habitat due to physiological constraints or lack of adaptability. In the present study an attempt was made to evaluate these crops for tuber yield, biochemical characters and the properties of starch.

METHODOLOGY

Information on wild edible tubers was collected from members of three tribal communities Paroja, Gadaba and Irulars in 15 villages in the

Manalodai tract. The Pechiparai hill ranges are distributed in parts of fourty two settlements of Pechipparai in Kanyakumari district of TamilNadu India. The study used a pre-structured questionnaire through focus group discussions. Tribal people aged between 15 and 85 years shared their knowledge on different tuber species gathered by them. Field visits were arranged to document the collecting process and photographs were taken. The tuber species were identified taxonomically by referring to using the characteristics provided by the tribal peoples. A special meeting was organized with a group of women to record food-processing procedures. The Kaaneesh and Irular tribals were characterized by dark skin, short stature, platyrrhine nose, long head, prominent chin, thick lips and scanty hairs on both head and body.

Queensland Arrowroot (*Canna edulis* ker-Gawler)

Canna edulis is a perennial herb, growing to a height of 1.0-2.5m leaves are arranged spirally with a prominent midrib and numerous lateral veins. It is widely distributed throughout the tropics and sub-tropics. It is grown for its branched and fleshy rhizomes. The plant is hardy and in view of low incidence of pest and diseases as well as the wind resistance of the crop, it is considered easy to grow in the typhoon region [7-8]. In India, it is grown for the edible, tuberous rhizome. Although both types of canna store starch in the root-stocks, the edible types have more fleshy rhizomes with better flavour, taste, low fiber and less tannin content than the ornamental types [7]. The rhizomes are formed in a compact mass. Duration of the crop varied from 8-12 months. The tubers are eaten boiled or baked. Starch is obtained from the tubers by a process of rasping, washing and straining. The final product is a shiny, cream coloured powder. Starch is easily digestible and used as food for children and invalids. Based on the leaf and emerging leaf colour and other morphological characters the five accessions in the germplasm are grouped into three morph types namely, dark purple, purple and green accessions. Out of five accessions only two (dark purple and green) are edible. The leaves of edible accessions are bigger than the non edible accessions. Eventhough flowering was observed in all the accessions no seed set was observed in the edible accessions. The yield data revealed that maximum yield of 32.8 t ha^{-1} was recorded in the dark purple accessions followed by 24.7 t ha-1 in the green accession. In the other three accessions the yield varied from 11-20 t ha^{-1}. Tubers of dark purple and one green accession was more fleshy, had better taste and low fiber and phenol content than the other three accessions. The biochemical analysis of tubers indicated that dark purple accession had higher dry matter (35.7%) and starch (27.03%) compared to other accessions. The studies on physico-chemical properties also revealed that canna starch has good potential in food application since it possesses high viscosity, gel strength and high phosphorus content[9]. Hermann [10] reported that the bakery products prepared from canna starch are much lighter, crispier and tastier than those from wheat.

Yam Bean (***Pachyrhizus erosus*)**

Yam bean is a leguminous root crop of good nutritional value. The plant is a coarse, hairy herbaceous twiner with alternate trifoliate leaves. The tubers are simple, lobed, turnip-like or elongated in shape and flesh of the tuber is white, crispy, juicy, refreshing and sweetish in taste and can be eaten as raw or cooked. The mature tuber yields starch, which is similar to arrowroot starch [11]. The pods are poisonous due to the presence of toxic substance 'rotenon'. The powered seeds are used as an insecticide [12]. Yam bean is propagated mainly through seeds and it is a self pollinated crop. Sometimes tubers are used for planting when a particular genotype is desired to be maintained. It grows well on light sandy soil. The plants are pruned once or twice after two months of planting in order to restrict vegetative growth and encourage better tuber development. The crop matures in 6-8 months. Non-flowering plant produces best quality tubers. Hence when grown for tubers, the buds or inflorescence are removed to prevent flower development. Yam bean being a legume, fixes nitrogen and hence increased the soil fertility [13]. A high yielding selection 'Rajendra Mishrik and' yielding 40 t ha-1 was released by the Rajendra Agricultural University, Pusa, Bihar [16]. The 63 accessions of yam bean were evaluated for tuber yield and biochemical characters. The dry matter ranged from 9.17-21.82%, starch varied from 3.63-15.78% and sugar content ranged from 3.07-5.43%. (Annual Report, 1992) [15]. The yield trial conducted with 16 promising accessions of yam bean for three years revealed that 6 accessions (DL-3, DL-20, DL-21, DL-29, EC 100566 and Rajendra local) produced significantly superior yield of > 25.0 t ha-1. Maximum yield of 29.3 t ha^{-1} was recorded in the accession EC 100566 (Annual Report 1999-2000) [15].

West Indian Arrowroot (*Maranta arundinacea* L.)

West Indian Arrowroot (*Maranta arundinacea* L.) is a perennial herb, cultivated for its edible rhizomes, throughout the tropical countries of the world. The plant is an erect, perennial herb, 1.0-1.5 m high, shallow-rooted with rhizomes penetrating into the soil. The plant thrives best in light, well drained, loamy or sandy soil and partial shade is beneficial. It is propagated by tips of rhizomes known as 'bits' which contains 2-4 nodes. The small rhizome containing eyes are used for planting. The land is ploughed and the bits are planted, 5.0-7.5 cm deep and 30 cm apart. Usually planting is done in May. The shoots come up within 15 days. Irrigation is necessary during the growing period and the flowers are nipped off as they appear. The rhizomes are ready for harvest in 10-11 months after planting. Maturity is indicated by yellowing, wilting and drying up of leaves. Harvested rhizomes are 20-45 cm long and 2.5 cm thick. The tubers are eaten boiled or baked and the bulk of the material is used for the production of

starch. Arrowroot starch is a fine, white powder and it is tasteless and odourless when dry, but a faint odour develops when it is wet or cooked. The starch granules are ovoid or ellipsoid in shape. The starch is easily digestible and valued as a food especially for infants, invalids and convalescents. It is used in the preparation of biscuits, cakes, puddings and jellies. It possesses demulcent properties and is given for correcting bowel complaints. It is employed as a suspending agent in the preparation of barium meals and the starch is preferred in tablet making since it disintegrates fast. Arrowroot starch is used as a base for face powders and in the preparation of special glues [17]. Four accessions of arrowroot collected from Kerala, Bihar, Madhya Pradesh and Shillong are maintained in the germplasm. The tuber yield of four accessions ranged from 22-25 t/ha under open conditions. There was no significant difference between the accessions for tuber yield, morphological and biochemical characters. Tuber contains 30.69-31.25% dry matter and 17.20-18.86% starch.

List of edible tuber with

Curcuma brog Val.

Plants are semi erect with green leaves and light green midrib. Root stocks are oblong, long fusiform tubers, pale yellow flesh with camphoraceous smell and bitter taste.

Plant height: 80-100 cm Yield : 1.5-2.0 kg/plant Dry matter : 30.40% Starch: 18.00%
Sugar: 0.99%, Lipids: 0.79%.

***a. Curcuma malabarica* Vel.**

Plants are semi erect with green leaf sheath and light purple midrib. Root stocks are slightly oblong, fusiform tubers, pale blue flesh with camphoraceous smell and bitter taste. Plant height: 100-120 cm Yield : 1.50-2.00 kg/plant Dry matter : 31.4% Starch: 21.4%, Sugar: 0.91%,Lipids: 0.75%.

***b. Curcuma amada* Roxb.**

Plants are semi erect with green leaves and leaf sheath. Root stocks are oblong, pale yellow or white in colour with mango aroma and no taste. Plant height:85-100 cm Yield : 1.25-1.50 kg/plant,Dry matter :22.40 %,Starch: 10.22%,Sugar: 0.72%,Lipids: 1.01%, Starch Granule Size: 8.60-21.60 µm

***c . Curcuma aromatica* Salisb**

Plants are semi erect, leaves with green leaf sheath and green midrib. Root stocks are oblong with fusiform tubers, camphoraceous smell and bitter taste.
Plant height: 75-90 cm
Yield : 1.25-1.50 kg/plant
Dry matter : 28.80%
Starch: 15.00%
Sugar: 0.99%
Lipids: 1.27%
Starch Granule Size: 10.0-33.30 µm

***d. Curcuma zedoaria* Rosc.**

Plants are erect with green leaf sheaths and light purple midrib. Root stocks are oblong with fusiform tubers, dark orange flesh colour, camphoraceous smell and bitter taste.
Plant height 135-150 cm
Yield : 1.25-1.50 kg/plant
Dry matter : 25.0%
Starch: 14.06%
Sugar: 1.3%
Lipids: 0.78%
Starch Granule Size: 6.60-23.00 µm

***e. Curcuma aeruginosa* Roxb.**

Plant are semi erect with green leaves and dark purple midrib. Root stocks are oblong, fusiform tubers, camphoraceous smell and bitter taste.
Plant height: 85-100 cm
Yield : 1.25-1.50 kg/plant
Dry matter : 29.30%
Starch: 14.10%
Sugar: 1.41%
Lipids: 0.47%
Starch Granule Size: 6.66-33.30 µm

***f. Curcuma harita* Mangaly and Sabu**

Plants are semi erect with green leaf sheath and midrib. Root stocks are oblong, fusiform
tubers, white or cream flesh colour, camphoraceous smell and bitter taste.
Plant height: 75-90 cm
Yield: 1.00-1.25 kg/plant
Dry matter : 24.1%
Starch: 14.32%
Sugar: 1.11%

***h. Curcuma caesia* Roxb.**

Plants are erect with purple leaf sheath and midrib. Root stocks are oblong, fusiform tubers, dark bluish flesh colour with camphoraceous smell and bitter taste.
Plant height: 85-95 cm
Yield : 1.00-1.25 kg/plant
Starch: 19.86
Sugar: 0.84%
Lipids: 0.81%
Starch Granule Size: 6.66-26.60 µm

***i. Curcuma raktakanta* Mangaly and Sabu**

Plants are semi erect with dark purple leaf sheath and brown midrib on the leaves. Root stocks are oblong, fusiform tubers with camphoraceous smell and slightly bitter taste.
Plant height: 100-125 cm
Yield : 1.50-1.75 kg/plant
Dry matter : 28.80%
Starch: 14.20%
Sugar: 0.62 %
Lipids: 1.15%
Starch Granule size: 6.66-26.60 µm

CONCLUSION

This study revealed that different tribal communities maintained specific knowledge about the wild tuber species, including their habitat, collecting period, sustainable collection, mode of preparation and consumption as well as marketing. To date, this knowledge appears to be fairly well conserved and used as a result of continued reliance of local communities on the wild edible tubers. Analysis of the results showed that most of the edible plants are used mainly by tribal and poor families both during normal and difficult times. Utilization of the wild edible plants by the younger generations ensures the maintenance of knowledge associated with the different species. This suggests that further investigation is needed into the pharmacological properties of all these species. Safe conservation, sustainable use and in-depth study of wild tuber diversity is essential to the sustained use of this diversity for meeting the present and future food needs of the tribal and rural people during periods of food scarcity, as well as their use in traditional medicine. This will require active community involvement in the process and sharing of benefits.

Acknowledgement

We would like to sincere thanks **Rev. Fr. Premkumar (M.S.W)** Secretary and Correspondent in Malankara Catholic College, Mariagiri for valuable suggestions, insightful advices and a boost of in my scientific endeavors.

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