

Ethnobotanical Observation on Tuberous Plants from Tribal Area of Rajasthan (India)

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ABSTRACT

The present paper gives an account of 42 tuberous plants of Ethnobotanical interest from Aravalli hills of Rajasthan. Main tribes inhabiting the study area are Bhil, Meena, Garasia, Damor and Kathodi. These tribes use the tuberous plants for various purposes in their daily life. Health, vitality and longevity enjoyed by the tribals have been attributed by them to these wild tuberous plants. On account of environmental changes and lack of insight of conservation of tuberous plants, many of them have become rare, threatened and endangered. If proper attention is not given, extinction of these plant species is certain and this is beyond doubt. Therefore identification and utility of these tuberous plants and compilation of a database on local information held by the tribes is stressed. Ethnobotanical information about tuberous plants is given by mentioning their botanical name, family, local name, time of flowering and fruiting, ecology and uses.

Key words: Tuberous plants, Ethnobotany, Tribals, Aravalli hills, food plants, medicinal plants, Rajasthan.

INTRODUCTION

Tuberous plants characteristically have a storage organ on or below the soil surface; this organ may be a true bulb, corm, tuber, tuberous root, rhizome, stolon or pseudobulb. Storage organs evolved over the years allowing the plants to survive for an extended period of environmental stress such as cold, heat or drought. Carbohydrate and nutrient reserve are stored in these organs to support the growth of shoot, root and flower after the stressful period has passed.

Rajasthan is the largest state of India, located in the north-western part of India. Geographically it lies between 23⁰30' to 30⁰12' longitude and 69⁰30' and 78⁰17' latitude. The most striking geological feature of Rajasthan are the Aravalli ranges – the oldest mountain range in the world, which runs from Khetri in north east to Khed Brahma in south west, a length of about 550 km. The variability in climate, edaphic, and topographic conditions causes diversity of vegetation in the Aravalli ranges. These hills ranges possess an abundant population of various tribes. The main tribes of the study area are Bhil, Meena, Garasia and Kathodi, which form 12% of the total population of the state. Ethnobotanical survey of Aravalli hills revealed that the tribal communities use a number of tuberous plants, which are commonly available in and around their habitat and also cultivate such plants in their agricultural fields.

Ethnobotany has been defined as the study of direct interaction between humans and plants (Ford, 1978.a) .As ethnobotanical studies have emphasized the use of plants by hunter gathered and agricultural societies, it is often assumed that it is restricted to those societies only. As plants play important role in almost every realm of human activity, Ethnobotany encompasses many field including botany, biochemistry, pharmacognosy, toxicology, medicine, nutrition,

agriculture, ecology, evolution, sociology, anthropology, linguistic, history and archeology. (Balick, M. J. et al (1995), Black et al (2001), Cook et al (1995), Cotton ,C.M.et al (1996), Gliessman, S.R.(ed) (1990), Rindos et al (1984), Rival, Laura (1998), Saucer, J. D. (1994), Etkin, N.L.(1993)).

Studies on Ethno-food and ethno-medicinal plants has been carried out all over the world in tribal areas.(Akarele,O 1990, Balick,M.j.1990, Bye,R.A1986, Croom,E.M.1983 Domingunz, X.A. et al 1985). Ethnobotanical studies in the tribal dominated area of Aravalli hill of Rajasthan have been carried out by Joshi, P. and Aawasthi A.(1991), Joshi, P.(1995b) , Joshi, P. (1995a), Joshi, P. (1995), Jain. S.K. (1991), Jain, S.K. (1981), Katewa, S.S. and Galav, P.K. (2005a.) Katewa, S.S. and Galav, P.K. (2005b) , Katewa, S.S. and Jain Anita. (2006.), Shetty B.V. and Singh V. (1993), Singh, V. and Pandey (1996) Katewa, S.S. and Guria, B.D.(1997)., Asha Arora (1997); Singh V. and Pandey, R.P. (1998), Nag, Ambika (1999) Singh V. and Pandey, R.P. (1998). A perusal of the literature reveals that there is still an ethnobotanical gap in knowledge about tuberous plants in these regions. The present paper therefore is an attempt to fill this gap. Apart from it and some new ethnobotanical uses have also been reported.

MATERIAL AND METHOD

Ethnobotanical survey of tribal areas of Rajasthan was conducted repeatedly in 2006-08 during different areas and seasons. Before laying hands into the field work, administrative things were worked out (like meeting the chief of the community, convincing and seeking the support from tribal people). The local informants were gathered, field sites were visited. The purpose of our survey was brought to their notice. For this we mainly targeted aged people, local vaid (doctor of the tribal community), priests, etc. a conversation was then sought with the local people selected at random and then the ones who were well versed in the use of these plant species. Public meeting was also held to arrive at a general view point; this all helped in maintaing the most expected data like what main purposes does a kind of plant fulfill and where they can be found in abundance. The secondary informations were collected form non tribal people like forest official, government physician, reason being their long association with the tribes and that area. List of informants of different area with name, tribe, sex, age and their occupation is given in Appendix 1.

During our survey, it was observed that women of the tribal areas also have good knowledge of plants. In forest with the ambient vegetation before them, tribals are promoted to remark on the utility of species especially when accompanied by a group. Both sexes were present in large and small groups. This all resulted in heterogeneity of information, like when will tuber sprout, when shall flowering and fruiting take place , when shall they go into dormant phase? etc etc.

In order to determine the authenticity of information collected during field work, repeated verification of data from different informants at different times was done. Thus, only the specific and reliable information cross checked with at least 10 informants has been incorporated in the present study.

During the ethnobotanical survey some interesting uses of tuberous plants have come into picture, which was not mentioned in the important ethnobotanical herbal literature. The collected herbal plants were identified up to genus level from the local flora of Singh and Shetty (revised 1999). Then final confirmation up to species level at the herbarium of Forest Research Institute, Dehradun (INDIA). The entire collected specimens were deposited in the Herbarium of Laboratory of Ethnobotany and Agrostology, Department of Botany, College of Science, M.L. Sukhadia University, Udaipur for authentication of information and further references. Numbers of voucher specimen is also provided. The information about the food and medicine are given by mentioning their botanical name, ecology, flowering and fruiting and mode of administration.

ENUMERATION

Ampelocissus latifolia (Roxb.) Planch. (Vitaceae)

¹EA 205

²Ln. : 'Tita'

³Fl. & Fr.: May-Sept.

⁴Ln. : Jhadol

Ecology : Common among hedges and as forest undergrowth.

Ethnobotanical uses:

1. Fresh crushed tuber is boiled in *Ricinus communis* oil and then applied externally for the treatment of gout.
2. Crushed tuber with water is given to animal with the help of drenching tube to cure fractured bone.
3. The extract of tuber is given orally to cure dyspepsia and indigestion.
4. Extract of tuber is given orally to cure tuberculosis
5. Infusion of whole plant is used as tonic by aged person.

Asparagus racemosus Wild. (Liliaceae)

EA 160

Ln. : 'Naharkanta'

Fl. & Fr.: Aug.-March

Loc. : Ruthi Rani Mahal (Jaisamand)

Ecology : Common in the forest either spreading or climbing on shrubs or bushes.

¹EA – Ethnobotany and Agrostology Herbarium number ²Ln. – Local name

³Fl. & Fr.: Flowering and Fruiting ⁴Loc. – Locality

Ethnobotanical uses:

1. Decoction of tuber of *Asparagus racemosus* and bark of *Azadirachta indica* is given twice a day to the patient of diabetes for one month to check blood sugar level.
2. Paste of 5 gm of fresh tuber is given orally with water twice a day for three days to increase lactation in nursing women.
3. Decoction of about 10 gm of tuber is also given to animals for a week to increase lactation.
4. paste of 5 gm of fresh tuber is given orally with water twice a day for three days to increase lactation in nursing women.
Decoction of about 10 gm of tuber is also given to animals for a week to increase lactation.

Arisaema tortuosum (wall.) Schott. (Araceae)

EA 359

Ln. : 'Halida'

Fl. & Fr.: July-Nov.

Loc. : Jhadol

Ecology : Rare, in shady localities in the forest.

Ethnobotanical uses :

1. Paste of the tuber is applied over the wound caused by snake – bite to check poisonous effect.
2. In case of abscess in the neck, dried powder of tuber is applied over the neck. It helps in early healing.
3. The decoction of tuber is given to animals for early recovery of fractured bone.

Costus speciosus (Koen.) J.E. Smith (Zingiberaceae)

EA 87

Ln. : 'Mahalakari'

Fl. & Fr.: June-Oct.

Loc. : Sitamata wild life sanctuary.

Ecology : In shady and moist places in forests.

Ethnobotanical uses:

1. Infusion rhizome is taken orally to cure asthma.
2. Dried powder of rhizome is taken orally for seven days to cure rheumatism.
3. Decoction (2-3 drops) of rhizome is poured in the ear for curing the ear ache.

Curculigo orchoides Gaertn. (Hypoxidaceae)

EA 126

Ln. : 'Kali musali' **Fl. & Fr.:** Aug.-Nov.

Loc. : Jaisamand

Ecology : In grassy plain or on the hills.

Ethnobotanical uses:

1. In case of scorpion bite, the paste of tuberous root is applied locally on the affected part.
2. Magico – religious belief: If the patient is suffering from body pain during cloudy season then talisman of tuber is worn by patient.
3. The tuber powder is given orally to cure leucorrhoea in women.
4. The tuber powder is taken to increase sexual vigor.

Crinum asiaticum L. (Amaryllidaceae)

EA322

Ln. : 'Jahari Kanda' **Fl. & Fr.:** After rainy season

Loc. : Kewda Ki Nal

Ecology : Commonly grown in garden as ornamental purposes.

Ethnobotanical uses :

1. The paste of the tuber is tied over the wound for early recovery.
2. The crushed leaf juice is dropped into the ear in earache.
3. This plant is used as ornamental purpose.

Ceropegia bulbosa Roxb. (Asclepiadaceae)

EA 211

Ln. : 'Khadula' **Fl. & Fr.:** July – Dec.

Loc. : Kewda Ki Nal

Ecology : Rare, in exposed rocky habitat, particularly on hillock.

Ethnobotanical uses:

1. The paste of seeds is dropped in the ear to cure deafness.
2. Decoction of tuber is taken orally to get rid of urinary bladder stone.
3. The tuber is eaten either in cooked or raw form.

Ceropegia tuberosa Roxb. (Asclepiadaceae)

EA 212

Ln. : 'Khadia' **Fl. & Fr.:** June – Oct.

Loc. : Kewda Ki Nal

Ecology : Rare, in exposed rocky habitat, particularly on hillock.

Ethnobotanical uses:

1. The tuber is eaten either in raw form or in cooked form.
2. In case of 'Besu' (poisonous animal) bite, the powder of tuberous root is applied over the infected area to prevent the poisonous effect of the animal.

Chlorophytum tuberosum (Roxb.) Baker (Liliaceae)

EA 293

Ln. : 'Safed moosli'

Fl. & Fr.: June – Oct.

Loc. : Dhimda Bag (Jaisamand)

Ecology : Frequent on the hill in protected area.

Ethnobotanical uses:

1. The tuberous root is washed and then dried. One gram powder of tuberous root is mixed with water and given to male as tonic.
2. The root powder is given to animal to cure fractured bone.
3. small amount of tuber is given to female to check Leuchorrhoea .

Corallocarpus epigaeus (Rottl. & Willd) Hook. (Cucurbitaceae)

EA 227

Ln. : 'Mirchia Kand'

Fl. & Fr.: Aug. – Nov.

Loc. : Jaisamand

Ecology : Found in sandy to gravelly habitat, not common.

Ethnobotanical uses:

1. Fruit of *Citrus medica* (5gm) with 5-6 pieces of this tuber is chewed in case of tumor in stomach or in stomachache.
2. The decoction of tuber is given to patient for seven days in typhoid.

Colocasia esculenta (L.) Schott. (Araceae)

EA 413

Ln. : 'Arbi'

Fl. & Fr.: Aug. – Oct.

Loc. : Jhadol

Ecology : Found wild in the marshy or moist shady localities in forest.

Ethnobotanical uses:

1. Tuber is eaten as a vegetable after cooking.
2. Tuber juice is rubbed on scalp for good growth of hairs.

Curcuma amada Roxb. (Zingiberaceae)

EA 323

Ln. : 'Amba haldi'

Fl. & Fr.: Aug. – Oct.

Loc. : Kotda (Bhula Ki Amali), Kota (Darah)

Ecology : Rare, in the forest.

Ethnobotanical uses:

1. Decoction of the rhizome is taken to cure dropsy.
2. The powder of the rhizome is applied locally in case of snake bite.
3. The rhizome with fodder is given to animal to cure fractured bone.
4. Paste is prepared by mixing powder of 50gm root of *Aristolochia indica* ('Gorisal'), 50 gm tuber of *Asparagus racemosus* ('Satavar'), 25gm rock salt, 25 gm cloves, 25 gm rhizome of *Curcuma amada* ('Amba haldi') 100 gm dried *Zingiber officinales* (ginger), 100gm seeds of *Trchyspermum ammi* ('Ajawain') and 250 gm bulbs of *Alium sativum* ('lahsun') . This paste is boiled with human urine and the decoction so formed is given after every three hours for two days to cure asthma in cattle.

Canna indica L. (Cannaceae)

EA 528

Ln. : 'Keli' **Fl. & Fr.:** Flowering almost throughout the year.

Loc. : Kewada ki nal

Ecology : Common near moist places and canal side, often cultivated in garden as ornamental purpose.

Ethnobotanical uses:

1. Magico – religious belief: The women, who don't have child, worship this plant every Thursday with the belief that they will get the child.
2. This rhizomatous plant is commonly used for ornamental purpose.

Cayratia trifolia (Linn.) Domin. (Vitaceae)

EA 331

Ln. : 'Khhata nimba' **Fl. & Fr.:** July – Dec.

Loc. : Rudhi Rani Ka Mahal (Jaisamand)

Ecology : Common among bushes in wasteland, forest and boundaries of field.

Ethnobotanical uses:

1. Extract of tuber along with infusion of *Trifolium* seed is given orally to diabetic patients to check sugar level of blood.
2. Paste of tuber applied on the affected part in case of snake bite.
3. root paste is applied locally in complained of carencules.
4. powder of tuberous root is taken orally with the milk for the early recovery for fractured bone.

Dioscorea bulbifera L. (Dioscoreaceae)

EA 276

Ln. : 'Jatashankari' **Fl. & Fr.:** Aug. – Dec.

Loc. : Kotda

Ecology : Common in wasteland and open forest among bush and shrubs and along hedges often cultivated for its edible bulbils and tuber.

Ethnobotanical uses:

1. The tuber is used as contraceptive by the tribal ladies. Powder (10gm) of dried tuber is given once in a day for 5 days after menses.
2. Tuber is cooked after processing or sometime without processing as vegetable.

Dioscorea hispida Dennstedt. (Dioscoreaceae)

EA 391

Ln. : 'Jatashankari' **Fl. & Fr.:** Aug. – Oct.

Loc. : Kotada (Bhula Ki Amali)

Ecology : Occasionally found in the forest.

Ethnobotanical uses:

1. The tuber is eaten as vegetable after keeping it overnight in water or after boiling.

Dioscorea pentaphylla L. (Dioscoreaceae)

EA 392

Ln. : 'Jatashankari' **Fl. & Fr.:** Aug. – Oct.

Loc. : Kotada (Bhula Ki Amali)

Ecology : Occasionally found in the forest, particularly in moist place.

Ethnobotanical uses:

1. The powder of tuber is given orally in abdominal pain after delivery.

2. Decoction of tuber is given for curing asthma or cough.
3. Decoction of tuber is also given to animals for early recovery of fractured bone.

***Dioscorea tomentosa Roxb* (Dioscoreaceae)**

EA 529

Ln. : 'Jangali ratalu'

Fl. & Fr.: Aug. – Nov.

Loc. : Kewada ki nal

Ecology : Generally found in moist places of forest.

Ethnobotanical uses:

1. The sliced tuber is kept overnight in water and after that the tuber is cooked as vegetable.

***Daucas carota L.* (Apiaceae)**

EA 177

Ln. : 'Gajar'

Fl. & Fr.: Nov. - March

Loc. : Jhadol

Ecology : Cultivated in agricultural field

Ethnobotanical uses:

1. Leaf extract (2-3 spoons) is taken twice a day for 10-15 days to cure sterility in males.
2. The juice of tuber is taken orally for strong eyesight.

***Eulophia ochreatea Lindl.* (Orchidaceae)**

EA 403

Ln. : 'Salam mishri'

Fl. & Fr.: May – Sept.

Loc. : Sitamata wild life sanctuary

Ecology : Rare, usually found as undergrowth in the forest.

Ethnobotanical uses:

1. Crushed bulb is given orally to the patient in of diarrhea.
2. One teaspoon of bulb powder is given orally to patient for almost 1-2 months to cure leukemia.

***Euphorbia fusiformis Don.* (Euphorbiaceae)**

EA 330

Ln. : 'Pahari mooli'

Fl. & Fr.: April - June

Loc. : Sitamata wild life sanctuary

Ecology : Rare in protected area.

Ethnobotanical uses:

1. Paste of tuberous rootstock is applied locally in rheumatic pain.
2. In case of gout the paste of tuber is warmed and then administrated locally.

***Gloroisa superba L.* (Liliaceae)**

EA 222

Ln. : 'Kalihari'

Fl. & Fr.: Aug. – Nov.

Loc. : Dhimda bag (Jaisamand)

Ecology : Rare in the forest.

Ethnobotanical uses:

1. In case of Vulvo–vaginal–uterine–prolapsed during delivery in animal; decoction is given orally for settling the uterus and in case of female (human) the powder of tuber is applied locally on the proposed uterus.
2. In case of infection of guinea – worm on the skin, the dried powder is locally applied on the affected area.
3. There is a myth about this plant among the tribals that if any part of this plant is brought into the home, there will be dispute in family.

4. one joint of tuber is tied on the stomach of woman to promote labour pain.

***Globba marantina* Linn. (Zingiberaceae)**

EA 472

Ln. : 'Runo'

Fl. & Fr.: Aug. – Sept.

Loc. : Gamadi Gam (Jaisamand)

Ecology : Common on the hedges of cultivated field and outskirts of forest.

Ethnobotanical uses:

1. Decoction of tuberous roots is taken once a day for two months in asthma.
2. Tuberous root extract is poured into the ear to cure earache.

***Iphigenia Indica* L. (Liliaceae)**

EA 530

Ln. : 'Dholi mooli'

Fl. & Fr.: June – Sept.

Loc. : Phalasia

Ecology : Occasionally found in the rock crevices on Aravalli hills among grasses.

Ethnobotanical uses:

1. Tribals use the corm as food.

***Leea indica* (N. Burn.) Merrill. (Leeaceae)**

EA 245

Ln. : 'Hastipalash'

Fl. & Fr.: July – Nov.

Loc. : Sitamata wild life sanctuary

Ecology : Occasional in the forest, in shady habitat.

Ethnobotanical uses:

1. Extract of inflorescence is given to children to cure chest pain.
2. In case of allergy from obnoxious weed, the paste of tuber of this plant is applied locally on the affected part.

***Leea macrophylla* Roxb. Ex. Horenem. (Leeaceae)**

EA 389

Ln. : 'Lalpatta'

Fl. & Fr.: Aug. – Nov.

Loc. : Sitamata wild life sanctuary

Ecology : Rare, in shady habitat of forest.

Ethnobotanical uses:

1. This plant is having anti-cancerous properties. Powder of leaves mixed with honey is given to patient of cancer.
2. Decoction of tuber is given to animal with drenching tube in dysentery.
3. Brak powder is given orally to cure cancer.
4. powder of tuber is given to cure sexual debility in male.

***Langenandra toxicaria* Dalz. (Zingiberaceae)**

EA 531

Ln. : 'Khariya'

Fl. & Fr.: Aug.-Nov.

Loc. : Salumber

Ecology : Common in hedges of cultivated field and outskirts of forest.

Ethnobotanical uses:

1. Infusion of tuberous rootstock is used in tuberculosis.
2. Decoction of tuberous root is used to check growth of old tumor in any body part.

Momordica dioica Roxb. ex Willd. (Cucurbitaceae)

EA 175

Ln. : 'Kinkoda'

Fl. & Fr.: Aug. – Oct.

Loc. : Jaisamand

Ecology : Common on hedges of cultivated field and outskirts of forest.

Ethnobotanical uses:

1. The unripe fruit is eaten as vegetable.
2. It is believed that the consumption of tuberous root of male plant increases height and tuberous root of female plant decreases height.
3. Root decoction causes infertility in females.

Momordica balsamina L. (Cucurbitaceae)

EA 530

Ln. : 'Jangali Karela'

Fl. & Fr.: July – Oct.

Loc. : Rawali Tadgarh

Ecology : Common in wasteland on the boundary of field and garden.

Ethnobotanical uses:

Although no specific use of tubers is reported but tribals sell fruits in market but consumption of higher quantity is reported to have poisonous to have poisonous effect causing vomiting etc. & the unripe fruits are cooked as vegetable.

Mirabilis jalapa L. (Nyctaginaceae)

EA 480

Ln. : 'Gulabbas'

Fl. & Fr.: Almost throughout the year

Loc. : Jaisamand

Ecology : Naturalized as weed in cultivated field.

Ethnobotanical uses:

1. The root tuber is ground and paste is applied on tumor to check growth of old tumor.
2. This plant is used as decorative plant.

Nelumbo nucifera Gaertn. (Nelumbonaceae)

EA 248

Ln. : 'Kamal Kakari'

Fl. & Fr.: Aug. – Nov.

Loc. : Aaspur

Ecology : Common in ponds.

Ethnobotanical uses:

The petiole and rhizome is cooked as vegetable and often sold in market by tribals.

Pupalia atropurpurea Mog. (Amaranthaceae)

EA 533

Ln. : 'Palakia'

Fl. & Fr.: July – Sept.

Loc. : Kotada

Ecology : Commonly in gravelly to rocky habitat in wasteland.

Ethnobotanical uses:

1. The tuberous root is edible and eaten raw like radish.

Puraria tuberosa (Roxb. ex Willd.) DC (Fabaceae)

EA 264

Ln. : 'Ghora bel' **Fl. & Fr.:** Feb. - April

Loc. : Kewada Ki nal

Ecology : Rare, in wasteland among clumps of tree and shrubs.

Ethnobotanical uses:

1. The tuber is having food value and eaten raw.
2. The tuber is supposed to be an antinematodal. Small quantity of paste of tuber is given to patient for easy expulsion of guinea – worm.

Raphanus sativaus L. (Brassicaceae)

EA 536

Ln. : 'Moolo'

Fl. & Fr.: Oct. – Nov.

Loc. : Phalasia

Ecology : Often cultivated

Ethnobotanical uses:

1. One liter juice of root is mixed with 120gms. Of Alums powder and boiled in iron pot till it becomes thick. Then tablets of about 1-1.5 gm of weight are made. One tablet is taken twice a day with 2 tea spoon of butter and 250gm curd of cow' milk for 15 days in case of boils.
2. The seed powder is taken to cure irregular menstruation.

Ruellia tuberosa L (Acanthaceae)

EA 537

Ln. : ----

Fl. & Fr.: Aug. – Nov.

Loc. : Som

Ecology : Common in wasteland and forest.

Ethnobotanical uses:

Tuber powder (5-10gm) is given with milk for checking abdominal pain after delivery.

Sauromatum venosum (Ait.) Kunth (Araceae)

EA 358

Ln. : Halida

Fl. & Fr.: March-April

Loc. : Chhota nala (Jhadol)

Ecology : Found in moist and shady places.

Ethnobotanical uses:

1. The tuber is having antidotal activity; so the paste of tuber is applied on the affected part in case of snake bite.
2. In case of protuberance on back, the tuber of this plant is sliced and after heating, tied over protuberance.

Tacca leontopetaloides (L.) Kuntze (Taccaceaea)

EA 535

Ln. : 'Jadi'

Fl. & Fr.: Aug-Oct.

Loc. : Sitamata wild life sanctuary

Ecology : Rare, in moist and shady places.

Ethnobotanical uses:

Decoction of tuber is taken once a day for 2-3 days to cure severe headache.

***Trichisanthes cucumerina* L. (Cucurbitaceae)**

EA 306

Ln. : 'Nagfani beldi'

Fl. & Fr.: Aug-Oct.

Loc. : Kotada

Ecology : Particularly in wasteland.

Ethnobotanical uses:

1. In case of snake bite, the powder of tuber is applied locally.
2. Decoction of tuber is given with drenching tube in case of Volvo-vaginal-uterine prolapsed in animals.

***Trapa natans* (Trapaceae)**

EA 534

Ln. : 'Singhara'

Fl. & Fr.: Aug. - June

Loc. : Oghana

Ecology : Marshy and aquatic places.

Ethnobotanical uses:

Bhil tribe cooks the rhizome and tender shoot as vegetable during the scarcity of food.

***Urginea indica* (Roxb.) Kunth(Liliaceae)**

EA 402

Ln. : 'Koli Kanda'

Fl. & Fr.: Feb. - May

Loc. : Pai

Ecology : Common in wasteland and open forest in gravelly rocky habitat.

Ethnobotanical uses:

1. Powder (1-2 gm) of bulb is given once to female with mild in case of leucorrhoea.
2. Leaves are cooked as vegetable.
3. This plant act as indicator of rain. If the growth of this plant is full it is an indication of heavy rain ahead. If this plant dried earlier it is the indication of low rain or famine ahead.
4. Decoction of tuber is taken orally to cure respiratory trouble.

***Withania somnifera* (L.) Dunal (Solanaceae)**

EA 81

Ln. : 'Ashgandha'

Fl. & Fr.: Most part of the year

Loc. : Gogunda

Ecology : Common in dry wastelands, preferably in fertile soil.

Ethnobotanical uses:

1. The dried powder of tuber is given to check constipation.
2. One teaspoon full of root powder is given with 250ml. milk twice a day in rheumatism.

***Zingiber officinale* Rose (Zingiberaceae)**

EA 282

Ln. : 'Aado'

Fl. & Fr.: Sept. – Nov.

Loc. : Phalasia

Ecology: In wasteland, often cultivated.

Ethnobotanical uses:

1. One teaspoon powder of rhizome is taken with water in abdominal pain.
2. One teaspoon powder of rhizome with small amount of salt is taken with water in vomiting.

RESULT AND DISCUSSION

The traditional knowledge system in India is fast disappearing. So there is an urgent need for inventorying and recording all ethnobotanical information among the diverse ethnic communities. In this paper ethnobotanical uses of 42 tuberous plants belonging to 21 families have been documented for their food value and their interesting therapeutic properties for various ailments. Thus plants have dual significance; firstly they can be promising future food, secondly these medicinal tuberous plants can have some active constituent for future pharmaceutical analysis.

The results show that gender and age class differ in their traditional knowledge with regard to medicinal plants reported. Males above 50 year of age had more traditional knowledge about medicinal plants and their uses than females. This may be attributed to their involvement in trade related activities. In most of the cases the older people were noted as being better informants and the vivid reason for this may be their personal experience of using these plants since old times.

We learned through the survey that local people are still dependent on plant resources for treatment of various ailments, but this kind of dependence is decreasing. This is likely due to multiple reasons. One such reason is lack of belief of the young generation in the traditional medicine systems and increasing use of allopathic medicines due to their availability and efficacy. Another reason likely is the harvest by drug manufacturers especially in areas near settlements and pastures, leaving behind very little for access by local communities.

Mostly the tuberous plants grow in shady and moist places but due to habitat destruction, climatic changes, introduction of exotic species (*Lantana amara*, *Parthenium* etc), overexploitation for food and medicine; the natural wild tuberous plants are facing the threat of extinction e.g. *Ceropegia odorata* which was endemic in eastern Rajasthan (Mt.Abu) but now it has not been reported in last decades that means it has been extinct now. Most tuberous plants have been categorized into rare and endangered. This lack of effort to sustain resources may result in their depletion from natural habitats. There is a great need to create awareness among the indigenous communities about endangering medicinal plants, if over exploited to meet market demand.

Arisaema tortuosum, *Costus speciosus*, *Eulophia ochreatea*, *Leea indica*, *Leea macrophylla*, *Pureria tuberosa*, *Corallocarpus epigaeus* etc. have medicinal value belonging to rare category while *Ceropegia bulbosa*, *Ceropegia tuberosa* and *Pureria tuberosa* having food value, but due to overexploitation now they have become rare and endangered and there is great threat of extinction. Genus *Dioscorea* which was much abundant previously has been kept into rare category.

Many plants are cultivated by tribals abundantly and sold in nearby market. These plants have much nutritional value. *Ceropegia bulbosa*, *Ceropegia tuberosa*, *Colocasia esculenta*, *Curcuma amada*, *Dioscorea bulbifera*, *Dioscorea hispida*, *Dioscorea tomentosa*, *Daucus carota*, *Iphigenia indica*, *Nelumbo nucifera*, *Pupalia atropurpuria*, *Pureria tuberosa*, *Raphanus sativaus*, *Zingiber officinale* are wild tuberous plants which are used by tribals as food. If proper strategies are proposed then this plants may become the part of tribal economy.

Some tuberous plants e.g. *Curcuma amada* and *Zingiber officinale* are widely used as spice and condiment not only by the tribals but also by the urban peoples.

Along with food value some plants e.g. *Crinum asiaticum* and *Gloriosa superba* now have become beautiful ornamental plants but both are rare plant and found only in protected forest.

Some plants are poisonous too e.g. *Gloriosa superba*, *Crinum asiaticum*, *Urginea indica*, *Withania somnifera*, (Seed), *Dioscorea bulbifera*. It is reported that being poisonous they have great medicinal value too. The tribal people have much knowledge about the detoxification; they use *Dioscorea bulbifera*, *Urginea indica* after detoxification, they either keep them overnight in running water or boil with water and after that they cook them.

Nearly about all plants are reported to be medicinal having medicinal value of curing various ailments. *Arisaema tortuosum*, *Curculigo orchoidies*, *Ceropegia tuberoae*, *Curcuma amada*, *Cayratia trifolia*, *Trichisanthes cucumerina*, *Sauromatum venosum* are widely used as antidote. Several plant species e.g. *Curcuma amada*, *Cayratia trifolia*,

Arisaema tortuosum and *Chlorophytum tuberosum* are used for curing bone fracture.

Tacca which is reported for the first time just little while ago in Rajasthan, (India) (Sharma, S. (2005), has medicinal value of curing severe headache or migraine. *Leea macrophylla* is reported to be anti cancerous .It is also observed that some tuberous plant species are used by tribals to cure various sexual disease , menorrhage to regularize menstruation , to increase fertility etc. the knowledge of tribals about contra receptive, which is one of the informal innovation by them, is quite relevant in present day situation . In this context *Gloriosa superba* used to develop sterility.

Curculigo orchiooides incareas sexual vigor. *Dioscorea bulbifera* is used by tribal ladies as contra receptive. *Arisaema tortuosum* , *Ampelocissus latifolia* , *Curculigo orchiooides* *Corallocarpus epigaeus* *Colocasia esculenta* , *Curcuma amada*, *Dioscorea bulbifera*, *Dioscorea pentaphylla* , *Eulophia ochreatea* , *Leea macrophylla*, *Withania somnifera*, *Ruelia tuberosa* are common important plants which are used by tribals to cure various ailments related to digestive tract like constipation, indigestion, abdominal pain, dysentery etc.

Skin diseases like wounds, tumors, boils, sunburn, cut, injury, and carbuncle are among tribals. Few important plant species which cure these diseases are *Sauromatum venosum*, *Cayratia trifolia*, *Raphanus sativaus*, *Zingiber officinale*, *Corallocarpus epigaeus* and *Crinum asiaticum*. Most of the skin diseases may be cured by application of a poultice or a paste which is applied locally.

Various ailments related to respiration like cough, cold, tuberculosis and asthma are cured by the tribals either using single herb or mixture of more than one herb i.e. *Costus speciosus*, *Dioscorea bulbifera*, *Dioscorea pentaphylla*, *Urginea indica*, *Ampelocissus latifolia*. Stones in the urinary tract, bladder, kidney and inflammation in urinary tract are some common disease of urinary system in the tribals of the study area which is cured by *Ceropegia bulbosa*. *Eulophia ochreatea* is reported for curing fever. *Corallocarpus epigaeus* is used for curing typhoid. *Costus speciosus*, *Crinum asiaticum*, *Ceropegia bulbosa* are widely used to cure various ailments of ear. *Asparagus racemosus*, *Cayratia trifolia* and *Withania somnifera* are widely used for curing diabetes. *Ampelocissus latifolia* .is effective against gout. *Costus speciosus*, *Euphorbia fusiformis* *Withania somnifera* are used against rheumatism. *Ampelocissus latifolia* , *Chlorophytum tuberosum*, *Daucas carota* are used as tonic .

Due to absence of proper hygiene, tribals are infected by nematodes, so they use *Arisaema tortuosum*, *Curculigo orchiooides* , *Gloriosa superba*, *Urginea indica*, *Pureria tuberosa* against nematodal infection.(Appendix 3).

These highly interesting finding require further research, while the efficacy of the various indigenous remedies will need to be subjected to pharmacological validation. During the ethnobotanical survey, observation on importance of tuberous plants has been observed as presented in Appendix 2.

It is observed that the dosages and duration of medicine generally depend on the intensity of the disease and age of patient. It is observed that tribal harvest that plant part used for medicinal purpose at particular growth period or season e.g. before flowering and fruiting period etc. presumably to obtain maximum concentration of the active principle. As tuberous plants remain in dormant phase and have a limited period for completing their life cycle, tribal preserve the tuber for various remedies, which is harvested in their particular period. Hence, the tribals have a specified way of collecting the herbs, preparing and applying the medicine. It is observed that single plant species or a combination of different plant species is used for curing various diseases .

We think that the present status of the economically and medicinally important plants of the study area needs to be determined in order to develop plans for their protection. Improved awareness of conservation issues is needed. Proper documentation of indigenous knowledge about the plants could be supportive in achievement of objectives. Local cultivation of medicinal plants and other economic species can play an important role in economic development of the area. For sustainable and long term conservation of natural resources of the area; there is a need to actively involve the quiescence of local people in evaluation, planning, implementation and monitoring processes as they are the best judges of the area.

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Name	Tribe	Sex	Age	Locality	Tehsil	District	occupation
Hansa ram	Meena	M	55	Kadeh	Gogunda	Udaipur	Medicine man
Heera lal	Meena	M	45	Kadech	Gogunda	Udaipur	Medicine man
Kachhori bai	Ghameti	F	50	Khanna khedi	jaisamand	Udaipur	Guni
Ratani bai	Gurjar	F	62	Dholpura	jaisamand	Udaipur	Guni
Vela ram	Kalal	M	48	Tulsi ka naka	jaisamand	Udaipur	Guni
Udai singh	Gurjar	M	65	Gatod	jaisamand	Udaipur	Local tribe
Amber singh	Ranawat	M	50	Kurabad	Kurabad	Udaipur	Medine man
Gota ji	Brahmin	M	45	Jaisamand	jaisamand	Udaipur	Renger (Jaisamand sanctuary)
Navela	Gaarasias	M	55	Kewda ki nal	Kewda ki nal	Udaipur	Local tribe
Ramu	Garasia	M	65	Kewda ki nal	Kewda ki nal	Udaipur	Local tribe
Mogji	Garasia	M	70	Kewda ki nal	Kewda ki nal	Udaipur	Local tribe
Rama rawal	Maharaj	M	60	Dhuhlesh mahadev	Ajmer	Ajmer	Pujari
Deva ba	bheel	M	60	Jhadol	Jhadol	Udaipur	Medicine man
Sohna lal prjapat	Kumar	M	50	tadgarh	Byavar	Ajmer	Retd. Principal
Talaba	Meena	M	65	Dhikanai khedi	Badi sadri	Chittor	Medicine man
Pushpalal	Garg	M	60	Pipli nagar	Bheem	Rajsamand	Medicine man
Dheer ji	Devasi	M	40	chandela	Abu road	sirohi	Medicine man
Cheta ji	Devasi	M	30	Chandela	Abu road	Sirohi	Medicine man
Swaroop ji	Meena	M	25	Chandela	Abu road	Sirohi	Medicine man
Neemaba	Garasia	M	50	chandela	Abu road	Sirohi	Medicine man
Pratap	Gurjar	M	45	Sarvan deri	Banswara	Banswara	Medicine man
Devali	Meena	F	45	Pansyo	Udaipur	Udaipur	Local tribe
Naval	Meena	F	48	Som dam	Aspur	Dungarpur	Pjuari
Rama	Pujari	F	55	dungarpur	Dungarpur	Dungarpur	Medicine man

Appendix 2. Plants list.

Edible plants	Medicinal plants	Spice plants	Poisionous plants	Ornamental plants
<i>Ceropegia bulbosa</i>	<i>Ampelociessus latifolia</i>	<i>Curcuma amada</i>	<i>Crinum asiaticum</i>	<i>Crinum asiaticum</i>
<i>Ceropegia tuberosa</i>	<i>Asparagus racemosus</i>	<i>Zingiber officinale</i>	: Bulb	<i>Glorioisa superba</i>
<i>Curcuma amada</i>	<i>Arisaema tortuosum</i>		<i>Glorioisa superba</i> :	
<i>Colocasia esculenta</i>	<i>Costus speciosus</i>		Tuber	
<i>Dioscorea bulbifera</i>	<i>Curculigo orchoidies</i>		<i>Withania somnifera</i> :	
<i>Nelumbo nucifera</i>	<i>Crinum asiaticum</i>		seed	
<i>Pupalia atropurpuria</i>	<i>Ceropegiabulbosa</i>		<i>Dioscorea bulbifera</i>	
<i>Pureria tuberosa</i>	<i>Ceropegia tuberosa</i>		: Tuber	
<i>Raphanus sativaus</i>	<i>Chlorophytum tuberosum</i>		<i>Urginea indica</i>	
	<i>Corallocarpus epigaeus</i>		: Bulb	
	<i>Colocasia esculenta</i>			

<i>Trapa natans</i>	<i>Curcuma amada</i> <i>Cayratia trifolia</i> <i>Dioscorea bulbifera</i> <i>Dioscorea hispida</i> <i>Dioscorea pentaphylla</i> <i>Dioscorea tomentosa</i> <i>Daucus carota</i> <i>Eulophia ochreatea</i> <i>Euphorbia fusiformi</i> <i>Gloroisa superba</i> <i>Globba marantina</i> <i>Leea indica</i> <i>Leea macrophylla</i> <i>Langenandra toxicaria</i> <i>Momordica dioica</i> <i>Momordica balsamina</i> <i>Mirabilis jalapa</i> <i>Nelumbo nucifera</i> <i>Pureria tuberosa</i> <i>Raphanus sativaus</i> <i>Ruellia tuberosa</i> <i>Sauromatum venosum</i> <i>Tacca leontopetaloides</i> <i>Trichisanthes cucumerina</i> <i>Urginea indica</i> <i>Withania somnifera</i> <i>Zingiber officinale</i>			
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Appendix 3

<i>Diseases</i>	<i>plant species</i>
Abscess	<i>Arisaema tortuosum</i>
Anti cancerous	<i>Leea macrophylla</i>
Antidote	<i>Ampelocissus latifolia</i> , <i>Ceropegia tuberosa</i> , <i>Arisaema tortuosum</i> , <i>Curculigo orchiooidies</i> , <i>Cayratia trifolia</i> , <i>Curcuma amada</i> , <i>Sauromatum venosum</i> , <i>Trichisanthes cucumerina</i>
Antinematodal	<i>Arisaema tortuosum</i> , <i>Curculigo orchiooidies</i> , <i>Gloroisa superba</i> , <i>Pureria tuberosa</i> , <i>Urginea indica</i>
Anti tumour	<i>Sauromatum venosum</i>
Asthma	<i>Globba marantina</i> , <i>Dioscorea bulbifera</i>
Body ache	<i>Costus speciosus</i> , <i>Curcuma amada</i> , <i>Leea indica</i> (<i>Leea macrophylla</i>)
Boils	<i>Raphanus sativus</i>
Bone fracture	<i>Arisaema tortuosum</i> , <i>Chlorophytum tuberosum</i> , <i>Curcuma amada</i> , <i>Cayratia trifolia</i>
Carbuncle	<i>Cayratia trifolia</i>
Constipation	<i>Curculigo orchiooidies</i>
Contra receptives	<i>Dioscorea bulbifera</i>
Diabetes	<i>Asparagus racemosus</i> , <i>Momordica dioica</i> <i>Withania somnifera</i>
Dysentery	<i>Curcuma amada</i> , <i>Withania somnifera</i> <i>Leea macrophylla</i>
Dyspepsia	<i>Ampelocissus latifolia</i>
Ear-ailment	<i>Costus speciosus</i> , <i>Crinum asiaticum</i> , <i>Ceropegia bulbosa</i>
Gastrointestinal disorder	<i>Zingiber officinale</i>
Gout	<i>Ampelocissus latifolia</i>
Hair lengthening	<i>Colocasia esculenta</i> , <i>Momordica dioica</i>
Health tonic	<i>Ampelocissus latifolia</i> , <i>Chlorophytum tuberosum</i> , <i>Daucus carota</i>
Headache	<i>Tacca leontopetaloides</i>
Indigestion	<i>Ampelocissus latifolia</i>

Irregular menstruation	<i>Raphanus sativaus</i>
Kidney stone	<i>Ceropegia bulbosa</i>
Lactagogue	<i>Asparagus racemosus</i>
Leuchorrhoea	<i>Chlorophytum tuberosum</i> <i>Curculigo orchiooidies</i> <i>Withania somnifera</i>
Leukemia	<i>Eulophia ochreata</i>
Pyrexia	<i>Urginea indica</i>
Respiratory trouble	<i>Urginea indica</i>
Rheumatism	<i>Withania somnifera</i> , <i>Costus speciosus</i> , <i>Euphorbia fusiformis</i>
Sexual delibity	<i>Leea macrophylla</i> <i>Daucas carota</i>
Sexual vigour	<i>Curculigo orchiooidies</i>
Skin disease	<i>Zingiber officinale</i>
Stomach ache	<i>Dioscorea pentaphylla</i> , <i>Ruellia tuberosa</i>
Sunstroke	<i>Corallocarpus epigaeus</i>
Tuberculosis	<i>Ampelocissus latifolia</i> , <i>Lagenandra toxicaria</i>
Typhoid	<i>Corallocarpus epigaeus</i>
Vulvo-vaginal uterine prolapse	<i>Asparagus racemosus</i> <i>Gloroisa superba</i>
	<i>Withania somnifera</i>
Wound healing	<i>Crinum asiaticum</i>
