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ETHNOBOTANICAL STUDIES AMONG THE COMMUNITIES OF RAJAJI TIGER RESERVE, UTTARAKHAND, INDIA

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Abstract

Plants are integral source of medicine in rural areas, particularly in tribal communities. An ethnobotanical studies on traditional medicinal plants was conducted from 2015 to 2018 in Rajaji Tiger Reserve, Uttarakhand, India. Information on the medicinal plants was mainly gathered from local people and Gujjars through questionnaires, formal and informal discussion by undertaking frequent field trips. A total 58 medicinal plants species were collected and identified from study area. More than one plant part was in use for the cure of different ailments. Most of these plants were used as decoction, solution, paste, powder, raw parts and ash etc. This study was undertaken for importance of traditional knowledge regarding medicinal plants used for the treatment of different diseases by the local people and Gujjars residing in the area.

Key words: Ethnobotany, Traditional Knowledge, Medicinal Plants, Rajaji Tiger Reserve.

Introduction

The Indian Himalayan region spreads across Jummu & Kashmir, Himachal Pradesh, Uttarakhand, West Bengal and Arunachal Pradesh (Mani, 1974). It support about 18,440 species of plants (Singh and Hajra, 1996), 1,748 species of medicinal plants (Samant *et al*., 1998), 241 mammalian species and 979 birds species. The representative biodiversity rich areas of the Indian Himalayan region have been protected through a Protected Area Network (PAN) programme. Many of biodiversity rich areas in Himalayas are still unexplored. One such less explored area is Rajaji Tiger Reserve which is situated in Haridwar district that encompasses the Shivalik range, near the foothills of Himalayas.

Ethnobotany deals with the direct relationship of plants with man. The term has often been considered synonymous with either economic botany or traditional medicine (Jain, 1995). The traditional systems of medicine are still very effective particularly in rural areas of India for the treatment of various ailments (Singh and Singh, 2009). Over 7,500 species of plants are estimated to be used by over 4,500 ethnic communities for both human and veterinary health care purpose from Himalayas to South India. Five hundred million people in India, depend directly or indirectly on plants derived drug for their health care needs. The socio-economic significant of this is formidable in term of employment particularly amongst rural communities (Karki, 2002). There are about 45,000 plant species used in ethnomedicinal practices today. The Government of India, has recognized ethnobotany and determined to encourage this system by asking scientists and folklorists to preserve it and popularize it among the people. According to WHO approximately 80% of world population in developing country depend on traditional medicines for primary health care (WHO, 2002). In India, about 65% of the population depends on traditional system of medicine (Uniyal and Shiva, 2005). The local uses of plants as a cure are common, particularly in those areas, where there is no modern health services, such as the tribal areas, forest and villages in India (Sandhya *et al*., 2006). This knowledge is of great potential value to humanity as a whole seems unfortunately to be doomed to extinction with the rapid acculturation and westernization in many parts of the globe (Schultes, 1997). The loss of this knowledge will be a grave hindrance to progress in many aspects of environment conservation. Realization of the seriousness of this impending loss has given rise in recent years to the urgent need for ethnobotanical conservation.

The ethnobotanical information in Uttarakhand has been documented by several workers like (Kaul and Singh, 1985) worked on the wild edibles of Himalayas, (Uniyal and Rao, 1993) work on Vegetation and flora of Rajaji

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Sanctuary, (Gaur and Bhatt, 1994) studied the folk utilization of some Pteridophytes of Deoprayag, (Gaur, 1999) documented the flora of Garhwal with ethnobotanical notes, (Singh and Prakash, 2002) work on Flora of Rajaji National Park, (Uniyal and Shiva, 2005) worked on traditional knowledge of medicinal plants among rural women of Garhwal Himalaya, (Semwal *et al*., 2013) work on Role of potential ethno-medicinal plants resources of Kalimath Valley. However, this area has their old traditional knowledge is least documented by workers. Therefore, the present study is taken to document the ethnobotanical importance related to plants used by communities of Rajaji Tiger Reserve.

Study Area

Uttarakhand is well known for its biodiversity richness and diverse cultural mosaic. The present study is confined to Rajaji Tiger Reserve Fig. 1. Rajaji Tiger Reserve is the new name of Rajaji National Park. Center Government notified on 15th April 2015 Rajaji National Park as 48th Tiger Reserve of India and 2nd Tiger Reserve (1st is Jim Corbett) of Uttarakhand. It spread over 1075 Sq. km in three districts of Uttarakhand: Haridwar, Deharadun and Pauri Garhwal. The tiger reserve lies in the Shivalik Hills of the outer Himalaya. The river Ganga flows 24 Km through the tiger reserve. The three main seasons are winter, summer and monsoons. Winter start from November to February when the days are pleasant (20-25^{0}C), nights cold and humidity is low. Temperature rises rapidly to 40-45^{0}C in the summer season (March to June) and rainfall increases with the occasional thunderstorm. Humidity is high in the rainy season (July to October). Annual rainfall ranges from 1200-1500 mm. Soils are generally poor and infertile, with accumulation of humus in only a few places. About 84% of the Rajaji Tiger Reserve is forested. Some 65% of forested land is under 20% crown cover in Rajaji range of the five vegetation types of the Shivaliks, four occur in Rajaji, namely: moist Shivalik Sal (*Shorea robusta*), dry Shivalik Sal, northern dry mixed deciduous and Khair (*Acacia catechu*), Sissu (*Dalbergia sissoo*) forest. The area has traditionally been inhabited by Gujjars (pastoralists). They herd buffalo between high Himalayan pastures in summer and lower foothills in winters.

Materials and Methods

To collect first-hand information on medicinal plants, intensive exploration was made in the study area. Field tour was done in different area of Rajaji Tiger Reserve from 2015 to 2018. Ethnobotanically important information was collected from different categories of people residing there like Gujjars, family head of villagers, old experienced people and knowledgeable informant. Many attempts were taken in each area for interview and discussion with local people. During the field survey, attempts were made to collect information regarding use of medicinal plants, mode of administration and part of plant used for different aliments.

Based on the specific proforma designed by (Jain and Goel, 1995) questionnaire was prepared and resultant information was recorded. An attempt was made to note whether the local people prepare pastes, pills, powders, solution, ash, fumes and decoctions from some parts of medicinal plants for the treatment of various diseases and disorders.

In each tour medicinal plants were collected and herbarium was prepared by standard method suggested by (Jain and Rao, 1978). The plants were identified with the help of floras Raizada and Saxena, (1978); Gaur, (1999) and Duthie, (1903). The identified medicinal plants were confirmed by consulting the herbaria of Botanical Survey of India, Deharadun and Forest Research Institute, Deharadun.

Results and Discussion

The people of Rajaji Tiger Reserve find their way of living by using local medicinal plants available to them. The local people and Gujjars are largely dependent on plant for their day to day need from house hold to medicine. The region is very rich in medicinal plants most of which are unexplored. After conducting the survey, a total 58 medicinal plants species were recorded are listed in table 1.

These medicinal plants are belonging to 30 families. The most common represented family used by the community of this area are Caesalpiniaceae (6), Euphorbiaceae (5), Mimosaceae (4) and Asteraceae (4) Fig. 2. These plants were used for treatment of a total 28 diseases, ranging from simple Itching to complicated Jaundice. Most of plant species used by the people in this area to cure diseases like Toothache, Asthma, Constipation, Bone fracture, Cholera, Diabetes, Diarrhoea, Earache, Jaundice, Knee pain, Joint pain, Stomachache and Wounds etc. The result shows that maximum number of plants used for curing Knee pain/Joint pain (7 species), Constipation/Stomachache (6 species), Toothache (5 species), Jaundice (4 species) and Wounds (4 species) Fig. 3. It was observed that in most of cases leaves (43%) of the plant was to cure the various diseases followed by bark (14%), fruits (12%), flowers (9%), roots (9%), seeds (5%), stem (5%) and whole plants (3%) Fig. 4. Mostly plants were used in fresh form for herbal preparation, mainly leaf paste (29%) was in used followed by raw

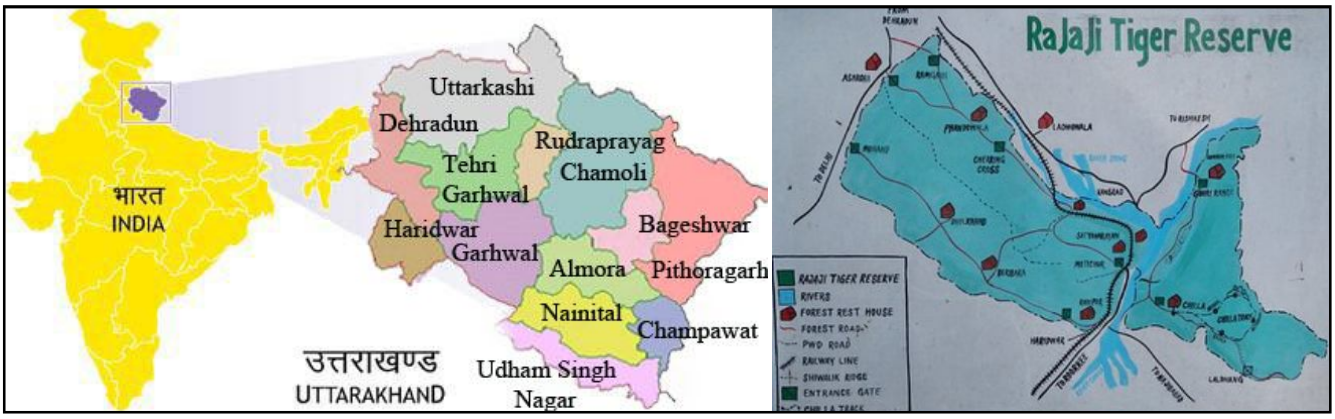

Fig. 1: Map showing location of study area.

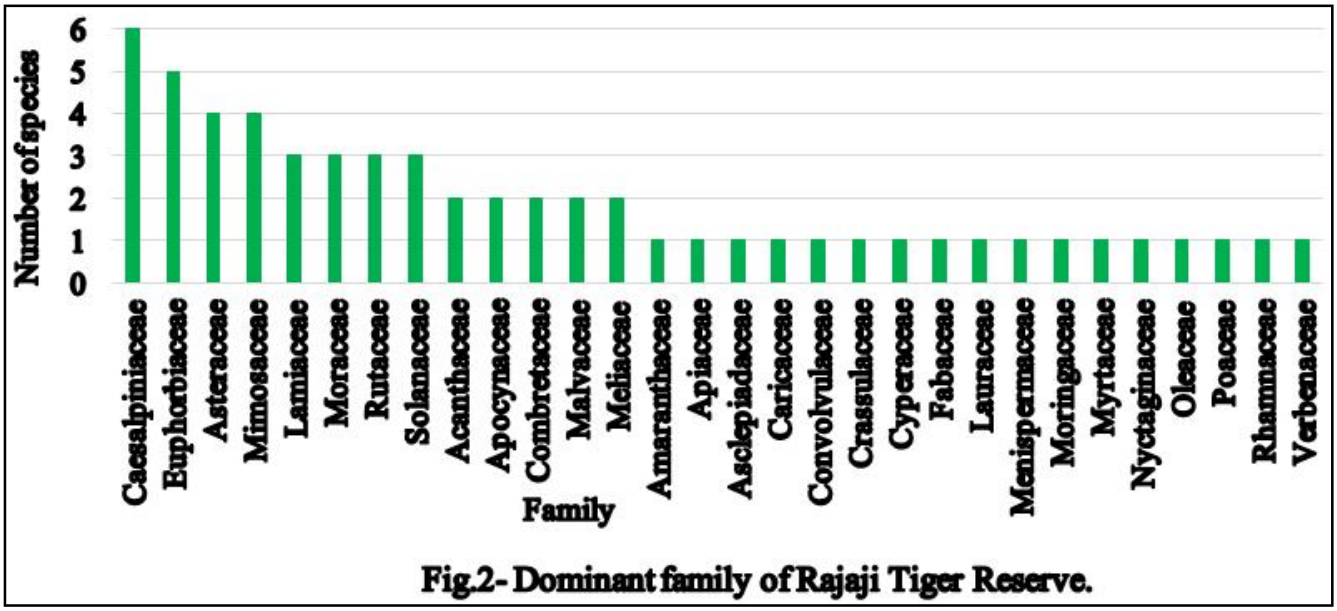

Fig.2- Dominant family of Rajaji Tiger Reserve.

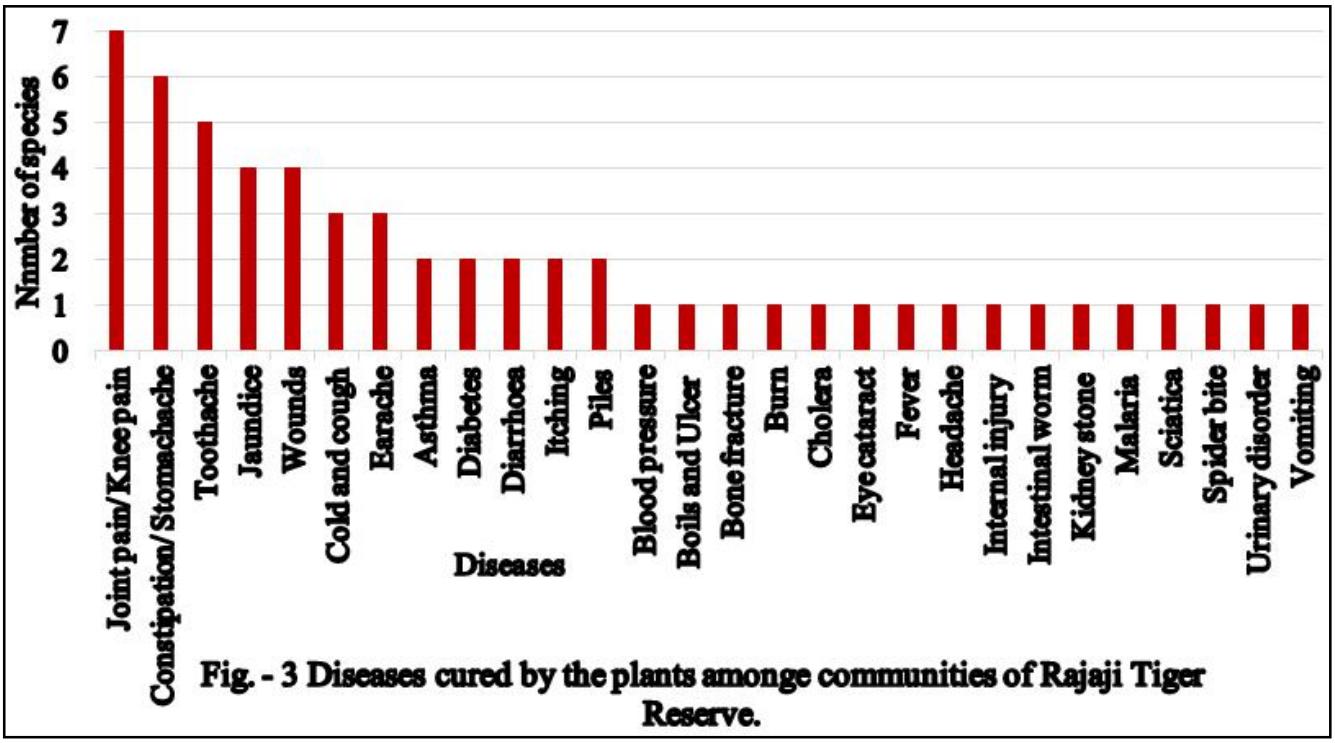

Fig. - 3 Diseases cured by the plants amonge communities of Rajaji Tiger Reserve.

Table 1: Medicinal plants used by communities of Rajaji Tiger Reserve.

S. N.	Botanical name of plant	Family	Local/Common name	Plant part used	Disease	Mode of uses
1	*Acacia catechu* (L.f.) Willd.	Mimos -aceae	Khair	Bark	Toothache	Take bark and boiled in water, used this water for gargling.
2	*Acacia nilotica* (L.) Del.	Mimos -aceae	Babul /Kikar	Fruits	Joint pain	Dried fruit is taken along with seed, grind it to make fine powder. One tea spoon powder taken with water daily in the morning.
3	*Achyranthes aspera* L.	Amaranth -aceae	Chirchita	Roots	Diarrhoea	The dried roots are grind to make powder. Small amount of powder given with mother milk to infants in treatment of diarrhoea.
4	*Aegle marmelos* (L.) Corr.	Rut -aceae	Bael	Leaves	Blood pressure	Take leaves and grind it with water. Mix jaggary in this solution, give it twice a day.
5	Ageratum conyzoides L.	Aster -aceae	Pudina ghas	Leaves	Wounds	Leaves juice is apply on cut, it stop bleeding immediately and heal the wound.
6	Albizia lebbeck (L.) Benth	Mimos -aceae	Siris	Leaves	Wounds	Paste of fresh leaves is apply on wound area twice a day.
7	Anacyclus pyrethrum DC.	Aster -aceae	Akarkara	Flowers	Toothache	Fresh flowers or leaves are taken in mouth and chew. Repeat process two to three times a day.
8	Azadirachta indica A. Juss	Meli -aceae	Neem	Leaves	Earache	Leaves are boiled in water and when water become half strain solution. Put one or two drop in ear.
9	Bauhinia variegata L.	Caesalpini -aceae	Kachnar	Bark	Intestinal worm	Prepare decoction of its bark. Take it two times daily.
10	Boerhavia diffusa L.	Nyctagin -aceae	Punerva	Roots	Vomiting	Grind the root and mix with water. Take two tea spoon.
11	Bombax ceiba L.	Malv -aceae	Semal	Flowers	Joint pain	Prepare dish of flower or eat as vegetable for few days.
12	Bryophyllum pinnatum (Lam.) Oken	Crassul -aceae	Dard mar	Leaves	Kidney stone	Take leaves and grind it with water. One cup of this solution is taken early in morning till cure.
13	Caesalpinia bonduc (L.) Roxb.	Caesalpini -aceae	Katki karanz	Leaves	Malaria	Prepare decoction of its leaves. Give one to two spoonful of this decoction with honey, two to three times a day.
14	Calotropis procera R. Br.	Asclepiad -aceae	Madar /Aak	Flowers	Asthma	One fresh flower is taken daily with water for ten days continuously to control fast breathing during Asthma.
15	Carica papaya L.	Caric -aceae	Papita	Fruits	Diarrhoea	Give it's ripen fruit with black salt thrice a day.
16	Cassia fistula L.	Caesalpini -aceae	Amaltas	Bark	Joint pain/ knee pain	Grind bark with raw turmeric and mix little amount of alum in it, then boil in water to make a paste. This paste is applied on painful area twice a day.
17	Cassia occidentalis L.	Caesalpini -aceae	Kasaunda	Flowers	Consti-pation	Give its flower with jaggery regularly.
18	Cassia tora L.	Caesalpini -aceae	Panwad/ Chakunda	Seeds	Itching	Burn the seeds into ash. Mix coconut oil in it and apply on itching area.
19	Catharanthus roseus (L.) G. Don.	Apocyn -aceae	Sadabahar	Leaves	Diabetes	Dry its leaves in shade, grind it to make powder. One tea spoon powder taken with water daily in the morning.

Table 1 continued.....

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20	Centella asiatica (L.) Urbans	Api -aceae	Birmi/ Bramhi	Leaves	Headache	Leaves paste is apply on forehead, which has cooling effect.
21	Citrus maxima (Burm.) Merr.	Rut -aceae	Chakotra	Fruits	Diabetes	Fresh fruit is taken with black salt daily.
22	Clitoria ternatea L.	Fab -aceae	Aprajita	Seeds	Jaundice	Seed is grind to make powder. One spoon full powder is taken with honey.
23	Cuscuta reflexa Roxb.	Convolvul -aceae	Aakash bel	Stem	Stoma-chache	Boil its creeper with salt then tie it on stomach and wrapped with cotton cloth.
24	Cynodon dactylon (L.) Pers.	Po -aceae	Doob	Leaves	Urinary disorder	Grind leaves with black salt and give it twice a day.
25	Cyperus rotundus L.	Cyper -aceae	Nagar motha	Roots	Piles	Prepare decoction of its root and let patient to sit in this warm decoction. It give immediate relief from pain.
26	Datura metel L.	Solan -aceae	Dhatura	Leaves	Wounds	Grind leaves and apply the paste on wound area. Tie it with cotton cloth.
27	Eclipta alba (L.) Hassk.	Aster -aceae	Bhringraj	Leaves	Toothache	Put two to three drops of leaves juice in ear opposite to aching tooth.
28	Emblica officinalis Gaertn.	Euphorbi -aceae	Amla	Fruits	Eye cataract	Fruits powder is taken with water two to three times a day.
29	Euphorbia hirta L.	Euphorbi -aceae	Dhudhi	Whole plant	Spider bite	Whole plant is crushed and paste is made. This paste is applied on affected area.
30	Euphorbia neriifolia L.	Euphorbi -aceae	Nagfani	Stem	Earache	Heat its soft stem and extract the juice and put one or two drop in ear.
31	Euphorbia thymifolia L.	Euphorbi -aceae	Choti dhudhi	Whole plant	Jaundice	Grind the fresh whole plant into a paste. Mix this paste in one cup of water and also add jaggary. this solution taken early in the morning before sunrise for one week.
32	Ficus benghalensis L.	Mor -aceae	Baragad	Roots	Asthma	Dried root powder mix with honey in equal proportion is taken twice a day to cure Asthma.
33	Ficus racemosa L.	Mor -aceae	Gular	Fruits	Stoma-chache	Take raw fruits and make it like vegetable, eat it daily till cure.
34	Ficus religiosa L.	Mor -aceae	Peepal	Bark	Boils and Ulcer	Grind the bark with water and apply paste on affected area.
35	Hibiscus rosa-sinensis L.	Malv -aceae	Gurhal	Flowers	Earache	Flower juice is put in ear, one or two drop to get relief.
36	Holarrhena ant-idysenterica (Roth.) DC.	Apocyn -aceae	Kura	Bark	Joint pain/ Knee pain	Grind bark, then boil in water till water evaporate and paste is left. Paste is dried in shade then mix with jaggery and prepare small pills. One pill is taken early in morning with milk.
37	Justicia adhatoda L.	Acanth -aceae	Adusa /Vasa	Leaves	Cold and cough	Leaves are boiled in water to prepare decoction. Two spoon full is given twice a day.
38	Justicia gend-arussa Burm. f.	Acanth -aceae	Kala vasa/ Kala adusa	Leaves	Whooping cough	Take its leaves in an earthen pot. Heat the pot over cow dung cakes. Take the ash and mix with honey, give this mixture twice a day.
39	Lantana camara L.	Verben -aceae	Lalten ghas	Leaves	Cholera	Leaves juice of plant is mix with onion juice and water. One tea spoon of juice is given.
40	Litsea glutinosa (Lour.) C.B.Robins.	Laur -aceae	Maida	Bark	Bone fracture	Bark is grind to make paste. This paste applied on fracture area and tie it with cotton cloth.
41	Melia azedarach L.	Meli -aceae	Bakain/ Sunena	Seeds	Joint pain	Grind its seeds with mustered oil. Apply this paste on painful area and tie with cotton cloth.

Table 1 continued.....

Table 1 continued.....

42	Mimosa pudica L.	Mimos -aceae	Chhuimui	Leaves	Jaundice	Give leaves juice with jaggery regularly. Within a week it cures Jaundice.
43	Moringa oleifera Lam.	Moring -aceae	Sahjan	Leaves	Joint pain/ Knee pain	Grind its leaves with equal amount of mustered oil, heat it and apply the paste on painful area.
44	Murraya koenigii (L.) Spreng.	Rut -aceae	Meethe neem	Stem	Toothache	Use its stem to brush the teeth and chew stem.
45	Nyctanthes arbor- tristis L.	Ole -aceae	Harsingar /Parijat	Leaves	Sciatica	Leaves are boiled in water to prepare decoction. Half cup is taken twice a day.
46	Ocimum sanctum L.	Lami -aceae	Tulsi	Leaves	Cold and cough	Fresh leaves are boiled in water to prepare decoction. One cup is taken twice a day.
47	Origanum vulgare L.	Lami -aceae	Marua	Leaves	Stoma-chache	Take eight to ten leaves and grind them with small amount of cumin seeds. Give this mixture orally.
48	Ricinus communis L.	Euphorbi -aceae	Arand	Leaves	Joint pain and Swelling	Warm its leaves and semar with mustard oil and tie them on affected area.
49	Solanum nigrum L.	Solan -aceae	Makoya/ Kiyuni	Leaves	Jaundice in infants	Fresh leaves are boiled in water. One tea spoon is given with mother milk.
						It cure jaundice in new born baby.
50	Solanum sura-ttense Burm.f.	Solan -aceae	Bhatkattiya /Kantakari	Roots	Piles	Dry root is burnt and its fumes is given on affected area.
51	Syzygium cumini (L.) Skeels	Myrt -aceae	Jamun	Leaves	Toothache	Chew some leaves, it relieves toothache.
52	Tagetes erecta L.	Aster -aceae	Genda	Leaves	Wounds	Leave paste is apply on wound area.
53	Tamarindus indica L.	Caesalpini -aceae	Imili	Fruits	Stoma-chache	Crush its fruits in water and strain the solution. Add sugar, salt and cumin in it. One cup is given.
54	Tectona grandis L.f.	Lamiaceae	Sagaun	Leaves	Skin itching	Leaves paste is applied on affected area.
55	Terminalia arjuna (Ro xb. ex DC.) Wt. & Arn.	Combret -aceae	Arjun	Bark	Internal injury	Grind bark, then boil in water till water evaporate and paste is left. This paste is apply on injured area and tie with cotton cloth.
56	Terminalia belliri-cia (Gaertn.) Roxb.	Combret -aceae	Baheda	Fruits	Consti-pation	Grind dried Bahera and Amla fruit to make powder. Take one tea spoon of this powder with water daily.
57	Tinospora cordi-folia (Willd.) Ho ok. f. & Thoms.	Menisperm -aceae	Giloye	Stem	Fever	Prepare decoction of its stem. Take one cup twice a day.
58	Ziziphus mauritiana Lamk.	Rhamn -aceae	Ber	Bark	Burn	Grind bark of Ber and Pepal to make paste. Apply paste on burn area.

part (17%), powder (14%), decoction (12%), juice (10%), solution (10%), ash (4%), fumes (2%) and pills (2%). However, the study in this area shows that, paste was used in highest number of preparation Fig. 5.

Result shows that people of study area used these medicinal plants for curing various diseases. The local people and Gujjars have their own knowledge about the utilization of plants which passes from parents to their offspring. Therefore, it is important to record such ethnobotanical knowledge from these communities for benefit of human being.

Ethnobotanical study in this region is not enough than required. Information of traditional medicinal practices from this region is poorly documented. Communities have their unique traditional cultures and indigenous knowledge are depleting gradually due to modernization, civilization and industrialization.

Conclusion

People in this region have good knowledge about the properties of plants and how they can be utilized but as the people in the area are migrating to city from their native place for education, employment and better life style, due to this their knowledge of traditional uses of plants may be lost in course of time. Thus their knowledge must be consider as essential component of all effort to conserve and develop in these area. We need to explore

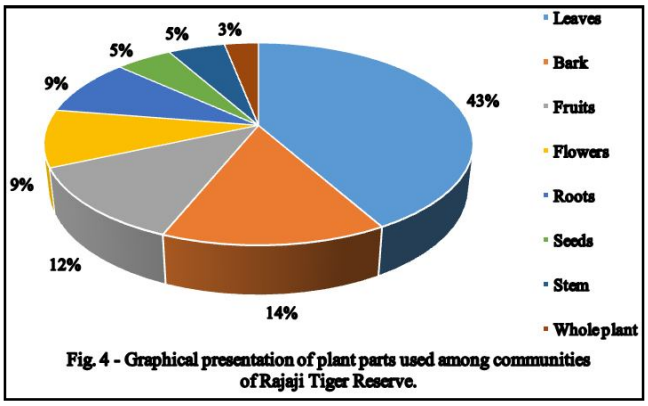

Fig. 4 - Graphical presentation of plant parts used among communities of Rajaji Tiger Reserve.

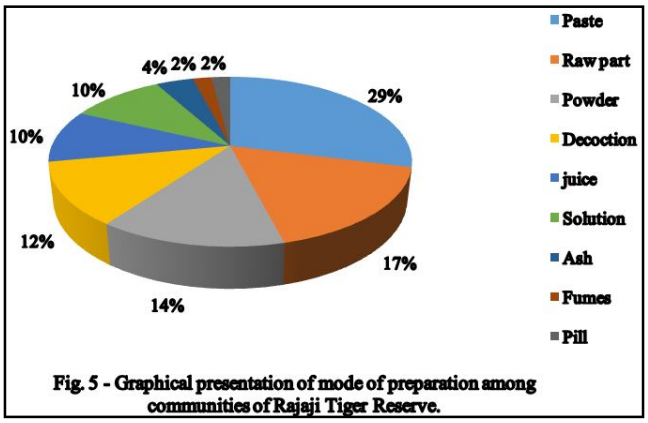

Fig. 5 - Graphical presentation of mode of preparation among communities of Rajaji Tiger Reserve.

these areas which have good knowledge of traditional medicine which are going to loss in near future due to lack of proper documentation and conservation. Communities living in this area should be involved in cultivation of medicinal plants as these plants would become threatened in near future. *In situ* and *ex situ* conservation steps should be taken on ethno-medicinal important plants found in the study area.

Hence the research work on important medicinal plants used by the communities of Rajaji Tiger Reserve must continue so that these plants and their knowledge can be conserved and utilized for human kind.

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