A Note on the Ethno-Medicinal Properties of Some Plants Used by
the Tribal and Rural Community in Ghatol Area of District Banswara
of South Rajasthan, India

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ABSTRACT

Ethno-botanical practices, in both the developing and developed countries, are increasing regularly. The trade of herbal products in the national and international market is also growing very fast. No nation can progress unless it makes its national heritage and rituals intelligible and accessible. The rich biodiversity and associated indigenous knowledge system for their sustainable use, more intelligible and accessible to masses is the need of the hour. The Banswara is well known for its scenic beauty, high tribal density, fascinating culture and tradition based on intricate relationship with the nature. Plants and plant products play an important role in tribal life of this region of Rajasthan. These plant species are used as edible plants, indicators of agricultural seasons and in the treatment of some common ailments. The rural community uses these herbal drugs along with modern medicines. An ethno-botanical exploration was carried out in the Ghatol-Peepalkhunt forest area of Banswara in the years 2011-2013, so far less frequently studied from the perspective of plant folk traditions. The study shows that tribes of this area still prefer to use herbs for different diagnostic purposes either the whole plant or different parts like leaves, stem, bark, roots directly or in different traditional formulations. About 38 plant species belonging to 35 genera and 22 families are employed ethno-medicinally by the rural people in 12 villages of Ghatol-Peepalkhunt area. Documentation of traditional knowledge on the ethno-medicinal uses of these plants is essential for conservation efforts for the plant resources and new drug development.

Key words: Ghatol, Banswara, ethno-medicinal plants, Rajasthan, ethno-botany, traditional remedies

INTRODUCTION

Tribal communities and ethnic races, throughout the world, have their own distinct culture, belief, taboos, totems, religious rites, medicine, traditional habit of foods, agricultural practices, etc. A large number of wild and cultivated plants are being used by these tribal groups for the treatment of various ailments, thus a considerable amount of information on medicinal plants is available with these communities.

Rajasthan is one of the largest state located in the North-western part of India. The southern part of Rajasthan state comprises of a large population of tribal communities belonging to various
ethnic groups. These forest dwellers live in forests and possess a vast knowledge on various aspects of plants. Ninama, Damor, Garasia, Bhagora, Kataria etc., are the main tribes of this region. These people are largely dependant on their traditional healing system for their healthcare and this information is passed on from generation to generation through the verbal communication without any written documentation. An attempt has been made to collect the information about plants used by these ethnic societies in their traditional healthcare system. They possess a vast knowledge on the ethno-biological uses of plants. These tribes move around the forest for their day-to-day requirements, cultural activities, beliefs, taboos, totems and performing religious rituals. Forest resources are the only means of livelihood for catering to the need of food, fodder, fuel, medicine etc (Meena and Yadav, 2010). They have accumulated enormous knowledge of the treatment of their cattle through herbs and sustainable use of plant species available to them in their native lands.

In Banswara, different plant species are the major source of folk medicine. The present study is an attempt towards a complete probe on the role of plants in medicines, especially by the people of Ghatol Tehsil of Banswara. In the various regions of study area, different plant species are the major source of local medicine for their ailments.

A significant contribution has been made by several workers on the ethno-biology from various part of world viz. Meghalaya (Rao, 1981), Arunachal Pradesh (Gangwar and Ramakrishnan, 1990), Bahrain (Abbas et al., 1992), Nepal (Manandhar, 1995), Biligiri Rangan Hills (Hegde et al., 1996) including India (Jain, 1975). In Rajasthan, ethno-botanical studies have been carried out by several scientists from different parts of the state namely Alwar (Singh, 1999a), Mt Abu (Sebastian and Bhandari, 1984), Udaipur (Sebastian and Bhandari, 1988), Eastern Rajasthan (Singh and Panday, 1980), Udaipur (Katewa and Arora, 1997), Aravalli hills of Rajasthan (Katewa et al., 2003) and Hadoti Plateau SE Rajasthan (Sharma, 2002). Some other scientists are Trivedi (2002), Joshi (1995), Jain et al. (2005), Katewa (2009), Meena and Yadav (2010) and Sharma and Khandelwal (2010).

**MATERIALS AND METHODS**

**Study area:** The Banswara is located in the extreme South of Rajasthan located between 23.11°N-23.56°N latitudes and 73.58°E-74.49°E longitudes, Fig. 1a and b show location of study area in district Banswara. It offers congenital climatic conditions favourable for luxuriant growth of various plants. It stretches an area of about 5037 km² and exhibit remarkable topographic and edaphic diversity. Consequently, the high rainfall (1500 mm annual) and humidity make this region suitable for the growth of certain medicinal plants. Exploration of small regions like Hilage, Khamera and Undvel Hanuman ji forest area of Tehsil Ghatol lead to our survey study.

**Methodology:** The proposed study was based on personal interviews of various groups like village headman, spiritual leader, teacher, veterinary doctors, social worker, postal authorities and ayurvedic doctors, etc., of Tehsil Ghatol (District Banswara) who could give correct information about the use of plant, mode of use and their collaboration to know-how the plants were collected.

The field tours for ethno-botanical survey were made at regular intervals in years 2011-2013 in order to cover the tribal areas in different seasons to collect the ethno-botanically interesting species either in flowering or fruiting stage for the survey to get maximum information. The data obtained in local language (Baagri) collected through questionnaire from different localities and
Fig. 1(a-b): Study area in district Banswara
villages was compared and cross linked so as to ascertain their validity and integrity. During the study, daily activities were closely observed and interpersonal contacts were established by participating in several social and religious ceremonies.

Among 56 informants interviewed, 34 were tribal practitioners. A total of 38 medicinal plant species distributed in 22 families are documented. The collected specimens were identified taxonomically with the help of Flora of India (Sharma and Balakrishanan, 1996), Flora of Indian Desert (Bhandari, 1990), Flowers of Himalaya, Flora of North East Rajasthan (Sharma and Tiagi, 1979), Flora of Upper Gangetic Plain and the Adjacent Siwalic and Sub Himalaya Tract (Duthie, 1903-1929). The verification and authentification of collected data were made in the light of standard literature (Jain, 1968, 1991; Chopra, 1982).

Enumerations: In the present study, the plants are arranged alphabetically. Other information provided includes name of family, brief description, plant part used and mode of utilisation, voucher number and date of collection (Fig. 2).

**Acacia catechu** (L. Khair f.) Willd (Mimosaceae): A deciduous, thorny tree which grows up to 15 m (50 ft.) in height. Leaves bipinnate compound; stipules spiny, flowers pale yellow, sessile, in long solitary or in groups of 2-4 axillary spikes.

The paste of the bark is applied locally in stomatitis. The exudates of the plant are given orally in case of difficult child birth. It is digestive and have cooling effect on human body. Traditional healers believe that the trees also have antileptotic properties. The extract of the seeds have antifungal properties and can be useful in some skin disease. It is also useful in women diseases (23.09.2011, 211 SGG) (Fig. 2d).

**Acacia nilotica** (L.) Babool Wild. Ex Delile sp. indica (Benth.) Brenen (Mimosaceae): It is a small to medium-sized tree. It’s bark is dark brown to almost black, thorns in pairs, straight, often typically pointing backwards, leaves compound, flowers in spherical heads, pods distinctive, constricted in between the seeds.

The fruit powder along with sugar is taken orally in case of dysentery. Bark latex is used in cholera treatment. Raw fruits have medicinal values in women diseases and check excessive bleeding during menstruation. It is also used in urino-genital disorder (23.09.2011, 218 SGG).

**Acacia senegal** L. Willd. (Mimosaceae): It is slender like tree with long erect, straggly branches, hooked prickles in tree, leaves with 3-5 pairs of pinnae, bearing grey-green leaflets, flowers in axillary spikes, white, appearing before the leaves.

The gum is taken orally in cases of inflammation of intestinal mucosa. This gum is also used on burning and other inflamed area. Fruits are stored for future use as vegetable (24.09.2011, 211 SGG).

**Acalypha indica** L. (Euphorbiaceae): Erect annual herb is up to 1.2 m tall. Leaves are rhombic-ovate, flowers axillary spikes, unisexual on the same inflorescence, female flowers are larger comparatively below the male flower, held in shallowly cup-shaped bracts with toothed margins.

Whole plant is used for bronchitis, asthama, pneumonia, rheumatism and ulcers. Leaf juice is emetic and can induce vomiting if needed. A poultice of fresh leaves useful in ulcers (24.09.2011, 221 SGG) (Fig. 2g).
Achyranthes aspera L. (Amaranthaceae): It has slender erect perennial herb, sometimes climbing or scrambling. The leaves are often covered in silvery indumentum when young. Flowers are greenish to silvery-white, often tinged with purple-red. The ash of whole plant is mixed with maize flour to make a cake, locally called “PANIA” which is given to patient of cold and cough specially before going to bed.

Whole plant has diuretic and stringent properties so used in relevant problems (23.09.2011, 241 SGG).

Aegle marmelos L. Correa (Rutaceae): Its tree is up to 12 m tall, deciduous, leaves alternate, trifoliolate, flowers bisexual, greenish white or yellow, fragrant.

Reputed medicinal properties of ripe fruits for curing chronic dysentery, habitual constipation, dyspepsia, vomiting, fever, piles, diabetes, brain tonic and soothing agent are widely known to the tribal communities. It is a divine gift for stomach and intestine. Leaves chewed every morning with black pepper help in healing stomach ulcer (23.09.2011, 249 SGG).

Aerva javanica (Burm. f) Juss. ex Schult. (Amaranthaceae): Plant is much branched, erect and perennial under shrubs, up to 1 m high, stem covered with thick, easily detachable tomentum. Leaves are alternate, flowers unisexual, dull-white, spikes.

The decoction of whole plant is used for swelling (24.09.2011, 232 SGG).

Ageratum conyzoides L. (Asteraceae): Aromatic herbs are flowers of bluish-white colour with globose heads. Fruits are black with pappus hairs.

These are used in stomach disorders as a tonic, sexual weakness, cough, asthmatic problems and traditional folk healers (23.09.2011, 56 SGG).

Amaranthus spinosus L. (Amaranthaceae): It has annual herb, mostly erect, up to 1.5 m, leaves glabrous or with sparse hairs. Flowers green in axillary clusters and branched terminal spikes. Male flowers on the apical part of the spikes.

Whole plant is used as blood purifier, in piles, as digestive agent, laxative and abortifacient (23.09.2011, 250 SGG).

Asparagus racemosus Wild. (Liliaceae): It is woody perennial climbers, stem often spinescent, green, cladodes from the axils of scale leaves in clusters of 2-8, flowers bisexual.

To treat white discharge in women, broken fresh tubers mixed with milk to improve sperm count (03.10.2012, 249 SGG).

Azadirachta indica A. Juss. (Meliaceae): It is evergreen tree, up to 20 m, bark greyish-brown, vertically striated, exudation red and sticky. Leaves are imparipinnate, flowers (white and fragrant) are arranged in more-or-less drooping axillary panicles. The fruit is smooth (glabrous) olive-like drupe.

Plant is considered as a divine tree and great gift of nature to cure human problems. Different parts of plant used to treat boils, abscesses, adenitis, eczema, ulcers, skin diseases, rheumatism, fever, stomachic and toothache (23.09.2011, 220 SGG).

Bauhinia purpurea L. (Caesalpiniaceae): Plant is perennial, trees, woody, erect or ascending, flowers red, blue, lavander to purple or violet actinomorphic or somewhat irregular.

It is used in constipation, gastric problems, headache and cosmetic (12.09.2012, 265 SGG).
Fig. 2(a-i): (a) Tridex procumbence, (b) Euphorbia hirta, (c) Ricinus communis, (d) Acacia catechu, (e) Calotropis procera, (f) Boerrhavia diffusa, (g) Acalypha indica, (h) Datura stramonium and (i) Jatropha curcas

**Boerrhavia diffusa** L. (Nyctaginaceae): Its herb is with long trailing branches, stem reddish and tomentose. Leaves unequal; flowers 4 mm long, purplish red to reddish pink or nearly white.

It is used in kidney stones, jaundice and hepatic disorders (12.09.2012, 261 SGG) (Fig. 2f).

**Calotropis procera** (Aiton) W.T. Aiton (Asclepiadaceae): Shrub or small tree with a rough corky bark, stems producing copious latex. Leaves are glaucous, flowers purplish-pink and white, fruits inflated, seeds with pappus of silky hairs.
It is used as anti-venom against snake bite, cough and cold, malarial fever, boils and to remove the thorn from the body and gastric problems (12.09.2012, 271 SGG) (Fig. 2e).

*Cassia fistula* Schimp. ex Oliv (*Caesalpiniaceae*): A medium-sized, deciduous tree with drooping branchlets, flowers bright yellow, in drooping races. Pods are oblong, woody and black on mature.

It is used as anti-helminthic, against ringworm and other skin infections, fever, purgative in all intestinal disorders and laxative (23.09.2011, 280 SGG).

*Cassia tora* L. (*Caesalpiniaceae*): A small annual herbs or undershrub growing as common weed, the herb is 1-2 m, leaves compound, paripinnate, flowers brightly yellow and axillary, fruit long pods-globose red.

Fresh or dried leaflet has been used as folk medicines in for treatment of constipation, stomach pain and ringworm and skin disease (23.10.2012, 76 SGG).

*Cynodon dactylon* L. Pers. (*Poaceae*): Perennials, terrestrial, stolons or runners, stems trailing, spreading or prostrate. Leaves mostly cauline, inflorescence a panicle with narrowly racemose or spicate branches, flowers bisexual, spikelets sessile or subsessile and laterally compressed.

It is used for boils, diabetes, piles and chronic gleet (23.09.2011, 277 SGG).

*Dalbergia sissoo* Roxb. ex DC. (*Fabaceae*): It is perennial, woody tree, stems erect or ascending and solid, flowers pinkish to rose, fruit legume, 2-seeded.

Leaves and bark on inflamed mammary glands (23.09.2011, 290 SGG).

*Datura stramonium* L. (*Solanaceae*): It is erect, usually dichotomously branched, annual or short-lived perennial herb, up to 1.5 m tall. Flowers solitary in the forks of the branches, white to pale mauve-purple, sometimes darker purple in the tube.

Asthma and ophthalmic problems (23.09.2011, 311 SGG) (Fig. 2h).

*Eclipta alba* (L.) Hassk (*Asteraceae*): It is annual herb, usually having prostrate or decumbent stems. Leaves subsessile; capitula solitary in the upper leaf axils, 6-10 mm in diameter. Ray-florets, 1-2 seriate, short, numerous, white.

Hair tonic, enlarge liver and spleen, skin diseases (23.09.2011, 301 SGG).

*Emblica officinalis* L. (*Euphorbiaceae*): Its tree 3-8 m tall, deciduous with bark brownish. Leaves distichous, stipules triangular-ovate; fascicles with many male flowers and sometimes 1 or 2 larger female flowers; fruit- drupe, globose, pale green or yellowish white.

For sores, pimples, laxative, refrigerant and diuretic (23.09.2011, 200 SGG).

*Euphorbia hirta* L. (*Euphorbiaceae*): Herb, annual, 30-60 cm tall, stem branched from middle or above, ascending to erect, rarely prostrate. Leaves opposite, cyathium in dense, often head like, pedunculate cymes at upper nodes and campanulate involucre. Male flowers 4 or 5, female flower pedicel short, exserted from involucre.

It is used against worms, asthma, vomiting and ulcers (23.10.2012, 111 SGG) (Fig. 2b).
Evolvulus alsinoides L. (Convolvulaceae): It is herb, perennial, stems soft, prostrate or ascending, slender, with spreading hairs. Leaves are petiolate or subsessile, simple, alternate. Flower axillary, solitary; blue with white throat, flowering throughout the year.
Whole plant Febrifuge, enhance memory, asthma (27.10.2012, 101 SGG).

Ficus benghalensis L. (Moraceae): It is tree, evergreen, up to 30 m, aerial root often descending to ground level and forming pillar-roots. Bark of trunks and older branches brown, smooth; leaves leathery, stipules stout, leaf blade ovate, base cordate, margins entire, apex obtuse; surfaces abaxially puberulent, adaxially glabrous.
It is used in obstinate vomiting, piles, boils and blisters, diarrhoea, sexual impotency, prevent loss of hair, rheumatism and leucorrhoea (23.09.2011, 98 SGG).

Ficus religiosa L. (Moraceae): It's tree, evergreen or deciduous, 6-15 m tall, trunk 2-3 cm in circumference with spreading branches and usually without aerial roots, barks grey, fissured, young twig pubescent with pink new leaves. Leaves with a pale-green lamina, hypanthodia sessile, in axillary pairs. Male flowers sessile in a single ostiolar whorl or sometimes absent, female and gall flowers are sessile or pedicellate; fruit/figs depressed globose, dark-purple on maturity.
It is used for inflammatory ulcers and prevent conception forever, leucorrhoea, impotency, astrinuent, expectorant laxative, contraceptive, asthma and whooping cough (23.09.2011, 96 SGG).

Jatropha curcas L. (Euphorbiaceae): Plant is glabrous shrub or small tree to 6-8 m, stems fleshy, copiously emitting a watery or milky sap. Leaves long-petiolate; lamina broadly ovate in outline, usually shallowly five-lobed, sometimes unlobed; flower terminal or axillary diarchial cymes; greenish-yellow. Fruits are ellipsoid, scarcely 3-lobed and flowering from April-July.
It is used for dysenteric, colitis, to promote lactation, stomach disorders, toothache, rheumatism and antidote for poisoning and purgative (23.09.2011, 87 SGG) (Fig. 2i).

Lawsonia inermis L. (Lytheraceae): Plant is fragrant shrub up to 2.5 meter tall. Leaves elliptic, ovate or obovate, arrange opposite decussate; flower terminal panicles, cream, fragrant. Flowering from January-April; fruit-capsule, globose, seeds many and flat.
It is used for controlling birth, spermatorrhoea, hair dye and yellow fever (23.09.2011, 176 SGG).

Mangifera indica L. (Anacardiaceae): It is large tree, flowers greenish-yellow, in terminal and axillary panicles, drupes 5-6 cm long, ovoid, greenish-yellow.
Indigestion and gastric problems, aphrodisiac, cardiac, appetite and astrinuent, jaundice and skin infections (23.09.2011, 67 SGG).

It is applied externally over wounds, diarrhoea, dysmenory and colitis (23.09.2011, 149 SGG).

Momordica balsamina L. (Cucurbitaceae): Perennial climber with prostrate or scendent stems up to 2.7 m long. Tendrils simple, leaves broadly ovate to almost circular in outline, deeply 5-7 lobed, each lobed often 3-5 lobed again, deeply cordate at the base. Flowers unisexual on the same plant, solitary; pale yellow, cream or white, darker at the base, often green-veined. Fruit ovoid, tuberculate, beaked, 2.5 - 6.5 cm long orange-red to red when ripe.
It is used as nutritive, diuretic, stomachic and blood purifier, jaundice and skin disorders, leucorrhoea diabetes (23.09.2011, 179 SGG).

**Nerium indicum** Mill. (Apocynaceae): An erect, gregarious evergreen shrubs up to 4 m high, latex milky; leaves leathery, linear-lanceolate, tapering at both ends, acuminate, thick coriaceous, midrib prominent, nerves numerous, petiole 5-7.5 mm long. Flowers white, pink or dark red, single or double in cultivated.

Bark, leaves, flower are used as cardio tonic, diuretic, cure jawache, toothache (23.09.2011, 193 SGG).

**Oxalis corniculata** L. (Oxalidaceae): Trailing herb with digitately trifoliolate leaves. Flowers yellow with long-peduncled pseudo-umbels; capsules oblong, acuminate.

It is used for sexual weakness, cough, dropsy, diuretic, traditional folk healer (23.09.2011, 152 SGO).

**Phyllanthus emblica** Schum. and Thonn. (Euphorbiaceae): Annual herbs, leaves bipinnate, flowers greenish-yellow, in axillary fascicles.

It is used for diabetes, leucorrhoea, diuretic, liver tonic, given in jaundice (23.09.2012, 62 SGG).

**Pterocarpus marsupium** Roxb. (Fabaceae): Large tree with imparipinnate leaves, flowers yellow in terminal and axillary racemes or panicles. Pod stipulate and auriculate. Water stored for 12 h in tumbler made out of the heartwood of the tree is taken internally for cardiac problems and diabetes.

Roots, leaves are used for sexual weakness, cough, dropsy, diuretic. Roots are used in several ailments by the traditional folk healers (23.09.2011, 77 SGG).

**Ricinus communis** L. (Euphorbiaceae): Glaucous shrubs, leaves alternate, palmately compound 6-8-lobed, monoecious, flowers in terminal paniculate racemes, pale yellow, male flowers below, female ones above; male flowers perianth cupular, 3 to5-lobed, lanceolate; stamens many, filaments connate; Female flowers tepals 5, subequal, lanceolate, ovary globose, trilocular, echinate, ovule unilocular, styles 3, papillose. Capsule 3-lobed, prickly. Seeds oblong, smooth, marbled with caruncle.

It is used in rheumatism, menses pain, headache; rat killer, purgative, carminative, aphrodisiac, diagnosis of urinary problems (23.09.2012, 61 SGG) (Fig. 2c).

**Tridex procumbens** L. (Asteraceae): Annual or sometimes perennial, prostrate to ascending herb; leaf simple with ovate lamina, opposite arrangement, margin coarsely and often deeply dentate, inflorescence Capitula 1-1.5 cm in diameter. Flower cream to yellow, flowering and fruiting throughout the year. Fruit a turbinate achene, smooth or faintly ribbed.

It is applied on wounds and cuts to stop bleeding (23.09.2012, 62 SGG) (Fig. 2a).

**Tylophora indica** (Burmn.F) Merill (Asclepiadaceae): The plant is perennial, small, slender, a twining or climbing herb. Leaves are ovate to elliptic, petioles are up to 12 mm long. Flowers are minute and corolla is greenish yellow or greenish purple in color. Fruit is a follicle.

It has been traditionally used for the treatment of bronchial asthma, jaundice and inflammation. It has antitumor, immunomodulatory, antioxidant, antiasthmatic, muscle relaxant (23.09.2011, 127 SGG).
**Withania somnifera** (L.) Dunal (Solanaceae): Shrub of 60-90 cm height, branches ascending; leaves elliptic-ovate to broadly ovate, acute, cuneate or oblique, entire to repand. Leaf arrangement alternate-spiral, flowers sessile to subsessile, greenish-yellow; fruit a globose berry, orange, overtopped by the inflated, seeds pyriform to reniform discoid and trigonous, fruiting from July-December.

It used for sexual weakness, cough, dropsy, diuretic and traditional folk healer (23.09.2011, 63 SGG).

**RESULTS AND DISCUSSION**

The tribals and rural people are dependent on herbal practices and have deep faith in their old treatise and traditions. Now days, much of the wealth of knowledge is being lost as the traditional culture is disappearing (Hamilton, 1995). So, documentation of traditional practices of herbal medicine will be coherence in future. There is an urgent need to study and document the precious knowledge of ethno-medicinal practices. Documentation of such information will go a long way in developing new drugs through further researches. A large number of plant species occur in tribal inhabited localities of Banswara district that are the intellectual property rights of indigenous people and documentation of such knowledge is necessary. The tribal community possess a vast knowledge regarding multifarious uses of plants.

Total 38 plant species belonging to 35 genera and 22 families have been recorded and enumerated. The data on ethno-medicinal plants like botanical name, local name, family, time and their traditional methods of drugs administration in different ailments are presented. These plants are being used ethnic groups and rural people of Ghatol of Banswara of southern Rajasthan to treat ailments such as injuries, wounds, cuts, fever, diarrhoea, ulcers, swelling, bone fractures, potency, anti-poisons, skin care, night blindness, toothache, asthma, cough and cold. In most of the cases, fresh part of the plant or some times dry powder was used for the preparation of medicine.

It was found that these tribal people still depend on the medicinal plants to cure their diseases and disorders. The paste or an extract of these plants are commonly applied externally on boils, wounds, cuts, swellings, burns, eczema, ringworm or taken orally as decoction or chewed in case of mouth ulcers, sore throat, toothache etc. Similar studies reported for the treatment of various ailments from different parts of Rajasthan and other states have also been reported from the area to have similar uses (Rao, 1981; Gangwar and Ramakrishnan, 1990; Abbas et al., 1992; Manandhar, 1995; Hegde et al., 1996; Jain, 1975; Singh, 1999b; Sebastian and Bhandari, 1984, 1988; Singh and Panday, 1980; Katwea and Arora, 1997; Katwea et al., 2003; Sharma, 2002; Trivedi, 2002; Joshi, 1995; Jain et al., 2005; Katwea, 2009; Meena and Yadav, 2010; Sharma and Khandelwal, 2010). The information on the ethno-medicinal plants certainly help in developing strategies for the conservation, cultivation of traditional medicine and economic welfare of rural and tribal population of this region of Rajasthan (Meena and Yadav, 2010).

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