

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.910.327>

## Traditional Health Practices of Rural and Tribal Communities using Ethno Medicinal Plants in Marwar Region of Rajasthan

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### ABSTRACT

The present study was to document ethno medicinal plants used against health disorders and diseases in Marwar region of Rajasthan, India and to select potential medicinal plants for further in vitro and in vivo investigation. An ethno medicinal plant exploration was carried out in Marwar region of Rajasthan in the year 2017-18. Data on ethno medicinal plants ethnographic profile of the respondents was documented using semi structured questionnaires. The present study revealed utilization of 70 medicinal plants for the treatment of different health disorders and diseases in studied region. Apiaceae and Fabaceae was the most dominant family reported to be used for the treatment of different health disorders (5 plants of each). Leaves and seed were the most preferred part used in herbal formulation followed by roots, whole plants and fruits. Growth form indicated that herbs (54%) were dominating followed by shrubs (22%), trees (20%) and climbers (4%). Highest degree of informant consensus was recorded for cold and cough (0.97), cuts, boils and wound (0.94), digestive and gastrointestinal disorder (0.92), dental and gum problem (0.90) and ophthalmic complaint (0.86). *Ziziphus nummularia* ranked first score highest FL value (82%) followed by *Trachyspermum ammi* (75%) ranked second, *Pedaliium murex* (72%) ranked third, *Acacia nilotica* (64%) and *Zingiber officinale* (63%) ranked fifth. Locals of the region are heavily dependent on these medicinal plants therefore causing serious threats to the abundance of these plants. There is a dire need to protect these medicinal plants before their extinction. Plants with high Fic and FL values should be subjected for further phytochemical and pharmacological investigation for scientific validation.

#### Keywords

Ethno Medicinal  
Plants,  
Apiaceae and  
Fabaceae

#### Article Info

Accepted:  
20 September 2020  
Available Online:  
10 October 2020

### Introduction

The traditional life styles in India are well acquainted with the secrets of herbal medicines.<sup>1</sup> Traditional medicine especially the folk herbal medicines have recently been receiving heightened interest the world over. Such age-old healthcare systems have been developed in different concerns of the world

where they were living in close interaction with nature. Information from ethnic groups on indigenous traditional herbal medicines had always played a vital role in the discovery of novel chemotherapeutic agents from plants.<sup>2</sup> In India, Ayurvedic system evolved over 5,000 years ago and is still in practice. The Rigveda and Atharva veda have included more than 700 medicinal prescriptions.<sup>3</sup>

Rajasthan is one of the largest state of India with about 12.44 per cent of the population belonging to tribes which enrich the ethnic heritage of Rajasthan.<sup>4</sup>

Modern healthcare in the tribal and rural area of Rajasthan is characterized by the deficiency of infrastructure, qualified personnel and of medicine. Access to and within the region is extremely difficult during certain periods of the year making it difficult to move to a distant place to avail the benefits of modern medicinal treatments. Given these extreme conditions the rural population has resource almost solely to traditional herbal medicines. In Rajasthan also a lot of work has been done on ethno medicinal plants used for various ailments by different rural and tribal communities.<sup>5, 6,7</sup> However, no such work has been done in the Marwar region of Rajasthan. The present paper records the plants of ethno medicinal significance occurring in the Marwar region of Rajasthan which may be used in future as plant resources for modern system of medicine.

## **Materials and Methods**

### **Study area**

Rajasthan is situated in the north-western part of India. It covers 342,239 square kilometers (132,139 square miles). Rajasthan lies between latitudes 23 degree 3' and 30 degree 12', north and longitudes 69 degree 30' and 78 degree 17', east. Compared to many other countries located in a similar latitudinal belt, such as in northern Arabia, Rajasthan has a less harsh climate. Marwar region of Rajasthan comprises of five large districts of south western part of this desert state. These districts are Pali, Jodhpur, Jalore, Nagaur and Barmer. Marwar is a sandy plain lying northwest of the Aravalli range, which runs southwest-northeast through Rajasthan state. The Aravalli's wring much of the moisture

from the southwest monsoon, which provides most of India's rainfall. Annual rainfall is low, ranging from 10 cm to 40 cm. Temperatures range from 45 to 50 degrees Celsius in the summer, to below freezing point in winter. The north western thorn scrub forests lie next to the Aravalli Range, while the rest of the region lies in the Thar desert. The Luni river is the principal feature of the Marwar plains. The sandy tracts of Thar desert in western Marwar (Maru Pradesh) are characterized by a harsh physical geography and a fragile ecology. High wind velocity, shifting sand dunes and very deep and saline water sources pose a challenge to sustained human habitation in the Thar.

### **Sampling and Data Collection**

Data collection was carried out from June 2018 to June 2019. Prior to data collection local agriculture officers of the regions were visited and it was explained them the main idea of the study in order to get their support. According to the information provided by the local agriculture officers 350 respondents were selected in five district of Marwar region with 70 informants in each district. The selection criterion of informants was mainly based on their rich indigenous knowledge and long term experience of utilization of plants as well as their living period of time in the study area. Selected respondents of the regions were aged between 35 and 80 years. Verbal consent, including consent for publication was received from all the informants before the interviews began. Semi structured questionnaires were designed to collect ethno medicinal knowledge of medicinal plants used against different health disorders.

### **Data Organization**

The collected data on ethno medicinal plants and ethnography of the respondents was

organized and summarized using statistical methods such as percentages. Plant parts use was categorized into leaves, roots, stem, whole plant, seeds, fruit, and flower. Health disorders were divided into fifteen major categories that is, cold and cough, fever and febrifuge, digestive and gastrointestinal disorder, heart disease, kidney and urination problem, dental and gum problem, skin problems, bone related problems, respiratory tract and lungs complaint, liver complaint and diabetes, cuts, boils and wound, ENT problem, ophthalmic complaint, sexual disease and related complaints and poison effect.

### Data Analysis

**Informant Consensus Factor (Fic):** Fic was used for the general uses of plants in different study areas and to indicate plants of particular interests. Informants' consensus is the most preferred method to highlight widely used plants for a particular ailment and help in the selection of plants for pharmacological and phytochemical studies.<sup>8</sup> Before using this method, diseases were classified into categories, as high Fic plants are likely to be more pharmacologically active in comparison with low Fic value plants.<sup>9</sup> Fic values lie between "0.00 and 1.00." When single plant or few plants are used by large number of informants to cure a specific disorder score high Fic values, low Fic values give an indication that informants do not agree over which plant to use.<sup>10</sup> The Fic can be calculated using the formula as follows:

$$Fic = \frac{nur - nt}{nur - 1}$$

where Fic = informants consensus factor, nur = number of use citation in each category, and nt = number of species used.

**Fidelity Level (FL):** Fidelity level (FL) is useful for recognizing the most favored plants

used for curing a special ailment by the respondents.<sup>11</sup> FL values of highly preferred plants are greater than values of less preferred plants. FL values are always calculated in terms of informant's percentage claiming the use of a definite plant species for the same ailment. The FL values indicate the importance of certain plant species for particular purpose. All of the reported ailments grouped into major classes for the calculation of FL values. FL values were estimated by using the formula

$$FL = \frac{Ip}{Iu} \times 100$$

Where Ip represents the number of respondents who reported the medicinal plants utilization for a particular ailment and Iu is the total number of respondents who mentioned the same plant for any ailment. It is assumed that those medicinal plants which are used frequently by most respondents for the same category are more likely to be biologically active plants.<sup>12</sup>

### Results and Discussion

In Marwar region of Rajasthan, total 70 plants belonging to 41 families were found to be used against different health disorders. Most dominant families used against health disorder were Apiaceae and Fabaceae (5 plants each) followed by Poaceae (4 plant) and Asclepiadaceae (3 plant). Leaves and seed were the most preferred part used in herbal formulation followed by roots, whole plants and fruits. Growth form indicated that herbs (54%) were dominating followed by shrubs (22%), trees (20%) and climbers (4%). Health disorders were divided into 15 major categories that is, cold and cough, fever and febrifuge, digestive and gastrointestinal disorder, heart disease, kidney and urination problem, dental and gum problem, skin problems, bone related problems, respiratory tract and lungs complaint, liver complaint and

diabetes, cuts, boils and wound, ENT problem, ophthalmic complaint, sexual disease and related complaints and poison effect. Most of the herbal recipes were taken orally in decoction or powder form with water, salt and sugar (Table 1).

Fic values for health disorder were estimated in range of 0.76 to 0.95. Highest degree of informant consensus was recorded for cold and cough (0.97), cuts, boils and wound (0.94), digestive and gastrointestinal disorder (0.92), dental and gum problem (0.90) and ophthalmic complaint (0.86). The highest

plant use citation was recorded for digestive and gastrointestinal disorder (238) followed by cold and cough (206) and cuts, boils and wound (138) (Table 2). The present study revealed 15 potential medicinal plants scoring high FL values. *Ziziphus nummularia* ranked first score highest FL value (82%) followed by *Trachyspermum ammi* (75%) ranked second, *Pedaliium murex* ranked third with FL value 72 per cent *Acacia nilotica* ranked fourth with FL value 64 per cent and *Zingiber officinale* ranked fifth with FL value 63 per cent (Table 3).

**Table.1** Medicinal plants used for curing different health problems

Botanical name; family	Local name; English name	Habit	Part used	Preparation and administration
<b>Cold and cough</b>				
<i>Allium sativum</i> Linn.; Alliaceae	Lahsun; Garlic	Herb	Flakes	Roasted flakes are given to patient to eat before going to bed. For children jaggery is mixed.
<i>Brassica nigra</i> ; Brassicaceae	Saron; Mustard	Herb	Seed	2 drops of mustard oil are put in nostrils.
<i>Cicer arietinum</i> L.; Fabaceae	Channa; Chickpea	Herb	Seed	2-3 spoon of chickpea powder ( <i>besan</i> ) is roasted and added half glass of milk and sugar. This mixture is taken before going to bed.
<i>Coriandrum sativum</i> Linn.; Apiaceae	Dhaniya; Coriander	Herb	Seed	Decoction of coriander seeds is given.
<i>Curcuma longa</i> ; Zingiberaceae	Haldi; Turmeric	Herb	Rhizome	Half spoon of turmeric powder with warm milk is taken before going to bed
<i>Justicia adhatoda</i> Linn.; Acanthaceae	Adua; Malabar nut	Tree	Leaves	Decoction of 5- 7 dry finely crushed leaves with <i>mishri</i> (sugar candy) and ginger. It is taken thrice a day.
<i>Ocimum sanctum</i> Linn., Lamiaceae	Tulsi; Basil	Herb	Flower	Decoction of 5-6 flowers, jaggery and turmeric is given before going to bed.
<i>Phoenix dactylifera</i> Linn.; Areaceae	Khajoor/ chuare;	Tree	Fruit	5-6 dry fruits are boiled with milk and taken both, before

	Dates			going to bed
<b><i>Trachyspermum ammi</i> (Linn.); Apiaceae</b>	<i>Ajwain;</i> Carom	Herb	Seed	Seeds roasted on iron frying pain wrapped in a piece of cloth are given to patient to inhale.
<b><i>Zingiber officinale</i> Rosc.;</b> <b>Zingiberaceae</b>	<i>Adrak;</i> Ginger	Herb	Rhizome	Juice of fresh rhizome is mixed with honey. One tea spoon taken thrice a day.
<b>Fever and febrifuge</b>				
<b><i>Azadirachta indica</i> A. Juss.;</b> <b>Meliaceae</b>	Neem	Tree	Leave	Fresh leaves are boiled in water and its filtrate is taken thrice a day to cure fever. 3-4 tender leaves are chewed daily early in the morning.
<b><i>Calotropis gigantea</i> Linn.;</b> <b>Asclepiadaceae</b>	<i>Safed aak;</i> Milkweed	Shrub	Flower	One piece of flower is taken with water once a day for 3-4 days.
<b><i>Piper longum</i> Linn.;</b> <b>Piperaceae</b>	<i>Pipli;</i> Long pepper	Herb	Fruit	Fruits kept in clarified butter over night are fried with small amount of salt chewed.
<b><i>Saccharum officinarum</i> Linn.;</b> <b>Poaceae</b>	<i>Ganna;</i> Sugarcane	Herb	Stem	Tea made from dried ginger, clove, <i>tulsi</i> leaves, tea leaves, jaggery (sugarcane juice candy) and milk is given before going to bed.
<b>Digestive and gastrointestinal disorder</b>				
<b><i>Aegle marmelos</i> (L.) Correa;</b> <b>Rutaceae</b>	<i>Bael;</i> Wood apple	Tree	Fruit	Powder of <i>bael</i> fruit and <i>Foeniculum vulgare</i> Mill. (fennel) seed is given with <i>isubgol</i> in chronic dysentery.
<b><i>Aerva javanica</i> (Burm.f.) Shult.;</b> <b>Amaranthaceae</b>	<i>Bui;</i> Desert cotton	Herb	Root	Powered root is taken with water to cure stomach ache.
<b><i>Aloe vera</i> (L.) Burm.f.;</b> <b>Liliaceae</b>	<i>Ganwar patha;</i> Aloe vera	Herb	Leaves	Leaves are taken as vegetable to cure constipation.
<b><i>Calotropis procera</i> (Ait.) R. Br.;</b> <b>Asclepiadaceae</b>	<i>Aak;</i> Milkweed	Shrub	Gynostegium	Aqueous paste of gynostegium is made and then its extract is taken out. Few drops of ghee and water are added in the extract and 2-3 drops are given to children to cure stomachache, which could be due to worms.
<b><i>Capparis deciduas</i> (Forsk.)</b>	<i>Ker;</i>	Shrub	Root	Aqueous paste of root is given

<b>Edgew.;</b> <b>Capparaceae</b>	Bare caper			with water to the patient suffering from typhoid.
<b><i>Citrullus colocynthis</i> (L.)</b> <b>Schrad;</b> <b>Cucurbitaceae</b>	<i>Tumba;</i> Bitter cucumber	Climber	Fruit	Dried fruit is powdered. Salt is added and one tea spoon of this mixture is taken with water in stomachache. Dried fruit powder is mixed with black pepper and rock salt. It is taken with water to cure constipation.
<b><i>Crotalaria burhia</i> Buch.-</b> <b>Ham.;</b> <b>Fabaceae</b>	<i>Khimp;</i> Burhia rattlepod	Shrub	Root	Powered roots are taken with lukewarm water in stomachache.
<b><i>Cuminum cyminum</i> L.;</b> <b>Apiaceae</b>	<i>Jeera;</i> Cumin	Herb	Seed	Decoction is prepared by adding seeds of this plant with rock salt and lemon juice. It is given to cure stomachache.
<b><i>Ferula asafetida</i> Linn.;</b> <b>Apiaceae</b>	<i>Hing;</i> Asafoetida	Herb	Latex	Latex powder mixed with water is massaged over abdomen and also given to drink in abdomen pain.
<b><i>Ficus religiosa</i> L.;</b> <b>Moraceae</b>	<i>Peepal;</i> Sacred fig	Tree	Knots (stem galls)	One tea spoon dried powder of galls is taken with water once a day to cure constipation.
<b><i>Foeniculum vulgare</i> Mill.;</b> <b>Apiaceae</b>	<i>Saunf;</i> Fennel	Herb	Seed	1 teaspoon of mixture, prepared from equal quantity of fennel and <i>Trigonella foenum-graecum</i> (fenugreek) seed powder is given with water to cure acidity.
<b><i>Indigofera cordifolia;</i></b> <b>Fabaceae</b>	<i>Gokhru;</i> Heart leaf indigo	Herb	Seed	Seeds are boiled in water and its filtrate is given to the typhoid patient for 3 days.
<b><i>Lawsonia inermis</i> Linn.;</b> <b>Lythraceae</b>	<i>Mehndi;</i> Heena	Shrub	Seed	Powered seed mixed with clarified butter and made small bolls are given twice a day to cure dysentery with mucus.
<b><i>Mangifera indica</i> Linn.;</b> <b>Anacardiaceae</b>	<i>Aam;</i> Mango	Tree	Seed	Paste of crushed mango seed ( <i>giri</i> ) with water or curd is given to child in diarrhoea.
<b><i>Nelumbo nucifera</i> Gaertn.;</b> <b>Nymphaeaceae</b>	<i>Kamal;</i> Lotus	Herb	Seed	Mixture of 4-5 seeds, salt in a small amount, 2-3 <i>Piper nigrum</i> seeds with lemon juice is given to vomit patient.
<b><i>Polygonum plebeium</i> R. Br.;</b>	<i>Lalbuti;</i>	Herb	Whole plant	Plant decoction is given in

<b>Polygonaceae</b>	Knotweed			colic complaints.
<b><i>Sarcostemma viminalis</i> (L.) r. Br.;</b> <b>Asclepiadaceae</b>	<i>Khair-khimp;</i> Milk rope	Climber	Whole plant	Plant extract is given in digestive disorder.
<b><i>Terminalia chebula</i> Retz.;</b> <b>Combretaceae</b>	<i>Harad;</i> Myrobalan	Tree	Fruit	One teaspoon of slightly fried fruit powder is taken with water.
<b><i>Trachyspermum ammi</i> (Linn.) Sprague;</b> <b>Apiaceae</b>	<i>Ajwain;</i> Carom	Herb	Seed	Half spoon of seed powder, small amount of <i>Ferula asafoetida</i> ( <i>hing</i> ) and one fourth spoon black salt are mixed and taken with water in gastric problem.
<b><i>Zingiber officinale</i> Rosc.;</b> <b>Zingiberaceae</b>	<i>Adrak;</i> Ginger	Herb	Rhizome	Ginger powder with small amount of salt is taken with water in abdominal pain.
<b>Heart disease</b>				
<b><i>Allium sativum</i> Linn.;</b> <b>Alliaceae</b>	<i>Lahsun;</i> Garlic	Herb	Flakes	<i>Kheer</i> or flakes boiled with milk is taken in early morning.
<b><i>Embilica officinalis</i> Gaertn.;</b> <b>Euphorbiaceae</b>	<i>Amla;</i> Aonla	Tree	Fruit	One spoon mixture of dried fruit powder and <i>mishri</i> (sugar candy) is taken with water.
<b><i>Ficus religiosa</i> L.;</b> <b>Moraceae</b>	<i>Peepal;</i> Sacred fig	Tree	Leaves	Boil 15 fully grown green chopped leaves in a glass water till remain one third and is taken to divide in 3 dosages in a day.
<b><i>Terminalia arjuna</i> Roxb.;</b> <b>Combretaceae</b>	<i>Arjun;</i> Arjuna	Tree	Bark	Bark powder with clarified butter or milk is given twice or thrice daily for 15 days.
<b>Kidney and urination problem</b>				
<b><i>Acacia nilotica</i> (L.) Delile;</b> <b>Mimosaceae</b>	<i>Babool;</i> Arabic tree	Tree	Leaves	1-2 gm leaves of <i>Acacia nilotica</i> , 1 gm of <i>Pedaliium murex</i> ( <i>gokhru</i> ) and <i>kalmi shora</i> in small amount crushed and finely mixed are taken with water before going to bed in urinary problem.
<b><i>Boerhavia diffusa</i> L.;</b> <b>Nyctaginaceae</b>	<i>Lal sathi;</i> Red spiderling	Herb	Leaves	Leaves are cooked as vegetable and used as diuretic
<b><i>Corbichonia decumbens</i> (Forssk.) Jacq ex Exell;</b> <b>Molluginaceae</b>	<i>Pathar-chatti;</i> Prostrate purslane	Herb	Leaves	Crushed leaves are taken in kidney stone problem.
<b><i>Coriandrum sativum</i> Linn.;</b>	<i>Dhaniya;</i>	Herb	Seed	50 gm coriander seeds boiled

<b>Apiaceae</b>	Coriander			in water and drunk to cure urination problem.
<b><i>Ocimum basilicum</i> Linn., Lamiaceae</b>	<i>Ban tulsi;</i> Forest basil	Herb	Seed	Sprouted seeds with curd are given to patient in urinary problem.
<b><i>Pedaliium murex</i> Linn.; Pedaliaceae</b>	<i>Gokhru;</i> Caltrops	Herb	Fruit	Fruit is boiled in water and its filtrate is given to the patient as diuretic.
<b><i>Ricinus communis</i> L.; Euphorbiaceae</b>	<i>Arandi;</i> Castor	Shrub	Seed	4 seeds are taken without seed coat and boiled in 1 liter milk till remains 150 ml. It is taken in evening for four days to cure kidney problem.
<b><i>Sesamum indicum</i> L.; Pedaliaceae</b>	<i>Til;</i> Sesame	Herb	Seed	Mixed equal part of <i>Sesamum indicum</i> seed powder and jaggery powder and it is taken before going to bed.
<b>Dental and gum problem</b>				
<b><i>Acacia nilotica</i> (L.) Delile; Mimosaceae</b>	<i>Babool;</i> Arabic tree	Tree	Bark	Bark ash (5-7 gm) mixed with crushed salt and black pepper is brushed daily to cure swollen gums (gingivitis).
<b><i>Azadirachta indica</i> A. Juss.; Meliaceae</b>	Neem	Tree	Branches	Fresh branches are used as a tooth brush. It is remedial treatment of pyorrhea.
<b><i>Calotropis gigantia</i> Linn.; Asclepiadaceae</b>	<i>Safed aak;</i> Milkweed	Shrub	Root	Pressing pieces of milkweed root with affected teeth reduces toothache.
<b><i>Ferula asafoetida</i> Linn.; Apiaceae</b>	<i>Hing;</i> asafoetida	Herb	Latex	Roasted latex is kept at the place of pain.
<b><i>Ziziphus nummularia</i> (Burm.f.) Wt.; Rhamnaceae</b>	<i>Jhar ber;</i> Jujube	Shrub	Root	Decoction of roots is given to patient to gargle.
<b>Skin problems</b>				
<b><i>Azadirachta indica</i> A. Juss.; Meliaceae</b>	Neem	Tree	Leaves	Aqueous paste of leaves is applied on affected portion to cure skin irritation. Leaves are boiled in water and this water is used for bathing to get relief in skin irritation.
<b><i>Calotropis procera</i> (Ait.) R. Br.; Asclepiadaceae</b>	<i>Aak;</i> Milkweed	Shrub	Root	Ash is prepared from fresh root tip and mixed with butter. It is applied on eczema.
<b><i>Cynodon dactylon</i> Pers.; Poaceae</b>	<i>Doob;</i> Couch grass	Herb	Whole plant	Paste is applied on eczema affected area.



<b><i>Justicia adhatoda</i> Linn.;</b> <b>Acanthaceae</b>	<i>Adusa</i> ; Malabar nut	Tree	Root and leaves	Paste of 5 gm roots and 7-10 leaves boiled in water is applied twice a day on affected area.
<b><i>Ocimum sanctum</i> Linn.,</b> <b>Lamiaceae</b>	<i>Tulsi</i> ; Basil	Hrub	Leaves	Paste of <i>tulsi</i> leaves applied of eczema.
<b><i>Polygonum plebeium</i> R. Br.;</b> <b>Polygonaceae</b>	<i>Lalbuti</i> ; Knotweed	Herb	Whole plant	Plant ash with oil is applied on eczema.
<b><i>Psoralea corylifolia</i> Linn.</b> <b>Fabaceae</b>	<i>Bavachi</i> ; Psoralea	Herb	Seed	One spoon seeds and <i>Embllica officinalis</i> dried fruit powder and <i>mishri</i> (sugar candy) soak in one glass water for 5-6 hours and is taken early morning as a remedy of leucoderma.
<b><i>Terminalia catappa</i> Linn.;</b> <b>Combretaceae</b>	<i>Jangli badam</i> ; Malabar almond	Tree	Leaves	Tender leaves paste is applied on eczema affected parts.
<b>Bone related problems</b>				
<b><i>Acacia nilotica</i> (L.) Delile;</b> <b>Mimosaceae</b>	<i>Babool</i> ;	Tree	Bark and seed	Bark and seed powder of <i>Acacia nilotica</i> given with honey twice daily for three days are very efficacious in bone fracture.
<b><i>Brassica nigra</i>;</b> <b>Brassicaceae</b>	<i>Saron</i> ; Mustard	Herb	Seed	<i>Syzygium aromaticum</i> (4-5 no.), <i>Trachyspernum ammi</i> (5 gm) and <i>Trgonella foenum-graecum</i> (5 gm) mixed in half liter mustard oil are massaged on the affected area twice a day.
<b><i>Justicia adhatoda</i> Linn.;</b> <b>Acanthaceae</b>	<i>Adusa</i> ; Malabar nut	Tree	Leaves	4-5 leaves are tied at the place of arthritis pain.
<b><i>Litsea glutinosa</i> (Lour.);</b> <b>Robins Lauraceae</b>	<i>Maida ki lakdi</i> ; Soft bollugum	Tree	Bark	Bark paste in sheep's milk is applied on fractured and swelled area.
<b><i>Martynia annua</i> Linn.;</b> <b>Martyniaceae</b>	<i>Bichhu kanta</i> ; Devils' claw	Shrub	Leaves	Leaves paste is applied for treating rheumatism.
<b><i>Ochthochlao compressa</i> (Forsk.) Hilu;</b> <b>Poaceae</b>	<i>Chia</i> ; Wire grass	Shrub	Root	Decoction is prepared from the pieces of roots of this plant with dried or fresh ginger and black pepper. It is taken for few days to cure rheumatism.
<b><i>Pedaliium murex</i> Linn.;</b> <b>Pedaliaceae</b>	<i>Gokhru</i> ; Caltrops	Herb	Seed	<i>Laddus</i> prepared from the seeds are given to patients

				suffering from joint pain and limbago.
<b><i>Ricinus communis</i> L.;</b> <b>Euphorbiaceae</b>	<i>Arandi;</i> Castor bean	Shrub	Leaves	Warmed leaves smeared with mustard oil on the upper surface are tied with cloth to the affected part. It gives relief in knee pain.
<b><i>Sarcostemma viminalis</i> (L.) r. Br.;</b> <b>Asclepiadaceae</b>	<i>Khira-khimp;</i> Milk rope	Climber	Whole plant	Plant paste is applied on fractured bone.
<b><i>Sida cordifolia.</i>;</b> <b>Malvaceae</b>	<i>Kharanti;</i> Flannel weed	Shrub	Seed	Elderly persons suffering from lumbago eat powdered seeds mixed with jaggery in winter.
<b><i>Trigonella foenum-graecum</i> Linn.;</b> <b>Fabaceae</b>	<i>Maithi;</i> Fenugreek	Herb	Seed	One teaspoon of finely powdered seeds is taken daily early in the morning with water.
<b><i>Withania somnifera</i> Dunal;</b> <b>Solanaceae</b>	<i>Ashwagandha;</i> Winter cherry	Shrub	Root	Roots powder is taken daily with water to avoid knee pain.
<b>Respiratory tract infection and lungs complaint (pneumonia and asthma)</b>				
<b><i>Achyranthus aspera</i> Linn.</b> <b>Amaranthaceae</b>	<i>Apaamarga</i> ( <i>chirchita</i> ); Chaff-flower	Herb	Leaves	Dry <i>apaamarga</i> leaves smoked in a pipe are very efficacious drug for asthma. The ash of burnt dry plant also is given with honey twice a day for seven days.
<b><i>Amaranthus viridis</i> L.;</b> <b>Amaranthaceae</b>	<i>Chaulai;</i> Amaranth	Herb	Seed	Seeds are boiled in water and its filtrate is given to the patient in pneumonia.
<b><i>Calotropis porcera</i> (Ait.) R.Br.;</b> <b>Asclepiadaceae</b>	<i>Aak;</i> milkweed	Shrub	Flowers	Ash of 5 gm flowers kept in sealed earthenware pot mixed with honey is given to asthmatic patient
<b><i>Citrullus colocynthis</i> (L.) Schrad.;</b> <b>Cucurbitaceae</b>	<i>Tumba;</i> Bitter cucumber	Climber	Fruit	Ash of fruits taken with water in asthma.
<b><i>Ficus glomerta</i> Roxb.,</b> <b>Moraceae</b>	<i>Gular;</i> Fig	Tree	Latex	In latex of the plant, carom seed, nutmeg, cloves and jaggery are added and given to patient.
<b>Liver complaint and diabetics</b>				
<b><i>Azadirachta indica</i> A. Juss.;</b> <b>Meliaceae</b>	Neem	Tree	Fruit	One tea spoon dried powder of fruit is taken with water twice a day before meal. It is reported to control sugar level.

<i>Boerhavia diffusa</i> L.; Nyctaginaceae	<i>Lal sathi</i> ; Red spiderling	Herb	Stem	Stem cut into small pieces like beads and made into garlands. It is worn around neck till the patient is free from jaundice.
<i>Capparis decidua</i> (Forsk.) Edgew.; Capparaceae	<i>Ker</i> ; Bare caper	Shrub	Root	Approximately 3 cm root crushed finely as powder is taken with water to cure liver problem.
<i>Nyctanthes arbor-tristis</i> Linn.; Oleaceae	<i>Harsingar</i> ; Jasmine	Shrub	Leaves	One teaspoonful of leaf powder with water is taken daily.
<i>Saccharum officinarum</i> Linn.; Poaceae	<i>Ganna</i> ; Sugar cane	Herb	Stem	Sugar cane juice is given to jaundice patient.
<i>Trigonella foenum-graecum</i> Linn.; Fabaceae	<i>Methi</i> ; Fenugreek	Herb	Seed	One tea spoon dried seed powder is taken daily early morning with water.
<b>Cuts, boils and wound</b>				
<i>Allium cepa</i> Linn.; Alliaceae	<i>Pyaj</i> ; Onion	Herb	Bulb	Paste of bulb and turmeric is applied on wound to heal up faster.
<i>Azadirachta indica</i> A.Juss.; Meliaceae	Neem	Tree	Leaves	Aqueous paste of leaves is applied on cuts and boils to hasten suppuration.
<i>Calotropis procera</i> (Ait.) R. Br.; Asclepiadaceae	<i>Aak</i> ; Milkweed	Shrub	Latex	Latex is applied on boils.
<i>Euphorbia granulate</i> Forsk.; Euphorbiaceae	<i>Dudheli</i> ; Common spurge	Herb	Latex	Latex is applied on boils.
<i>Martynia annua</i> Linn.; Martyniaceae	<i>Bichhu kanta</i> ; Devils' claw	Shrub	Leaves	Leaves paste is applied on swelling and boils.
<i>Salvadora oleoides</i> Decne.; Salvadoraceae	<i>Pilu</i> ; Mustard tree	Tree	Leaves	Aqueous paste of leaves is applied on boils.
<i>Triticum aestivum</i> L.; Poaceae	<i>Genhu</i> ; Wheat	Herb	Seed	Chapatti is made from seed flour of this plant and roasted from one side only. Clarified butter, turmeric and jaggery are applied on half roasted side which tied on tumor portion with a cloth to hasten suppuration.
<i>Ziziphus nummularia</i> (Burm.f.) Wt.;	<i>Jhar ber</i> ; Jujube	Shrub	Leaves	Aqueous paste of leaves is applied on boils.

<b>Rhamnaceae</b>				
<b>ENT problem</b>				
<i>Acacia nilotica</i> (L.) Delile; <b>Mimosaceae</b>	<i>Babool</i> ; Arebic tree	Tree	Bark	Bark decoction is used as astringent gargle and mouth wash in sore throat and other disease of throat.
<i>Allium cepa</i> Linn.;; <b>Alliaceae</b>	<i>Pyaj</i> ; Onion	Herb	Bulb	2 drops of roasted bulb juice are put in the ear.
<i>Allium sativum</i> Linn.;; <b>Alliaceae</b>	<i>Lahsun</i> ; Garlic	Herb	Flakes	2 flakes of crushed of garlic hardly fried in mustard oil than cool and filtered this oil and put 2 drops in the ear.
<i>Boerhavia procumbens</i> Bnks ex Roxb.;; <b>Nyctaginaceae</b>	<i>Sathi</i> ; Hogweed	Herb	Root	Root decoction is used as eye tonic.
<i>Cleome gynandra</i> Linn.;; <b>Cleomaceae</b>	<i>Bagro</i> ; Wild spider	Herb	Leaves	Leaf extract is used to cure earache.
<i>Solanum surattense</i> <b>Burm.F.;; Solanaceae</b>	<i>Ringni</i> ; Wild eggplant	Shrub	Leaves	Fresh leaf extract is poured into the ear to remove the insect.
<i>Tecomella undulate</i> (Sm) <b>Seem.;; Bignoniaceae</b>	<i>Rohira</i> ; Timber	Tree	Root	Few drops of extract of fresh roots are dropped into ear to cure ear pain.
<b>Ophthalmic complaint</b>				
<i>Allium cepa</i> Linn.;; <b>Alliaceae</b>	<i>Safed pyaj</i> ; Onion	Herb	Bulb	2 drops of bulb juice mixed with honey are put in the eye to increase eye sight.
<i>Boerhavia procumbens</i> <b>Banks ex Roxb.;; Nyctaginaceae</b>	<i>Sathi</i> ; Hogweed	Herb	Root	Root decoction is used as an eye tonic.
<i>Citrus medica</i> Linn.;; <b>Rutaceae</b>	<i>Nimbu</i> ; Lemon	Shrub	Fruit	2 drops of juice put in the eyes to cure sty or external hordeolum. 2 drop of mixture made from lemon juice, onion and ginger juice (one forth spoon each), honey and rose water are put in the eyes daily.
<b>Sexual disease and related complaints</b>				
<i>Cocculus hirsutus</i> (L.) Diels; <b>Menispermaceae</b>	<i>Bajar-bel</i> ; Broom creeper	Climber	Leaves	Leaves decoction mixed with sugar is taken in the morning for a week to cure leucorrhoea.
<i>Corbichonia decumbens</i> <b>(Forssk.) Jacq. Ex Exell;</b>	<i>Pathar-chatti</i> ; Prostrate	Herb	Whole plant	The plant extract is taken to cure gonorrhoea.

<b>Molluginaceae</b>	purslane			
<b><i>Withania somnifera</i> (L.) Dunal; Solanaceae</b>	<i>Ashwagandha</i> ; Winter cherry	Shrub	Root	Root decoction is mixed with milk and given orally to cure sterility in men. Decoction of powdered root is given to the ladies in leucorrhoea.
<b><i>Zaleya govindia</i> (Buch. Ham. Ex G. Don) Nair; Aizoaceae</b>	<i>Santhi</i> ; Trianthema	Herb	Root	Fresh root decoction orally by men against syphilis and swellings of sex organs.
<b>Poison effect</b>				
<b><i>Allium cepa</i> Linn.; Alliaceae</b>	<i>Pyaj</i> ; Onion	Herb	Bulb	In snake bite 2 teaspoonful bulb juice mixed with mustard oil is given to affected person to expel poison with vomiting. Bulb juice with small amount of <i>nausadar</i> is applied on scorpion bitten area.
<b><i>Calotropis procera</i> (Ait.) R. Br.; Asclepiadaceae</b>	<i>Aak</i> ; Milkweed	Shrub	Latex	Apply milkweed latex on the scorpion bitten body part again and again to alleviate poisoning. Grind milkweed root with cold water and it is taken or mix juice of 5-6 soft leaves of milkweed with clarified butter and give it to patient; it provides relief in all type of poison too.
<b><i>Capsicum annum</i> Linn.var. <i>acuminatum</i>.; Solanaceae</b>	<i>Lal mirch</i> ; Red chilli	Herb	Fruit	In scorpion bite, fruit powder with some honey is applied at the affected area.
<b><i>Citrullus lanatus</i> (Thunb.); Cucurbitaceae</b>	<i>Matira</i> ; Water melon	Climber	Fruit	The juice of fruit is filled in a glass bottle and kept 2 years. In snake bite this juice is given to the affected person. Poison will come out through vomiting.
<b><i>Portulaca oleracea</i> L.; Portulacaceae</b>	<i>Bicchu-buti</i> ; Parsley	Herb	Latex	In scorpion bite the latex of this plant is applied on affected portion.

**Table.2** FIC values of traditional medicinal plants for treating different health disorder in study region

S.No.	Disease category	Nt	Nur	FIC
1.	Cold and cough	10	206	0.95
2.	Fever and febrifuge	4	21	0.85
3.	Digestive and gastrointestinal disorder	20	238	0.92
4.	Heart disease	4	15	0.78
5.	Kidney and urination problem	8	46	0.84
6.	Dental and gum problem	5	44	0.90
7.	Skin problem	8	39	0.81
8.	Bone related problem	12	47	0.76
9.	Respiratory tract and lungs complaint	5	28	0.85
10.	Liver complaint and diabetes	6	35	0.85
11.	Cuts, boils and wound	8	138	0.94
12.	ENT problem	7	32	0.80
13.	Ophthalmic complaint	3	16	0.86
14.	Sexual disease and related complaints	4	17	0.81
15.	Poison effect	5	24	0.82

**Table.3** Fidelity level (FL) values for common medical plants used by local traditional healers by aliment category

S.No.	Plant spp.	Disease category	Ip	Iu	FL%
1.	<i>Zingiber officinale</i>	Cold and cough	36	57	63
2.	<i>Azadirachta indica</i>	Fever and febrifuge	14	52	26
3.	<i>Trachyspermum ammi</i>	Digestive and gastrointestinal disorder	42	56	75
4.	<i>Ficus religiosa</i>	Heart disease	8	15	53
5.	<i>Coriandrum sativum</i>	Kidney and urination problem	16	29	55
6.	<i>Acacia nilotica</i>	Dental and gum problem	22	34	64
7.	<i>Polygonum plebeium</i>	Skin problem	5	12	42
8.	<i>Pedaliium murex</i>	Bone related problem	13	18	72
9.	<i>Citrullus colocynthis</i>	Respiratory tract and lungs complaint	10	17	58
10.	<i>Capparis decidua</i>	Liver complaint and diabetes	7	13	53
11.	<i>Ziziphus nummularia</i>	Cuts, boils and wound	33	40	82
12.	<i>Allium sativum</i>	ENT problem	26	44	59
13.	<i>Allium cepa</i>	Ophthalmic complaint	6	19	31
14.	<i>Withania somnifera</i>	Sexual disease and related complaints	3	7	42
15.	<i>Calotropis procera</i>	Poison effect	26	42	61

The tribal and rural people are dependent on indigenous 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.<sup>13</sup> So, documentation of traditional practices of plant 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 and rural localities of Marwar region that are an intellectual property rights of indigenous people and documentation of such knowledge is necessary. The tribal community possesses a vast knowledge regarding multifarious uses of plants.

Total 70 plant species belonging to 41 families have been recorded and enumerated. The data on medicinal plants like botanical name, family local name, habit, part used and their traditional methods of drug administration in different ailments are presented. These plants are being used by ethnic groups and rural people of Marwar region of Rajasthan to treat cold and cough, fever and febrifuge, digestive and gastrointestinal disorder, heart disease, kidney and urination problem, dental and gum problem, skin problems, bone related problems, respiratory tract and lung complaint, liver complaint and diabetes, cuts, boils and wound, ENT problem, ophthalmic complaint, sexual disease and related complaints and poison effect.

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.<sup>14,15,16,17,18</sup> Local healers mostly used plants that belong to family Apiaceae and Fabaceae because this family has a unique place in homemade remedies and most of its plants are traditionally being used against various health disorder and disease not only in India but throughout the world that might be due to presence of potential phytochemical. Poaceae and Asclepiadaceae are also used by the healers after Apiaceae and Fabaceae.<sup>19</sup> Present findings are contradictory with another ethno medicinal study conducted somewhere else in

which Asteraceae was found to be most frequently used plant family against health disorder.<sup>20</sup>

In most of the cases fresh part of the plant or sometimes dry powder was used for the preparation of medicine. Traditional healers used all plant parts in remedy preparation but leaves and seeds were used most frequently. Possible reason behind these results might be that they contain high concentration of soluble metabolites such as alkaloids, glycoside, phenolics, terpenoids and flavonoids.<sup>21</sup> Present results are in line with study conducted in another country in which leaves is most commonly used part against health disorder and diseases while contradictory with other studies in which fruits are commonly used against digestive problems.<sup>22,23</sup> Often different parts of a single plant may be concocted and used for a particular type of ailment. For example, leaves and root of *Ziziphus nummularia* are used to treat cuts, boils and wounds and dental and gum problem. *Ziziphus nummularia* also ranked first in present study score highest FL value (82%). This species could be further subjected to phytochemical and pharmacological investigation for proving its efficacy. Decoction was found largest mode of recipe preparation in studied regions and different studies also reported that decoction and infusion are the methods mostly used for the preparation of the folk medicine.<sup>24</sup> Traditional healers of studied regions used variety of vehicles such as sugar, salt, milk, and clarified butter to in herbal formulation and intake of these preparations in order to minimize the bitter taste of plants and avoid vomiting.

In conclusion the people of the Marwar region are using medicinal plants for different health disorder and diseases due to lack of modern health facilities. They have centuries old traditional knowledge to prepare different

types of effective plant remedies against health disorders. Locals of the region are heavily dependent on these medicinal plants therefore causing serious threats to the abundance of these plants.<sup>25</sup> There is a dire need to protect these medicinal plants before their extinction. Proper training should be given to traditional healers for sustainable collection and utilization of this valuable flora. Plants with high Fic and FL values should be subjected to further *in vitro* and *in vivo* screening that could lead toward the development of some novel drugs with fewer side effects. Young generation should be mobilized toward learning these practices before the extinction of this knowledge as ethno medicinal knowledge provide a baseline information to chemists, pharmacists, and pharmacologists for drug developments.

### Acknowledgement

Authors are thankful to local people of study area for his valuable guidance and help at each stage of his work

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#### **How to cite this article:**

Aishwarya Dudi, M. L. Meena and Dheeraj Singh. 2020. Traditional Health Practices of Rural and Tribal Communities using Ethno Medicinal Plants in *Marwar* Region of Rajasthan. *Int.J.Curr.Microbiol.App.Sci.* 9(10): 2705-2721. doi: <https://doi.org/10.20546/ijcmas.2020.910.327>