Pak. J. Bot., 51(4): 1493-1506, 2019. DOI: http://dx.doi.org/10.30848/PJB2019-4(32)

AN APPRAISAL OF ETHNOBOTANICAL INVESTIGATION OF INDIGENOUS FLORA FROM A HIGH TEMPERATURE AFFECTED AREA IN THE SOUTHERN PUNJAB, PAKISTAN

NADEEM AHMED[1*], MUHMMAD ANEES[2] AND LIXIN ZHANG[3]

[1]*Department of Botany, Mohi-Ud-Din Islamic University, Nerian Sharif, AJ & K*
[2]*Department of Microbiology, Kohat University of Science and Technology, Pakistan*
[3]*College of Life Sciences, Northwest A&F University, Yangling, Shaanxi, China*
[*]*Corresponding author's email: shnadeem77@yahoo.co.in*

Abstract

Traditional herbal medicine uses cultural knowledge and practices for maintenance of human health. In economically poor regions of Pakistan such as Distric Rajanpur, the majority of people rely on traditional medicines. Since such practices have not been rigorously and systematically studied or reported, a quantitative ethnobotanical study was conducted to document the medicinal plants and their uses in traditional herbal therapies which will help in developing socio-economic reforms in health-care systems. Rapid appraisal approach (RAA), Used value (UV), and Informant census factor (ICF) were used to analyze the data which was collected during spring-summer (March to June) and monsoon season to winter (August to December, 2014). A total of 64 medicinal plants belonging to 56 genera and 34 families were reported to be effective for 08 major ailments in the local healthcare system of Rajanpur, Punjab Province, Pakistan. Among medicinal plants, *Acacia nilotica* used in the treatment to purifier blood, laxative and anticonvulsant had the highest used value (UV=0.88). Poaceae, the predominant family contributed 08 species. Leaves (31.3%) were the major parts of the plant used in herbal therapies. Eleven medicinal plants were used for the treatment of skin diseases and rheumatism. The highest informant census factor (0.80) was reported for the respiratory systems problems. Quantitative analyses made of collected data indicated that medicinal plants were an integral part of the life of district Rajanpur. The vegetation of the study area comprises valuable to its natural resources are used for the treatment of various ailments.

Key words: Ethnomedicines, Used value, Informant census factor, Rajanpur.

Introduction

Traditional medicinal plant practices are of immense importance and there is a need to document this knowledge for future drug discovery and development. In underdeveloped countries particularly Pakistan, India, Thailand, Mexico and Nigeria, 88% of local inhabitants depend on the traditional medicinal system for their basic health-care needs (Balick & Cox, 1997; Hoareau & Dasilva, 1999). In this connection, ethnobotany plays a key role in the documentation of traditional health practices, basic knowledge of pharmacology and conservation of biological knowledge (Cakilcioglu *et al*., 2011). Nowadays, ethnobotany is an important tool to conserve traditional knowledge and has a cultural value between people and plants interactions (Heinrich *et al*., 2006).

Pakistan including Kashmir contains more than 6000 flowering and medicinal plants due to its diverse climatic and edaphic factors (Shinwari & Shinwari, 2006). These medicinal plants have been extensively used in the formulation of different drugs in rural and northern and northwestern areas of Pakistan. It has been estimated that 40,000-50,000 local healers (called tabibs) are utilizing 200 medicinal plants in folk and traditional remedies for the cure of several diseases (Zaidi, 2001). In Pakistan ethnomedicines have been given less importance, however during the recent past the trend to explore and investigate the ethnomedicinal importance of plants is increasing (Qureshi *et al*., 2009; Mahmood *et al*., 2011c; Ahmed *et al*., 2014a, b; 2015; Ahmad *et al*., 2018; Barkatullah *et al*., 2018). Harsh climatic conditions cause lowering in photosynthesis, generation of reducing equivalents such as NADPH which pushed plant metabolism towards the biosynthesis of highly reduced secondary metabolites such as isoprenoid, alkaloids, and phenols (Taize *et al*., 2015). Production and accumulation of active substances in medicinal plants native to harsh climatic conditions enhanced the quality of medicinal plants. District Rajanpur is severely affected with water deficit due to high light intensities and high temperature throughout the year as compared to adjoining districts. Local communities of distric Rajanpur are still relying on folk medicines due to high cost of modern drug system, economic pressure, lacking modern health care facility in rural areas (Mehmood *et al*., 2011a). In view of this information, it is hypothesized that medicinal plants native to district Rajanpur are of high quality and much helpful in local health care system. However, there is no report available about the use of medicinal flora in district Rajanpur.

This study signified to evaluate ethnomedicinal plants of the highly drought stressed area with ethnobotanical indices and to know their advantages. For this purpose, we relied on the pieces of information or knowledge about wild and cultivated plants traditionally used in district Rajanpur Southern Punjab, Pakistan.

Materials and Methods

Ethno-geography of study area: Rajanpur, district of Province Punjab (South), Pakistan lies between 29º06 N, 70º19' E with an area of 12,319 km^2. It consists of three tehsils namely Jampur, Rajanpur and Rojhan (Fig. 1). The total population of district Rajanpur is about 1,103,618. Of which population only 14.27% live in urban areas and

rest of the population live in rural areas. The maximum and minimum temperature during summer ranged about 50°C and 31°C. Major agricultural crops are cotton, sugarcane and tobacco. The spoken languages are Punjabi, Seraiki, Raangri, Riyasti, Thalouchi, Balouchi and Sindhi (Fig. 1). We tried to document the important medicinal plant species which are being used by local inhabitants of district Rajanpur and employ culturally important quantitative ethnobotanical indices to know the prime importance of indigenous active plant species.

Data collection: Field surveys were conducted during the year 2014 (March to June and July to December) to collect ethnobotanical data from local inhabitants of district Rajanpur. Interviewees were conducted from elderly knowledgeable inhabitants including herb vendors, farmers and herbalists (Hakims). 140 informants between age 35-55, above 60 (60 men and 55 women) and 25 herbalists (male) contributed to get data about folk medicines. Much of informations about the local names, plants habit, plant parts used, modes of administration, preparations of herbal remedies and therapeutic uses were asked. Useful indigenous knowledge was recorded through semi-structures interviews with native people (Table 1).

Plant collection and identification: Plants collection was started from March to June and July to December (2014) with the help of local people and a botanist (first author) from three tehsils namely Jampur, Rajanpur and Rojhan. The Plants were air dried, pressed, sprayed with $HgCl_2$ as herbarium specimens and deposited at Quaid-i-Azam University herbarium, (ISL), Pakistan. Plants were identified by taxonomist (first author) and compared with (www.ThePlantList.org) and Pakistan Plant Database (http://the plantlist.org; http://www.tropicos.org/project webportal; Nasir & Ali, 1970-1988; Ali & Nasir, 1989-1991; Ali & Qaiser, 1993-2011).

Data analysis

Quantitative ethnobotanical indices such as Frequency of citation (FC), Used value (UV) of species and Informant census factor were used to analyze the collected data.

Frequency of citation (FC): The Frequency of citation (FC) was recorded on the basis of each plant species reported by indigenous informants as useful in herbal remedy.

Used value index (UVs): Used value index of a particular plant species was described by Phillips & Gentry (1993) as:

$$UV_s = \sum \frac{U_i}{N}$$

Informants census factor (ICF): Informant census factor (ICF) was calculated as:

$$ICF = Nur - Nt / (Nt-1)$$

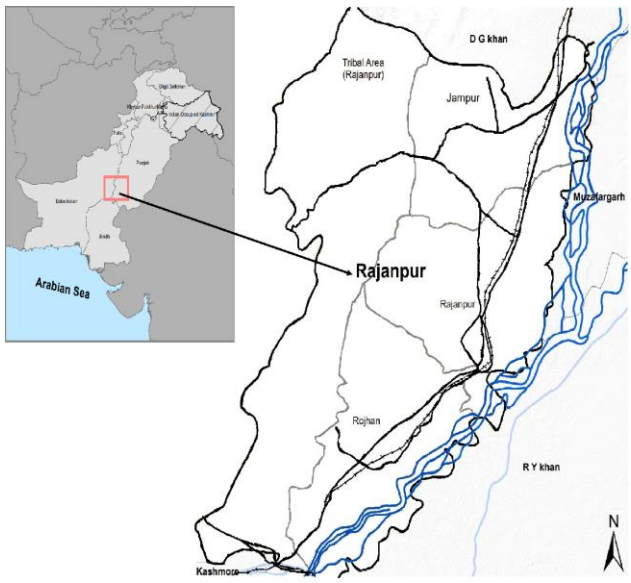

Fig. 1. Map of the study area showing boundary of district Rajanpur.

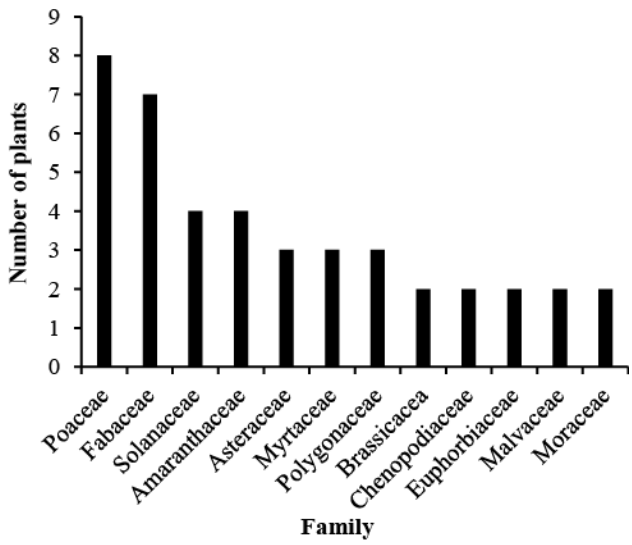

Fig. 2. Number of plants in each family.

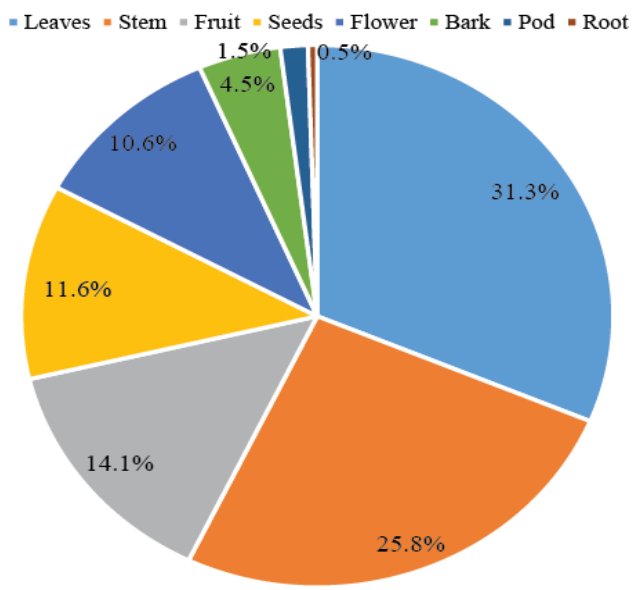

Fig. 3. Percentage of plant parts used in herbal preparations.

Table 1. Demographic characteristics of the interviewed participants.

Administrative areas	Male age (37-55)	Male age (>60)	Female age (37-55)	Female age (>60)	Herbalists (Hakeems)
Rajanpur	10	10	10	10	10
Jam Pur	10	10	10	8	8
Rhojhan	10	10	10	7	7
Total	**30**	**30**	**30**	**25**	**25**

Results and Discussion

Quantitative ethnobotanical methods have been used to document the indigenous knowledge (Peironi *et al*., 2010). Used value Index and by adopting minor modifications in the same methods resulted statistically to test various ethnobotanical hypotheses (Rossato & Begossi, 1999; Byg & Balslev, 2001; Kristensen & Balslev, 2003; Khajoei & Khosravi, 2014; Sadeghi & Mahmood, 2014; Bulut *et al*., 2018; Ahmad *et al*., 2018). A total 64 of indigenous medicinal plant species belonging to 34 families were being used to treat 08 major diseases categories in the folk medicinal system of district Rajanpur, Punjab province, Pakistan (Table 3). It was observed that local healers (Hakeems) and older people preserved the treasure of ethnomedicinal knowledge of plants which should be conserved and disseminated to the next generation. Local residents of the area are using this knowledge in the herbal medicines quite frequently. Poaceae (08 species) is the predominant family followed by Fabaceae (07), Solanaceae, Amaranthaceae (04), Asteraceae, Myrtaceae and Polygonaceae (03), Brassicaceae, Chenopodiaceae, Euphorbiaceae, Malvaceae and Moraceae (02). The rest of the families have only one species (Fig. 2).

Table 2 shows the used value of medicinal plants of economic importance along with their therapeutic uses. *Acacia nilotica* showed the highest used value (0.88) followed by *Trifolium alexandrium* (0.80), *Coriandrum sativum*, *Dicanthium annulatum* and *Ziziphus jujuba* (0.69) and *Mentha spicata* and *Solanum melongena* (0.68). *Polypogon monspeliansis* showed the least used value (0.28) followed by *Suaeda fruiticosa*, *Asphodelus tenuifolius* (0.27), *Melilotus indicus*, *Conyza bonariansis* and *Morus alba* (0.25), *Salvadora oleoides* and *Calligonum polygonoides* (0.22) and *Fagonia indica* and *Neurada procumbens* with UV (0.18) respectively (Ahmed *et al*., 2015; Ahmad *et al*., 2018).

Major indigenous medicinal plants in the study area were wild herbs (63.07%), cultivated shrubs (9.23%), cultivated trees (13.85%), Wild trees (7.69%) and Wild shrubs (3.07%) respectively. Major plant parts such as Leaves, stem, roots, seeds, pods, gum, flowers, fruit, and bulb were used for cure of various ailments. Leaves were abundantly used (31.3%), followed by stem (25.8%), fruit (14.1%), seeds (11.6%), flowers (10.6%), roots (4.5%), bark (1.55%), and pod (0.48%; Fig. 3).

Out of the 65 medicinal plants species, 11 were used for skin diseases and diabetes, 10 for the treatment of Rheumatism and to regular bowel movement, 09 for piles, infection and anticonvulsant and for expectorant(08), dysentery, sexual power and jaundice (07), scabies, antidote, enhance maleness, fever, diuretic, flu, cooling effect, and gastric problem (06) respectively (Fig. 4).

A total of 883 are used reports that have been documented in the present study and are categorized into eight different ailments groups. These include Digestive system problems (23 %), respiratory system problems (15%), sex-related disorders (8%), used as tonic (7%), liver and kidney associated problems (13%), problems related to skin(10%), eye, ear and teeth related disorders (1%) and others problems (22%) use the citations respectively. Various scientists in different regions of the world have categorized digestive system problems ranking as an important use category (Miraldi *et al*., 2001; Ghorbani, 2005; Ghorbani *et al*., 2011; Mosaddegh *et al*., 2012; Ullah *et al*., 2013; Bulut *et al*., 2018). All plants had multiple therapeutic properties (Table 3).

Out of 64 medicinal plants, 51 had been used in digestive system problem category with informant census factor (0.76), 46 plants were used in others category (0.77), followed by 31 plants in liver and kidney associated problems (0.73), 28 plants in respiratory system problems (0.80), 24 plants in problems related to skin (0.73), 18 plants in the problems related to sex disorders (0.77), 16 plants in tonic (0.75) and 04 plants in eye, ear and teeth problems category with 0.73 informant census factor (Sadeghi & Mahmood, 2014; Ahmad *et al*., 2018; Bulut *et al*., 2018; Table 4).

There were several plants which had gained special focus as edible plants. *Capparis decidua*, *Cordia myxa* were harvested and used in their growing season, and the one major use was making up of pickles as favorite food article and were also used to cure eczema, chronic renal problems and as cardio tonic, carminative and to enhance maleness and sexual power. *Brassica campestris*, *Solanum melongena*, *Mentha spicata*, *Trifolium foenum-graecum*, *Cyamopsis tetragonoloba*, *Coriandrum sativum* and *Zingiber officinali*s were used as vegetables and to treat jaundice, antidote, anticonvulsant, intestinal problems, piles, rheumatism, cancer, epilepsy and dyspepsia (Table 2). *Mangifera indica*, *Syzgium cumini*, *Phoenix dactylifera*, *Salvadora oleoides* and *Ficus reliogiosa* were used as populace fruits and in practice to treat cancer, ailment of bile ducts, teeth problems, eczema, scabies and gynecological problems and sexual illness. *Avena sativa*, *Pennisetum glaucum* and *Melilotus indicus* were used as forage. *Phoenix dactylifera* leaves were used for making carpets (Chataii) and as cooling material in room coolers. The wood of *Delbergia sissoo* and *Acacia nilotica* was used in making handicrafts and furniture and exported all over the world. *Rosa indica* flowers were used in making sweetener (Gulkand) which was popular in marriages and happy ceremonies.

Table 2. Medicinal plants used as folk medicines by indigenous people of district Rajanpur, Punjab province, Pakistan.

No.	Family	Plant species/ Accession number	Habit	Local name	Part(s) preparations	Therapeutic uses	Application	Used value	FC value
1.	Amaranthaceae	*Aerva javanica* L. (127675)	Wild Herb Annual	Bhoe	Flower, Fruit, Stem, Leaves, Decoction, Juice, Paste	Diabetes Blood purifier Diuretic Ring worm Scabies Skin diseases	Oral Oral Oral Topical Topical Topical	0.30	10
		Amaranthus albus L. (127676)	Wild Herb Annual	Soorni	Flower , Stem Leaves, Seeds, Decoction, Juice, Infusion, Poultice	Anthelmintic Chronic Renal problems Carminative Asthma Sedatives Snake bite Cough	Oral Oral Oral Topical Oral Topical Oral	0.41	5
		Salsola baryosma L. (127677)	Wild Herb Annual	Khaaree	Stem, Leaves, Decoction, Infusion, Juice	Diabetes Heat burn Scabies Premature ejaculation Hepatitis Fever Flu	Oral Oral Topical Oral Oral Oral Oral	0.42	6
		Suaeda fruiticosa L. Forssk. (127678)	Wild Herb Annual	Khaari	Stem,Leaves, Decoction, Juice	Skin diseases Snake bite Rheumatism	Topical Topical Topical	0.27	6
2.	Anacardiaceae	*Mangifera indica* L. (127679)	Cultivated Tree Annual	Aam	Fruit, Leaves, Seeds, Decoction, Juice, Infusion, Poultice, Vegetable, Paste, Ash, Powder	Cardio tonic Carminative Diuretic Dysentery Dyspepsia Premature ejaculation	Oral Oral Oral Oral Oral Oral	0.44	8
3.	Apiaceae	*Coriandrum sativum* L. (127680)	Cultivated Herb Annual	Dhaniya	Flower, Fruit, Stem, Leaves, Seeds, Decoction, Vegetable	Cooling effect Carminative Hypertension Remove bladder and pancreas stones Respiratory tract infection Throat infection	Oral Oral Oral Oral Oral Oral	0.69	9
4.	Araceae	*Colocasia esculenta* L. (127681)	Cultivated Herb Annual	Arvi	Stem, Leaves, Vegetable	Blood purifier Cardio tonic Hypertension Intestinal problems Purgative Rheumatism	Oral Oral Oral Oral Oral Topical	0.33	3

Table 2. (Cont'd.).

No.	Family	Plant species/ Accession number	Habit	Local name	Part(s) preparations	Therapeutic uses	Application	Used value	FC value
5.	Arecaceae	*Phoenix dactylifera* L. (127682)	Wild Tree Annual	Khajji	Fruit, Leaves, Seeds, Decoction, Juice, Infusion, Paste	Cardio tonic Carminative Enhance maleness Sexual power Sexual illness	Oral Oral Oral Oral Oral	0.33	3
6.	Asclepiadaceae	*Calotropis procera* Aiton (127683)	Wild Shrub Annual	Aak	Flower, Fruit, Leaves, Stem, Decoction, Powder, Paste	Chronic renal problems Earache Emetic Enhance eye sight Kidney stones Purgative	Oral Topical Topical Oral Oral Oral	0.48	13
7.	Asteraceae	*Conyza bonariensis* L. Cronquist (127684)	Wild Herb Annual	Beili	Stem, Leaves, Seeds, Decoction, Juice, Infusion, Powder, Poultice, Mix with oil, Vegetable	Antibacterial Heat burn Kidney problems Kidney stones Regular bowl Rheumatism	Oral Topical Oral Oral Oral Topical	0.25	3
		Sonchus asper L. Hill (127685)	Wild Herb Annual	Chichorni	Stem, Leaves, Decoction, Juice, Infusion, Poultice	Cancer Cardio tonic Emetic Emollient Insect biting	Oral Oral Oral Topical	0.52	9
		Tagetes erecta L. (127686)	Wild Herb Annual	Gainda	Flower, Fruit, Leaves, Decoction, Juice, Infusion, Powder	Liver infection Remove bladder and pancreas stones Respiratory tract infection Blood purifier Asthma Antidote	Oral Oral Oral Oral Oral Topical Oral	0.46	7
8.	Boraginaceae	*Cordia myxa* L. (127687)	Wild Tree Annual	Lasoora	Fruit, Leaves, Seeds, Bark, Decoction, Juice, Infusion, Powder, Vegetable	Chronic renal problems Dysentery Enhance maleness Premature ejaculation Respiratory tract infection Sexual power	Oral Oral Oral Oral Oral Oral	0.42	6

Table 2. (Cont'd.).

No.	Family	Plant species/ Accession number	Habit	Local name	Part(s) preparations	Therapeutic uses	Application	Used value	FC value
9.	Brassicaceae	*Brassica campestris* L. (127688)	CultivatedHerb Annual	Sarson	Flower, Fruit, Leaves, Seeds, Stem, Decoction, Juice, Infusion, Poultice, Vegetable , Paste, Mix with Oil	Blood purifier Cold Enhance maleness Intestinal problems Jaundice Sexual power Anticonvulsant Antidote Diabetes Healing of wounds	Oral Oral Oral Oral Oral Oral Topical Topical Oral Oral Topical	0.44	8
		Coronopus didymus L. Sm. (127689)	Cultivated Herb Annual	Haryani	Flower, Leaves, Stem, Decoction, Juice, Vegetable	Hepatitis Narcotics and sedative	Oral Oral	0.44	8
10.	Capparidaceae	*Capparis decidua* Forssk. Edgew (127690)	Wild Herb Annual	Karir	Flower, Fruit, Seeds, Decoction, Juice, Infusion, Powder, Vegetable	Cardio tonic Carminative Eczema Expectorant Enhance maleness Heat burn	Oral Oral Topical Oral Oral Oral	0.58	7
11.	Chenopodiaceae	*Chenopodium album* L. (127691)	Wild Herb Annual	Batwan	Flower, Fruit, Leaves, Seeds, Stem, Decoction, Juice, Vegetable	Blood purifier Cold Diabetes Hepatitis Insect biting Sedatives Abortion Anthelmintic	Oral Oral Oral Oral Topical Oral Oral Oral	0.50	8
		Chenopodium morale L. (127692)	Wild Herb Annual	Bathuwa	Flower, Fruit, Leaves, Seeds, Stem, Decoction, Juice, Vegetable	Diabetes Emetic Fever Flu	Oral Oral Oral Oral	0.33	3
12.	Convolvulaceae	*Convolvulus arvensis* L (127693)	Wild Herb Annual	Wanveri	Flower, Fruit, Leaves, Seeds, Stem, Decoction, Juice, Infusion, Powder	Carminative Cooling effect Dyspepsia Dysurea Epilepsy Expectorant	Oral Oral Oral Oral Oral Oral	0.33	3
13.	Cucurbitaceae	*Citrullus colocynthis* L. Schard (127694)	Wild Herb Annual	Kore Tumma	Seeds, Leaves, Decoction, Juice, Infusion, Powder	Anticonvulsant Eczema Gonorrhea Jaundice Skin diseases Vermifuge	Oral Topical Oral Oral Topical Oral	0.47	9

Table 2. (Cont'd.).

No.	Family	Plant species/ Accession number	Habit	Local name	Part(s) preparations	Therapeutic uses	Application	Used value	FC value
14.	Euphorbiaceae	*Euphorbia heliscopia* L. (127695)	Wild Herb Annual	Dhodak	Fruit, Flower, Leaves, Stem, Decoction, Juice, Infusion, Vegetable, Paste, Poultice	Nerve tonic Regular bowl Skin diseases Laxative Anticonvulsant Constipation	Oral Oral Topical Oral Topical Oral	0.33	3
		Euphorbia palustris L. (127696)	Wild Herb Annual	Dhodak	Fruit, Flower, Leaves, Stem, Decoction, Juice, Infusion, Vegetable, Paste, Poultice	Nerve tonic Regular bowl Skin diseases Expectorant Fever Flu	Oral Oral Topical Oral Oral Oral	0.43	6
15.	Fabaceae	*Acacia arabica* (Lam.) Willd. (127697)	Wild Tree Annual	Kikri	Fruit, Leaves, Stem, Bark, Decoction, Juice, Infusion, Powder, Paste, Bark, Poultice, Mix with Oil	Antibacterial Anticonvulsant Blood purifier Laxative Toothache Skin diseases	Oral Topical Oral Oral Topical Topical	0.88	7
		Alhaji maurarum Medik. (127698)	Wild Herb Annual	Puthkanda	Flower, Fruit, Leaves, Stem, Seeds, Decoction, Juice, Infusion, Powder,Vegetable, Paste, Poultice, Mix with Oil, Tea	Abortifacient Abortion Asthma Cough Insect biting Piles	Oral Oral Topical Oral Topical	0.50	6
		Cyamopsis tetragonoloba (L.) Taub. (127699)	Wild Herb Annual	Guar	Leaves, Stem, Seeds, Pod, Decoction, Juice,Infusion, Vegetable	Diuretic Dysentery Emetic Laxative Piles Rheumatism	Oral Oral Oral Oral Oral	0.61	8
		Dalbergia sissoo DC. (127700)	Wild Tree Annual	Tahli	Fruit, Leaves, Stem, Pod, Seeds, Juice, Infusion,Powder, Vegetable,	Diuretic Eczema Laxative Pneumonia Regular bowl Scabies	Oral Oral Topical Oral Topical Oral	0.37	3
		*Melilotus indicus (*L.) All. (127701)	Wild Herb Annual	Safed Senjin	Fruit, Leaves, Stem, Flower, Decoction, Juice, Infusion, Powder,Vegetable	Dyspepsia Dysurea Heat burn Hypertension Skin diseases Snake bite	Oral Oral Oral Oral Topical Topical	0.25	3

Table 2. (Cont'd.).

No.	Family	Plant species/ Accession number	Habit	Local name	Part(s) preparations	Therapeutic uses	Application	Used value	FC value
		Trifolium alexandrium L. (127701)	Wild Herb Annual	Berseem	Stem, Leaves, Decoction, Juice, Vegetable, Paste	Dyspepsia Dysurea Respiratory tract infection Rheumatism Ring worm	Oral Oral Oral Oral Topical Topical	0.80	8
		Trigonella foenum- graecum L. (127702)	Cultivated Herb Annual	Methi	Stem, Leaves, Decoction, Juice, Infusion, Powder, Vegetable	Abortion Blood purifier Cancer Constipation Nematocides Piles	Oral Oral Oral Oral Oral Oral	0.50	8
16.	Lamiaceae	*Mentha spicata* L. (127703)	Wild Herb Annual	Poodna	Leaves, Stem, Decoction, Juice ,Infusion, Powder	Dysentery Dyspepsia Eczema Constipation Epilepsy Expectorant	Oral Oral Topical Oral Oral Oral	0.66	4
17.	Malvaceae	*Hibiscus rosa- sinensis* L. (127704)	Cultivated Annual	China rose	Flower, Leaves, Decoction, Infusion, Paste, Poultice, Tea	Cancer Cardio tonic Gas troubles Gastric problems Gonorrhea Rheumatism Syphilis	Oral Oral Oral Oral Oral Topical Oral	0.46	13
		Hibiscus mutabilis L.(127705)	Cultivated Tree	Cheene phol	Flower, Leaves, Decoction, Infusion, Paste, Poultice, Tea	Cardio tonic Gas troubles Gastric problems Gonorrhea Rheumatism Abortifacient	Topical Topical Oral Oral Oral Oral	0.50	2
18.	Molluginaceae	*Mollugo cerviana* L. (127706)	Wild Herb Annual	Dhandal	Leaves, Stem, Decoction, Juice, Vegetable	Narcotics and sedative Regular bowl Remove pancreas and bladder stone Sexual illness Sexual power	Oral Oral Oral Oral Oral	0.33	2
19.	Moraceae	*Ficus religiosa* L. (127707)	Wild Tree Annual	Bohar	Fruit, Stem, Bark, Decoction, Juice, Infusion, Powder	Eczema Scabies Sexual power Sexual problems Gynecological problems Spermatoria	Topical Topical Oral Oral Oral Oral	0.44	4

Table 2. (Cont'd.).

No.	Family	Plant species/ Accession number	Habit	Local name	Part(s) preparations	Therapeutic uses	Application	Used value	FC value
		Morus alba L. (127708)	Wild Tree Annual	Toot	Fruit, Leaves, Seeds, Bark, Decoction, Juice, Infusion	Cancer Cardio tonic Dysurea Epistasis Expectorant Liver infection	Oral Oral Oral Oral Oral Oral	0.25	2
20.	Myrsinaceae	*Anagalis arvensis* L. (127709)	Wild Herb Annual	Choozi booti	Fruit, Leaves, Seeds, Flower, Juice, Infusion, Powder	Anticonvulsant Cancer Expectorant Fever Flu Purgative	Topical Oral Oral Oral Oral Oral	0.42	6
21.	Myrtaceae	*Eucalyptus obliqua* L. (127710)	Cultivated Tree Annual	Safeeda	Fruit, Leaves, Flower, Bark, Juice, Infusion, Paste, Brush	Antibacterial Diabetes Cooling effect Eczema Skin diseases	Topical Oral Oral Topical Topical	0.40	4
		Psidium guajava L. (127711)	Cultivated Tree Annual	Amrud	Fruit, Leaves, Seeds, Decoction, Infusion, Paste	Antiseptics Gas troubles Gastric problems Nematocides Nerve tonic	Topical Oral Oral Oral	0.36	8
		Syzgium cumini L. (127712)	Wild Tree Annual	Jamman	Fruit, Leaves, Seeds, Bark, Decoction, Juice,Infusion, Powder, Paste	Regular bowl Blood purifier Cardio tonic Diabetes Healing of wounds Kidney problems Liver infection	Oral Oral Oral Oral Oral Oral Oral Oral	0.54	6
22.	Neuradaceae	*Neurada procumbens* (127713)	Wild Herb Annual	Chaatni	Stem, Leaves, Seeds, Decoction, Powder	Insect biting Jaundice Liver infection Piles Purgative Sedative	Topical Oral Oral Oral Oral Oral	0.18	2
23.	Oxalidaceae	*Oxalis corniculata* L. (127714)	Wild Herb Annual	Khatti Booti	Stem, Leaves, Decoction, Juice, Powder, Poultice, Mix with Oil	Gas troubles Gastric problems Gonorrhea Kidney problems Kidney stones	Oral Oral Oral Oral Oral	0.38	7

Table 2. (Cont'd.).

No.	Family	Plant species/ Accession number	Habit	Local name	Part(s) preparations	Therapeutic uses	Application	Used value	FC value
24.	Poaceae	*Avena sativa* L. (127715)	Wild Herb Annual	Jangli Gha	Stem, Leaves, Decoction, Juice, Infusion, Paste	Anticonvulsant Cardio tonic Carminative Gas troubles Gastric problems Piles	Topical Oral Oral Oral Oral Oral	0.53	8
		Cynodon dactlylon L.(127716)	Wild Herb Annual	Ghaa	Stem, Leaves, Decoction, Juice, Infusion, Paste	Piles Gastric problems Asthma	Topical Oral Topical	0.30	4
		Desmostachya bippinata(L.) Stapf. (127717)	Wild Herb Annual	Cheetah gha	Fruit, Stem, Leaves, Seeds, Juice, Infusion, Powder	Asthma Antidote Hypertension Jaundice	Topical Oral Oral Oral	0.30	10
		Dicanthium annulatum (Forssk).Stapf. (127718)	Wild Herb Annual	Khew	Leaves, Stem, Juice, Infusion, Powder	Dyspepsia Dysurea Jaundice Regular bowl sedatives	Oral Oral Oral Oral Oral	0.69	9
		Lasiurus scindicus Henrard. (127719)	Wild Herb Annual	Khurdi	Leaves, Stem, Juice, Infusion	Piles Sexual illness Sexual power Enhance maleness	Oral Oral Oral Oral	0.50	7
		Pennisetum glaucum L. (127720)	Wild Herb Annual	Bajra	Flower, Leaves, Stem, Decoction, Juice, Infusion	Diuretic Dysentery Dyspepsia Emetic Emollient Regular bowl	Oral Oral Oral Oral Oral Oral	0.33	3
		Phalaris minor Retz. (127721)	Wild Herb Annual	Dumbi sitti	Leaves, Stem, Infusion, Paste	Cold Cough Diabetes Diarrhoea Premature ejaculation Sedative	Oral Oral Oral Oral Oral Oral	0.33	6
		Polypogon monspeliensis (L.) Desf. (127722)	Wild Herb Annual	Khuth ponchal	Leaves, Stem, Decoction, Juice	Eczema Emollient Healing of wounds Rheumatism Ring worm	Topical Oral Topical Topical Topical	0.28	2

Table 2. (Cont'd.).

No.	Family	Plant species/ Accession number	Habit	Local name	Part(s) preparations	Therapeutic uses	Application	Used value	FC value
25.	Polygonaceae	*Calligonum polygonoides* (127723)	Wild Herb Annual	Phoken	Flower, Fruit, Leaves, Stem, Decoction, Juice, Infusion	Nerve tonic Rheumatism Ring worm Scabies Skin diseases Snake bite Ring worm Anticonvulsant	Topical Topical Topical Topical Topical Topical Topical Topical	0.22	2
		Rumex dentatus L. (127725)	Wild HerbAnnual	Khar palake	Leaves, Stem, Decoction, Juice, Tea	Antidote Emetic Emollient Epistasis	Oral Oral Oral Topical	0.50	8
26.	Ranunculaceae	*Ranunculus mauricatus* L. (127726)	Wild Herb Annual	Chamblen	Fruit, Leaves, Stem, Decoction, Juice, Infusion	Cooling effect Diabetes Diarrhea Gonorrhea Heat burn	Oral Oral Oral Oral Oral	0.37	3
27.	Rhamnaceae	*Zizypus spina* L. Desf. (127727)	Wild Tree, Annual	Bairee	Leaves, Stem, Fruit, Bark, Decoction, Juice, Infusion, Paste, Bark	Cancer Carminative Cardio tonic Jaundice Nerve tonic Rheumatism	Oral Oral Oral Oral Oral Topical	0.69	16
28.	Rosaceae	*Rosa indica* L. (127728)	Wild Cultivated Shrub Annual	Ghulab	Leaves, Flower, Decoction, Juice, Infusion, Poultice, Tea	Emollient Hypertension Hepatitis Laxative Regular bowl Skin diseases Eye diseases	Oral Oral Oral Oral Oral Topical Topical	0.33	3
29.	Salicaceae	*Populus tremula* L. (127729)	Wild Tree Annual	Peepalee	Leaves, Bark, Decoction, Juice, Infusion	Chronic renal problems Cooling effect Cough Heat burn Hypertension	Oral Oral Oral Oral Oral Oral	0.46	7
30.	Salvadoraceae	*Salvadora oleoides* Decne. (127730)	Wild Tree Annual	Peeluni	Fruit, Leaves, Stem, Root, Decoction, Juice, Paste, Brush	Cancer Cardio tonic Constipation Strengthen hair Ailments of Bile ducts Teeth Problems	Oral Oral Oral Oral Oral Topical	0.22	2

Table 2. (Cont'd.).

No.	Family	Plant species/ Accession number	Habit	Local name	Part(s) preparations	Therapeutic uses	Application	Used value	FC value
31.	Solanaceae	*Solanum melongena* L. (127731)	Wild Herb Annul	Bataon	Leaves, Stem, Juice, Infusion	Anticonvulsant Antidote Chronic renal problems Regular bowl Sedative Piles Carminative	Topical Oral Oral Oral Oral Oral Oral	0.66	16
		Solanum nigrum L. (127732)	Cultivated Herb Annual	Makku	Leaves, Stem, Decoction, Juice, Infusion	Constipation Diabetes Dysentery Dyspepsia Expectorant	Oral Oral Oral Oral Oral	0.33	3
		Solanum surratense L. (127733)	Wild Herb Annual	Kandri	Leaves, Stem, Poultice, Mix with Oil	Eczema Ring worm Scabies Skin diseases Snake bite Asthma Piles	Topical Topical Topical Topical Topical Topical Topical	0.30	4
		Withania somnifera L. Dund. (127734)	Wild Herb Annual	Aksen	Flower, Fruit, Stem, Leaves, Seeds, Decoction, Juice, Infusion, Tea, Mix with Oil	Diabetes Diarrhea Fever Flu Narcotics and sedative	Oral Oral Oral Oral Oral	0.50	7
32.	Xanthorhoeaceae	*Asphodelus tenuifolius* Cav. (127736)	Wild Herb Annual	Piyazinee	Stem, Leaves, Seeds, Decoction, Juice, Infusion, Vegetable, Tea	Cold Constipation Diuretic Dysentery Hepatitis Narcotic and sedative Sexual problems	Oral Oral Oral Oral Oral Oral Oral	0.27	3
33.	Zingerberaceae	*Zingiber officinalis* L. (127737)	Cult Herb Annual	Adhrek	Stem, Leaves, Decoction, Juice, Infusion, Vegetable, Paste, Poultice	Enhance maleness Expectorant Fever Flu Sexual illness Sexual power	Oral Oral Oral Oral Oral Oral Oral	0.69	16
34.	Zygophyllaceae	*Fagonia indica* L. (127738)	Wild Herb Annual	Dhaman/zaman	Leaves, Stem, Decoction, Juice, Infusion, Powder,	Cooling effect Hypertension Insect biting Jaundice Purgative Cancer	Oral Oral Oral Oral Oral Oral	0.18	3

Table 3. Number of use categories (Ur) and percentage of use categories.

Categories	Number of UR	Percentage
Digestive system problems (DSP)	206	23%
Respiratory system problems (RSP)	136	15%
Sex related disorders (SRD)	75	8%
Tonic (TON)	60	7%
Liver kidneys problems (LKP)	111	13%
Problems related to skin (PRS)	85	10%
Ear, eye, teeth problems (EET)	12	1%
Others problems(OTH)	198	22%
Total	**883**	**100%**

Table 4. Disease based categories and ICF.

Categories	Use citations	Plant use	ICF
Digestive system problems (DSP)	206	51	0.76
Respiratory system problems (RSP)	136	28	0.80
Sex related disorders (SRD)	75	18	0.77
Tonic (TON)	60	16	0.75
Liver kidneys problems (LKP)	111	31	0.73
Problems related to skin (PRS)	85	24	0.73
Ear, eye, teeth problems (EET)	12	4	0.73
Others problems(OTH)	198	46	0.77

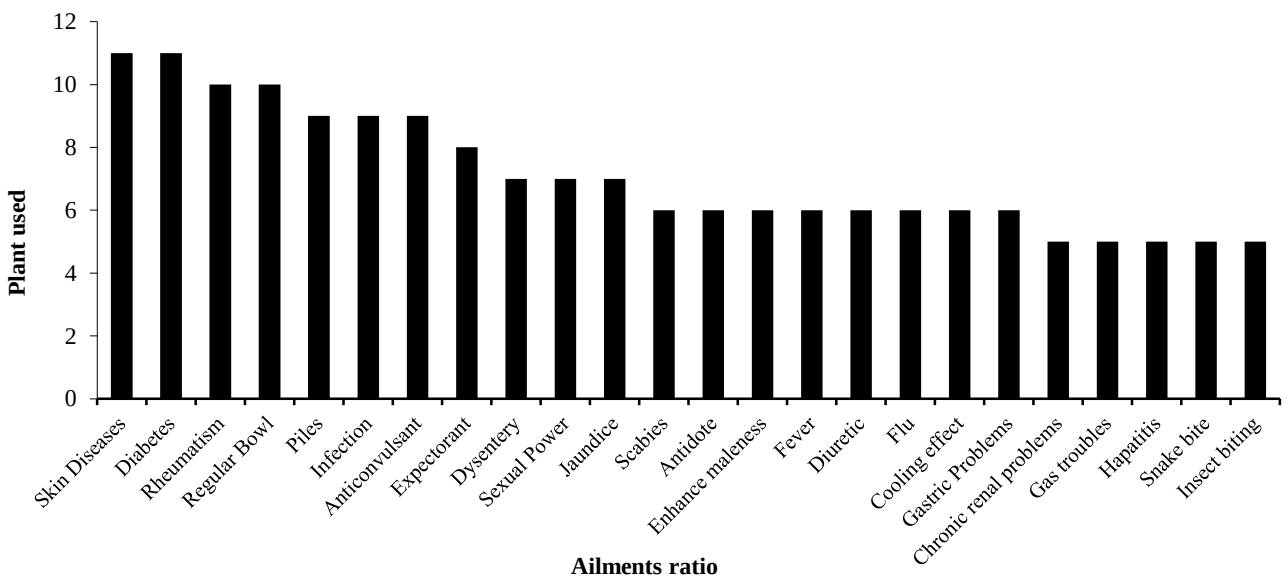

Fig. 4. Number of plants used per disease.

The Respiratory system problems including throat infection, cough, cold, flu, expectorant, epilepsy, anticonvulsant, pneumonia, nasal Polyps, respiratory tract infection and asthma were treated with the indigenous medicinal plants by local inhabitants. The category named others (OTH) include antibacterial, antidote, blood purifier, cooling effect, diabetes, epistasis, healing of wounds, heat burn, hypertension, narcotics and sedatives, rheumatism, spasmodic, antiseptics, glandular tumors was the second major category treated by medicinal plants of the study area. Harsh climatic conditions, inefficient soil moisture and poorly livelihood were also affected the disease incidence. Furthermore, poor nutrition and poverty, vulnerable conditions for women were the major causes of the diseases outbreaks.

The use of single plant herbal formulation was frequent, although few herbal preparations containing of mixture different parts of the plants were also in practice. Herbal doses were taken in the form of decoction, infusion, juice and powder. Decoction was used as plant parts boiled for some specific time in water and infusion was used by soaking different aerial plant parts in water for 3 or more hours at room temperature. Plant materials is dried under shade and ground into powder and paste is made by mixing water and oil. Herbal remedies being bitterness and pungent mixed with oil, honey, sugar, rose water and butter. The Liquid herbal dosage was most common and the concentrations vary with age and sex of individuals of the community. All herbal remedies used by indigenous people were based on estimation from local healers and there were no scientific rules regarding the use of herbal formulation (Ahmed *et al*., 2014b, 2015).

Conclusion

Ethnomedicinal uses of 64 plant species belonging 40 families from district Rajanpur were identified by different ethnobotanical indices. The results suggested that medicinal plants were an integral part of the life of district Rajanpur. Certain plants *Brassica campestris*, *Zizyphus jujuba*, *Solanum melongena*, *Habiscus rosa-sinensis* and *Brassica campestris* showed high used values which should be screened to investigate active phytoconstituents. It was noted that women were the most vulnerable part of the study area and completely depended on native flora for their most complex gynecological ailments.

Acknowledgements

The authors are grateful to ALHASAN System (PVT) Ltd. for providing the map of the study area. The authors express special thanks Mr. Nadeem Ahmad at WATER AID Pakistan for extraordinary support in statistical analysis of collected data.

References

Ahmad, M, M. Zafar, N. Shahzadi, G. Yaseen, T.M. Murphey and S. Sultana. 2018. Ethnobotanical importance of medicinal plants traded in herbal markets of Rawalpindi-Pakistan. *J. Herb. Med*., 11: 78-89.

Ahmed, N., A. Mahmmod, A. Mahmmod, S.S. Tahir, A. Bano, R.N. Malik, S. Hassan and M. Ishtiaq. 2014a. Relative importance of indigenous medicinal plants from Layyah district, Punjab Province, Pakistan. *J. Ethnopharmacol*., 155: 509-523.

Ahmed, N., A. Mahmmod, S.S. Tahir, A. Bano, R.N. Malik, S. Hassan and A. Ashraf. 2014b. Ethnomedicinal knowledge and relative importance of indigenous medicinal plants of Cholistan desert, Punjab Province, Pakistan. *J. Ethnopharmacol*., 155: 1263-1275.

Ahmed, N.A., A. Mahmood, Z. Sadeghi and M. Farman. 2015. Ethnopharmacological importance of medicinal flora from the district of Vehari, Punjab province, Pakistan. *J. Ethnopharmacol*., 168: 68-77.

Ali, S.I and Y.J. Nasir. (Eds.) 1989-1991. *Flora of Pakistan*. Nos. 191-193. Department of Botany. University of Karachi and National Herbarium, PARC, Islamabad Pakistan.

Ali, S.I. and M. Qaiser (Eds.) 1993-2011. *Flora of Pakistan*. Nos. 194-218. Department of Botany, University of Karachi, Pakistan.

Balick, M.J. and A. Cox. 1997. Ethnobotanical research and traditional health care in developing countries Non-Wood Forest Products (FAO),

Barkatullah, M. Khan, H. Ahmad, M.S. Khan and A. Razzaq. 2018. Ethnobotanial indices based ethnoverterinary plant profie of Jabban Hills, Malakand, Hindukhush range, Pakistan. *Pak. J. Bot*., 50(5): 1899-1905.

Bulut, M.M., Z. Haznedaruglu, A. Dogan, H. Koyo and E. Tuzlaci. 2018. An ethnobotanical study of medicinal plants in Acipayam (Denizli-Turkey). *J. Herb. Med*., 10: 64-81.

Byg, A. and H. Balslev. 2001. Diversity and use of palms in Zahamena, Eastern Madagascar. *Biodiver. & Conser*., 10: 951-970.

Cakilcioglu, U., S. Khatun and I. Turkoglu. 2011. Ethnopharmacological survey of medicinal plants in Maden (Elazig-Turkey). *J. Ethnopharmacol*., 137: 469-486.

Ghorbani, A. 2005. Studies on Pharmaceutical ethnobotany in the region of Turkmen Sahra, North of Iran (Part I): general results. *J. Ethnopharmacol*., 102: 58-68.

Ghorbani, A.G., L. Angenberger, I. Feng and J. Sauerborn. 2011. Ethnobotanical study of medicinal plants utilized by Hani ethnicity in Naban river Watershed National Nature Reserve, Yunnan, China. *J. Ethnopharmacol*., 134: 651-667.

Heinrich, M., J. Kufer, M. Leonti and M. Pardo de Santayana. 2006. Ethnobotany and Ethnopharmacology. *Interdiscip. Links Hist. Sci*., 107: 157-160.

Hoareau, L. and E.J. Dasilva. 1999. Medicinal plants: a re-emerging health aid. *Electronic. J. Biotech*., 2: 56-70.

Khajoei, N.F. and A.R. Khosravi. 2014. Ethnobotanical study of medicinal plants of Sirjan in Kerman Province, Iran. *J. Ethnopharmacol*., 154: 190-197.

Kristensen, M. and H. Balslev. 2003. Perceptions, use and availability of woody plants among the Gourounsi in Burkina Faso. *Biodiver & Conser*., 12: 1715-1739.

Mahmood, A, R.A. Qureshi, A. Mahmood, Y. Sangi, H. Shaheen, I. Ahmad and Z. Nawaz. 2011c. Ethnobotanical survey of common medicinal plants used by people of district Mirpur, A.J.K, Pakistan. *J. Med. Plant Res*., 5: 4493-4498.

Mahmood, A., A. Mahmood and A. Tabassum. 2011a. Ethnomedicinal survey of plants from District Sialkot, Pakistan. *J. App. Pharm*. 2. 212-220.

Mahmood, A., A. Mahmood, H. Shaheen, R.A. Qureshi. Y. Sangi and S.A. Gilani. 2011b. Ethnomedicinal survey of plants from district Bhimber Azad Jammu and Kashmir, Pakistan. *J. Med. Plant Res*., 5: 2348-2360.

Miraldi, E., S. Ferri and V. Mostaghimi. 2001. Botanical drugs and preparations in the traditional medicine of West Azerbaijan (Iran). *J. Ethnopharmacol*., 75: 77-87.

Mosaddegh, M., F. Naghibi, H. Moazzini, A. Pirani and S. Esmaeili. 2012. Ethnobotanical survey of herbal remedies traditionally used in Kohghiluyeh va Boyer Ahmad province of Iran. *J. Ethnopharmacol*., 141: 80-95.

Nasir, E. and S.I. Ali. 1970-1988. *Flora of Pakistan*, Panagraphics, Limited, Islamabad.

Peironi, A., S. Nebel, R.F. Santoro and M. Heinrich. 2010. Medicinal plants and food medicines in the folk tradition of the upper Lucca Province, Italy. *J. Ethnopharmacol*., 70: 235-273.

Phillips, O. and A.H. Gentry. 1993. The useful plants of Tambopata Peru: I. Statistical hypotheses tests with a new quantitative technique. *Eco. Bot.*, 47: 15-32.

Qureshi, R.A., M.A. Ghufran., S.A. Gilani, Z. Yousaf and A. Batool. 2009. Indigenous medicinal plants used by local women in southern Himalayan regions of Pakistan. *Pak. J. Bot*., 41: 19-25.

Rossato, S.C. and A. Begossi. 1999. Ethnobotany of Caiçaras of the Atlantic Forest Coast (Brazil). *Eco. Bot*., 53: 387-395.

Sadeghi, Z. and A. Mahmood. 2014. Ethno-gynecological knowledge of medicinal plants used by Baluch tribes, southeast of Baluchistan, Iran. *Rev. Brasil. De Farmacog.*, 24: 706-715.

Shinwari, M.I. and M. Shinwari. 2006. Ethnobotany of Medicinal and aromatic Plants in Pakistan-An Overview. 4th International Congress of Ethnobotany, At Istubul-Turkey, Volume I

Ullah, M., M.U. Khan, A. Mahmood, R.N. Malik, M. Hussain, S.M. Wazir, M. Daud and Z.K. Shinwari. 2013. An ethnobotanical survey of indigenous medicinal plants in Wana district South Waziristan agency, Pakistan. *J. Ethnopharmacol*., 150: 918-924.

Zaidi, S.H. 2001. Existing Indigenous Medicinal Plants Resources of Pakistan and their Prospective for utilization. In: *Medicinal Plants of Pakistan.* (Eds): R. Anwar, N, Haq amd S. Massod, Proc, Symp. Held at PGRI, PASTIC press, Islamabad.

(Received for publication 22 March 2019)