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Ethnobotanical Appraisal on Selected Gamopetalae Plant Species from Saharanpur, Uttar Pradesh

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ABSTRACT: The present ethnobotanical study was conducted in rural parts of district Saharanpur in the state of Uttar Pradesh to obtain information on utilization ofmedicinal plants by the local inhabitants to treat their various health problems. This traditional knowledge plays key role in maintaining health care system in rural areas. The information has been recorded and documented for 54 Gamopetalae plant species. In order to obtain ethnobotanical information, a number of group discussions and the open interviews were organized to interact with local inhabitants. The study recorded the indigenous use of medicinal plants by the local people of this area for the treatment of various diseases. The study area has rich biodiversity of medicinal plants but due to the lack of awareness and proper monitoring about cultivation, harvesting and sustainable utilization, these valuable plant resources are declining very fast. In addition, the indigenous traditional knowledge regarding the use of valuable medicinal plants of this region is also declining rapidly. Therefore, documentation of this traditional knowledge is an important step to ensure sustainable utilization and conservation of valuable medicinal plant resources. The prime objective of this study was the documentation of floristic diversity and traditional knowledge of plant resources that are used by local inhabitants of the study area for curing various ailments. The most preferred plant part for medicinal purposes was the leaves followed by root and other parts.

Keywords: Gamopetalae, ethnobotanical, traditional use, monitoring, local inhabitants, sustainable utilization.

INTRODUCTION

Plants have been used as a great source of medicine since the time immemorial and remained as an indispensable part of human life. History reveals that the medicinal plants have been used extensively in one or the other ways to treat even dreadful diseases. The considerable economic benefits are derived from the development of indigenous medicine by using medicinal plants for the treatment of different diseases (Azaizeh *et al.,* 2003). Medicinal plants are used by large number of people in different corners of the world not only by the tribal community but also in advanced healthcare system both in developing and developed countries (Smith-Hall *et al.*, 2012). Ethnobotanical information on medicinal importance of plants is useful not only in conservation of traditional cultures but equally important for community health care and drug development (Farooq *et al.,* 2014). Ethnobotanical studies emphasize the dynamic relations amongst biodiversity and cultural systems (Mahmood *et al.,* 2011). The indigenous ethnic communities in various parts of the world are familiar with the medicinal plants, their basic identification and ethnobotanical utility. India has been recognized as one of the important mega biodiversity centers in the world. In India, the tribal people mainly depend on plant resources to fulfill their basic needs, food source, and herbal medicines for the cure of diseases. Joshi and Awasthi (1991) stated that certain life-supporting plant species utilized by the local people of the Aravalli hills have been proved highly significant during the times of hunger. In local communities, the indigenous medicinal plants are the basic source for primary health care (Bibi *et al.,* 2014). In developing countries, approximately 60% of the world's total population still depends on traditional ethnomedicinal plant resources for the treatment of different ailments due the improper healthcare facilities. According to WHO, approximately 25% of the recent drugs are made from useful plant parts based on the indigenous knowledge and research which further lead to the development of approximately 75% new herbal drugs (Johnsy *et al.,* 2013). The drugs of plant origin are more common and their application is considered safe against various disorders (Butt *et al.,* 2015). The plants contain high content of bioactive secondary metabolites that indicate potential for new drugs discovery. Due to the limitations of modern medicine in control and cure of diseases, the ethnobotanical research is getting more attention in recent years. The significant portion of the world population is now paying interest in herbal products because of their negligible side effects and better efficacy. Recently, some pioneer ethnobotanists have developed certain quantitative methods for describing the nutritional, culinary and medicinal values of different plant species for a specific group of people (Prance *et al.,* 1987; Reyes-Garcia *et al.,* 2006).

The traditional information regarding the significance of plants collected from natural environment and used for various ethnobotanical purposes is usually passed down from old generation to new generation by means of

natural flow of daily life. However, due to the lack of awareness there occurs hindrance in the transfer of this information from the older to younger generation, and as a result the transfer of ethnobotanical data is in danger. Documentation of this indigenous traditional knowledge through ethnobotanical studies is highly important for the sake of conservation and sustainable utilization of available medicinal plant resources. The wild flora of Saharanpur region contains great diversity of useful medicinal plants which have been a valuable source of medicine for the local people of this area. In present study an attempt has been made to document floristic diversity and indigenous traditional knowledge regarding medicinal plants with special reference to Gamopetalae, used by the local inhabitants of this area.

MATERIAL AND METHODS

Study Area. The Saharanpur district is selected as the site for ethnobotanical studies (Fig. 1). Saharanpur is the northernmost of the districts of Uttar Pradesh state. The district is covered by three states i.e. Haryana, Himachal Pradesh and Uttarakhand. In the east of the district lies district Haridwar of Uttarakhand and districts Karnal and Yamuna Nagar of Haryana in the west, while in the north, lies district Dehradun of Uttarakhand and districts Muzaffarnagar and Shamli of Saharanpur division in the south. District Saharanpur is situated in the North-West edge of the state in the foothills of Shiwalik region that forms a part of the outer Himalaya. The district area is differentiated into the Shiwalik, Bhabar, Khadar, Tarai and the plain regions. Northern part of the district is composed of hilly tract of the Shiwalik range that stretches from west to east directions. Most of the area in southern part consists of plain and constitute major part of the district. The climate of the region is tropical. Rainfall is the most crucial climatic factor that has direct impact on the vegetation composition of this area. The region receives maximum rainfall during the monsoon season from the month of June to September. The most important river of the district is Yamuna which is the major source of irrigation in western part of the district. Other important rivers of the district include Dhamola, Hindon, Panvdhoi and Krishna. This region constitutes the northernmost part of Ganga-Yamuna Doab, and therefore, due to good irrigation facilities, rich diversity of valuable medicinal plants exist in this area.

Method. An extensive ethnobotanical survey of the study area was conducted in the year 2022 to obtain information following the suggested protocols for the collection of ethnobotanical facts (Martin, 2004). The first hand traditional ethnomedicinal information was obtained by organizing group discussions and interviews with local inhabitants of the study area. These informants included elder people, medical practitioners and plant collectors. Successive field visits were arranged at regular intervals in various seasons to collect maximum number of plant specimens in their flowering and fruiting stages. Floristic diversity, scientific and local name of plants, useful parts, method of preparation were recorded and documented by regular visit to villages. Photographs of plant specimens were taken at site with digital camera to facilitate description. All the data of collected plant specimens were noted down in field diary. Further processing of collected plant samples were done following the Standard methods of collection and preservation and maintenance of specimens in the herbarium (Jain and Rao 1977).

Identification of all the collected plant specimens was done using available monographs and floras (Duthie, 1903-1929; Kanjilal, 1928; Kanjilal, 1933; Hooker, 1973; Raizada,1976; Babu, 1977). The International Plant Name Index (http://www.ipni.org) and the Plant List (http://www.theplantlist.org) were used in order to get correct botanical names. The ethnomedicinal information regarding collected plant samples was documented on the basis of useful plant part and the disease cured. The collected plant species of Gamopetalae were first arranged family wise and then kept alphabetically with their botanical names, habit, local names, useful part and ethnomedicinal significance (Table 1).

RESULTS AND DISCUSSION

The occurrence of large number of medicinal plants indicates that the study site is rich in biodiversity and possesses indigenous traditional knowledge. The floristic and ethnobotanical data recorded from the investigation is depicted in Table 1. A total of 54 medicinally important angiospermic plant species from 43 genera and 19 families of Gamopetalae were documented along with their botanical names, habit, local names, useful parts and ethnomedicinal importance. The statistical analysis of total number of families, genera and species is represented in Fig. 2. The family wise distribution of plant species is shown in Table 2. It is evident from Fig. 3 that Asteraceae (10 species) was found to be the most dominant family of the study area followed by Convolvulaceae (6 species), Solanaceae (6 species), Acanthaceae (5 species), Boraginaceae (4 species), Lamiaceae (4 species) and Scrophulariaceae (3 species). Most dominant genera of the study are *Heliotropium, Ipomoea* and *Datura* with 3 species each. Distribution of species according to habit is shown in Fig. 4. The study revealed that the herbs (59.26%) constitute the dominant form of the study area, followed by shrubs (20.37%), trees (12.96%), under shrubs (3.70%) and climbers (3.70%).

It is evident from the study that different parts of the collected medicinal plants such as root, stem, leaves, flowers, fruits, whole plant, seeds and bark are used as medicine, but the leaves were found to be the most commonly used plant part (used in 27 species), followed by root (15 species), whole plant (10 species), seed (8 species), fruit (5 species), bark (4 species), flower (3 species) and stem (2 species) (Fig. 5). The local inhabitants of study area are mostly dependent on these valuable medicinal plants to fulfill their fundamental health care needs. The remedies prepared using these medicinal plants have been found highly effective in the treatment of several human diseases. Some selected medicinal plants of Gamopetalae used by the rural people of Saharanpur district have been shown in Figure 6. Local inhabitant collects these medicinal plants from their locality for the purpose of medicine, some of these are wild while very few are cultivated too. Though the

advancement in medical science and technology reached the significant level, but most of the rural people still believe on their indigenous traditional knowledge for the treatment of various ailments. The highest number of remedie were used for the treatment of stomach troubles followed by the urinary disorders, respiratory diseases, skin problems, fever, gynaecological problems, cuts and wounds, piles, muscular problems, diabetes, nervous disorders, eye troubles and snake bite. In terms of percentage, the highest proportion of remedies was used to treat stomach disorders. The documentation and preservation of indigenous traditional knowledge about available medicinal plants is necessary step towards preservation of valuable medicinal plant wealth in this area.

The ethnomedicinal utilization of available plant resources have been documented and the comparison is made with available authentic literature (Jain, 1991; Chandel *et al.*,1996; Nagiyan *et al.*, 2003; Dhiman *et al.*, 2006; Khare, 2007; Prachi *et al.*, 2009; Tomar, 2009; Mohammad *et al.*, 2010; Gaur and Sharma 2011; Kumar, 2014). Proper systematic documentation of this valuable indigenous knowledge regarding medicinal plants would play a significance role for understanding the biodiversity and ensuring sustainable utilization of medicinal plant resources (Singh, 1999). The results of the study reveals that medicinal plants have been a regular source of medicines and still playing highly important role in maintaining the lives of local people who are dependent on these medicinal plants for their regular health care. Recent studies have shown that many of these important plants are under threat and depleting very fast due to the lack of awareness. Therefore, it is the need of today to adopt powerful conservational system to provide protection to the natural plant resources in this area, particularly medicinal species.

Table 1: The Ethnobotanicals documented from Saharanpur district.

Family/ Species	Habit	Local Name	Useful Part	Medicinal Uses
Rubiaceae				
Neolamarckia cadamba (Roxb.) Bosser	Tree	Kadam	Leaf	Leaves are used to reduce pain. The plant is considered as sacred also.
Mitragyna parvifolia (Roxb.) Korth.	Tree	Kadam	Bark, Root	Bark is used for relief in muscular pain. Root and bark useful in colic and fever.
Asteraceae				
Ageratum conyzoides L.	Herb	Nilam, Neela Phool	Leaf	Leaf decoction is used in treatment of dysentery, rheumatism and fever. Leaf extract act as antidote against snake bite. Leaves are also used to prevent loss of hairs.
Cichorium intybus L.	Herb	Kasni	Root	Roots are used as diuretic, also applied for treatment of gall bladder and liver disorders.
Echinops echinatus Roxb.	Shrub	Untkanta	Root	Roots in powdered form are used to destroy lice. Root paste is employed in case of snake bite. Decoction of root is used in impotency.
Eclipta prostrata L.	Herb	Bhringaraj	Whole Plant	Whole plant is used to treat fever, jaundice, skin problems and urinary tract infections. Leaf paste mixed with coconut oil is used to prevent hair loss.
Parthenium hysterophorus L.	Herb	Gajar Ghas	Root	Decoction of roots is used as tonic. Root decoction is also used in treatment of dysentery and skin diseases.
Sonchus asper (L.) Hill	Herb	Dudhi	Root, Stem	Root paste is a good medicine for jaundice. Paste of herb is used for treating wounds and boils.
Sonchus oleraceus L.	Herb	Peeli Dudhi	Leaf, Root	Roots and leaves are used for digestive problems. An ointment is prepared from the decoction for wounds and ulcers.
Sphaeranthus indicus L.	Herb	Gorakhmundi	Leaf	Leaf juice is used in tumors and piles. It is also used as a vermifuge. Plant juice is used for treatment of gastric disorders.
Tridax procumbens L.	Herb	Sadahari	Leaf	Leaf juice is used to get relief from ear ache. Leaves are used to treat dysentery and dental problems.
Xanthium strumarium L.	Herb	Bharunt	Fruit, Root, Seed	Fruits are used in constipation and leprosy. Roots are useful in treatment of tumor. Seeds are eaten raw to get relief from headache.
Plumbaginaceae				
Plumbago zeylanica L.	Under shrub	Chitrak	Root	Infusion of root is useful in influenza. Roots are given for stimulation of digestive process. Root extract is used as an astringent and for treatment of skin problems.
Primulaceae				
Anagallis arvensis L.	Herb	Krishna neel	Whole Plant	It is used to expel leeches from nostrils of cattle. Plant paste is applied on wounds, tumors and swellings. The plant extract is also used in treatment of leprosy and hydrophobia.
Sapotaceae				
Maduca indica Gmel.	Tree	Mahua	Seed, Flower	Flowers are employed in coughs and bronchitis. Seeds oil is applied on skin diseases and rheumatism.
Ebenaceae				
Diospyros montana Roxb.	Shrub	Tendu	Flower, Fruit	Flowers are useful in urinary, skin and blood related diseases. Unripe fruit juice is applied on wounds for quick healing.
Salvadoraceae				
Salvadora persica L.	Tree	Meswak	Leaf, Fruit, Seed	Leaves juice is given in piles, asthma, coughs and

				indigestion. Fruits are utilized in calculi, flatulence and constipation. Seeds are purgative and diuretic.
Apocynaceae				
Alstonia scholaris (L.) R. Br.	Tree	Saptparni	Bark	Bark is used as blood purifier. Decoction of bark is useful in fever to reduce body temperature.
Tylophora indica (Burm. f.) Merr.	Climber	Anant mool	Leaf	Leaves are used for the treatment of asthma, cough, bronchitis and dysentery.
Asclepiadaceae				
Calotropis gigantea (L.) Dryand. R. Br.	Shrub	Safed Aak, Madar	Leaf, Root	Milky juice is applied or ring worm, eczema and swelling. Fresh root twigs are used as tooth brush in toothache. Leaves are used in treatment of paralysis. Root bark is used in elephantiasis.
Calotropis procera (Ait.) Dryand. R. Br.	Shrub	Aak, Madar	Whole Plant	Almost all plant parts are used for various purposes. Leaves are used in dysentery. Stem fibres are used to prepare rope and cords. Root and latex are used for treatment of asthma.
Gentianaceae				
Centaurium pulchellum (Sw.) Druce	Herb	Branching Centaury	Whole Plant	It used in treatment of high blood pressure, fever and kidney stones.Also useful in digestive system disorders.
Boraginaceae				
Cordia dichotoma G. Forst.	Tree	Lisoda	Leaf, Bark	Bark is employed for cough and chest diseases. Leaves juice and honey is given in foot and mouth disease of cattle.
Heliotropium curassavicum L.	Herb	Monkey Tail	Leaf, Root	Decoction of leaves is useful in fever. Powdered roots are applied on boils and wounds.
Heliotropium ellipticum Ledeb.	Herb	Pili-Buti	Leaf, Root	Root paste is applied on snake bite. Leaves juice is applied on wounds, sores, boils and pimples.
Heliotropim strigosum Willd.	Herb	Safed Bhangra	Leaf	Plant juice is applied to sore eyes. Leaf juice is useful in treatment of boils, wounds and ulcers.
Convolvulaceae				
Cuscuta reflexa Roxb.	Herb	Amar bel	Stem	It is utilized in treatment of liver related diseases. Decoction of stem is employed in constipation and flatulence. Stem paste is given with curd to cure diarrhoea.
Evolvulus alsinoides L.	Herb	Phooli	Leaf	Leaves are used to prepare tonics and as medicine for fever. Also used in treatment of syphilis, diarrhoea, bronchitis and asthma.
Evolvulus nummularius L.	Herb	Morning Glory	Whole Plant	Plant used as anthelmintic. Fresh plant juice is used for the treatment of amoebic dysentery.
Ipomoea aquatica Forsk.	Herb	Kalmi Sag	Leaf	Leaf paste is applied on ringworm, leprosy and other skin disorders. It is also used in treatment of fever, jaundice and to increase breast milk.
Ipomoea cairica(L.)Sweet	Climber	Morning Glory	Leaf	The plant is useful in treatment of cough, asthma and tuberculosis. Leaves paste is applied in skin diseases.
Ipomoea nil (L.) Roth	Shrub	Kala Dana	Seed	Seeds are used to treat urinary disorders. Dried seeds are used as purgative.
Solanaceae				
Datura innoxia Mill.	Herb	Safed Datura	Leaf, Seed	Seeds are used to treat hydrophobia. Seeds are said to be smoked in asthma. Roasted leaves are applied on enlarged testicles.
Datura metel L.	Herb	Kala Dhatura	Leaf, Seed	Leaves are used as narcotic and anti-spasmodic. Seeds are said to be smoked in asthma.
Datura stramonium L.	Herb	Dhatura	Leaf, Seed	Seeds are used as cerebral depressant. Also used in muscular pain and rheumatism. Leaves are useful in asthma and bronchitis.
Physalis minima L.	Herb	Rasbhari	Leaf, Fruit	Used as diuretic and purgative. Leaf juice is used in case of ear ache. Fruits are also used in colic complaints.
Solanum nigrum L.	Herb	Makoy	Leaf	Leaves are used in fever and eye troubles. Leaf decoction used as antispasmodic. Leaf extract is taken orally in whooping cough.
Withania somnifera (L.) Dunal *in* DC.	Shrub	Ashwagandha, Asgandh	Root	Powdered roots are employed to improve sexual power. Root powder is used to get relief from inflammation. Root paste is applied to cure ulcers, fever, cough and rheumatism.
Scrophulariaceae				
Bacopa monnieri (L.) Wettst.	Herb	Jalneem, Brahmi	Leaf	The plant extract is an important nerve tonic. Leaves are important medicine for epilepsy, bronchitis, asthma and diarrhoea.
Lindenbergia indica(L.) Vatke Kuntze	Herb	Pili-Buti	Whole Plant	Juice given in chronic bronchitis. It is also used for treatment of skin disorders.
Verbascum chinense (L.) Santapau	Herb	Gadar-Tamakhu	Leaf	Plant juice is used as febrifuge and applied in skin eruptions. Leaf juice is useful in treatment of diarrhoea.
Bignoniaceae				
Kigellia africana(Lam.) Benth.	Tree	Balam Khira	Fruit, Bark	Powdered fruit is used for digestive purposes. Bark paste is applied for skin diseases. Decoction of bark is given in treatment of diarrhoea.
Pedaliaceae				
Pedalium murex L.	Herb	Vilayti Gokhru	Leaf	Sap of fresh leaves with water is used to treat gonorrhoea

				and dysuria. It is also used in calculi and burning micturition.
Acanthaceae				
Barleria prionitis L.	Under shrub	Vajradanti	Leaf	Raw leaves chewed to get relief in tooth ache. Leaf ash is used with honey against cough. Leaves paste is useful in boils and cracked heel.
Justicia adhatoda L.	Shrub	Bansa	Leaf	Leaf ash is used for the treatment of cough. Leaf juice is useful in treatment of dysentery, diarrhoea and tumors.
*Justicia procumbens*L.	Shrub	Makhania Ghas	Leaf	Leaves juice is squeezed into the eyes for treatment of ophthalmia. Plant infusion is used in asthma, cough, rheumatism and liver disorders.
Ruellia prostrate Poir.	Herb	Bell weed	Whole Plant	Plant decoction is used in fever, cough, indigestion and liver disorders.
Ruellia tuberosa L.	Shrub	Blue bell	Whole Plant	Plant is used as anti-diabetic, analgesic and gastric tonic. Also useful in treatment of gonorrhea and skin disorders.
Verbenaceae				
Clerodendrum indicum (L.) Kuntze.	Shrub	Bharangi	Leaf, Root	Roots are used in treatment of asthma and cough. Leaves are used as vermifuge and anti-inflammatory.
Lantana camara L.	Shrub	Panchrangia	Whole Plant	Young twigs are used as tooth brushes. Plant decoction is used as antidote for snake bite. Decoction of root is employed as mouthwash in toothache.
Lamiaceae				
Anisomeles indica (L.) Kuntze	Herb	Kala Bhangra	Root, Seed	Root paste is applied on rheumatism. Seed oil is used to cure uterine infections. Plant ash mixed with coconut oil is applied to remove dandruff.
Leucas cephalotes (Roth) Spreng.	Herb	Gubha	Root, Flower	Used as laxative and anthelmintic. Root juice is given in rheumatism. Flower juice is given in cough, cold and jaundice.
Ocimum basilicum L.	Herb	Tulsi,	Leaf	Leaf along with honey is used as decoction to cure cold, cough and fever.
*Salvia plebeia*R. Br.	Herb	Sathi	Whole Plant	Plant used as diuretic, astringent and anthelmintic. Leaves are used in toothache. Seeds used for treatment of diarrhoea, leucorrhea and haemorrhoids.

Table 2: Family wise distribution of plant species.

Sr. No.	Family	No. of Species	Sr. No.	Family	No. of Species
1.	Rubiaceae	2	11.	Boraginaceae	4
2.	Asteraceae	10	12.	Convolvulaceae	6
3.	Plumbaginaceae	1	13.	Solanaceae	6
4.	Primulaceae	1	14.	Scrophulariaceae	3
5.	Sapotaceae	1	15.	Bignoniaceae	1
6.	Ebenaceae	1	16.	Pedaliaceae	1
7.	Salvadoraceae	1	17.	Acanthaceae	5
8.	Apocynaceae	2	18.	Verbenaceae	2
9.	Asclepiadaceae	2	19.	Lamiaceae	4
10.	Gentianaceae	1		**Total No. of Species**	**54**

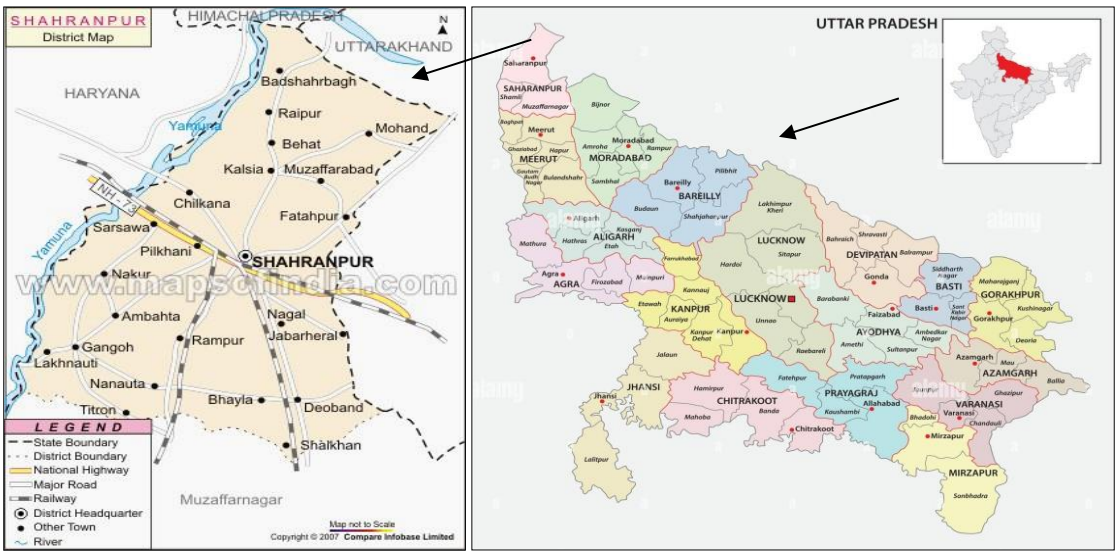

Fig. 1. Map of the Study Area.

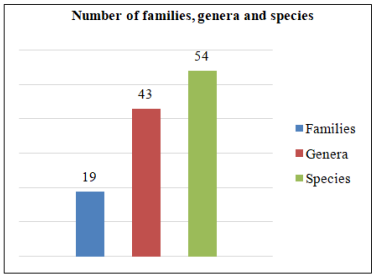

Fig. 2. Total number of families, genera and species.

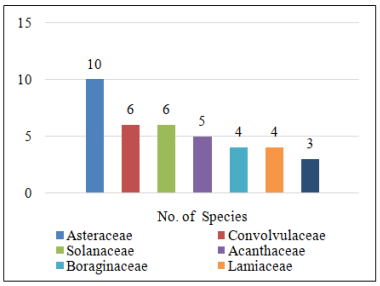

Fig. 3. Dominant families with number of species.

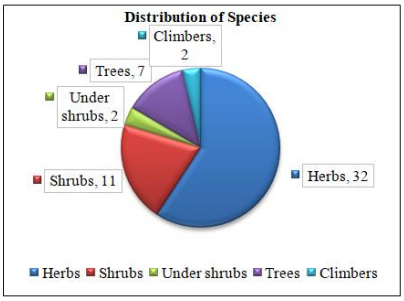

Fig. 4. Habit wise distribution of species.

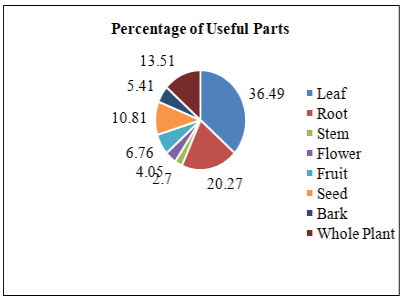

Fig. 5. Percentage of plant parts used.

Fig. 6 (A-L). Selected medicinal plants of Gamopetalae used by local inhabitants of Saharanpur district: **A**-*Eclipta prostrata*, **B**-*Parthenium hysterophorus*, **C**-*Tridax procumbens*, **D**-*Xanthium strumarium*, **E**-*Anagallis arvensis*, **F**-*Alstonia scholaris*, **G**-*Calotropis procera*, **H**-*Cuscuta reflexa*, **I**- *Ipomoea cairica*, **J**-*Withania somnifera*, **K**-*Barleria prionitis*, **L**-*Lantana camara*.

CONCLUSIONS

In recent years, as a result of environmental degradation and modernization of social systems, significant changes are observed in various aspects of ethno medicine. Because of these factors, the system of traditional knowledge in India is degrading at very fast rate. Hence, there is urgent need of necessary steps to document all valuable traditional information among the various ethnic groups before it vanishes. It is evident from the present study that the indigenous ethnomedicinal knowledge is still in alive state in this region as the phytomedicines are still using by the local people to treat their various health problems. A total of 54 medicinal plant species from Gamopetalae group were collected and their significance in the treatment of different diseases is documented. The major life form used for medicine was the herb and leaf was the principal useful part. These plants possess enormous potentials for the preparation of commercially important pharmaceutical products but this plant wealth is declining day by day due to the lack of proper documentation and awareness in younger generation. Therefore, paying special attention on identification and conservation of medicinally important plant resources is an essential requirement of today in order to maintain our rich traditional ethnobotanical knowledge of medicinal plants. Success can be achieved by motivating younger generation towards identification, cultivation and conservation of medicinal plants in this area.

FUTURE SCOPE

Present study may be proved a big step in conservation of medicinal plant resources and preserving the traditional knowledge used by the local inhabitants of Saharanpur district for treating their various health problems. Due to their tremendous potential, these medicinal plants can be used to prepare several commercially important pharmaceutical products at large scale.

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Conflict of interest. None.

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