Annals of Plant and Soil Research 26(3): 537-544 (2024)
https://doi.org/10.47815/apsr.2024.10396

Distribution and ethnomedicinal significance of family euphorbiaceae in the Rohilkhand region of Uttar Pradesh, India

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Received, April, 2024; Revised accepted, July, 2024

ABSTRACT

Efforts have been undertaken to study the traditional medicinal knowledge of plants from the family Euphorbiaceae, readily available in the Rohilkhand region of the U.P. state. The region contains 43 species from 17 genera of euphorbiaceae, the most common of which are Euphorbia (15 species), Phyllanthus (8 species), Antidesma, Breynia, Bridelia, Chrozophora, and Jatropha (2 species each), and the rest genera are monotypic. In this region, herbs are represented by 17 species, followed by shrubs with 11 species, trees with 7 species, small trees with 5 species, and under shrubs with 3 species. Ethnobotanical information was collected through quite a lot of visits and group discussions with local peoples, and cross-checked with Vaidyas. The study identified that various species of family Euphorbiaceae have been used to cure skin diseases, diarrhoea, dysentery, urinary infections, stomach disorder, snake-bite, scorpion bite, inflammations, bone fracture/ dislocation, hair related problems, warts, fish poisons, wounds/cuts/burns, rheumatism, diabetes, fever, gonorrhoea, jaundice, vomiting, viral fever, arthritis and as antiseptic. The results are encouraging but thorough scientific scrutiny is necessary before being put into practice.

Keywords: Euphorbiaceae, ethnobotanical, Rohilkhand region, India

INTRODUCTION

Family Euphorbiaceae (spurge) is one of the principal families of angiosperms. The species are widely distributed in the tropical countries and occupy several types of vegetation and habitats (Mwine and Damme, 2011; Bijekar and Gayatri, 2014). The species of this family are often cited as pioneers and frequently occupy invasive, ruderal environments, forest and road edges, rocky outcrops and disturbed areas (Alves, 1999; Santos and Sales, 2009; Lucena and Alves, 2010; Silva *et al.*, 2010; Araújo *et al.*, 2010; Kumari *et al.*, 2016 and 2018). The family Euphorbiaceae is characterized by the presence of milky latex, cyathium inflorescence and hypogynous, actinomorphic, unisexual flowers. It includes great variation in habits ranging from woody trees, shrubs, cacti like shrubs and herbs. The plants may be perennials or annuals. A number of plants of the spurge family are of considerable economic importance. Some Euphorbiaceae plants have shown promise in treating a variety of disorders. Euphorbiaceae is a complex heterogeneous family which has developed various life forms from herbs, shrubs, stunted succulents to tall canopy trees due to diverse habitats. The indigenous community of various nations have utilized species of the Euphorbiaceae in traditional medicines as treatments for a variety of illnesses and complaints, including cancer, diabetes, diarrhoea, heart ailments, haemorrhages, hepatitis, jaundice, malaria, ophthalmic diseases, rheumatism, and scabies, etc., (Tripathi and Srivastava, 2010; Kumar and Chaturvedi, 2010; Mcine and Damme, 2011; Bijekar and Gayatri, 2014). Knowing how a particular plant was utilized by ancient folk healers to treat a certain condition has led to the discovery of many important herbal medications (Ekka and Dixit, 2007). In Uttar Pradesh, the following genera of Euphorbiaceae are reported as medicinal plants: *Acalypha, Antidesma, Baliospermum, Bischofia, Bridelia, Chrozophora, Croton, Euphorbia, Jatropha, Manihot, Phyllanthus, Putranjiva and Ricinus* (Nandkarni, 1954; Ambasta, 1986; Prakash and Singh, 2001; Khan, 2002; Khanna *et al.*, 2004; Gaur and Sharma, 2010; Tripathi and Srivastava, 2010; Chaudhary and Gupta, 2011; Kumar, 2014; Kumar and Bharti, 2014; Chaudhary and Kumar, 2015; Rahaman *et al.*, 2017; Singh and Kumari, 2019; Singh *et al.*, 2019; Khajuria *et al.*, 2021; Amtaghri *et al.*, 2022).

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Phyllanthus fratarnus and *Aclaypha indica*, two other species of the Euphorbiaceae, are utilized in traditional folk medicines to treat leprosy and rheumatoid arthritis, respectively (Chaturvedi and Diwanji, 1995). While *Euphorbia thymifolia* is utilized as an anti-inflammatory (Kumar and Balakrishnan, 1996). Other species of *Euphorbia* are also known to cure gonorrhoea, urogenital infections, various skin disorders, reduced conjunctivitis, jaundice and are used as a diuretic and astringent (Kumar and Balakrishnan, 1996; Singh and Kumari, 2019). Oil of *Croton bonplandianum* is used as a violent purgative, vesicant, counter-irritant and in skin disorders (Kapoor *et al.*, 1989; Singh *et al.*, 2020). *Baliospermum solanifolium* for abdominal disorder, skin-disorders, piles and worm infestations (Rout *et al.*, 2017). Root of *Manihot esculenta* used in hypertension, headache and fever (Zekarias *et al.*, 2019). Small dose of root of *Euphorbia heterophylla* used in gonorrhoea and rise milk production in breast feeding women (Singh *et al.*, 2020). Latex of *Euphorbia tirucalli* used to reduce swelling, relieve pain in Haemorrhoids (Nyirenda and Chipuwa, 2024).

Study area

Rohilkhand is a region of north-western Uttar Pradesh state of India. It is located between longitudes 78°00' to 80°27' East and latitudes 27°35' to 29°58' North. That is concentrated in the divisions of Bareilly and Moradabad. It is a section of the upper Ganges Plain and bears the name of Rohilla tribe. It is separated into two portions based on agro-climatic zones: the upper Tarai region and the lower Central-western Zone. Amroha, Bareilly, Bijnore, Budaun, Moradabad, Pilibhit, Rampur, Sambhal and Shahjahanpur are the nine districts that make up the entire plain. Around the Bareilly and Moradabad divisions, Rohilkhand covers an area of around 25,000 square Km (9,700 sq mi), in the upper Ganges alluvial plain. The two distinguishing characteristics of the physiography of Rohilkhand is a nearly imperceptible change in elevation and a homogeneous surface. It is bordered on the south and west by the Ganges River, on the north by Nepal and Uttarakhand, and on the east by the Awadh area. The principal rivers of Rohilkhand region include the Ganga, Ramganga, Gangan, Kali, Gaula, and Sot, as well as their tributaries (Figure-1). The climate of Rohilkhand Region is primarily subtropical, but location and season have a big impact on the weather. Three distinct seasons are associated with the subtropical monsoon climate; Summer (March–June): Warm and dry (temperatures reach 44.2°C, occasionally 45°C), low relative humidity (20%), dusty winds; Monsoon (June–September): 85% of the 990–1000 mm annual average rainfall and Winter (October–February): cold (temperatures fall to 4-5 °C, occasionally even below 4 °C), clear skies, occasionally misty circumstances.

Crop failure and persistent drought are the results of monsoon failure. Relative humidity decreases in the summer and increases as monsoon season approaches. It is at its lowest from April to June during the summer and at its highest during the rainy season. August is when it reaches its height. In October and November, there is a steady drop, followed by a quick spike in December and January, before a long decline to a minimum in May. Wintertime is when dewfall occurs. In the winter, it is about 65% in the morning and 30-35% in the afternoon, while it is roughly 80% in the morning and 60-65% in the evening during the rainy season. The principal topographic characteristics of this region depend on year-round and seasonal rivers and canals.

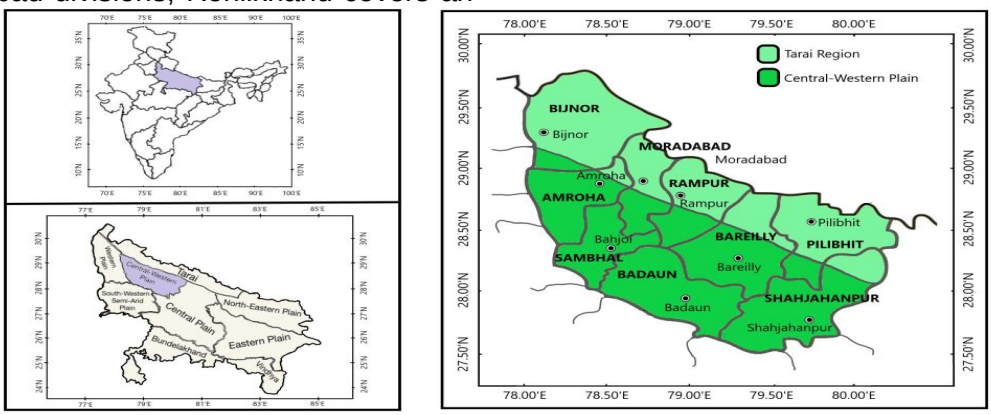

Figure 1: Map of Rohilkhand Region, Uttar Pradesh, India

MATERIALS AND METHODS

From 2020 to 2022, several field expeditions were organized in nine districts of Rohilkhand region of Uttar Pradesh to gather plant specimens from diverse species of the family Euphorbiaceae. Plant specimens gathered during the study were dried, processed, and identified using Floras (Singh *et al.*, 2016; Sinha and Shukla, 2020). The plant specimens were stored in the Departmental Herbarium of Hindu College in Moradabad. Firsthand data regarding plant medicinal properties was gathered (Nandkarni, 1954; Kirtikar and Basu, 1975; Ambasta, 1986; Jain, 1991; Alexiades, 1996; Bridges and Lau, 2006; Martin, 2010; Kaul and Dwivedi, 2010). Native health practitioners and other people of either gender with expertise of herbal remedies in the villages under study.

RESULTS AND DISCUSSION

In the present investigation, taxonomical observations of family Euphorbiaceae was done in areas of Amroha, Bareilly, Bijnore, Budaun, Moradabad, Pilibhit, Rampur, Sambhal and Shahjahanpur districts of Rohilkhand region of Uttar Pradesh (Table 1).

Table 1: Species Diversity of the family Euphorbiaceae from Rohilkhand region of U.P.

S. No.	Species name	Local Name	Fl. & Fr.	Habit	Occurrence
1.	*Acalypha indica* L.	Kupi	Sept-Mar	H	W
2.	*Antidesma acidum* Retz.	Ban-musari	July-Oct	T	W
3.	*Antidesma ghaesembilla* Gaertn.	Amlola	July-Oct	T	W
4.	*Baliospermum solanifolium* (Burm.) Suresh	Danti	Feb-Apr	US	W
5.	*Bischofia javanica* Blume	Marcha	Feb-Apr	T	P
6.	*Breynia retusa* (Dennst.) Alston	Kamboji	Mar-July	S	W
7.	*Breynia vitis-idaea* (Burm.f.) C.E.C.Fisch.	Tikhar	Apr-Nov	St	W
8.	*Bridelia montana* (Roxb.) Willd.	Gandani	Oct-Dec	S	W
9.	*Bridelia stipularis* (L.) Blume	---	Dec-Apr	S	P
10.	*Chrozophora plicata* (Vahl) A.Juss. ex Spreng.	Teela	Mar-June	H	W
11.	*Chrozophora rottleri* (Geis) A. Juss.	Shadevi	Mar-May	H	W
12.	*Codiaeum variegatum* (L.) A.Juss.	---	Sept-Feb	S	O
13.	*Croton bonplandianum* Baill.	Jangli Croton	Mar-Aug	H	W
14.	*Euphorbia antiquorum* L.	Vajrakantak	Nov-Jan	St	P
15.	*Euphorbia dracunculoides* Lam.	Titli	Dec-Mar	H	C
16.	*Euphorbia heterophylla* L.	Maitulajhar	Aug-Oct	H	P
17.	*Euphorbia heyneana* Spreng.	Dudhia	Sept-Nov	H	W
18.	*Euphorbia hirta* L.	Dudhi	Aug-Nov	H	W
19.	*Euphorbia indica* Lam.	---	Sept-Nov	H	W
20.	*Euphorbia milii* Des Moul.	Mili	Through out the Year	US	C
21.	*Euphorbia neriifolia* L.	Sehund	Oct-Dec	St	W/P
22.	*Euphorbia prostrata* Aiton	Duhti	Aug-Oct	H	W
23.	*Euphorbia pulcherrima* Willd. ex Klotzsch	Lalpatta	Nov-Mar	S	C
24.	*Euphorbia royleana* Boiss.	Thur	Apr-June	S	C
25.	*Euphorbia serpens* Kunth.	Dudhi	Aug-Nov	H	W
26.	*Euphorbia thymifolia* L.	Chhota-dudhi	Aug-Dec	H	W
27.	*Euphorbia tirucalli* L.	Anglithor	Aug-Sept	St	P
28.	*Euphorbia tithymaloides* L.	---	Oct-Dec	US	O
29.	*Jatropha curcas* L.	Bakrendi	Aug-Nov	S	C
30.	*Jatropha gossypifolia* L.	Vilayati arand	Apr-Oct	S	O
31.	*Manihot esculenta* Crantz	Kalpakand	Dec-Mar	S	C
32.	*Phyllanthus acidus* (L.) Skeels	Chalmeri	Sept-Apr	St	C
33.	*Phyllanthus amarus* Schumach. & Thonn.	Jaramla	Aug-Dec	H	W
34.	*Phyllanthus emblica* L.	Awnla	Mar-Dec	T	C
35.	*Phyllanthus fraternus* G.L.Webster	Bhuiaovla	Aug-Dec	H	W
36.	*Phyllanthus maderaspatensis* L.	Kanocha	Aug-Oct	H	W
37.	*Phyllanthus reticulatus* Poir.	Seekat	Sept-Mar	S	W
38.	*Phyllanthus simplex* Retz.	Bhuiavla	Aug-Dec	H	W
39.	*Phyllanthus urinaria* L.	Lal bhuinanwalah	July-Dec	H	W
40.	*Putranjiva roxburghii* Wall	Putranjiva	Mar-Next June	T	C
41.	*Ricinus communis* L.	Arand	Throughout the Year	S	W
42.	*Trewia nudiflora* L.	Bhilongur	Feb-Nov	T	W
43.	*Triadica sebifera* (L.) Small	---	Jun-Dec	T	C

Habit: H= Herb; S=Shrub; St=Small Tree; T=Tree; US= Undershrub, Occurrence: C = Cultivated; W =Wild; O =Ornamental; P = Planted

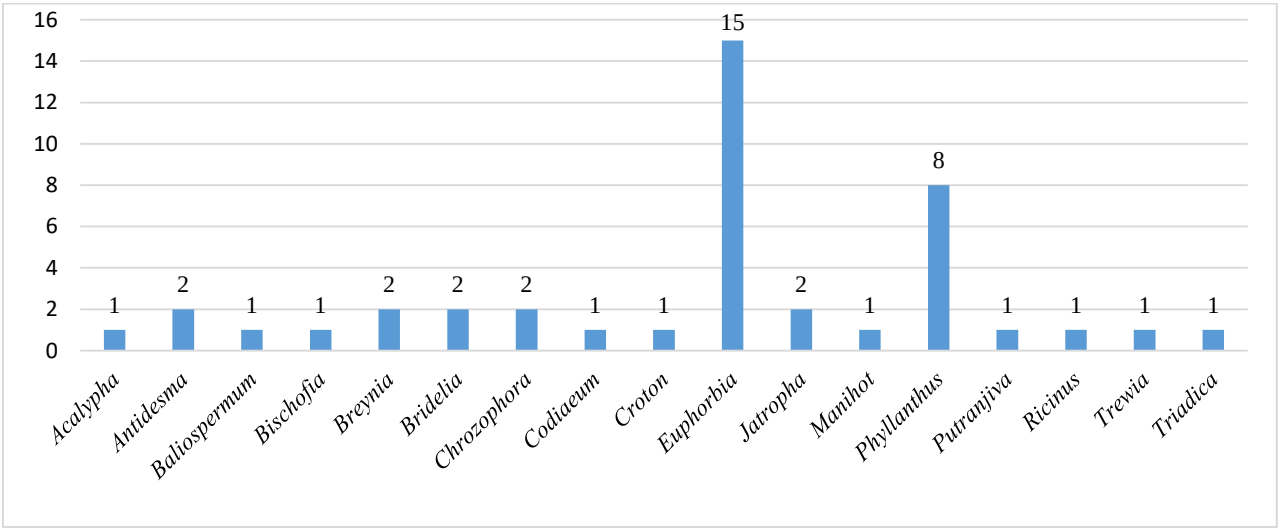

Figure 2: Dominant species of Euphorbiaceae in Rohilkhand region

During investigation the family Euphorbiaceae represents 43 species under 17 genera. Genus *Euphorbia* (15 species) found dominant followed by *Phyllanthus* (8 species), *Antidesma, Breynia, Bridelia, Chrozophora,* and *Jatropha* (2 species each), while ten genera are monotypic (Figure- 2). Habit wise analysis shows dominancy of Herbs with 17 species, followed by shrubs with 11 species, trees 7 species, small trees 5 species, and under shrubs 3 species (Figure- 3).This dominance could be attributed to various ecological factors such as soil type, climate, and habitat preferences. Family represents mostly wild plants as compare to ornamentals, cultivated (Figure 4). The predominance of wild plants over ornamentals and cultivated species underscores the significance of Euphorbiaceae in the local ecosystem. This prevalence of wild species could be indicative of their ecological resilience and adaptive capacity to survive in natural habitats (Aishwath and Lal, 2016). Around 27 plant species of Euphorbiaceae are being used by the rural peoples of this area for treating their diseases and disorders. However, it was discovered in the current investigation that it is also used to treat scabies, catarrh, bronchitis, leprosy, rheumatoid arthritis, reduced conjunctivitis, jaundice, hypertension, headache, fever, gonorrhoea, haemorrhoids, asthma and asthma. It has been noted that several cultures employ the same plant or component of a plant for a variety of reasons (Table 2). This widespread use highlights the deep-rooted traditional knowledge and cultural significance of species of family Euphorbiaceae in the region.

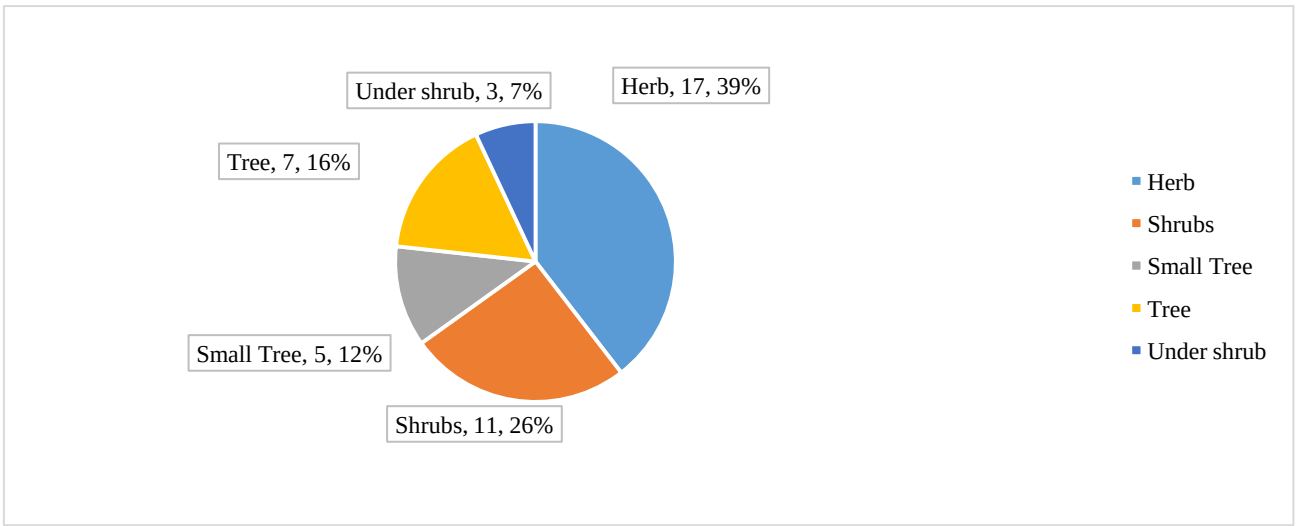

Figure 3: Habit wise analysis of species of Euphorbiaceae in Rohilkhand region

Table 2: Species of family Euphorbiaceae used in various diseases in Rohilkhand region

S. No.	Species name	Parts Used	Diseases
1.	*Acalypha indica* L.	Leaf, Whole plant	Plant decoction as laxative; Leaves powder in sores and wounds; Leaves paste in ringworms and snake bites; Leaves juice in cough problems.
2.	*Antidesma acidum* Retz.	Leaf	Leaves used in treatment of stomach ache of children, digestion related issues and diabetes.
3.	*Baliospermum solanifolium* (Burm.) Suresh	Whole plant	Plant useful in abdominal disorder, skin disorders, piles and worm infestations.
4.	*Bischofia javanica* Blume	Bark	Bark used in throat trouble.
5.	*Bridelia stipularis* (L.) Blume	Bark, Leaf	Bark decoction in cough, fever and asthma; Leaves decoction in jaundice.
6.	*Chrozophora rottleri* (Geis) A. Juss.	Leaf	Leaves paste used in leukoderma.
7.	*Croton bonplandianum* Baill.	Leaf, Stem, Latex	Leaves decoction used in diarrhoea, Cuts and wounds to stop bleeding; Stem used in bronchitis & asthma; Latex used in Scabies and sores.
8.	*Euphorbia dracunculoides* Lam.	Whole Plant, Root, Leaf	Leaves used to kill lice in human as well as animals; Root paste in scorpion sting.
9.	*Euphorbia heterophylla* L.	Leaf	Leaves used in Gonorrhoea, Respiratory tract infection, Malaria, Eczema & Asthma.
10.	*Euphorbia heyneana* Spreng.	Whole plant	Decoction used in diarrhoea & Dysentery.
11.	*Euphorbia hirta* L.	Whole Plant	Whole plant used to remove stomach worms in children, Juice in dysentery, colic trouble, Urinary disorders; decoction in viral fever and cough; Latex in snake bite.
12.	*Euphorbia indica* Lam.	Leaf	Infusion as an astringent and in diarrhoea, dysentery and leucorrhoea.
13.	*Euphorbia pulcherrima* Willd. ex Klotzsch	Latex	Latex used to cure rheumatic pain.
14.	*Euphorbia thymifolia* L.	Whole Plant	Plant decoction used to purification of blood, antidote for snake bite, dysentery and spermatorrhoea.
15.	*Euphorbia tirucalli* L.	Latex	Latex used to remove warts, cure skin diseases, fish poison.
16.	*Euphorbia tithymaloides* L.	Latex, Stem & Root	Latex use to cure headache. Decoction of stem and root used in Skin diseases.
17.	*Jatropha curcas* L.	Leaf, Seed, Twig, Bark	Leaves in body inflammation and juice in chest congestion. Twig in toothache and gums. Bark powder in dysentery, biliousness, tuberculosis, and anaemia. Seed oil in rheumatism.
18.	*Jatropha gossypifolia* L.	Leaf, Twig, Latex	Leaves paste in eczema and itches. Latex in ulcer.
19.	*Manihot esculenta* Crantz	Root	Used in hypertension, headache and fever.
20.	*Phyllanthus acidus* (L.) Skeels	Leaf, Fruit	Leaves used to make a poultice to treat sciatica, lumbago and rheumatism. Remove dandruff, cure night blindness, anti-vomiting. Fruits are eaten as a blood-enhancer for the liver.
21.	*Phyllanthus amarus* Schumach. & Thonn.	Whole plant	Decoction of plant as liver tonic.
22.	*Phyllanthus emblica* L.	Fruit, Leaf, Stem, Bark	Fruits used in wide-ranging weakness, cure night blindness, cough, vomiting, removing dandruff. Stem and Bark cure diarrhoea & dysentery. Leaves are antibacterial and antiviral.
23.	*Phyllanthus fraternus* G.L.Webster	Whole Plant	Plants paste on boils and in jaundice. Leaves paste in piles and powder in leucorrhoea.
24.	*Phyllanthus maderaspatensis* L.	Seed	Seed in dyspepsia, constipation and urine retention.
25.	*Phyllanthus urinaria* L.	Whole Plant	Leaves juice as an appetizer to children. Control gonorrhoea, rheumatic fever.
26.	*Putranjiva roxburghii* Wall	Leaf, Fruits	Leaves with fruits decoction in viral fever, cold and cough. Rosaries of fruits place around the neck of children to cure skin allergy.
27.	*Ricinus communis* L.	Leaf, Root, Seed oil	Leaf pastes in pain reliever in swelling, pneumonia fever and decoction in menstrual disorder and jaundice. Root paste to cure boils, wart. Luke warm seeds oil in rheumatism and constipation.

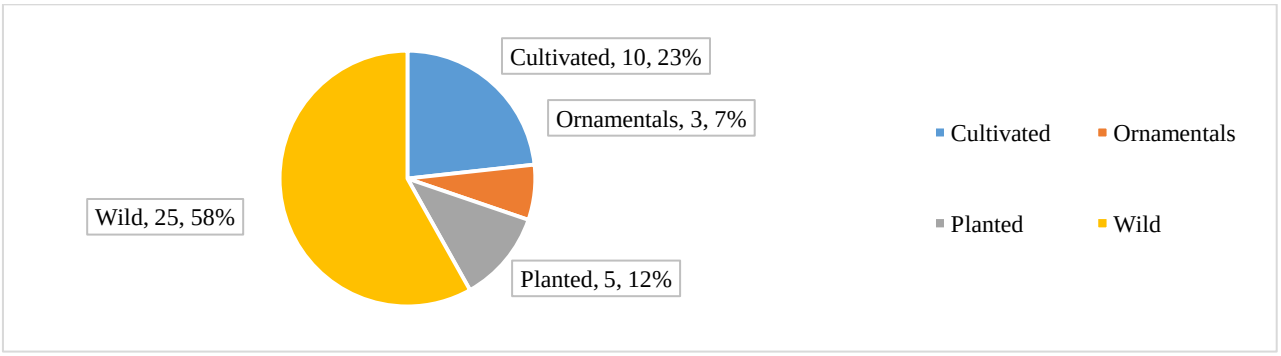

Figure 4: Distribution of species of Euphorbiaceae in Rohilkhand region

Species *Baliospermum solanifolium, Euphorbia tirucalli* and *Croton bonplandianus* are most frequently used to treat respiratory system problems, inflammation, skin conditions, and digestive issues (Bijekar and Gayatri, 2014). According to Kaul and Dwivedi (2010), plants milky sap, or latex, is utilized in defence and protection to aid in the healing of wounds. Study indicates that *Euphorbia tirucalli* and *Acalypha indica* treat warts, cure skin diseases, fish poison (Kumar and Chaturvedi, 2010). Species of *Euphorbia, Acalypha* and *Phyllanthus* has been used for treating diarrhoea, dysentery, urinary infections, stomach disorder, hair related problems, rheumatism, diabetes, gonorrhoea, jaundice, haemorrhages, abscesses and blisters (Santos *et al.*, 2009; Khajuria *et al.*, 2021). Various plant parts used for preparing medicine i.e., leaf, stem, bark, root, fruits, latex, seeds, twig as well as whole plant. During the investigation leaves were used as maximum (30%), followed by whole plant (19%), latex (11%), Bark and Root (9% each), Fruit, Seed and Stem (6% each), and Twig (4%) (Figure 5). This diversity suggests the presence of bioactive compounds distributed across different plant organs, each with unique medicinal properties (Chuskit *et al.*, 2024). However, it is important to note that while traditional knowledge systems offer valuable insights into the medicinal uses of plants, they must be subjected to demanding scientific validation. The therapeutic efficacy of these plants needs to be systematically evaluated through pharmacological and phytochemical studies to ensure their safety and efficacy.

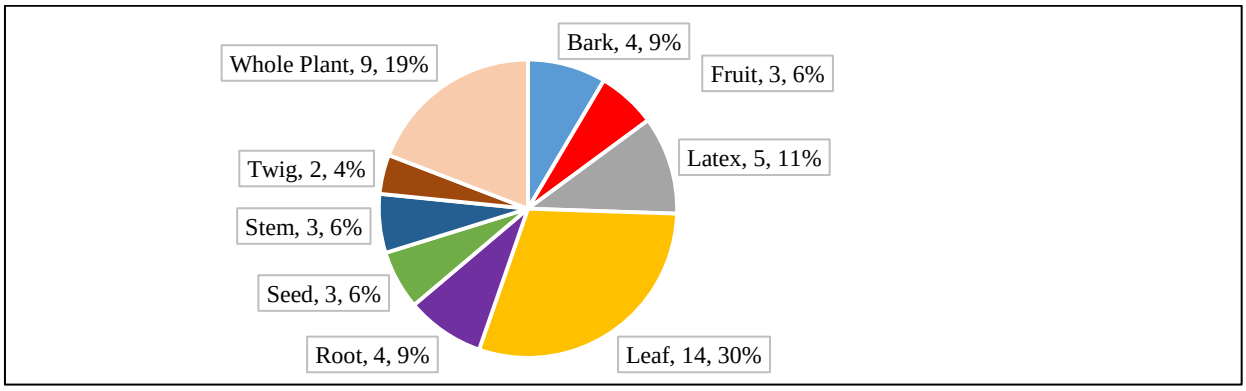

Figure 5: Plant parts of Euphorbiaceae family used in various diseases in Rohilkhand region

CONCLUSION

Family Euphorbiaceae is a widespread family and considered as one of the most economical among angiosperms. Herbal therapy is not only cost-effective but also provides means for the treatment of many diseases, which are considered to be incurable in another system of medicines. From the foregoing account, it is very clear that the local people of the Rohilkhand region are using a number of medicines of plant origin. They are consuming various species of family Euphorbiaceae for various diseases related to skin, bowel complaints, joint pains, diabetes, and jaundice. These plants are also in use as vegetables, insecticides, against snakebite, and as a fish poison.

ACKNOWLEDGEMENT

The authors are thankful to the local people of the study area for their cooperation and help during the field study and so much thankful to local medicine men (Vaidyas, Hakims) clarifying medicinal uses. Authors also grateful to Dr. B. K. Singh, Director, School of Sciences, IFTM University Moradabad for providing necessary facilities.

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