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ASTERACEAE: A TAXONOMICALLY AND MEDICINALLY IMPORTANT SUNFLOWER FAMILY

Mst. Farhana Easmin
Plant Taxonomy Laboratory, Department of Botany
Faculty of Biological Sciences, University of Rajshahi, Bangladesh
E-mail: rbfarhanaru@gmail.com

Laila Al Faria
Ph.D. Research Fellow
Plant Taxonomy Laboratory, Department of Botany
Faculty of Biological Sciences, University of Rajshahi, Bangladesh
E-mail: faria.restc@gmail.com

Rony Rani
Assistant Professor
Department of Botany, Faculty of Biological Sciences,
University of Rajshahi, Bangladesh
E-mail: ronyranibot@gmail.com

Dr. A.H.M. Mahbubur Rahman
Professor
Department of Botany, Faculty of Biological Sciences,
University of Rajshahi, Bangladesh
E-mail: drrahmanahmm@ru.ac.bd

ABSTRACT

The Purpose of the research: *The study aimed to document the Asteraceae species in the study area. The study also examined the species diversity and medicinally important plants.* ***Data, Materials, and Methodology:*** *The work is based on fresh materials collected during thirty-six field visits to Paba Upazila of Rajshahi district, Bangladesh was carried out from November 2018 to October 2019 to cover the seasonal variations. Plant parts with either flower or fruits collected using traditional herbarium techniques to make voucher specimens for documentation.* ***The results:*** *The result shows in all, 44 species under 35 genera of the family Asteraceae were reported, out of which 40 (90.90%) were used medicinal applications for the treatment of more than 59 diseases.* ***Major findings:*** The findings of the study that 25% of species were very common, 43.18% were common, 25% species were rare and 6.82% species were very rare in the study area. Mikania cordata *(Burm.f.) Robinson is the only climbing species.* Blumea laciniata *(Roxb.) DC. and* Wedelia trilobata *(L.) Hitchc. has been reported for the first time in Paba Upazila of Rajshahi. The present study will help in identifying the major Asteraceae species for further investigation and also beneficial to develop the herbal drug development.*

Keywords: Asteraceae, Diversity, Medicinal Uses, Rajshahi, Bangladesh.

JEL Classification Codes: A19, B10, B29, C10, C59.

INTRODUCTION

Introduce of the Family Asteraceae

The original name for Asteraceae (Compositae) was first described by the German botanist Paul Dietrich Giseke in 1792 (Solbrig, 1963). Asteraceae is one of the largest flowering plant families containing about 1100 genera and more than 20,000 species worldwide (Jones and Luchsinger, 1987). Some of the largely with their approximately known number of species in brackets include *Senecio* (2000), *Eupatorium* (1200), *Vernonia* (1000), *Hieracium* (1000), *Centaurea* (600), *Aster* (500), *Helichrysum* (500), *Cousinia* (400), *Artemisia* (400), *Baccharis* (400), *Mikania* (250), *Bidens* (230), *Crepis* (200), *Inula* (200), *Achillea* (200), *Gnaphalium* (200), *Chrysanthemum* (200), *Anthemis* (200), *Erigeron* (200), *Cirsium* (150), *Ligularia* (150), *Helianthus* (110), *Lactuca* (100), *Hypochoeris* (100), and *Carduus* (100). In Bangladesh, 71 genera and 130 species make up the family (Ahmed et al., 2008). Asteraceae species have a cosmopolitan distribution, except for Antarctica and the deep Arctic. In tropical and subtropical regions, in particular Central America, Eastern Brazil, the Mediterranean, the Levant, South Africa, Central Asia and Southwestern China (Panero et al., 2002), they are especially numerous. Some Asteraceae members are annual or perennial herbs but even shrubs, vines, or trees are a small number. The family has a cosmopolitan distribution that colonizes a wide range of environments with species ranging from sub-polar to tropical. The highest proportion of the species occurs in subtropical and lower temperate latitudes in the arid and semiarid regions Asteraceans are particularly prevalent in open and dry environments (Judd et al., 2007).

Importance of the Family Asteraceae

Asteraceae is an economically important family that supplies products such as cooking oils, sunflower seeds, lettuce, artichokes, sweeteners, coffee alternatives and herbal teas. Also important in herbal medicine is Asteraceae, including Grindelia, yarrow, and many more. Many family members are grown to their flowers as ornamental plants, and some are important ornamental crops for cut flower industry. *Chrysanthemum*, *Gerbera*, *Calendula*, *Dendranthema*, *Argyranthemum*, *Dahlia*, *Tagetes*, *Zinnia* and several others are some examples (Singh et al., 2015). Often widely used in medical and phytochemical journals are members of the Asteraceae family because the sesquiterpene lactone compounds found within them are an important cause of allergic contact dermatitis. The total global demand for botanical extracts and medicinal products was estimated at several hundred billion dollars in 2017 (Ahn, 2017). Allergy to these compounds is the leading cause of allergic contact dermatitis in US florists (Odom et al., 2000). Pollen from ragweed Ambrosia is one of the main causes of so-called hay fever in the US. Asteraceae are used for some industrial purposes, too. Marigold (*Tagetes patula*) is common in commercial poultry feeds, and extracts its oil for cola and cigarette use. Several family members are abundant nectar producers and are useful for assessing pollinator populations during their bloom. There are species with useful insecticidal properties in the genera *Chrysanthemum*, *Pulicaria*, *Tagetes*, and *Tanacetum*, A type of hypoallergenic latex is found in *Parthenium argentatum* (guayule) (Singh et al., 2015). Many of the species are detrimental weeds and poisonous plants that cause great economic loss to our field crops.

Similar Research in Bangladesh

Similar research was carried out in Bangladesh by Uddin et al. (2013), Tutul et al. (2010), Rahman and Alam (2013), Rahman and Uddin (1997), Rahman and Hassan (1995), Muniruzzaman et al. (2012), Hossain and Khan (1993), Islam et al. (2009), Khan and Huq (2001), Khan and Afza (1968), Khan and Banu (1972) and Khan and Hassan (1984). The present research was to record the diversity of Asteraceae in Paba Upazila of Rajshahi, Bangladesh.

MATERIALS AND METHODS

Study Area

Paba is an Upazila of Rajshahi District in the Division of Rajshahi, Bangladesh. Paba is located at 24.4417°N 88.6278°E. It has 40,000 households and a total area of 280.42 km^2. Paba Upazila is bounded by Mohanpur and Tanore Upazilas on the north, Puthia and Durgapur Upazila on the east, Bhagawangola II and Raninagar II CD Blocks, in Murshidabad district, West Bengal, India, across the Ganges (Padma), and Charghat Upazila, on the south, and Godagari Upazila on the west (Islam, 2012).

Research Methodology

Taxonomy and medicinal uses of the Asteraceae family in Paba Upazila of Rajshahi district, Bangladesh was carried out from November 2018 to October 2019. Plant parts with either flower or fruits collected using traditional herbarium techniques to make voucher specimens for documentation. Field identification of the collected specimens was confirmed comparing with herbarium specimens Rajshahi University Herbarium. In some cases, standard literature such as Hooker (1877), Prain (1903), and Ahmed et al. (2008) was consulted for identification purpose. For update nomenclature, Pasha and Uddin (2013) and Huq (1986) were also consulted. The specimens are deposited in the Herbarium, Department of Botany, and University of Rajshahi, Bangladesh for future reference.

Plant Identification

The collected specimens were identified by consulting different Floras and literatures. The major collected materials were identified and described up to species with the help of Hooker (1877); Prain (1903); Kirtikar and Basu (1987). For the current name and up to date nomenclature Huq (1986), Ahmed et al. (2008) and Pasha and Uddin (2013) were consulted.

Figure 1. Field observation and sample collection in the study area

Figure 2. Herbarium Sheet preparation in the Plant Taxonomy Laboratory

Figure 3. Interview with local people in the study area

RESULTS AND DISCUSSION

The present paper investigated the family Asteraceae growing throughout Paba Upazila of Rajshahi district, Bangladesh was carried out from November 2018 to October 2019. A total of 44 species under 35 genera of the family Asteraceae were collected and identified (Table 1). Out of 44 species, 25% species were very common, 43.18% was common, 25% was rare and 6.82% species was very rare in the study area (Figure 4). The recorded species is comparable with the results of other studies in Bangladesh. A total of 10 species was recorded in leafy vegetables of Bangladesh (Khatun et al., 2013). 9 species was documented in Lalmai Hills, Comilla, Bangladesh (Hossain et al., 2005). A total of 9 species was focused in Lawachara National Park (Uddin & Hassan, 2010). 7 species was recorded in Runctia Sal Forest, Bangladesh (Tutul et al., 2010). A total of 27 species was recorded in Sundarban Mangrove Forest of Bangladesh (Rahman et al., 2015). 13 species was documented in Teknaf Wildlife Sanctuary, Bangladesh (Uddin et al., 2013). A total of 27 species was recorded in Baraiyadhala National Park, Chittagong, Bangladesh (Harun-Ur-Rashid et al., 2018). 17 species was recorded in Rajkandi Reserve Forest of Moulvibazar, Bangladesh (Haque et al., 2018). A total of 7 species was recorded in Satchari National Park, Habiganj, Bangladesh (Arefin et al., 2011). No publish information recorded on the family Asteraceae in Paba Upazila of Rajshahi, Bangladesh.

Table 1. Species diversity of Asteraceae family in Paba upazila of Rajshahi district, Bangladesh

Scientific name	**Tribe name**	**Local name**	**Common name**	**Status of occurance**	**Flowering time**	**Voucher number**
Ageratum conyzoides L.	Eupatorieae	Ochunti	Billy Goat Weed	Very Common	Nov-Jun	FE 01
Aster laevis L.	Astereae	Aster	Smooth Aster	Common	Jan-Apr	FE 04
Blumea lacera (Burm.f.) DC.	Inuleae	Kuksung	Blumea	Common	Nov-Jul	FE 02
Blumea laciniata (Roxb.) DC.	Inuleae	Kuksung	Cutleaf False Oxtongue	Rare	Jan-Dec	FE 05
Blumea membranacea Wall. ex DC.	Inuleae	Kukur muta	Common Borage	Rare	Jan-Mar	FE 06
Blumea oxyodonta DC.	Inuleae	Kuksung	Spiny Leaved Blumea	Rare	Feb-May	FE 10
Caesulia axillaris Roxb.	Inuleae	Golphuli	Pink Node Flower	Common	Dec-Feb	FE 03
Calendula officinalis L.	Calenduleae	Calen dula	Pot Marigold	Common	Dec-Mar	FE 08
Callistephus chinensis Bailey	Astereae	Aster	China Aster	Common	Apr-Oct	FE 13
Chromolaena odorata (L.) King & Robin.	Eupatoreae	Jarman lata	Paraffin Weed	Rare	Nov-May	FE 11

Chrysanthemm coronarium L.	Anthemideae	Chandra mollika	Crown Daisy	Common	Dec-Mar	FE 12
Cirsium arvense (L.) Scop.	Cynareae	Shialkata	Canada Thistle	Very Common	Feb-Jun	FE 14
Cosmos bipinnatus Cav.	Coreopsideae	Cosmos	Garden Cosmos	Common	Dec-Feb	FE 09
Dahlia pinnata Cav.	Coreopsideae	Dalia	Dahlia	Common	Oct-Apr	FE 15
Eclipta alba (L.) Hassk.	Heliantheae	Kalo keshi	False Daisy	Very Common	Jan-Dec	FE 07
Elephantopus scaber L.	Vernonieae	Footchan dali	Elephant's Foot	Very Rare	Nov-Mar	FE 44
Emilia sonchifolia (L.) DC.	Senecioneae	Mechitra	Lilac Tassel flower	Rare	Jan-Dec	FE 18
Enhydra fluctuans Lour.	Heliantheae	Helencha	Buffalo Spinach	Rare	Jan-Apr	FE 16
Gazania rigens (L.) Gaertn	Arctotideae	Gazania	Gazania	Very Rare	Nov-Mar	FE 43
Gerbera aurantiaca Sch.-Bip.	Mutisieae	Gerbera	Barberton Daisy	Rare	Sep-Apr	FE 40
Gnaphalium luteo-album L.	Inuleae	Bara kamra	Weedy Cudweed	Common	Mar-Aug	FE 20
Gnaphalium polycaulon Pers.	Inuleae	Bara kamra	Many Stem Cudweed	Very Common	Dec-May	FE 22
Gnaphalium pulvinatum Del.	Inuleae	Bara kamra	Gnapha lium	Common	Feb-Mar	FE 21
Grangea maderaspatana (L.) Poir.	Astereae	Namuti	Madaras Carpet	Rare	Dec-May	FE 17
Helianthus annuus L.	Heliantheae	Surja mukhi	Sunflower	Very Common	Jan-Dec	FE 23
Hemistepta lyrata Bunge ex Fischer et Mem.	Cynareae	Not known	Lyrate Hemistepra	Very Rare	Feb-May	FE 25
Lactuca sativa L.	Cichorieae	Lettuce	Garden Lettuce	Common	Dec-Apr	FE 24
Launaea aspleniifolia DC.	Cichorieae	Tikchana	Titlia	Common	Jan-Dec	FE 26
Mikania cordata (Burm.f.) Robinson	Eupatorieae	Assam lata	Heart Leaf	Very Common	Oct-Feb	FE 29
Parthenium hysterophorus L.	Heliantheae	Gandi booti	Gajar Ghas	Very Common	Dec-Jan	FE 19
Sonchus asper	Cichorieae	Ban	Spiny	Common	Sep-Jun	FE 30

(L.) Hill.		palang	Sowthistle			
Sonchus wightianus DC.	Cichorieae	Ban palang	Wight's Sot-Thistle	Rare	Nov-Jun	FE 33
Spilanthes calva DC.	Heliantheae	Marha tatiga	Toothache plant	Very Common	Jan-Dec	FE 32
Synedrella nodiflora (L.) Gaertn.	Heliantheae	Gunjoni vutraj	Nodeweed	Very Common	Jan-Dec	FE 31
Tagetes patula L.	Tageteae	Genda	French Marigold	Common	Jan-Dec	FE 27
Tagetes erecta L.	Tageteae	Gadaphul	African Marigold	Common	Jan-Dec	FE 28
Tridax procumbens L.	Heliantheae	Tridhara	Coat Button	Very Common	Jan-Dec	FE 34
Vernonia cineria (L.) Less.	Vernonieae	Kuksim	Little Ironweed	Very Common	Jan-Dec	FE 35
Vernonia patula (Dryand.) Merr.	Vernonieae	Shial mutra	Vernonia	Rare	Sep-Mar	FE 42
Wedelia trilobata (L.) A.S. Hitchc.	Heliantheae	Keshraj	Creeping Daisy	Common	Feb-Aug	FE 38
Wedelia chinensis (Osbeck.) Merr.	Heliantheae	Mohavrin goraj	Trailing Dairy	Rare	Feb-Sep	FE 36
Xanthium indicum Koen. ex Roxb.	Heliantheae	Ghagra	Rough Cocklebur	Common	Jan-Dec	FE 39
Youngia japonica (L.) DC.	Cichorieae	Crepis	Oriental False Hawks beard	Common	Aug-Jan	FE 37
Zinnia pauciflora L.	Heliantheae	Zinnia	Zinnia	Common	Jun-Aug	FE 41

Jan = January, Feb = February, Mar = March, Apr = April, May = May, Jun = June , Jul = July, Aug = August, Sep = September, Oct = October, Nov = November, Dec = December

Medicinally Important Species

Forty (40) medicinal plants have been documented with their uses for the treatment of more than 59 diseases (Table 2). The result of this information showed that these local people of study area still depend on medicinal uses of plants for the treatment of burning sensation, diabetes, bronchitis, weakness, insects and snake bite, high blood pressure, asthma, passing of semen, gonorrhea, skin diseases, jaundice, headache, glandular swelling, diarrhea, acidity, dry cough, cancer, dysentery, scabies, menstrual disorder, tumors, catarrhal fever, chronic fever, malarial fever, toothache, stomachache, piles, epilepsy, gout, rheumatism, traumatic injury, abortion, vomiting, ulcer, anemia, ringworm, hiccup, pneumonia, gastritis, tuberculosis, arthritis, heart disease, abdominal hypertension, paralysis, constipation, baldness, sore, dyspepsia, chickenpox, pain, pyorrhea, eczema, cholera, scurvy, indigestion, whooping cough, digestive system disorders, liver disorders, intestinal worms, wound, lung infection, eye inflammation, boils,

mouth freshener, high cholesterol, hepatitis, hair fall, cough and many types of diseases. Plant parts as medicine were used shows variation. Leaf (63.63%) are the leading part used in a majority of medicinal plans followed by the stem (13.63%), root (45.45%), whole plant (47.72%), flower (25%), bark (2.27%), seed (2.27%) and fruit (2.27%) (Figure 5). This finding is comparable with the result of other studies in Bangladesh like Alam (1992), Alam et al. (1996), Chakma et al. (2003), Choudhury and Rahmatullah (2012), Roy et al. (2008), Faruque and Uddin (2014), Ghani (2003), Khan (1998), Uddin et al. (2006, 2008, 2012) and Yusuf et al. (2006, 2009).

Table 2. Medicinal plants are used by the local people in Paba Upazila of Rajshahi district, Bangladesh.

Scientific name	**Local name**	**Part(s) used**	**Ailments**
Ageratum conyzoides L.	Ochunti	Whole plant, leaf, stem, root	Skin disease, leprosy, sore, tonic, stomach disorder
Aster laevis L.	Aster	Leaf, root, stem	Epilepsy, colds, rheumatism, headache, nervous weakness, pain in stomach, dizziness, menstrual irregularities
Blumea lacera (Burm.f.) DC.	Kuksung	Leaf, root	Fevers, diuretic, bleeding piles, cholera, anthelmintic, astringent
Blumea laciniata (Roxb.) DC.	Kuksung	Whole plant, root	Blood disease, fever, burning sensation, bronchitis, antipyretic, thirst, disease of mouth
Blumea membranacea Wall. ex DC.	Kukurmuta	Leaf, root	Cancer, fungal and bacterial infections
Blumea oxyodonta DC.	Kuksung	Whole plant, leaf	Cut, wound, sore, skin disease, rheumatism
Caesulia axillaris Roxb.	Golphuli	Whole plant, leaf, root	Wound, cut, antilithic
Calendula officinalis L.	Calendula	Whole plant, flower	Wound, ulcers, injury, skin diseases, burning sensation
Callistephus chinensis Bailey	Aster	Root	Coughs, pulmonary disease, malaria, hemorrhages
Chromolaena odorata (L.) King & Robin.	Jarman lata	Whole plant, root, leaf	Diuretic, snake-bite, emetic, blood clotting
Chrysanthemm coronarium L.	Chandra mollika	Bark, flower, leaf, root	Inflammation, syphilis, skin disease, burning sensation, gonorrhea
Cirsium arvense (L.) Scop.	Shialkata	Leaf, stem, root	Antiscorbutic, scabies, eczema, paralysis
Cosmos bipinnatus Cav.	Cosmos	Leaf, stem	Skin disease, eczema, leprosy
Dahlia pinnata Cav.	Dalia	Flower, leaf	Skin disease, leprosy, boils, wound, tetanus
Eclipta alba (L.) Hassk.	Kalo keshi	Leaf, root, whole plant	Hair disease, skin disease, jaundice, wound, fever, toothache, asthma,

			glandular swellings, hemorrhages, blood purifier
Elephantopus scaber L.	Footchan dali	Root, leaf	Cardiac tonic, astringent, poultice
Enhydra fluctuans Lour.	Helencha	Leaf, whole plant	Inflammation, small pox, headache, ulcers, leucoderma, bronchitis, gonorrhea, biliousness
Gazania rigens (L.) Gaertn	Gazania	Whole plant	Earache, fungal and bacterial infections, sterility
Gnaphalium luteo-album L.	Bara kamra	Leaf	Astringent
Gnaphalium polycaulon Pers.	Barakamra	Whole plant	Astringent, vulnerary
Gnaphalium pulvinatum Del.	Bara kamra	Whole plant	Astringent, vulnerary
Grangea maderaspatana (L.) Poir.	Namuti	Whole plant, leaf	Cough, ovarian disorder, earache
Helianthus annuus L.	Surja mukhi	Flower, seed	Heart disease, skin disease, ulcers, anthelmintic, scabies, leprosy, fever, hysteria, asthma, bronchitis, biliousness, anemia, urinary discharges, burning sensation, snake and scorpion bite, pulmonary affections, cough, colds, bronchial laryngeal
Lactuca sativa L.	Lettuce	Whole plant, leaf	Purify the blood, stomachic, biliousness, burning sensation, headache, nasal disease, appetite, cough, bronchitis, itching, heart disease, asthma, diuretic, eye disorder, liver disease
Launaea aspleniifolia DC.	Tikchana	Root	Lactagogue
Mikania cordata (Burm.f.) Robinson	Assam lata	Whole plant, leaf	Wound, snake-bite, mutilation
Sonchus asper (L.) Hill.	Banpalang	Whole plant, root	Diuretic, jaundice, chronic fever, bitter, scabies
Sonchus wightianus DC.	Ban palang	Leaf, root, stem	Tonic
Spilanthes calva DC.	Marha tatiga	Flower, whole plant, leaf	Dental problem, sore throat, dysentery, childbirth, sexual problem
Synedrella nodiflora (L.) Gaertn.	Gunjoni vutraj	Whole plant, leaf, root	Boils, tetanus, wound, purulent ophthalmic

Tagetes patula L.	Genda	Flower, leaf	Piles, cut, wound, kidney problem, muscular pain, bitter, opthalmia, earache, boils
Tagetes erecta L.	Gadaphul	Leaf, flower	Wound, injury
Tridax procumbens L.	Tridhara	Whole plant, leaf, flower	Bleeding piles, muscular pain, opthalmia, kidney troubles, inflammation, carminative, stomachic, ulcers, blood purify, earache, astringent, skin disease, liver complaints, snake and scorpion bite, asthma
Vernonia cinerea (L.) Less.	Kuksim	Whole plant, root, flower	Cold, fevers, tonic, stomachic, astringent, bronchitis, asthma, sores, wound, leucoderma, perspiration, edema, conjunctivitis, sex power
Vernonia patula (Dryand.)Merr.	Shialmutra	Flower	Wounds, ulcers, dropsy
Wedelia trilobata (L.) A.S. Hitchc.	Keshraj	Whole plant, leaf, root	Hair disease, Jaundice, toothache, asthma, bronchitis, fever, hemorrhages, astringent, and blood problem
Wedelia chinensis (Osbeck.) Merr.	Moha vringoraj	Leaf	Tonic, alterative, alopecia, swelling of abdomen, cough, skin disease
Xanthium indicum Koen. ex Roxb.	Ghagra	Whole plant, leaf, stem, root, fruit	Cancer, ulcers, tonic, small pox, boils, diabetes, bitter, snake and scorpion bite, herpes, dysentery
Youngia japonica (L.) DC.	Crepis	Leaf, root	Wound, cut
Zinnia pauciflora L.	Zinnia	Leaf, stem	Skin disease, wound, leprosy, boils, tetanus

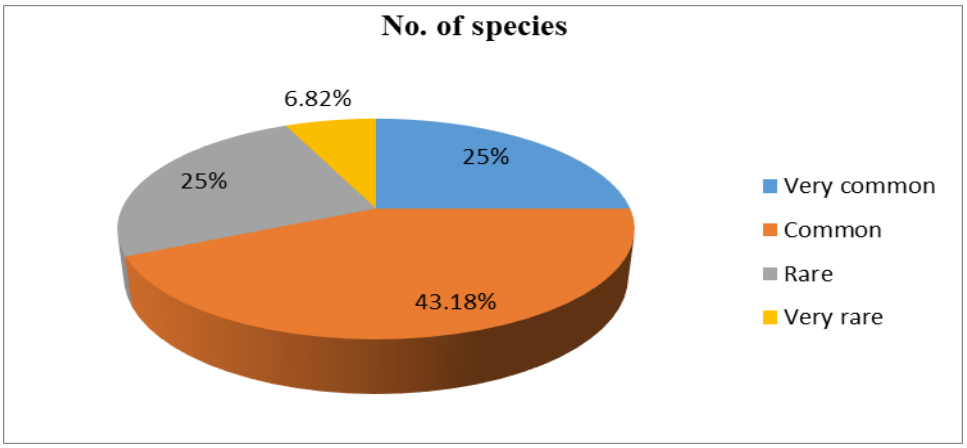

Figure 4. Recorded status of occurrence in the study area

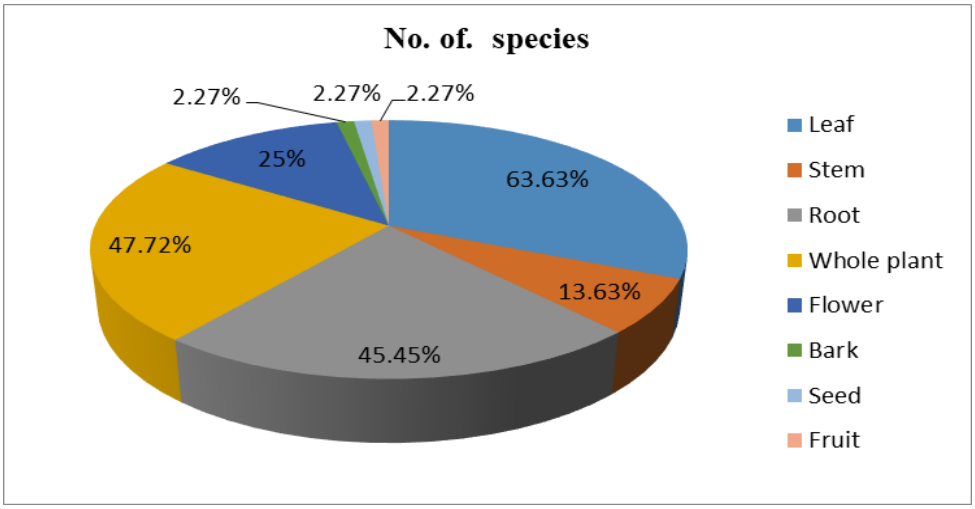

Figure 5. Recorded plant parts used as medicine

CONCLUSION

The present research focused on the family Asteraceae growing throughout the Paba Upazila of Rajshahi district, Bangladesh was carried out from November 2018 to October 2019. A total of 44 species under 35 genera of the family Asteraceae were collected and identified. Forty (40) medicinal plants have been documented with their uses for the treatment of more than 59 diseases. The present research documented that the study area has a rich diversity of Asteraceae species using for different diseases. The conservation status shows that some Asteraceae species of the study area is going to be extinct due to environmental factors. This research aims to bring awareness among the local people, save this indigenous knowledge and protect these threatened species, for the next generation.

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Conflict of Interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are presented in this paper.

Peer-review

External peer-review was done through double-blind method.

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