



DIVERSITY OF MEMBERS OF POLYGONACEAE FROM WEST BENGAL, INDIA

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Abstract

Polygonaceae is an economically important angiospermic plant family and mostly distributed in moist areas of plains and hilly areas. Present study recorded the occurrence of 36 taxa representing 9 genera of Polygonaceae growing in wild, home gardens, roadsides and cultivated areas from different parts of West Bengal. Among the recorded taxa, 22 species have medicinal values, 10 species are edible, and 4 ornamental.

Key words : Polygonaceae; diversity; distribution; uses; West Bengal; India.

Introduction

Polygonaceae are known informally as the knotweed family or smartweed- buckwheat family and the type genus is *Polygonum*, first coined by Antoine Laurent de Jussieu in 1789 in his book, *Genera Plantarum*. Due to presence of many swollen nodes on stem, the family name has derived as Greek words *poly* means many and *goni* means knee or joint. The family comprises about 1200 species of 56 genera distributed globally and in India, a good number species are distributed mainly in the Ganga-Brahmaputra Plains, Himalayas and sub-Himalayan moist areas. Polygonaceae is a very complex family with exceptionally diverse morphological variation and habit ranges (annual or perennial herbs, shrubs to lianas and trees) species level identification is quite perplexing. The most idiosyncratic and highly variable attribute of the family is presence of swollen nodes on stems, presence of membranous or hyaline sheath uniting the stipules forming ochrea. Polygonaceae is characterized by its alternate simple leaves mostly with ochreate stipules, flowers with free tepals and stamens, trigonus ovary with sub terminal styles, nuts trigonus and shiny etc which have been found to be widely debated. Ultimately, the two subfamilies Polygonoideae and Eriogonoideae have been universally accepted based on existence of ochrea (Choudhury *et al.*, 2012). From time

to time different workers have shown their curiosity in Polygonaceae in terms of diversity, ethnic uses, taxonomy, floral morphology, nutrition, pharmacology, medicine, pollen morphology, foliar trichomes and stomata, stipule character, genetics, cytology, molecular systematic and phylogeny of different members of the family (Ayodele and Olowokudejo 2006; Yasmin *et al.*, 2010; Sanchez *et al.*, 2009). The members of the family were highly valued for their curative uses for treatment of various ailments as folk medicine in different part of India by various racial communities.

Materials and Methods

Study area

The State of West Bengal lies between 21°45' – 27° 16' N latitude and 85°55' – 89° 56' E longitude, covering the total geographical area of about 88,752 sq km. It is bounded on the North by Sikkim and Bhutan, on the East by Assam and Bangladesh, on the South by Bay of Bengal on the West by Bihar, Jharkhand and Orissa and on the North West by Nepal. The land of West Bengal is consists of various types of topography including high altitude Himalayan ranges from North, sub -Himalayan Terai, Duars, Central Bengal is part of great Gangetic plains and Southern and Western plateau, and salt water great Gangetic estuarine and coastal areas of Southern Bengal. The area is basically located in sub-tropical region

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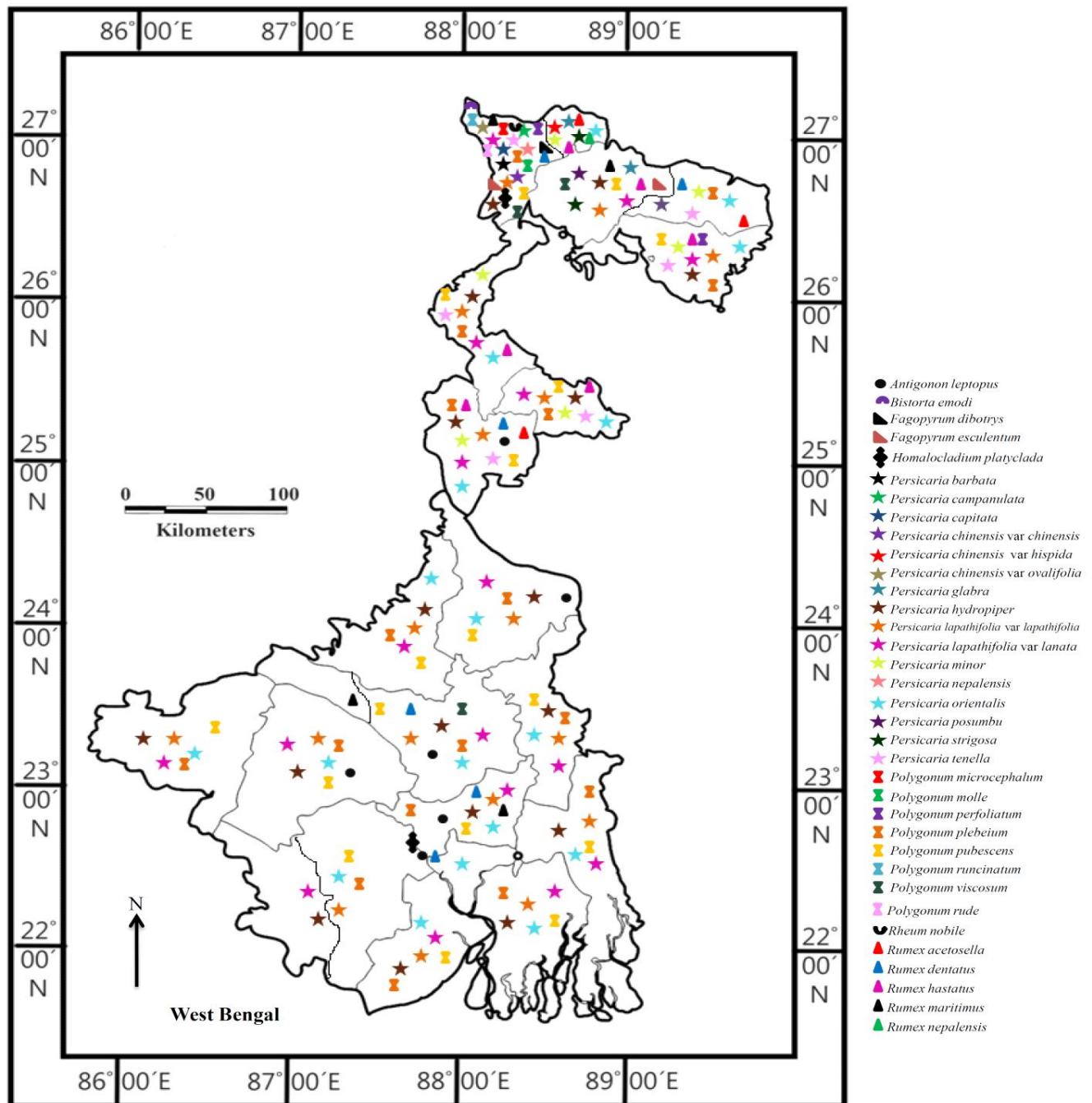


Fig. 1: Distribution of different taxa of Polygonaceae in the different parts of West Bengal.

and facing the heavier rainfall during summer and monsoon seasons and three pre-dominant seasons namely pre-monsoon, monsoon and post-monsoon are quite prominently recognizable. The pre-monsoon starts from the 1st week of February and extended up to the middle of May whereas, monsoon starts from the last week of May and extended up to end of September. The post-monsoon season begins from the 3rd week of November and extended up to last week of January. November to February is recorded as the driest months of the year. The temperature of this region fluctuates from 48°C during

summer to about 1°C in winter.

Methodology

During 2015 – 2018 extensive field exploration were undertaken for the documentation of various species of Polygonaceae available in different habitats of West Bengal (Fig. 1). Plant specimens were collected at their vegetative, flowering and fruiting stages and were processed and mounted on standard herbarium sheets following conventional herbarium techniques (Jain & Rao 1977; Chowdhury, 2009). The processed plant specimens

Table 1: Species diversity of Polygonaceae in West Bengal [Abbreviation used C= Climber; H= Herb; S= Shrub; P= Perennial; A= Annual; Co=Common; Ab= Abundant; VF= Very Few; F=Few].

Taxa	Habit	Life Span	Fl. & Fr. period	Status	Distribution	Ethnic uses
<i>Antigonon leptopus</i> Hooker & Arnott [NBU-9861]	C	P	July – Nov.	Co	Malda, Mursidabad, Bankura, Burdwan, Hoogly, Howrah (recently naturalized); India, West Indies, Africa, N, C & S America, Native to Mexico, Australia	Ornamental
<i>Bistorta emodi</i> (Meisn.) H. Hara [NBU-7635]	H	P	July – Sept.	F	Darjeeling; India (Sikkim, Kashmir, Himachal Pradesh, Uttarakhand), Bhutan, W China	-
<i>Fagopyrum dibotrys</i> (D. Don) Hara [NBU-9858]	H	P	June – Sept.	Ab	Temperate forest of Darjeeling; India, Nepal, Bhutan, China, Tibet, Vietnam, Myanmar	Seeds, leaves used for treatment of colic, choleric diarrhea and abdominal blockage troubles; young leaves used as vegetable
<i>Fagopyrum esculentum</i> Moench [NBU-5657]	H	A	May – Oct.	Co	Darjeeling, Kalimpong, Jalpaiguri; India (Sikkim, Himachal Pradesh, Jammu & Kashmir), Pakistan, Iran, China, Tibet, S Europe, N America	Leaves used as vegetable
<i>Fallopia convolvulus</i> (Linnaeus) A. Love [NBU-7825]	H	A	May –Sept.	VF	Darjeeling; India, Nepal, Bhutan, Pakistan, Afghanistan, Kazakhstan, Mongolia, Korea, Japan, Russia, Europe, introduced in N America	Seeds are used as nutritious food
<i>Homalocladium platycladum</i> (F. Mueller) L. H. Bailey	S	P	Feb. – May	F	Darjeeling, Howrah (cultivated); India, Australia, Pacific Islands (New Zealand), America	Entire plants are used for the treatment of anthracias, sores, snake bite, insect bite
<i>Persicaria barbata</i> (Linnaeus) H. Hara [NBU-10314]	H	P	Aug. – Oct.	Co	Moist areas of W. Bengal; India, Nepal, Bhutan, Pakistan, Sri Lanka, Myanmar, Thailand, Vietnam, Malaysia, Indonesia, New Guinea, Philippines, China	Watery sap from roots used as antiseptic
<i>Persicaria campulata</i> (Hooker f.) Ronse Deane [NBU-10312]	H	P	July – Aug.	F	Hilly slopes of Darjeeling (Meghma, Tumling upto Sandakphu); India (Sikkim), Nepal, Bhutan, Myanmar	Ornamental
<i>Persicaria capitata</i> (Buchanan-Hamilton ex D. Don) H. Gross [NBU-7829]	H	P	July – Sept.	Co	Darjeeling (Kurseong, Meghma), Kalimpong; India (Arunachal Pradesh, Meghalaya, Sikkim), Nepal, Bhutan, Sri Lanka, Myanmar, Thailand, Vietnam, Malaysia	Ornamental, whole plant extract used as antidote in snakebite and insect sting
<i>Persicaria chinensis</i> (Linnaeus) H. Gross var <i>chinensis</i> [NBU-10162]	S	P	Mar. – Sept.	Ab	Darjeeling, Kalimpong (Mirik), Jalpaiguri, Alipurduar; India, Nepal, Bhutan, introduced in Pakistan, Sri Lanka, China, Japan, Myanmar, Philippines, Vietnam	Root used for fluxes, anthelmintic and neutralizes scorpion poisoning
<i>Persicaria chinensis</i> (Linnaeus) H. Gross	H	P	Aug. – Nov.	VF	Kalimpong (New Distributional Record); India (Khasi Hills of	-

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Taxa	Habit	Life Span	Fl. & Fr. period	Status	Distribution	Ethnic uses
<i>var hispida</i> Kanta- chot [NBU-10317]					Meghalaya, Kohima of Nagaland) Myanmar, Thailand, China	
<i>Persicaria chinensis</i> (Linnaeus) H. Gross <i>var ovalifolia</i> (Linnaeus) H. Gross [NBU-10313]	H	P	July – Nov.	VF	Darjeeling (Kurseong); India, S Japan, Malaysia, Myanmar, Nepal, Thailand	
<i>Persicaria glabra</i> (Willdenow) M. Gómes [NBU-10334]	H	P	Mar. – Sept.	Co	Darjeeling, Kalimpong (Mirik), Jalpaiguri, Alipurduar; India, Bhutan, Bangladesh, Sri Lanka, Myanmar, Philippines, Thailand, Vietnam; Africa, Australia, N & S America, Pacific Islands	Plant juice and rootstock used in pneumonia, jaundice, fevers. Leaves are antispas- modic and are used for colic
<i>Persicaria hydropi- per</i> (Linnaeus) Spach [NBU-10332]	H	A	April – Oct.	Ab	Throughout marshy lands of W. Bengal; India, Pakistan, Japan, Temperate Asia, N & W Africa, N America, Europe.	Seeds, leaves used for treatment of arthritis, bladder stone, cholera
<i>Persicaria lapathi- folia</i> (Linnaeus) S. F. Gray <i>var. lapathifolia</i> [NBU-10331]	H	A	Mar – Sept.	Ab	Throughout marshy lands of W. Bengal; India, Pakistan, Temperate Asia, Japan, N & W Africa, N America, Europe.	Decoctions from root used as cathartic and emetic drug
<i>Persicaria lapathi- folia</i> (Linnaeus) Del- arbre <i>var. lanata</i> (Roxb.) H.Hara [NBU-10324]	H	A	Mar. – Nov.	Co	Throughout marshy lands of W. Bengal; India, Pakistan, China, Temperate Asia, Japan, N America, Europe	-
<i>Persicaria minor</i> (Hudson) Opiz [NBU -10190]	H	A	April – Aug.	Co	Throughout marshy lands of North Bengal; India (Kerala), Malaysia, Thailand, Vietnam, Indonesia Australia	Young shoot and leaves are edible; Decoctions from leaves has been used in Young shoot and leaves are post-natal tonics and for treatment of digestion oil has been used for aromatherapy and in treatments for dandruff
<i>Persicaria nepalensis</i> (Meissner) H. Gross [NBU-10311]	H	A	June – Sept.	Co	Darjeeling (Kurseong upto Meghma), Kalimpong; India (Arunachal Pradesh, Meghalaya, Kashmir to Sikkim,), Pakistan, Afghanistan, Nepal, Bhutan, China, Japan, Malaysia, Thailand, Indonesia, Philippines, Korea, Russia, New Guinea, Tropical Africa,	Whole plant extract used in the treatment of swelling
<i>Persicaria orientalis</i> (Linnaeus) Spach [NBU-7824]	H	A	May – Sept.	Ab	Throughout moist areas of West Bengal; India, China, Japan, Korea Malaysia, Thailand, Indonesia, Philippines	Ornamental; nuts are used in tuberculous swellings and flatulence; decoction of the ripe fruits is used in the Ornamental; nuts are used in treatment of hepatitis, sloughing ulcers, tympanites and cancer

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Taxa	Habit	Life Span	Fl. & Fr. period	Status	Distribution	Ethnic uses
<i>Persicaria posumbu</i> (Buchanon-Hamilton ex D. Don) H. Gross [NBU-10187]	H	P	May – Oct.	Co	Marshy areas of Jalpaiguri; India (Assam, Arunachal Pradesh, Meghalaya, Manipur, Nagaland, Sikkim), Nepal, Bhutan, China, Bangladesh, Malaysia	Decoction is used in the treatment of dysentery, enteritis, boils and abscesses; aromatic leaves are added to other vegetables for flavor
<i>Persicaria strigosa</i> (R. Brown) Nakai [NBU-9870]	H	A	May – Oct.	Co	Darjeeling (Kurseong), Marshy areas of Jalpaiguri; India, Nepal, Bhutan, Bangladesh, Myanmar, Malaysia, Thailand, Indonesia, Vietnam, Australia, New Guinea	Tender roasted shoots are used for the dysentery of cattles
<i>Persicaria tenella</i> (Blume) Hara [NBU-5816]	H	A	Mar. – Sept.	Ab	Throughout the moist lands of North Bengal plains; India (Himachal Pradesh, Jammu & Kashmir, NE India specially Assam, Manipur, Meghalaya, Sikkim, Uttarakhand, Tamilnadu) Pakistan, Nepal, China, Japan, Bangladesh, Myanmar, Malaysia, Europe	-
<i>Polygonum microcephalum</i> D. Don [NBU-10320]	H	P	April – Oct.	VF	Temperate hilly areas of Darjeeling, Kalimpong; India (Assam, Meghalaya, Nagaland, Sikkim), Nepal, Bhutan, China, Bangladesh	Young shoot and seeds are used as vegetable and condiment respectively
<i>Polygonum molle</i> D. Don [NBU-10329]	S	A	Aug. – Nov.	Ab	Throughout the temperate hilly areas of Darjeeling (Kurseong, Tumling, Meghma upto Sandakphu), Kalimpong; India (Arunachal Pradesh, Sikkim), Nepal, Bhutan, N Myanmar, Thailand, Indonesia	The whole plant used as astringent; young shoot, leaves and seeds are edible
<i>Polygonum perfoliatum</i> Linnaeus [NBU-10359]	H	A	June – Oct.	VF	Darjeeling Himalaya, Coochbeher; Nepal, Bhutan, India (Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Sikkim, Uttara-khand), China, Japan, Korea, Bangladesh, Vietnam, Malaysia, Thailand, Indonesia, Philippines, New Guinea, Russia, N. America	Tender leaves, shoots and fruit are edible; whole plant is depurative, diuretic, febrifuge and also used to stimulate blood circulation; decoction is used in the treatment of dysentery enteritis, boils and abscesses, poisonous snake bites, haematuria, cloudy urine and traumatic injuries
<i>Polygonum plebeium</i> R. Brown [NBU-5615]	H	A	May – Aug.	Co	Throughout the plains of West Bengal; India, Kazakhstan, Nepal, Myanmar, Philippines, Indonesia, Thailand, Russia, Japan, N Africa, Australia, Europe (introduced)	Leaves used for the treatment of pneumonia and young leaves are used as vegetable; roots are used in treatment of baldness

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Taxa	Habit	Life Span	Fl. & Fr. period	Status	Distribution	Ethnic uses
<i>Polygonum pubescens</i> Blume [NBU – 10330]	H	A	Aug. – Nov.	F	Throughout moist areas of West Bengal; India, Bhutan, Indonesia, Japan, Korea	Leaves and seeds are edible; of the plant, combined with onion, is used as a styptic; bruised plant is applied locally to blistered and swollen feet
<i>Polygonum rude</i> Meissner [NBU – 10582]	S	P	Aug. – Nov.	VF	Darjeeling (Sandakphu); India, Nepal, Bhutan. N. Myanmar, Thailand	-
<i>Polygonum runcinatum</i> Buchanan-Hamilton ex D. Don [NBU – 10326]	H	P	July – Sept.	Co	Temperate parts of Darjeeling (Kurseong, Mirik), Kalimpong; India (Assam, Jammu & Kashmir, Nagaland, Sikkim, Tamilnadu), Nepal, Myanmar, Malaysia, Philippines, Thailand, Indonesia (Sumatra)	Leaves are edible
<i>Polygonum viscosum</i> Buchanan-Hamilton ex D. Don [NBU – 10319]	H	A	July – Oct.	Co	Moist areas of plains of Darjeeling, Jalpaiguri, Burdwan, India, Nepal, Japan, Korea, Russia	Aerial parts have antiHIV1, anticholinergic, analgesic and CNS depressant activities and significant cytotoxicity against the ovarian cancer cell line
<i>Rheum nobile</i> Hooker & Thomson [NBU – 10347]	H	P	June – Sept.	VF	Darjeeling; India (Sikkim), Afghanistan, Bhutan, China, Myanmar, Nepal, Pakistan	Young stems are used for salads; flowering stem used in the treatment of swellings and fullness of the abdomen; dried leaves used as a substitute for tobacco; root extract used as antiemetic, astringent, carminative, depurative, diuretic, laxative
<i>Rumex acetosella</i> Linnaeus [NBU – 10161]	H	P	Jan. – April	Co	Darjeeling, Jalpaiguri, Malda; India, Kazakhstan, China, Japan, Korea, Mongolia, Russia, Europe, North America.	Leaves used as vegetable
<i>Rumex dentatus</i> Linnaeus [NBU – 7018]	H	A	May – Aug.	VF	Darjeeling, Jalpaiguri, Malda, Burdwan, Howrah, Hoogly; India (Jammu & Kashmir to Sikkim), Afghanistan, Kazakhstan, Nepal, Russia, N Africa, S.E. Europe	Root extract used as an astringent and dye
<i>Rumex hastatus</i> D. Don [NBU – 7021]	S	P	June – Oct.	F	North Bengal; India (Kashmir, Uttarakhand, Chandigarh, Himachal Pradesh), Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Europe	Leaf extract applied on wounds and cuts to check bleeding and for nettle sting; root is laxative and anti rheumatic and also be used in skin disease
<i>Rumex maritimus</i> Linnaeus [NBU – 7020]	H	A	May – July	Co	Darjeeling, Jalpaiguri, Burdwan, Howrah; India, Kazakhstan, Myanmar, Mongolia, Russia, Europe, N America	Leaves are applied externally to burns; leaves and seed extract are also used as aphrodisiac, astringent and carminative

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Taxa	Habit	Life Span	Fl. & Fr. period	Status	Distribution	Ethnic uses
<i>Rumex nepalensis</i> Sprengel [NBU – 10165]	H	P	Sept.– Mar.	Co	Darjeeling (Kurseong, Meghma, Tumling), Kalimpong; India, SW Asia, Pakistan, Afghanistan, Tajikistan, Nepal, Bhutan, Myanmar, Indonesia, Japan (introduced), Vietnam.	Leaves used for treatment of colic, headache and body pain

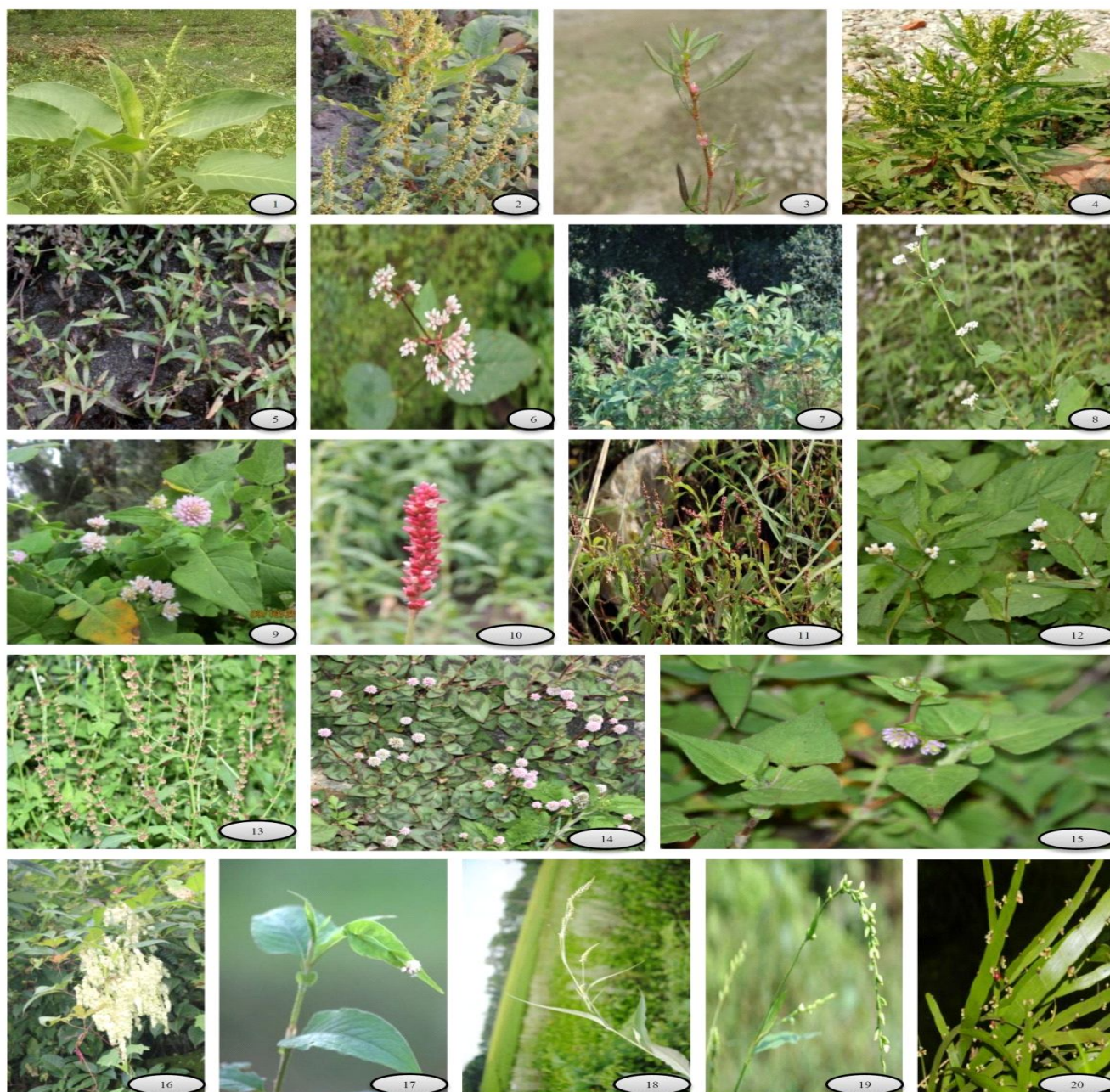


Fig. 2: Different taxa of Polygonaceae in their natural habitat 1. *Persicaria orientalis* 2. *Rumex dentatus* 3. *Polygonum plebeium* 4. *Rumex maritimus* 5. *Persicaria tenella* 6. *Persicaria campanulata* 7. *Polygonum molle* 8. *Fagopyrum debotrys* 9. *Persicaria runcinatum* 10. *Polygonum viscosum* 11. *Persicaria barbata* 12. *Persicaria chinensis* var *chinensis* 13. *Rumex nepalensis* 14. *Persicaria capitata* 15. *Persicaria nepalensis* 16. *Fallopia convolvulus* 17. *Persicaria chinensis* var *hispida* 18. *Persicaria lapathifolia* var *lanata* 19. *Persicaria hydropiper* 20. *Homalocladium platyclada*.

were identified using the relevant taxonomic literatures (Hooker 1886; Prain 1908; Grierson & Long 1983) and by matching with the reliable specimens housed in various herbaria (CAL, NBU, ASSAM). Identified specimens were deposited into NBU Herbarium with accession number. Vernacular names and status of different species were documented during field work from the local people and some of the information was noted down from available literature (Watt and Breyer-Brandwijk 1962; Szczawinski and Hardy 1972; Liu *et al.*, 1981; Agarwal 1997; Qaiser 2001; Ghosh *et al.*, 2003; Khatun *et al.*, 2015; Keya *et al.*, 2017).

Results

A Total of thirty six taxa of Polygonaceae (Fig. 2) were collected from different moist and temperate habitats of West Bengal. All the recorded species were tabulated (Table 1) alphabetically accompanied by habit, life span, flowering and fruiting time, availability status, bio-geography and ethnic uses.

Table 2: Number of taxa of Polygonaceae reported by different workers.

Taxa	Prain, 1903	Maiti, 1985	Srivastava, 2014	Present work, 2019
Genus	3	8	4	9
Species	25	28	25	36
Sub-Species	4	5	2	5

Discussion

According to earlier available literature (Maiti, 1985; Prain 1903; Srivastava 2014) it was revealed that among the recorded 36 taxa, only 28 species of Polygonaceae were reported earlier from the study area (Table 2). The distribution of *Persicaria chinensis* var *hispida* was earlier known only from Myanmar, Thailand, China and North east India and is endemic to South-east Asia, present work recorded from Durpin (Kalimpong) of Darjeeling Himalaya (Paul & Chowdhury, 2016). The members of the Polygonaceae are highly valued for their medicinal properties. The Genus *Polygonum* is growing as weed in various habitats and it has several economical and ecological importances. Some species of Polygonaceae were extensively used in traditional medicine system among the various ethnic groups in India. *Polygonum aviculare* Linnaeus is an accepted plant in international pharmaceutical market, sold in German drug stores as Homeriana Tea; it contains 2 – 2.5% sugar, traces of essential oil, tannin, resin and wax (Bamber, 1916). In China, *Fagopyrum dibotrys* (D. Don) Hara was used for the treatment of lung diseases, including lung tumor (Liu *et al.*, 1981). There are large numbers

of ornamental plants in Polygonaceae. However, from West Bengal only four species are used as ornamentals namely *Antigonon leptopus*, *Coccoloba uvifera*, *Persicaria capitata*, *Persicaria orientalis*. Young leaves of *Fagopyrum dibotrys*, *Fagopyrum esculentum*, *Fagopyrum tartaricum*, *Rumex acetosella*, young shoot of *Rumex hastatus*, and rhizome of *Bistorta amplexicaulis* have extensive local market value. Further study focused on cultural, medicinal and commercial aspects of Polygonaceae are required to unveil valuable bio resource.

Conclusion

Present study concludes that Polygonaceae is the most diversified family. Most of the members of this family are confined to Himalayan regions, so the study area occupies the prominent position regarding their diversity. But rapid urbanization, over population and drastic climate change alter the natural habitats of many important species such as *Rheum nobile*, *Bistorta emodi*, *Persicaria campanulata* etc. Extensive collection of useful roots, fruits, seeds etc. from plants effects the natural regeneration of population of the species. On the other hand the indigenous knowledge especially the uses of the herbal drugs are in threat due to modernization of the society and loss of interest among the young generation of ethnic and rural peoples about the traditional healing methods. It is, therefore, an urgent need to protect the plants to save the diversity of Polygonaceae as well as the ethnic culture of the district.

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