DISCOVERY

Diversity of weed flora of eight selected crop fields in Joypurhat district of Bangladesh

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ABSTRACT

From October 2021 to September 2022, weed flora variation was studied in eight selected crop fields in the Joypurhat district of Bangladesh. These fields included rice, wheat, potato, maize, brinjal, chili, black gram and sugarcane. There was a total of 77 weed species that belonged to 27 families were recorded and described below 53 genera. Asteraceae accounted for 20.78%, Amaranthaceae for 6.49%, Poaceae for 15.58%, Euphorbiaceae for 6.49%, Cyperaceae for 3.89%, Marsileaceae for 6.49% and Solanaceae for 3.89% of the influential families. Among the species that were found *Anagalis arvensis, Euphorbia helioscopia, Glinus oppositifolia, Senna tora* and *Ludwigia perennis* were all listed as rare species. The survey found the most species in sugarcane fields (94.80%), followed by wheat fields (84.42 %), maize fields (81.81%), brinjal fields (77.92 %), chili fields (68.83 %), potato fields (64.96 %), rice fields (46.75%) and black gram fields (45.45 %). Monocot species had less influence than dicot species. Scientific name, local name, flowering time and family name were recorded of each species.

Keywords: Weed diversity, crop fields, Joypurhat district, Bangladesh

1. INTRODUCTION

A weed is generally considered to be a plant that grows where it is not wanted. A better Definition would be a weed plant that can invade natural ecosystems or cultivated or disturbed land. Many weeds are annuals with short life spans. That usually makes use of temporarily bare soil to produce another generation of seeds before slower growth covers the soil again. The opportunities for substitutes have significantly increased since agriculture began, which exposes large areas of plowed soil annually. A botanist finds the weed fascinating for several reasons. There are some benefits to weeds that overgrow in the field and are neglected. The majority of weeds have deeper root systems that protect the soil from water and wind stream erosion and support it. In fact, when a plant dies, its entire body is mixed with soil and humus, increasing soil fertility.

Several other plants that fix nitrogen grow like weeds in the field and produce bacterial cysts in their root systems, which hold valuable atmospheric nitrogen for plants. Forage can be obtained from many of the weeds. Some weeds are grown as vegetables by farmers, while others are used as medicine to treat a variety of illnesses by locals. As a result, the weeds have a significant impact on the growth of cultivated plants. Naturally, they expand rapidly and are more resistant.

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Because of their more intricate root systems and less fertile soil, these can consume more nutrients. Any plant that needs to be controlled in some way to lessen its impact on the economy, the environment, human health and public amenities is considered a weed. Weedy species can reproduce rapidly, spread widely, live in a variety of environments, establish communities in unusual locations, survive in disturbed environments and resist elimination once established. Ruderal adaptations are present in numerous weed groups. Put another way: Degraded habitats are areas where the land or regular properties of the soil have been damaged or are frequently damaged. These disruptions give the weeds clear advantages over valuable crops, pastures, or native plants. The weed species that prevail will be influenced or even determined by the structure of the environment and its disruptions (Graham, 2005).

Species that have adapted to natural disturbed habitats like upland and other windblown regions with varying lands, sedimentary floodplains, water bodies and deltas and regularly incinerated areas are examples of these ruderal or forerunner species (Lamber, 2008). Some plants are essentially pre-adapted to emerge and propagate in locations that are disturbed by humans, such as farm areas, gardens, roadsides and industrial sites, because modern farming practices also imitate these natural ecosystems where weedy plants have formed. These genus often have a weedy appearance, which makes them better than the more popular crop plants because they often grow quickly, reproduce quickly and either have seeds that stay in the soil for a long time or have a limited lifespan during the same planting season with subsequent generations. In contrast, perennial plants either have submerged branches that grow below the surface of the land or have spreading branches that root and grow across the ground, like ground ivy (*Glechoma hederacea*).

Angiospermic flora was carried out in Bangladesh by Zahra and Rahman, (2018), Uddin and Hassan, (2010), Uddin et al., (2013), Uddin et al., (2014), Sultana and Rahman, (2016), Sarker and Rahman, (2016, 2017, 2019), Roy and Rahman, (2018), Rahman et al., (2014), Rahman et al., (2007a, 2007b), Rahman et al., (2008), Rahman, (2021), Debnath and Rahman, (2017), Rahman and Khatun, (2020), Khatun and Rahman, (2018), Rahman and Mamun, (2017), Islam and Rahman, (2017), Rahman, (2017), Nahar and Rahman, (2016a, 2016b), Roy et al., (2016), Ismail and Rahman, (2016), Rahman and Jamila, (2015), Rahman and Jamila, (2016), Rahman et al., (2015a), Rahman et al., (2015b), Rahman et al., (2015c), Rahman and Mahfuza, (2015), Rahman and Parvin, (2015), Rahman and Gulshana, (2014), Rahman and Rahman, (2014), Rahman et al., (2014a), Rahman et al., (2014c), Rahman and Rojonogondha, (2014), Rahman and Keya, (2014), Kona and Rahman, (2015), Keya and Rahman, (2017), Rahman and Akter, (2013). The aim of the present research was to explore and assesses the diversity of weed flora in Joypurhat district of Bangladesh.

2. MATERIALS AND METHODS

Study area

Joypurhat Zila is a district in the northern part of Bangladesh. It is one of the 8 districts of Rajshahi Division. Joypurhat is a district of Tropical climate. In winter there is much more rainfall in Joypurhat than in summer. The average annual temperature in here is 25.4 °C and the average annual rainfall is 1738 mm. The driest month is December with 3 mm. Most precipitation falls in July, with an average of 364 mm. The warmest month of the year is August with an average temperature of 28.9 °C. In January, the average temperature is 18 °C. It is the lowest average temperature of the whole year (BPC, 2001).

Methodology

The work is based on fresh materials collected during twenty-two visits to Joypurhat, Bangladesh from October 2021 to September 2022 to cover the seasonal variations. The visits covered eight crop fields in the study area. Plant parts with either flowers or fruits were collected using traditional herbarium techniques to make voucher specimens for documentation.

Identification

Collected angiospermic plant species were authentically identified with the help of various journals (Hooker, 1877), (Prain, 1903) and (Ahmed et al., 2008-2009). For the current name and up-to-date nomenclature Huq, (1986) and Pasha and Uddin, (2013) were also consulted.

3. RESULTS

According to this analysis, weed species diversity in eight selected crop fields, including rice, wheat, potato, maize, brinjal, black gram, chili and sugarcane fields were identified in the Joypurhat district of Bangladesh, comprising 77 species below 60 genera and 27 families. Asteraceae (20.78%), Poaceae (15.58%), Amaranthaceae (6.49%), Euphorbiaceae (6.49%), Marsileaceae (6.49%), Cyperaceae (3.89 %) and Solanaceae (3.89 %) were dominant families with a high diversity of species (Figure 3). Distribution within

families of weed species indicates variability. Asteraceae is represented by 16 species. Amaranthaceae is represented by 5 species, Poaceae 12 species, Euphorbiaceae 5 species, maesileaceae 5 species, Cyperaceae and Solanaceae are represented by 3 species. Cyperaceae and Solanaceae are represented by 3 species in each. Nyctaginaceae, Cucurbitaceae, Fabaceae, Commelinaceae, Phyllanthaceae, Araceae, Convolvulaceae, Lamiaceae and Onagraceac are represented by 2 species. A single species in each was recorded by 12 families (Table 1). The survey recorded maximum 94.80% species in Sugarcane field followed by wheat field (84.42 % species), maize field (81.81% species), Brinjal field (77.22% species), chili field (70.13% specie), potato field (61.03% species), rice fields (46.75% species) and Black gram field (45.45% species (Figure 4). Monocot species were less influential than dicot species. Monocotyledons (22.08%) and Dicotyledons (77.92%) species were recorded (Table 1).

Table 1 Total number of monocotyledons and dicotyledons weed species and their percentage.

Categories	Monocotyledons	Percentage	Dicotyledons	Percentage	Total
Number of families	5	18.52%	22	81.48%	27
Number of genera	14	23.33%	46	76.67%	60
Weed Species	17	22.08%	60	77.92%	77

Ageratum conyzoides, Chenopodium album, Cynodon dactylon, Euphorbia hirta, Marsilea, Cyanotis axillaris, Leptochloa chinensis,Cyperus michelianus, Paspalum distichum, Digitaria sanguinalis, Centella asiatica, Cynodon dactylon, Eleusine indica, Wedelia chinensis were dominant weed species in eight selected crop fields. In this research fields, 24 weed species were native species (31.17%) and 53 weed species were alien (exotic) species (68.83%) also recorded (Table 2).

Table 2 Total number of Native and Alien weeds species and their percentage.

Categories	No. of Species	Percentage (%)
Native weed species	24	31.17%
Alien weed species	53	68.83%
Total	77	100%

Table 3 The families of the plant species recorded.

No.	Family Name	Species of each Family
01	Amaranthaceae	5
02	Asteraceae	16
03	Peperaceae	1
04	Apiaceae.	1
05	Araceae	2
06	Boraginaceae	1
07	Chenopodiaceae	1
08	Cucurbitaceae	2
09	Commelinaceae	2
10	Cyperaceae	3
11	Convolvulaceae	2
12	Euphorbiaceae	5
13	Fabaceae	2
14	Verbanaceae	1
15	Lamiaceae	2
16	Marsileaceae	5
17	Molluginaceae	1
18	Nyctaginaceae	2
19	Onagraceae	1

20	Polygonaceae	2
21	Poaceae	12
22	Caesalpinaceae	1
23	Urticaceae	1
24	Solanaceae	3
25	Malvaceae	1
26	Menispermaceae	1
27	Phyllanthaceae	2
		Total = 77

Table 4 Angiosperm weeds diversity in eight crop fields of Joypurhat district

Sl No	Scientific name	Family	Local name	Crop Fields							
				Rice	Wheat	Potato	Maize	Chili	Black gram	Brinjal	Sugarcane
01	*Amaranthus viridis*	Amaranthaceae	Saknote	_	+	+	+	+	+	+	+
02	*Amaranthus spinosus*	Amaranthaceae	Katanote	_	+	+	+	+	+	+	+
03	*Aternanthera sessilis*	Amaranthaceae	Sanchir shak	+	+	+	+	_	_	+	+
04	*Acalyphaindica*	Euphorbiaceae	muktajhuri	_	+	_	+	+	_	+	_
05	*Achyranthes aspera*	Amaranthaceae	Apang	_	+	+	+	+	+	+	+
06	*Ageratum conyzoides*	Asteraceae	Ochunti	_	+	+	+	+	+	+	+
07	*Alternanthera philoxeroides*	Amaranthaceae	Shanchi shak	+	+	_	+	_	_	+	+
08	*Axonopus compressus*	Poaceae	Shialkata	_	+	+	+	_	_	_	+
09	*Boerhaavia diffusa*	Nyctaginaceae	Punornova	_	+	+	_	_	_	+	+
10	*Boerhaavia repens*	Nyctaginaceae	Punornova	_	+	_	_	+	_	+	+
11	*Chenopodium album*	Chenopodiaceae	Bathuashak	_	+	+	+	+	_	+	+
12	*Coccinia cordifolia*	Cucurbitaceae	Telakucha	_	+	_	+	+	_	_	+
13	*Coccinia grandis*	Cucurbitaceae	Telakucha	_	+	_	+	+	_	+	+
14	*Croton bonplandianus*	: Euphorbiaceae	Ban Tulsi	_	+	_	+	_	_	+	+
15	*Commelina benghalensis*	Commelinaceae	Kanshira	+	+	+	+	+	+	+	+
16	*Cyperus rotundus*	Cyperaceae	Mutha ghash	+	+	+	+	+	+	+	+

17	*Cyperus triceps*	Cyperaceae	Ghash	+	+	_	+	+	+	+	+
18	*Chrysopogon aciculatus*	Poaceae	Premkata	_	+	-	-	_	_	+	+
19	*Colocasia esculenta*	Araceae	Kochu	+	+	+	+	+	+	+	+
20	*Eclipta alba*	Asteraceae	Kalokesh	_	+	+	+	+	+	+	+
21	*Enhydra fluctuans*	Asteraceae	Helencha	+	_	_	+	+	_	_	+
22	*Euphorbia hirta*	Euphorbiaceae	Dudhiya	+	+	+	+	+	+	+	+
23	*Euphorbia helioscopia*	Euphorbiaceae	Dudhiya	_	+	+	_	_	_	_	_
24	*Glinus oppositifiilus*	Molluginaceae	Gimma shak	_	+	+	+	+	_	_	+
25	*Heliotropium indicum*	Boraginaceae	Hatishur	_	+	+	+	_	+	+	+
26	*Ipomea Alba*	Convolvulaceae	Kalmi shak	_	_	_	_	_	_	_	+
27	*Leucas aspera*	Lamiaceae	shetodron	_	+	+	+	+	+	+	+
28	*Leucas cephalotes*	Lamiaceae	Dandakolos	_	+	_	+	+	+	+	+
29	*Launaea asplenifolia*	Asteraceae	Tikchaina	_	+	+	+	+	_	+	+
30	*Marsilea minuta*	Marsileaceae	Amrul	+	+	+	+	+	_	+	+
31	*Marsilea crenata*	Marsileaceae	Amrul	+	+	+	+	+	_	+	+
32	*Marsilea quadrifolia*	Marsileaceae	Amrul	+	_	_	+	+	_	_	+
33	*Nicotiana plumbaginifolia*	Solanaceae	Bantamak	_	+	+	_	+	+	+	+
34	*Oxalis corniculata*	Marsileaceae	Amrul	+	+	+	+	+	_	+	+
35	*Portulaca Oleracea*	Marsileaceae	Nunia shak	+	+	+	_	_	_	+	_
36	*Parthenium hysterophorus*	Asteraceae	Kukursukha	_	+	_	_	_	_	+	+
37	*Peperomia pellucida*	Piperaceae	Peperaceae	_	+	+	+	+	_	+	+
38	*Physalis minima*	Solanaceae	Kopal phofka	_	+	+	+	+	+	+	+

39	*Pouzolzia indica*	Urticaceae	Pouzolzia	+	_	_	+	+	_	+	+
40	*Stephania japonica*	Menispermaceae	Akanand	_	+	_	_	__		+	+
41	*Sida acuta*	Dilleniaceae	Berella	_	_	+	+	_	_	_	+
42	*Senna tora*	Fabaceae	Chakunda	_	_	_	+	_	_	_	+
43	*Solanum nigrum*	Solanaceae	Tit Begun	+	+	+	+	+	+	+	+
44	*Sonchus asper*	Asteraceae	Ban palong	_	+	_	+	+	_	+	+
45	*Sonchus arevensis*	Asteraceae	Ban palong	_	+	_	+	+	_	_	+
46	*Synedrella nodiflora*	Asteraceae	Synedrella	+	_	+	+	+	_	+	+
47	*Tridax procumbens*	Asteraceae	Tridhara	_	+	+	+	+	+	+	+
48	*Typhonium trilobatum*	Araceae	Ghetkol	_	+	+	+	+	+	+	+
49	*Vernonia patula*	Asteraceae	Kukshim	_	+	+	_	_	+	+	+
50	*Wedelia chinensis*	Asteraceae	Mohavingoraj	+	+	+	+	+	+	+	+
51	*Wedelia biflora*	Asteraceae	vingoraj	+	+	+	+	+	_	+	+
52	*Youngia japonica*	Asteraceae	Youngia	_	_	+	+	+	_	_	+
53	*Mimosa pudica*	Fabaceae	Lojjabati	+	+	+	+	+	+	+	+
54	*Eleusine indica*	Poaceae	Rumput sambau	+	+	+	+	+	+	+	+
55	*Cynodon dactylon*	Poaceae	Durbaghas	+	+	+	+	+	+	+	+
56	*Centella asiatica*	Apiaceae	Thankuni	_	+	+	+	+	+	_	+
57	*Phyllanthus niruri*	Phyllanthaceae	Phyllanthus	+	+	_	+	+	_	_	_
58	*Polygonum barbatum*	Polygonaceae	Biskatali	+	+	+	+	+	_	+	+
59	*Eragrostis pilosa*	Poaceae	*Eragrostis*	+	+	+	+	_	+	+	+
60	*Lippia Alba*	Verbanaeae	Motmote	__	_	_	_	_	+	+	+
61	*Echinochloa colona*	Poaceae	Ban dhan	+	+	+	+	+	_	_	+
62	*Chloris barbata*	Poaceae	Jargi	+	+	_	+	_	+	+	+

63	*Digitaria sanguinalis*	Poaceae	Gemegeba	+	+	+	+	+	+	+	+
64	*Xanthium indicum*	Asteraceae	Ghagra	_	+	_	+	_	_	+	+
65	*Paspalum distichum*	Poaceae	knotgrass	+	+	+	+	+	+	+	+
66	*Cyperus michelianus*	Cyperacea	*Cyperus*	+	+	+	+	+	+	+	+
67	*Leptochloa chinensis*	Poaceae	Unknown	+	+	_	+	+	+	+	+
68	*Ludwigia decurrens*	Onagraceae	Kesordams	+	+	_	+	+	_	+	+
69	*Gnaphalium purpureum*	Asteraceae	Unknown	_	+	+	+	+	_	+	+ '
70	*Phyllanthus urinaria*	Phyllanthaceae	Panchitchite	_	+	—	_	_	+	+	+
71	*Polygonum hydropiper*	Polygonaceae	Biskatali	+	+	_	+	_	_	+	+
72	*Ipomea aquatica*	convolvulaceae	Kalmi shak	+	_	_	_	_	-	_	+
73	*Rumex obtusifolius*	Polygonaceae	Rumex	_	+	+	+	+	_	+	+
74	*Digitaria ischaemum*	Poaceae	Crabgrass	+	+	+	+	+	+	+	+
75	*Cyanotis axillaris*	Commelinaceae	kanduli	+	+	_	+	+	+	+	+
76	*Solvia sessilis*	Asteraceae	Bindii	+	_	_	_	+	+	+	+
77	*Euphorbia prostrata*	Euphorbiaceae	Dudhia	_	_	_	+	_	_	_	+
			Total	37	65	47	63	54	36	61	73

+ = Present - = Absent

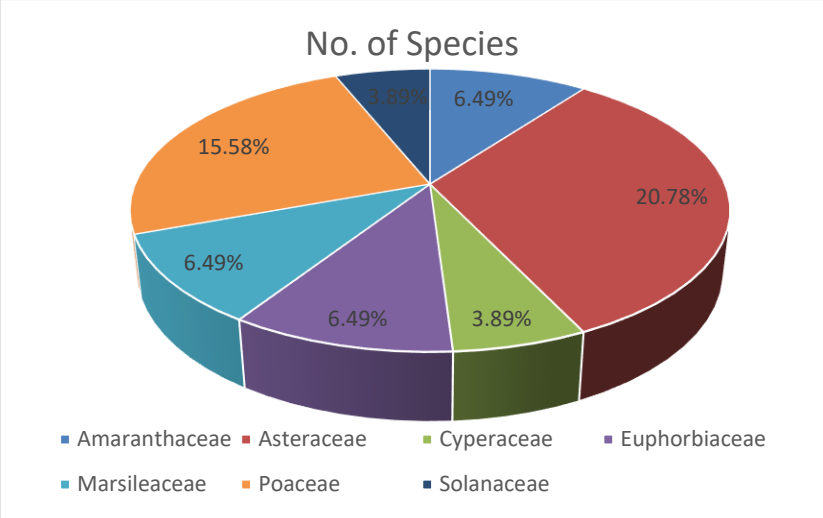

Figure 1 Dominant plant families in study area.

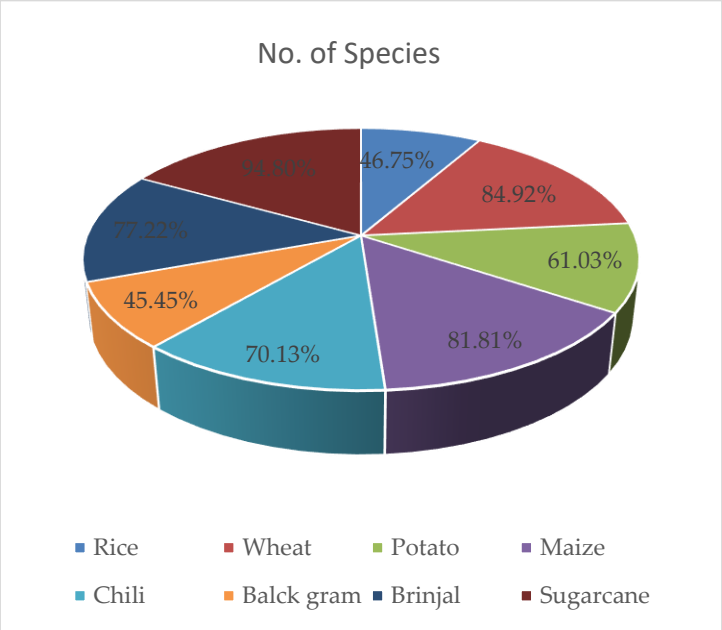

Figure 2 Recorded species diversity in eight selected crop fields.

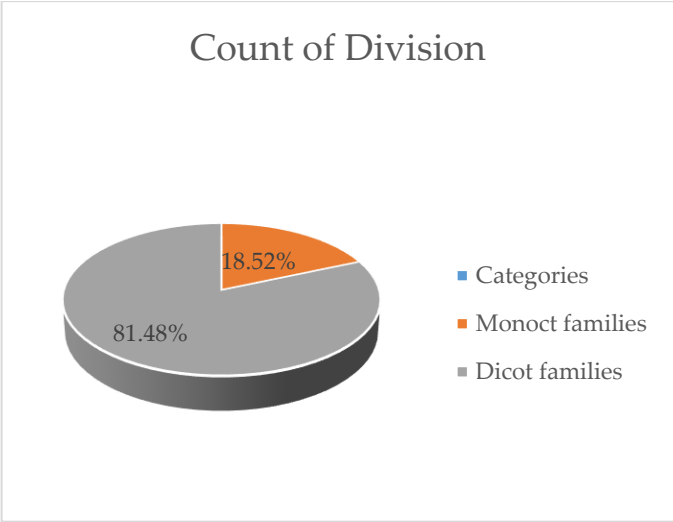

Figure 3 Percentage of Monocot and Dicot families.

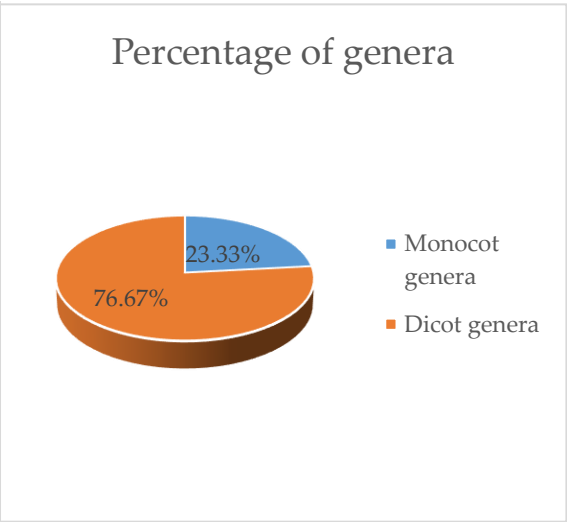

Figure 4 Percentage of Monocot and Dicot genera.

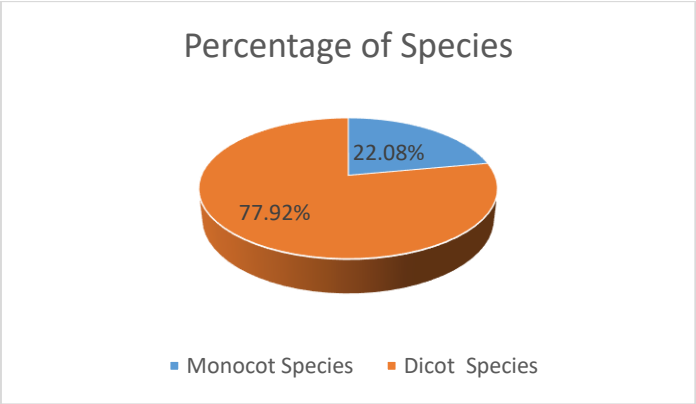

Figure 5 Percentage of Monocot and Dicot

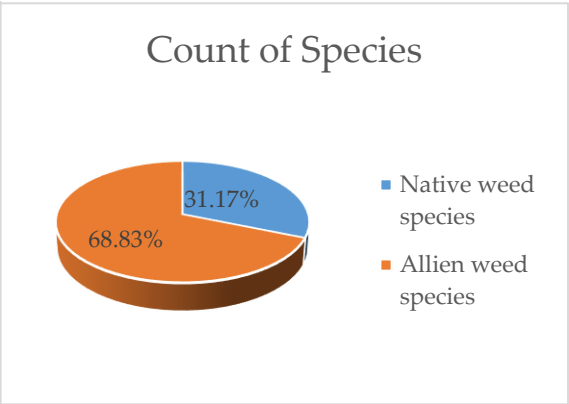

Figure 6 Percentage of Native and Allien weed species.

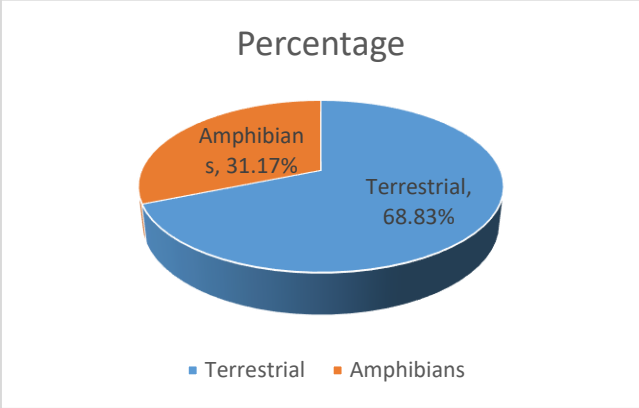

Figure 7 Percentage of Terrestrial and Amphibians weed species.

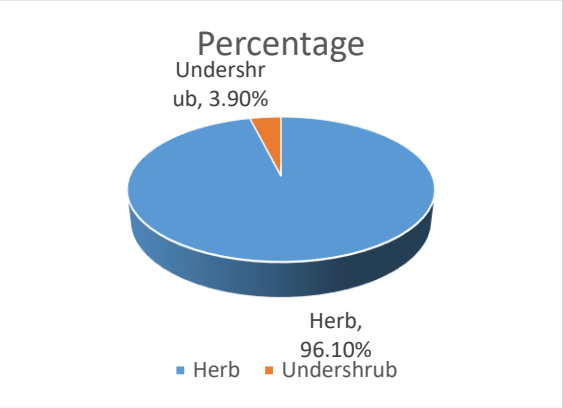

Figure 8 Percentage of shrub and undershrub weed species.

4. DISCUSSION

The data collected are comparable to those from other studies conducted in and outside of Bangladesh. A total of 56 weed species from 17 families have been discovered in five different rice fields in the Vanurtaluk district of Villupuram, Tamil Nadu, India (Nithyaand Ramamoorthy, 2015). 24 weed species below 22 genera and 14 families were researched in nine crop fields in West Bengal, India (Mondal and Hossain, 2015). A total of 40 plant species in 19 families grew as weeds in Kashmir Valley rice fields which belonged to 27 genera (Hassan et al., 2015). In the village of Qambar, 23 species from 13 families have been identified as wheat field weeds in five different Fields, District Swat, Pakistan (Akhter and Hussain, 2007). In sum, 58 weed species were reported in the Nowshera District Rajouri (J & K) wheat field, India (Dangwal et al., 2011). A total of 73 weed species from 65 genera and 27 families have been reported in District Banu sugarcane field, Khyber Pakhtunkhawa, Pakistan (Khan et al., 2012). In the mixed winter crop of Uttar Pradesh, India a total of 39 weed species belonging to 37 genera and 19 families were reported (Singh et al., 2012). The Rajshahi University Campus in Bangladesh's Mulberry Field is home to 37 weed species that are divided into 36 genera and 20 families (Rahman and Mamun, 2017). There are currently no published data on the angiosperm weed species found in the crop fields of Joypurhat district, Bangladesh. The current analysis will support further investigation into categorizing the major angiosperm weeds.

Acknowledgements

The authors are thanks to the local people in Joypurhat district, Bangladesh for their co-operation and help during the research work.

Ethical approval

Weed flora of eight selected crop fields from Joypurhat district of Bangladesh was observed in the study. The ethical guidelines for plants & plant materials are followed in the study for sample collection & identification.

Informed consent

Not applicable.

Conflicts of interests

The authors declare that there are no conflicts of interests.

Funding

The study has not received any external funding.

Data and materials availability

All data associated with this study are present in the paper.

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