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Research Article

DIVERSITY OF WEED COMMUNITIES IN DIFFERENT MAJOR CROP FIELDS OF JALPAIGURI DISTRICT OF WEST BENGAL, INDIA

Arijita Sen, Anurag Chowdhury, A. P. Das and * Chowdhury M

Taxonomy of Angiosperms & Biosystematics Lab., Department of Botany
University of North Bengal, 734013, Darjeeling, West Bengal, India

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ABSTRACT

Jalpaiguri is one of the important agriculture based district of West Bengal after the Burdwan district. The economical backbone of this district mainly based on different types of cultivated vegetables and tea gardens. The sprawling tea gardens of the Duars area constitute the chief asset of this district. Other major agrarian products of the district like jute, paddy, potato, etc. also make a significant contribution to the district's revenue pool. During field survey a total no. of 68 quadrates have been studied, which recorded around 111 unwanted plants (weeds) species from various crop fields.

INTRODUCTION

Weeds are the plants, which grow where they are not wanted, Shapira (2009). Weeds are unwanted or undesirable plants compete with crops for water, soil nutrients, light and space (i.e. CO2) and thus reduce crop yields abruptly. Weeds can also be referred to as plants out of place and are competitive or highly adaptable to all the adverse environments. It has been estimated that in general weeds can cause 5% loss to Agricultural production in most of the developed countries, whereas around 10% loss in less developed countries and 25% loss in least developed countries. Though the weeds are unwanted elements, it still recognized to be an important component of biological diversity and an essential trophic resource for pollinators, phytophagous insects, granivorous birds and herbivores (Storkey, 2006). Organic agriculture favours wild flora and fauna and the composition of the seed bank is dependent on the management practiced through the whole rotation (Andreasen & Stryhn, 2008). Weed ecology is the study of inter-relationship between weed and their environment and also thus concerned with growth characteristics and adoptions that enable to survive with changes in the environment. In crop field various weeds are also considered as a source of wild food, medicines, fodder etc. among the poor and tribal communities.

The analysis of association of plant communities in various ecosystems is very important part of ecological studies. The phytosociological study shows different data which can help us to understand properly the negative and positive relationship among the different weed species that growing in a particular association. The collected data also useful to realize the functioning of habitat structure or degree of change in vegetation or the kind of succession which can make possible in formulating the proper strategy for conservation of different species or the total community.

Study Area

The Jalpaiguri district occupies a prime position in the domain of North Bengal. It is established in the year 1869. It stretches over an area of 6227 sq. km (Census, 1991). It is believed that the district of Jalpaiguri has derived its name from the "Jalpai" trees (olive trees) which grow abundantly in the forests covering the northern hilly terrain. It is also assumed that the name comes from the Bhutanese term je-le-pe-gu-ri meaning a place where warm clothes are traded, suggesting a trading center. Again the name may be associated with Jalpesh, the presiding deity (Shiva) of the entire region. The agriculture is the main economical backbone of this area. Along with the tea gardens, other major agrarian products of the district like jute, paddy, potato, etc. makes significant contribution to the district's revenue pool. For these reasons the study area has been selected to complete the said work.

MATERIALS AND METHODS

To understand the community structure of various weed vegetation of different crop field random quadrate sampling technique was adopted as suggested by Misra (1968), Shimwell (1971), Tripathi & Misra (1971), Phillip (1959), Das & Lahiri (1997) and Kadir (2001), Rai (2006). During this dissertation 17 larger selected crop fields were sampled in various pre-dominant different seasons during 2014-15. **Sampling:** Quadrate samples are taken randomly in several crop fields of Jalpaiguri district. As the weed floras are mainly herbaceous

*✉ *Corresponding author:* **Chowdhury M**
Taxonomy of Angiosperms & Biosystematics Lab., Department of Botany
University of North Bengal, 734013, Darjeeling, West Bengal, India

covering the floor of crop fields, so 1m x 1m quadrates were selected for sampling. During sampling all possible plants including angiosperms, pteridophytes and bryophytes were recorded. **Data processing:** Recorded data is transferred to MS Excel worksheet and different parameters like Frequency (F%), Density (D), Abundance (A), Relative Frequency (RF), Relative Density (RD), Relative Abundance (RA) and Important Value Index (IVI) of each and every species were determined. The following formulas were used for data analysis as suggested by Misra (1968) and Phillips (1959), Shimwell (1971), Tripathi & Misra (1971), Acharyya (1998).

RESULT AND DISCUSSION

During this survey, a lot of seed plants including some tree seedling have been collected from the various crop fields. The present floral study helps us to prepare a detailed list of major noxious crop weed plants of this part of this country. This study includes different major plant groups that are presented in Table: 1.

Table1 Numerical distribution of different floristic elements

Taxa	Family	Genus	Species
Dicot	32	71	84
Monocot	4	18	25
Pteridophyte	2	2	2
Total	**38**	**91**	**111**

Weeds can be grouped for the convenience of planning, interpreting and recording control measures against them. Weeds belonging to any group of these classes have specific mode of propagation, dispersal and persistence. Weeds can be classified according to the following categories as presented in table 2.

Table 2 Broad categories of weeds using different parameters

Parameter	Category	Example
Life cycle pattern	• Annual	*Aerva javanica*
	• Biennial	*Tribulus terrestris*
	• Perennial	*Alternanthera sessilis*
Habitat	• Terrestrial	*Centella asiatica*
	• Aquatic	*Pistia stratiotes*
Morphology	• Woody	*Azadirachta indica (seedling)*
	• Semi woody	*Sida acuta*
	• Herbaceous	*Ageratum conyzoides*
Leaf type	• Broad leaved	*Heliotropium indicum*
	• Narrow leaved	*Bulbostyles densa*
Origin	• Native	*Cynodon dactylon*
	• Introduced	*Mimosa pudica*

Phytosociological study has been made in several major crop fields of Jalpaiguri district. During field survey a total no. of 68 quadrates has been studied (Table 3), which recorded 111 species of plants. Analyzed data shows that *Cynodon dactylon* [F=73.53 & RF=5.56] with highest Frequency and Relative Frequency and followed by *Chenopodium album, Hydrocotyle sibthorpioides* and *Laphangium leuteo album* with the same value [F=48.53 & RF=3.67]. *Cynodon dactylon* shows highest Density and Relative Density [D=7.76 & RD= 10.7], and followed by *Hydrocotyle sibthorpioides* [D=4.48 & RD=6.19], *Oxalis corniculata* [D=4.10 & RD=5.67], *Centella asiatica* [D=3.42 & RD=4.73]. Maximum IVI value shows by *Cynodon dactylon* [IVI=18.41], and followed by *Hydrocotyle sibthorpioides* [IVI=11.72], *Oxalis corniculata* [IVI=10.78], *Chenopodium album* [IVI=9.80], where as *Heliotropium indicum* [IVI=0.47] shows the minimum value.

The annual pictures of various crop field weeds regarding Species Diversity and Richness, several parameters have been studied. Shannon-Weiner Index of weed diversity of crop fields ware calculated to be 1.72 for the vegetation.

Simpson Index for Concentration of Dominance was observed to be 0.03 for the vegetation. The Menhinick and Margalef Index for Species Richness of weed vegetation were calculated and their value is to be 1.58 and 0.74 respectively.

The community type of various crop field of Jaipaiguri district shows moderate Species Diversity and Species Richness with very low Concentration of Dominance of weed species. The analyzed data clearly showing that the crop fields of this district is quite maintained and regularly makes free from such unwanted species.

CONCLUSSION

Through the full set up of the present work information's from different angles on the very rich flora of crop field weeds of Jalpaiguri district have been accumulated which might be helpful in drawing strategies to improve the yield of various crop plants. The weed plants with their distribution pattern, early identification through seedling morphological characters are very important and can be used in the programs of weed management. The usefulness of weedy plants has been discussed and it is found that many weeds offer food to the man and often should in the market. In addition there are also a large number of medicinal plants, many of which are also used by the local inhabitants. Weeds are not useless plants. They constitute a very important part of the countries amazing biodiversity and in future many of these weeds might be treated as important cultivable plants when their proper method of utilization will be discovered. Hence, extension activities of State Agricultural Universities and Agricultural Department should be strengthened to create awareness about different cost effective weed management practices. This would pave way for increased adoption rate and ultimately productivity levels also would increase substantially.

Table 3 Species showing Phytosociological data

FAMILY	PLANT NAMES	NQ	NI	F	D	A	RF	RD	RA	IVI
	Hygrophila polysperma (Roxb.) T. Anderson	1	2	1.47	0.03	2.00	0.11	0.04	0.41	0.56
Acanthaceae	*Rungia pectinata* (L.) Nees	4	4	5.88	0.06	1.00	0.44	0.08	0.21	0.73
	Alternanthera panonychioides A. St.-Hill	12	65	17.65	0.96	5.42	1.33	1.32	1.11	3.77
	Alternanthera sessilis (L.) R.Br. *ex* DC.	15	80	22.06	1.18	5.33	1.67	1.62	1.10	4.39
	Amaranthus blitum subsp. oleraceus (L.) Costea	2	3	2.94	0.04	1.50	0.22	0.06	0.31	0.59
Amaranthaceae	*Chenopodium album* L.	33	232	48.53	3.41	7.03	3.67	4.71	1.45	9.82
	Dysphania ambrosioides (L.) Mosyakin & Clemants	9	46	13.24	0.68	5.11	1.00	0.93	1.05	2.99
	Spinacia oleracea L.	3	20	4.41	0.29	6.67	0.33	0.41	1.37	2.11
	Centella asiatica (L.) Urb.	23	233	33.82	3.43	10.13	2.56	4.73	2.08	9.37
Apiaceae	*Coriandrum sativum* L.	1	5	1.47	0.07	5.00	0.11	0.10	1.03	1.24
	Seseli indicum Wight & Arn.	3	5	4.41	0.07	1.67	0.33	0.10	0.34	0.78
Araliaceae	*Hydrocotyle javanica* Thunb.	13	48	19.12	0.71	3.69	1.44	0.97	0.76	3.18
	Hydrocotyle sibthorpioides Lam.	33	305	48.53	4.49	9.24	3.67	6.19	1.90	11.80
	Acmella calva (DC.) R.K. Jansen	9	55	13.24	0.81	6.11	1.00	1.12	1.26	3.37
	Acmella radicans (Jacq.) R.K. Jansen	4	19	5.88	0.28	4.75	0.44	0.39	0.98	1.81
	Acmella uliginosa (Sw.) Cass.	2	6	2.94	0.09	3.00	0.22	0.12	0.62	0.96
	Ageratum conyzoides (L.) L.	15	74	22.06	1.09	4.93	1.67	1.50	1.02	4.18
	Blumea eriantha DC.	4	14	5.88	0.21	3.50	0.44	0.28	0.72	1.45
	Crassocephalum crepidioides (Benth.)S. Moore	4	23	5.88	0.34	5.75	0.44	0.47	1.18	2.09
	Eclipta prostrata (L.) L.	9	24	13.24	0.35	2.67	1.00	0.49	0.55	2.04
Asteraceae	*Emilia sonchifolia* (L.) DC. *ex* DC.	7	17	10.29	0.25	2.43	0.78	0.35	0.50	1.62
	Laphangium leuteo-album (L.) Tzvelev	33	152	48.53	2.24	4.61	3.67	3.09	0.95	7.70
	Pseudognephalium affine (D. Don) Anderb.	9	36	13.24	0.53	4.00	1.00	0.73	0.82	2.55
	Grangea maderaspatana (L.) Poir.	10	37	14.71	0.54	3.70	1.11	0.75	0.76	2.62
	Parthenium hysterophorus L.	12	49	17.65	0.72	4.08	1.33	1.00	0.84	3.17
	Soliva anthemifolia (Juss.) R.Br. *ex* Less.	4	25	5.88	0.37	6.25	0.44	0.51	1.29	2.24
	Spilanthes acmella (L.) L.	4	19	5.88	0.28	4.75	0.44	0.39	0.98	1.81
	Synedrella nodiflora (L.) Gaertn.	4	6	5.88	0.09	1.50	0.44	0.12	0.31	0.87
	Xanthium strumarium L.	1	2	1.47	0.03	2.00	0.11	0.04	0.41	0.56
Boraginaceae	*Heliotropium indicum* L.	2	2	2.94	0.03	1.00	0.22	0.04	0.21	0.47
Brassicaceae	*Rorippa indica* (L.) Hiern	7	22	10.29	0.32	3.14	0.78	0.45	0.65	1.87
Cannabaceae	*Trema orientalis* (L.) Blume	4	5	5.88	0.07	1.25	0.44	0.10	0.26	0.80
Carryophyllaceae	*Polycarpon prostratum* (Forsskål) Ascherson & Schweinfurth	6	19	8.82	0.28	3.17	0.67	0.39	0.65	1.70
	Spergula pentandra L.	3	19	4.41	0.28	6.33	0.33	0.39	1.30	2.02
	Stellaria media (L.) Vill.	3	20	4.41	0.29	6.67	0.33	0.41	1.37	2.11
	Stellaria wallichiana Haines	18	150	26.47	2.21	8.33	2.00	3.05	1.71	6.76
Cleomaceae	*Cleome rutidosperma* DC.	7	23	10.29	0.34	3.29	0.78	0.47	0.68	1.92
	Evolvulus numularius (L.) L.	4	18	5.88	0.26	4.50	0.44	0.37	0.93	1.74
Convolvulaceae	*Ipomoea aquatica* Forssk.	1	2	1.47	0.03	2.00	0.11	0.04	0.41	0.56
	Croton bonplandianus Baill.	7	49	10.29	0.72	7.00	0.78	1.00	1.44	3.21
Euphorbiaceae	*Euphorbia hirta* L.	8	48	11.76	0.71	6.00	0.89	0.97	1.23	3.10
Hypericaceae	*Hypericum japonicum* Thunb.	8	28	11.76	0.41	3.50	0.89	0.57	0.72	2.18
Lamiaceae	*Leucas zeylanica* var. *zeylanica* L.	5	13	7.35	0.19	2.60	0.56	0.26	0.54	1.35
	Desmodium triflorum (L.) DC.	17	146	25.00	2.15	8.59	1.89	2.97	1.77	6.62
Leguminosae	*Lathyrus sativus* L.	2	10	2.94	0.15	5.00	0.22	0.20	1.03	1.45
	Mimosa pudica L.	4	11	5.88	0.16	2.75	0.44	0.22	0.57	1.23
	Sesbania sesban (L.) Merr.	2	4	2.94	0.06	2.00	0.22	0.08	0.41	0.71
	Vicia hirsuta (L.) Gray	1	5	1.47	0.07	5.00	0.11	0.10	1.03	1.24
Linderniaceae	*Lindernia crustacea* (L.) F.Muell.	5	36	7.35	0.53	7.20	0.56	0.73	1.48	2.77
	Rotala macrandra Koehne	2	13	2.94	0.19	6.50	0.22	0.26	1.34	1.82
Lythraceae	*Cuphea procumbens* Ortega	4	19	5.88	0.28	4.75	0.44	0.39	0.98	1.81
Malvaceae	*Sida acuta* Burm. *f.*	2	10	2.94	0.15	5.00	0.22	0.20	1.03	1.45
	Corchorus olitorius L.	4	9	5.88	0.13	2.25	0.44	0.18	0.46	1.09
Meliaceae	*Azadirachta indica* A. Juss.	12	32	17.65	0.47	2.67	1.33	0.65	0.55	2.53
	Glynus lotoides L.	12	64	17.65	0.94	5.33	1.33	1.30	1.10	3.73
Molluginaceae	*Glynus oppositifolius* (L.) DC	23	103	33.82	1.51	4.48	2.56	2.09	0.92	5.57
	Ludwigia octovaluis (Jacq.) P.H.Raven	4	15	5.88	0.22	3.75	0.44	0.30	0.77	1.52
Onagraceae	*Ludwigia perennis* L.	8	40	11.76	0.59	5.00	0.89	0.81	1.03	2.73
Oxalidaceae	*Oxalis corniculata* L.	28	279	41.18	4.10	9.96	3.11	5.67	2.05	10.80
Phylanthaceae	*Phyllanthus fraternus* G.L.Webster	8	56	11.76	0.82	7.00	0.89	1.14	1.44	3.47
Piperaceae	*Peperomia pellucida* (L.) Kunth	4	17	5.88	0.25	4.25	0.44	0.35	0.87	1.66
Plantaginaceae	*Scoparia dulcis* L.	5	20	7.35	0.29	4.00	0.56	0.41	0.82	1.78
	Persicaria glabra (Willd.) M. Gómez	5	38	7.35	0.56	7.60	0.56	0.77	1.56	2.89
Polygonaceae	*Persicaria hydropiper* (L.) Delarbre	3	4	4.41	0.06	1.33	0.33	0.08	0.27	0.69
	Persicaria lapathifolia (L.) Delarbre	3	7	4.41	0.10	2.33	0.33	0.14	0.48	0.96

Table 3 Species showing Phytosociological data

	Polygonum plebeium R. Br.	28	179	41.18	2.63	6.39	3.11	3.64	1.32	8.06
Portulaccaceae	*Portulacca oleracea* L.	5	10	7.35	0.15	2.00	0.56	0.20	0.41	1.17
	Dentella repens (L.) J.R.Forst & G. Forst	9	60	13.24	0.88	6.67	1.00	1.22	1.37	3.59
	Mitracarpus hirtus (L.) DC	1	7	1.47	0.10	7.00	0.11	0.14	1.44	1.69
Rubiaceae	*Oldenlandia lactea* (Willd.) DC.	11	65	16.18	0.96	5.91	1.22	1.32	1.22	3.76
	*Oldenlandia diffusa (*Willd.) Roxb.	2	3	2.94	0.04	1.50	0.22	0.06	0.31	0.59
	Spermacoce alata Aubl.	4	17	5.88	0.25	4.25	0.44	0.35	0.87	1.66
Scrophulariaceae	*Vandellia roxburghii* Blanco	4	25	5.88	0.37	6.25	0.44	0.51	1.29	2.24
	Veronica anagalis-aquatica L.	4	11	5.88	0.16	2.75	0.44	0.22	0.57	1.23
	Capsicum annuum L.	4	6	5.88	0.09	1.50	0.44	0.12	0.31	0.87
	Physalis angulata var. angulata L.	7	16	10.29	0.24	2.29	0.78	0.32	0.47	1.57
Solanaceae	*Solanum americanum* Mill.	16	55	23.53	0.81	3.44	1.78	1.12	0.71	3.60
	Solanum rudepannum Dunal	8	17	11.76	0.25	2.13	0.89	0.35	0.44	1.67
	Solanum villosum Mill.	5	17	7.35	0.25	3.40	0.56	0.35	0.70	1.60
Urticaceae	*Pilea microphylla* (L.) Liebm.	3	11	4.41	0.16	3.67	0.33	0.22	0.75	1.31
	Pouzolzia zeylanica var.zeylanica L.	2	9	2.94	0.13	4.50	0.22	0.18	0.93	1.33
Verbenaceae	*Lippia alba* (Mill.) N.E.Br. *ex* Britton & P.Wilson	4	23	5.88	0.34	5.75	0.44	0.47	1.18	2.09
Araceae	*Colocasia esculenta* (L.) Schott	6	25	8.82	0.37	4.17	0.67	0.51	0.86	2.03
	Pistia stratiotes L.	2	4	2.94	0.06	2.00	0.22	0.08	0.41	0.71
Commelinaceae	*Commelina diffusa* Burm. *f.*	21	86	30.88	1.26	4.10	2.33	1.75	0.84	4.92
	Bulbostyles densa (Wall.) Hand.-Mazz.	9	43	13.24	0.63	4.78	1.00	0.87	0.98	2.86
	Cyperus haspan L.	4	17	5.88	0.25	4.25	0.44	0.35	0.87	1.66
	Cyperus iria L.	8	34	11.76	0.50	4.25	0.89	0.69	0.87	2.45
	Cyperus niveus Retz.	4	17	5.88	0.25	4.25	0.44	0.35	0.87	1.66
Cyperaceae	*Cyperus rotundus* L.	8	32	11.76	0.47	4.00	0.89	0.65	0.82	2.36
	Cyperus bulbosus Vahl	8	22	11.76	0.32	2.75	0.89	0.45	0.57	1.90
	Eleocharis retroflexa (Poir.) Urb.	4	27	5.88	0.40	6.75	0.44	0.55	1.39	2.38
	Fimbristylis ovata (Burm. *f.*) J. Kern	7	35	10.29	0.51	5.00	0.78	0.71	1.03	2.52
	Rhynchospora colorata (L.) H. Pfeiff.	6	39	8.82	0.57	6.50	0.67	0.79	1.34	2.80
	Axonopus compressus (Sw.) P. Beauv.	8	17	11.76	0.25	2.13	0.89	0.35	0.44	1.67
	Cynodon dactylon (L.) Pers.	50	528	73.53	7.76	10.56	5.56	10.70	2.17	18.50
	Digitaria sanguinalis (L.) Socp.	13	95	19.12	1.40	7.31	1.44	1.93	1.50	4.88
	Echinochloa colona (L.) Link	4	12	5.88	0.18	3.00	0.44	0.24	0.62	1.31
	Eleusine indica (Libb.) Gaertn.	29	178	42.65	2.62	6.14	3.22	3.61	1.26	8.10
	Eragrostis atrovirens (Desf.) Trin. *ex* Steud.	8	24	11.76	0.35	3.00	0.89	0.49	0.62	1.99
Poaceae	*Eragrostis gangetica* (Roxb.) Steud.	4	13	5.88	0.19	3.25	0.44	0.26	0.67	1.38
	Eragrostis nigra Nees *ex* Steud.	3	12	4.41	0.18	4.00	0.33	0.24	0.82	1.40
	*Eragrostis unioloides (*Retz.) Nees *ex* Steud.	7	15	10.29	0.22	2.14	0.78	0.30	0.44	1.52
	Imperata cylindrica (L.) Raeusch	4	10	5.88	0.15	2.50	0.44	0.20	0.51	1.16
	*Oplismenus burmanii (*Retz.) P. Beauv.	3	20	4.41	0.29	6.67	0.33	0.41	1.37	2.11
	Phalaris minor Retz.	4	11	5.88	0.16	2.75	0.44	0.22	0.57	1.23
	Sporobolus indicus (L.) R.Br.	4	14	5.88	0.21	3.50	0.44	0.28	0.72	1.45
Dryopteridaceae	*Dryopteris sikkimensis* (Bedd.) Kuntze	4	15	5.88	0.22	3.75	0.44	0.30	0.77	1.52
Marsilieaceae	*Marsilea quadrifolia* L.	1	4	1.47	0.06	4.00	0.11	0.08	0.82	1.01

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