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FLORISTIC COMPOSITION OF WEEDS IN PADDY FIELDS IN MAHENDRANAGAR, NEPAL

M.D. Bhatt, A. Tewari[1] and **S.P. Singh**[2]
Department of Botany
Siddhanath Science Campus, Mahendranagar, Nepal
Email: bhattmd@rediffmail.com
[1]Department of Forestry, Kumaun University, Nainital, India
[2]Department of Botany, Kumaun University, Nainital, India

ABSTRACT

Field experiments were conducted during 2004 and 2005 in paddy fields to evaluate the floristic composition of weeds, in lowland and upland areas of Mahendranagar, Nepal. A total of 61 weed species belonging to 42 genera and 23 families were recorded. Of the 23 families, Cyperaceae was the largest (13 spp.), followed by Poaceae (11 spp.), Euphorbiaceae (4 spp.), Amaranthaceae, Commelinaceae and Asteraceae (3 spp. each), Polygonaceae (2 spp.) and one species each belonged to Apiaceae, Acanthaceae, Alismataceae, Pontederiaceae, Leguminosae, Convolvulaceae, Eriocaulaceae, Marsileaceae, Malvaceae, Oxalidaceae, Onagraceae, Parkeriaceae, Portulaceae, Rubiaceae and Verbenaceae. The number of weed species was higher in upland (55) when compared with the lowland sites (48). On the basis of Importance Value Index (IVI) dominating weed species in paddy fields were: *Fimbristylis miliacea* (13.4), *Lindernia oppositifolia* (13.2), *Eleocharis atropurpurea* (13.1), *Ageratum conyzoides* (13.0), *Cyperus iria* (13.0), *Echinochloa crus-galli* (11.9), *Ischaemum rugosum* (11.7), *Echinochloa colona* (11.4), *Cyperus difformis* (11.1) and *Schoenoplectus juncoides* (11.0). Besides dicots and monocots, two species of pteridophytes (*Ceratopteris thalictriodes* and *Marsilea minuta*) were also recorded in lowland paddy fields.

Key words: Paddy, weeds, upland, lowland, IVI.

INTRODUCTION

Paddy is the most important staple crop of Nepal. The weeds that abound along with the paddy crops further affect the low agriculture production because of limited area for cultivation. There is a need to assess the loss in paddy crop production because of these unwanted, useless and persistent weed species. Further to restrict the loss in paddy biomass it is necessary to reduce their soil seed bank and reduce their population in the coming year by poor farmers. The reduction in paddy yield due to weed composition ranges from 9-51% (Mani *et al*. 1968). Grain yield was drastically reduced if paddy is not weeded out during early growth stages. In Nepal, weed surveys in paddy fields have received very little attention in comparison to other southeastern countries of Asia (Moody 1989). Species composition (Dangol *et al.* 1986, Ranjit 1998, Dangol 2002, Thapa and Jha 2002) of paddy field weeds was studied in some

parts of Nepal. The present study was undertaken to record and analyze the weed species composition in upland broadcasting and lowland transplanting paddy fields of Mahendranagar, in Far Western Region of Nepal.

MATERIALS AND METHODS

The field experiments were conducted during rainy season of 2004 and 2005 at farmers' agricultural fields in Mahendranagar (28°32' N and 80°33' E and 185-300 m amsl), in two study sites, i.e., upland in which irrigation facility lacks and a broadcasted system was applied on the basis of traditional methods adopted by the farmers, and in lowland, which is facilitated with irrigation and transplanted system was applied. The soil was silty clay in texture and high in fertility with 6.2-6.5 pH. The paddy was broadcasted in early June with the arrival of pre-monsoon at upland site. At lowland site 29 days old seedlings were transplanted in early-July on 5m x 5m sized plots in randomised block design (RBD). From the date of paddy cultivation to harvest time, weed species were observed for floristic study. All the collected weeds were identified with the relevant literature and finally confirmed with the help of authentic specimens at National Herbarium and Plant Laboratories, Godawari, Lalitpur, Nepal. For the vegetational analysis of weeds, ten quadrats of 1m x 1m were placed for density, frequency, and abundance, recorded as per Misra (1968). The weeds with higher density and Importance Value Index (IVI) were considered as dominant weeds.

RESULTS AND DISCUSSION

Of the Sixty one species of weeds recorded in the paddy fields, 29 species were dicotyledons, 30 monocotyledons (15 grasses and 15 sedges species) and 2 pteridophytes (Table 1). Out of the total weed species, 55 were recorded at upland site and 48 at lowland site. At upland site there were 49.1% dicot species and 50.9% monocot species, and at lowland site, 47.9% were dicots and 47.9% monocot species as well, and 4.2% pteridophytes (Table 2). The dominance of monocots over dicots at upland site in present investigation was similar to the findings of Satyanarayan (1962), and Thapa and Jha (2002). The dominance of grasses and sedges in the present study corresponds to the findings of Thapa and Jha (2002) and Dangol *et al*. (2002). Two species of pteridophytes (*Ceratopteris thalictroides* and *Marsilea minuta*) were recorded at lowland transplanted paddy fields of Mahendranagar. Similar results have been reported by Dangol *et al*. (1986) from the paddy fields of Rampur, Chitwan, Nepal. Recorded species belonged to 23 families: Cyperaceae (13 spp.), Poaceae (11 spp.), Scrophulariaceae (7 spp.), Euphorbiaceae (4 spp.), Amaranthaceae, Commelinaceae and Asteraceae (3 spp. each), Polygonaceae (2 spp.) and one species each belonged to Apiaceae, Acanthaceae, Alismataceae, Pontederiaceae, Leguminosae, Convolvulaceae, Eriocaulaceae, Marsileaceae, Malvaceae, Oxalidaceae, Onagraceae, Parkeriaceae, Portulaceae, Rubiaceae and Verbenaceae.

The total density of weeds was 240 individuals m^{-2} at upland site and 208 individuals m^{-2} at lowland site revealing that paddy field of upland site had more weeds than the paddy field of lowland site. On the basis of density and IVI, 12 weed species dominated both the study sites. The maximum weed density was recorded for *Fimbristylis miliacea* (16.9 m^{-2}, at upland site) and *Eleocharis atropurpurea* (15.6 m^{-2}, at lowland site) (Table 1).

Thus, on the basis of density and importance value index, 12 species of weeds recorded as dominant in paddy fields at upland and lowland sites. Among them *Cyperus iria*, *Echinochloa colona*, *Echinochloa crus-galli*, *Sagittaria guayanensis*, *Cyperus difformis*, *Ischaemum*

rugosum, *Eleocharis atropurpurea* and *Cynodon dactylon* are reported as being the important weeds of paddy fields in the world by Holm *et al.* (1977). Of the 12 most important weeds, 8 were common to both upland and lowland sites. Of them *Ageratum conyzoides*, which had the maximum density at upland site, had poor density at lowland site.

Table 1. Species, families average density (ind./m^2) and Importance Value Index (IVI) of weeds in upland and lowland paddy fields of Mahendranagar, Nepal.

Weed species	**Family**	**Upland**		**Lowland**	
		Density	**IVI**	**Density**	**IVI**
Ageratum conyzoides L.	Asteraceae	16.1	13.0	5.0	6.5
Alternanthera sessilis (L.) DC.	Amaranthaceae	6.9	10.2	7.1	11.3
Alysicarpus vaginalis (L.) DC.[#]	Leguminosae	1.9	3.0	-	-
Amaranthus spinosus L.[#]	Amaranthaceae	0.7	1.5	-	
Amaranthus viridus L.[#]	Amaranthaceae	1.9	2.7	-	-
Brachiaria ramosa (L.) Stapf.[#]	Poaceae	2.7	2.0	-	-
Caesulia axillaris Roxb.	Asteraceae	2.4	2.9	2.7	4.8
Centella asiatica (L.) Urb	Apiaceae	1.6	3.2	2.4	4.8
Ceratopteris thalictroides (L.) A. Brongu*	Parkeriaceae	-	-	2.2	3.2
Commelina benghalensis Blume[#]	Commelinaceae	2.4	4.7	-	-
Commelina paludosa Blume	Commelinaceae	1.5	3.7	3.2	4.2
Cynodon dactylon (L.) Pers.	Poaceae	9.3	9.5	6.5	10.0
Cyperus corymbosus Rottb.	Cyperaceae	1.7	3.2	2.9	5.0
Cyperus difformis L.	Cyperaceae	2.4	4.1	9.1	11.1
Cyperus esculentus L.	Cyperaceae	2.6	3.6	2.9	4.1
Cyperus halepens L.	Cyperaceae	5.1	6.3	2.6	3.3
Cyperus iria L	Cyperaceae	15.1	12.5	12.1	13.0
Cyperus kyllingia Endl.	Cyperaceae	2.1	4.6	1.9	4.9
Cyperus rotundus L.	Cyperaceae	3.9	4.7	3.7	5.9
Cyperus sanguinolentus Vahl	Cyperaceae	1.9	2.7	1.8	2.3
Dactyloctenium aegypticum (L.) Gaertn.[#]	Poaceae	2.7	4.2	-	-
Digitaria sanguinalis (L.) Scop.[#]	Poaceae	2.9	6.4	-	-
Dopatrium junceum (Roxb.) F. Halminton ex Bentham*	Scrophulariaceae	-	-	3.8	5.4
Echinochloa colona (L.) Link	Poaceae	7.0	10.2	6.7	11.4
Echinochloa crus-galli (L.) Beauv.	Poaceae	6.8	10.1	7.8	11.9
Eclipta prostrata (L.) L.	Asteraceae	5.8	9.7	2.8	5.4
Eleocharis atropurpurea (Retz.) Presl	Cyperaceae	16.0	13.1	15.6	11.7
Elusine indica (L.) P. Beauv.	Poaceae	2.1	2.8	2.0	3.1
Eragrostis tenella (Retz.) Stapf.[#]	Poaceae	1.3	2.4	-	-
Eragrostis uniloides (Retz.) Nees ex Steud.	Poaceae	2.2	2.8	2.4	3.3
Eriocaulon cinereum R. Br.	Eriocaulaceae	6.1	6.1	3.8	5.4
Euphorbia hirta L.	Euphorbiaceae	3.1	3.8	2.9	4.1

Euphorbia parviflora L.	Euphorbiaceae	1.5	3.5	1.8	3.6
Evolvulus nummularis (L.) L.	Convolvulaceae	2.8	4.3	3.2	4.2
Fimbristylis dichotoma (L.) Vahl	Cyperaceae	7.9	8.2	3.3	5.2
Fimbristylis miliacea (L.) Vahl	Cyperaceae	16.9	13.4	11.5	11.7
Fimbristylis ovata (N.L. Burman) Kern[#]	Cyperaceae	1.5	3.5	-	-
Hedyotis corymbosa (L.) Lam.	Rubiaceae	1.8	5.0	1.9	4.5
Hygrophila auriculata (Schumach) Heine*	Acanthaceae	-	-	1.3	2.0
Ischaemum rugosum Salisb.	Poaceae	6.9	10.2	7.2	11.7
Lindernia antipoda (L.) Alston	Scrophulariaceae	7.2	6.7	3.7	5.9
Lindernia ciliata (Colsm.) Pennell[#]	Scrophulariaceae	0.9	1.6	-	-
Lindernia oppositifolia (L.) Mukerjee	Scrophulariaceae	16.2	13.2	4.6	6.3
Lindernia procumbens (Krock.) Borbas	Scrophulariaceae	10.6	10.8	3.2	5.6
Lindernia viscosa (Hornem) Boldigh	Scrophulariaceae	3.3	4.5	2.8	3.4
Lippia nodiflora (L.) Rich	Verbenaceae	1.4	4.3	3.2	5.6
Ludwigia perennis L.	Onagraceae	3.8	5.6	6.6	10.9
Marsilea minuta L. *	Marsileaceae	-	-	3.2	5.1
Mecardonia procumbens (Mill.) Small	Scrophulariaceae	2.6	3.6	2.1	3.7
Monocharia hastata (L.) Solms. *	Pontederiaceae	-	-	2.7	4.9
Murdania nudiflora (L.) Brenan	Commelinaceae	1.9	3.9	3.1	4.8
Oxalis corniculata L. [#]	Oxalidaceae	1.3	2.9	-	-
Persicaria barbata (L.) Hara	Polygonaceae	1.1	1.7	2.4	4.8
Phyllanthus urinaria L.	Euphorbiaceae	1.4	3.1	2.1	3.7
Phyllanthus varigatus G. Frost	Euphorbiaceae	1.9	4.5	2.5	4.8
Polygonum plebejum R. Br.	Polygonaceae	1.9	3.9	1.3	3.3
Portulaca oleracea L.	Portulacaceae	1.5	2.2	3.9	6.6
Sagittaria guayanensis Kunth*	Alismataceae	-	-	8.1	10.6
*Schoenoplectus juncoides (*Roxb.) Palla	Cyperaceae	3.7	5.2	8.4	11.0
Setaria pumia (Poiret) Romer & Schulte[#]	Poaceae	1.1	1.2	-	-
Sida acuta Brum. f. [#]	Malvaceae	0.7	1.5	-	-
Total 61 species	23 families	240.0	300	208.0	300

[#] Species occurring only at upland site, * Species occurring only at lowland site, - = absent.

Table 2. Floristic analysis of weed species in different fields of paddy (Values in parentheses are percentage of total).

Plant groups	**Upland (broadcasted paddy)**			**Lowland (transplanted paddy)**		
	Family	**Genera**	**Species**	**Family**	**Genera**	**Species**
Dicotyledons	14 (77.8)	20 (55.6)	27 (49.1)	12 (60.0)	18 (51.4)	23 (47.9)
Monocotyledons	4 (22.2)	16 (44.4)	28 (50.9)	6 (30.0)	15 (42.9)	23 (47.9)
Pteridophytes	-	-	-	2 (10.0)	2 (5.7)	2 (4.2)
Total	18 (100.0)	36 (100.0)	55 (100.0)	20 (100.0)	35 (100.0)	8 (100.0)

From the two years observations, it was found that weed growth occurs within forty one days after paddy sowing/planting and they may propagate by seeds and propagules or by both. The perennial weeds create the most serious problem in paddy fields. Major weeds produce a large number of seeds, which may remain in soil and serve as soil seed bank for the next cropping season. It can be emphasized that major weeds should be controlled at proper time to check reduction in paddy yield, and they must be removed before flowering and fruiting to reduce the production of seeds that remain as soil seed bank for the following years.

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