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Research Article

Weed diversity in Maize fields of Mastuj valley, Hindukush range, Pakistan

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Abstract

Ecological studies in maize *(Zea mays* L.) fields of Mastuj valley was conducted to record the weeds in three villages. Forty-three 43 species belonging to 19 families were recorded. It included seventeen dicotyledonous, one monocotyledon and one pteridophyte families. Asteraceae was prominent with eight species which was followed by Papilionaceae and Polygonaceae with six and four species. Poaceae and Caryophyllaceae were represented by three species each. Five families had two while nine families had one species. Therophytes were abundant succeeded by geophytes with four and hemicryptophytes with two species. Microphyll (thirteen species) and mesophyll (twelve species) were leading leaf-sizes. Nanophyll had (nine species), macrophyll (eight species) and leptophyll had only one species. Phenologically forty one were in flowering and two species were in dying/post-reproductive stages. The abundance assessment indicated that 18 species were occasional, 9 frequent, 8 rare, 5 common and 3 were abundant. The weeds were classified into fodder (37 spp.), medicinal (13 ssp.), vegetables (8 spp.) and oil yielding (1 sp.). Weed management procedures must be practiced to control the weed infusion and invasion. Weeds must be categorized into economic use classes to get additional economic values. Pre-mature hand pulling of whole plant of noxious weeds is recommended. Future researches to conserve the genetic resources through their propagation and distribution is strongly recommended. The traditional cereal crops pattern must be practiced to conserve the vanishing agro plant biodiversity.

Keywords: Mastuj Valley; Maize; Crop; Weeds; Diversity

Introduction

Mastuj Valley is a high altitude subalpine area in Hindukush Range, District Chitral, Pakistan. Mastuj Valley lies approximately in between 72º-0/ and 37º-58/ east longitude and 36º-2/ and 36º-57/ north latitude. It is bounded on the North by Baroghil Pass, on the South by Shandur Pass, on the East by Chumarkhan Pass and on the West by Chitral sub-division. Precipitation in the state of rainfall and snow fall, springs, streams and river channels are source of irrigation. Maize (*Zea mays* L.) is a monocotyledonous cereal crop which is grown as a spring and summer seasons staple food crop in both plain and hilly rural areas. It needs soil with added OM, adequate irrigation and weeding and thinning. It is cultivated for grain and fodder in the area. White and yellow varieties are met in the

area (Figure 1, 2). Weed infestation and smut attack are the major threats to maize in the area (Figure 2). Many articles have been published on weeds from maize fields from aboard and Pakistan. Some work on the weed ecology in Mastuj is also available; Hussain *et al*.[1], Murad *et al*. [2], Hussain and Murad [3], Hussain *et al*. [4], Hussain *et al*. [5], Hussain and Murad [6]and Shah *et al*.[7]. Vieyra-Odilon & Vibrans [8], Shah *et al*. [9], Muhammad *et al*. [10], Yeganehpoor *et al*. [11], Janak and Grichar [12] and Dlamini *et al*. [13] worked on weed ecology. The present study was conducted to further the knowledge about the weeds of this remote area of Hindukush for future workers (Figure 3).

Figure 1. A view of Maize field in Mastuj village showing some weeds

Figure 2. Weeds in Maize field in Mastuj

Materials and methods

Three villages viz; Mastuj, Tooque and Chinar were surveyed for the presence of weeds during July and August, 2014. The collected weeds were named following Flora of Pakistan [14-16]. Life-forms and leaf-sizes calculated known after C.C. Raunkiaer [17] and Hussain [18]. Plants were classified by field observation into flowering and dying phenological stages. Plant species were assigned into various abundance classes based on visual relative species abundance. Ethnobotanical information was

gathered from the local inhabitants; and also Added voucher specimen number to the collected specimen and deposited in the herbarium.

Results and discussion

There were 34 species in Mastuj, 32 in Tooque and35 in Chinar thus making a total of 43 species within 19 families. It included 17 dicotyledons, one monocotyledon and one pteridophyte families (Table 1). Asteraceae with eight species (18.60 percent) was dominant, followed by Papilionaceae with six species (13.95 percent) and Polygonaceae possessed four species (9.30 percent). Caryophyllaceae and Poaceae each had three species (6.97 percent). Five families namely: Amaranthaceae, Chenopodiaceae, Lamiaceae, Plantaginaceae and Solanaceae had two species (4.65 percent).Nine families had one species representation. Asteraceae is a leading family in flora of Pakistan and also in Mastuj Valley [1-7]. This supports the present findings. Some of the weeds are common to previous reports in maize fields from the same location [1, 2].There were 37 (86.04 percent) therophytes, 4 (9.30 percent) geophytes and two (4.65 percent) hemicryptophytes. Microphylls were the leading leaf-size class (13 spp., 30.23 percent). A similar life form spectrum of weeds **[1, 7]** from Mastuj has been recorded that supports the present findings. It was followed by mesophylls (12 spp., 27.90 percent), nanophylls (9 spp., 20.93 percent), macrophylls (8 spp., 18.60 percent) and supplemented with personal observations. leptophylls (1 sp., 2.32 percent). Previously **[1, 7]** also reported leaf size spectra of weeds of some crops from Mastuj. This agrees with them. Phenological studies indicated that 41(95.34%) weeds were in reproductive and only two (4.65%) were in the post-reproductive stages. Abundance classes revealed that majority of weed species were occasional (18 spp, 41.86%), followed by frequent (9., 20.93%), rare (8., 18.60%) and common (5., 11.62%). Only three species (6.97%) were abundant (Table 2). Ethnobotanical classification indicated that 37 (86.04%) species were used as fodder, 13 (30.23%) were medicinal, 8(18.60%) served as vegetables and one (2.32%) yielded vegetable oil. Weeds are considered as unwanted plants that grow against the will of man; but some weeds are useful **[8, 9]** as fodder, vegetable, medicinal species as is the case in present study. *Cannabis sativa*, *Eragrostris minor*,*Helianthus annuus*, *Nepeta cataria* and *Papaver somniferum* were present in Mastuj village, while *Amaranthus cruetiens*, *Dtura stramonium*, *Lotus corniculatus* and *Trifolium resupinatum* were found in Chinar village and *Cynodon dactylon* was observed only in Tooque village (Table 1). Weeds compete, exhibit allelopathy and provide habitats for harmful pathogenic organisms. The yield of maize can be increased by advance agronomic practices including weed control.

Table 1. Floristic composition and ecological characteristics of weeds of maize fields in Mastuj valley Hindukush range, Pakistan

S. No.	Weed species	Localities			Life-form	Leaf-size	Phenology	Abundance classes	Ethnobotanical uses	Voucher No
		Mastuj	Tooque	Chinar						
	A. Pteridophytes									
	1. **Equisetaceae**									
1.	*Equisetum ramossimum* Desf.	-	+	+	G	L	Rep	O	Fd	SMF01
	B. Angiosperms									
	Monocotyledons									
	2. **Poaceae**									SMF02
2.	*Cynodon dactylon* (L.) Pers	-	+	-	H	Mic	Rep	F	Fd	
3.	*Eragrostris minor* Host.	+	-	-	Th	Mic	Rep	C	Fd	SMF03
4.	*Setaria glauca* (Retz.) Trinex Steud.	+	+	+	Th	Mic	Rep	C	Fd	SMF04
	Dicotyledons									
	3. **Amaranthaceae**									
5.	*Amaranthus cruetiens* L.	-	-	+	Th	Mac	Rep	R	Fd	SMF05
6.	*Amaranthus reteoflexus* L.	+	+	+	Th	Mes	Rep	R	Fd	SMF06
	4. **Asteraceae**									
7.	*Artemisia japonica* Thunb.	+	+	+	Th	Mes	Rep	F	Med	SMFO7
8.	*Cichorium intybus* L.	+	+	+	Th	Mes	Rep	C	Fd	SMF08
9.	*Cnicus benedictus* L.	-	-	+	Th	Mes	Rep	A	Fd	SMF09
10.	*Helianthus annuus* L.	+	-	-	Th	Mac	Rep	O	Fd, oil	SMF10
11.	*Matricaria chamomila* L.	+	+	+	Th	Mic	Rep	O	Fd	SMF11
12.	*Sonchus arvensis* Boiss	+	+	+	Th	Mes	Rep	F	Fd	SMF12
13.	*Taraxacum officinale* Weber.	+	+	+	Yh	Mac	Rep	F	Fd	SMF13
14.	*Xanthium strumarium* L.	-	+	+	Th	Mac	Rep.	A	Fd	SMF14
	5.**Brassicaceae**									
15.	*Capsella bursa-pastoris* (L.) Medic.	+	+	+	Th	Mic	Rep.	F	Fd	SMF15
	6.**Cannabaceae**									
16.	*Cannabis sativa* L.	+	-	-	Th	Mes	Rep	R	Med	SMF16
	7.**Caryophyllaceae**									
17.	*Arenaria serphyllifolia* L.	+	+	+	Th	Mic	Rep	O	Fd	SMF17
18.	*Silene conoidea* L.	+	+	+	Th	Mic	Rep	O	Fd, Veg	SMF18
19.	*Vaccaria pyramidata* Medik.	+	+	-	Th	N	Rep.	O	Fd	SMF19
	8.**Chenopodiaceae**									
20.	*Chenopodium album* L.	+	+	+	Th	Mic	Rep	C	Fd	SMF20
21.	*Chenopodium botrys* L.	+	+	+	Th	N	Rep	C	Fd	SMF21
	9.**Convolvulaceae**									
22.	*Convolvulus arvensis* L.	+	+	+	Th	Mic	Rep	O	Fd	SMF22

	10.**Euphorbiaceae**									
23.	*Euphorbia peplus* L.	-	+	+	Th	N	Rep	R	Fd	SMF23
	11.**Labiatae**									
24.	*Mentha longifolia* (L.) Huds	+	+	+	G	Mic	Rep	O	Fd, Med	SMF24
25.	*Nepeta cataria* L.	+	-	-	Th	Mes	Rep	R	Fd, Med	SMF25
	12.**Malvaceae**									
26.	*Malva neglecta* Wall.	+	+	+	Th	Mic	Rep.	O	Fd, Med, Veg	SMF26
	13.**Papaveraceae**									
27.	*Papaver somniferum* L.	+	-	-	Th	Mac	Post-Rep	R	Med	SMF27
	14.**Papilionaceae**									
28.	*Glycyrrhiza glabra* L.	+	+	+	G	Mes	Rep	A	Fd, Med	SMF28
29.	*Lotus corniculatus* L.	-	-	+	Th	N	Rep	F	Fd	SMF29
30.	*Medicago sativa* L.	+	+	+	H	N	Rep	F	Fd, Veg	SMF30
31.	*Trifolium repens* L.	+	+	+	Th	N	Rep	F	Fd	SMF31
32.	*Trifolium resupinatum* L.	-	-	+	Th	Mic	Rep	O	Fd, Veg	SMF32
33.	*Vicia sativa* L.	+	+	-	Th	Mic	Rep	O	Fd	SMF33
	15.**Plantaginaceae**									
34.	*Plantago lanceolata* L.	+	+	+	Th	Mes	Rep	F	Fd, Med	SMF34
35.	*Plantago major* Aitch.	+	+	+	G	Mac	Rep.	O	Fd, Med	SMF35
	16.**Polygonaceae**									
36.	*Polygonum aviculare* L.	+	+	+	Th	N	Rep	O	Fd	SMF36
37.	*Fallopia dumetorum* (Linn.) Holub	+	+	+	Th	Mes	Rep	R	Fd, Veg	SMF37
38.	*Persicaria maculosa* Gray.	+	+	+	Th	Mes	Post-Rep	O	Fd	SMF38
39.	*Rumex longifolius* DC.	+	-	+	Th	Mac	Post-Rep	O	Fd, Med, Veg	SMF39
	17.**Portulacaceae**									
40.	*Portulaca oleracea* L.	+	+	+	Th	N	Rep	R	Med, Veg	SMF40
	18.**Rubiaceae**									
41.	*Gallium aparine* L.	+	+	+	Th	N	Rep	O	Fd	SMF41
	19. **Solanaceae**									
42.	*Datura stramonium*L.	-	-	+	Th	Mac	Rep	O	Med	SMF42
43.	*Solanum nigrum* L.	+	+	+	Th	Mes	Rep.	O	Med, Veg	SMF43

Key: 1. Life-form classes: Th. Therophyte., G. Geophyte., H. Hemicryptophyte. 2. Leaf-size classes: L. Leptophyll., N. Nanophyll., Mic. Microphyll., Mes. Mesophyll., Mac. Macrophyll. 3. Phenological stages: Rep. Reproductive., Post-Rep. Post Reproductive. 4. Abundance classes: A. Abundant., C. Common., F. Frequent., O. Occasional. R. Rare. 5. Economic values: Fd. Fodder., Med. Medicinal., Veg. Vegetables Oil

Table 2. Summary of biological spectra and economic uses of weeds of maize in Mastuj valley, Pakistan.

S.No.	Ecological Parameters	No. of Species	Percentage (%)
A.	**Life-form classes**		
i.	Therophytes: Th	37	86
ii.	Geophytes: G	04	09
iii.	Hemicryptophytes: H	02	04
Total		**43**	**99**
B.	**Leaf-size classes**		
i.	Microphyll: Mic	13	30
ii.	Mesophyll: Mes	12	27
iii.	Nanophyll: N	09	20
iv.	Macrophyll: Mac	08	18
v.	Leptophyll: L	01	02
Total		**43**	**97**
C.	**Phenological Stage**		
i.	Reproductive	41	95
ii.	Post-Rep.	02	04
Total		**43**	**99**
D.	**Abundance Classes**		
i.	Occasional	18	41.86
ii.	Frequent	09	20.93
iii.	Rare	08	18.60
iv.	Common	05	11.62
v.	Abundant	03	6.97
Total		**43**	**99.98**
D.	**Economic use Classification**		
i.	Fodder	37	86.04
ii.	Medicinal	13	30.23
iii.	Vegetables	08	18.60
iv.	Edible oil yielding	01	2.32

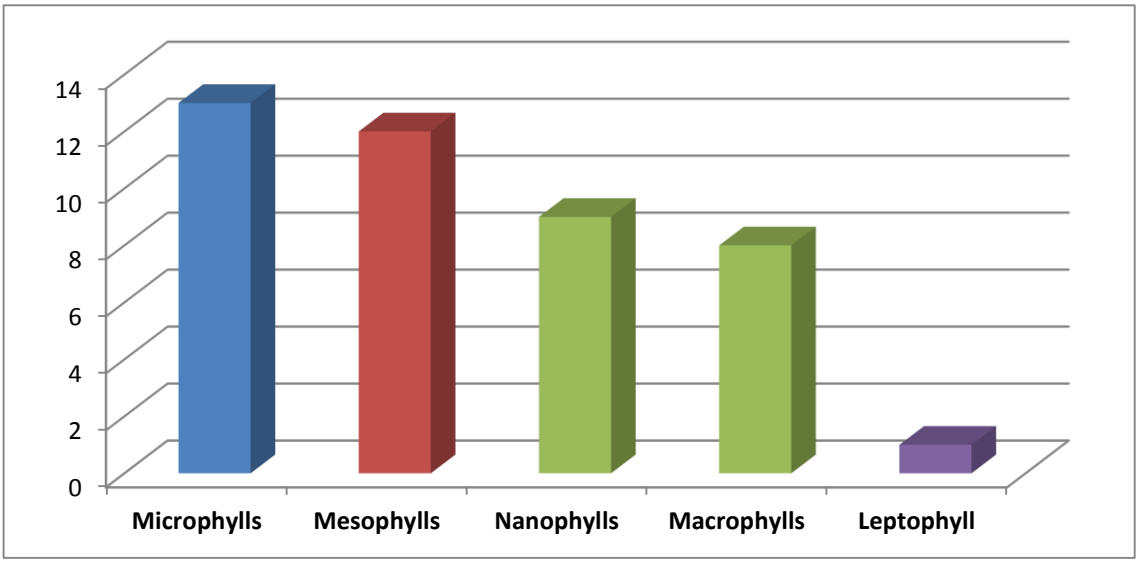

Figure 3. Leaf-size spectrum of weeds in maize fields of Mastuj valley

Conclusion and recommendations

It is concluded that the research area is suitable for maize cultivation due to its fertility, availability of water and farmer hard working. Hand pulling of weeds at pre-reproductive stage is recommended.

Author's contributions

Conceived and designed the experiments: SM Shah, Performed the experiments: SM Shah, Analyzed the data: F Hussain, Provided reagents: F Hussain, Wrote the paper: SM Shah.

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