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WEED DISTRIBUTION IN POTATO FIELDS OF NAZIMABAD, TEHSIL GOJAL, GILGIT-BALTISTAN, PAKISTAN

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ABSTRACT

A survey of ten random potato fields of Nazimabad Gojal (Gilgit-Baltistan) Pakistan was carried out in September, 2009 to identify density, frequency, importance value (IV) and frequency classes of weeds. A total of 24 weed species belonging to ten families were recorded. The most frequent families were found as: Chenopodiaceae 100%, Labiatae 85%, Asteraceae, Papillionaceae, Poaceae, and Polygonaceae each 80%, Caryophyllaceae 50%, Convolvulaceae and Brassicacea 45 and 15%, respectively in the quadrates of the study area. Among which four species of Asteraceae, Papillionaceae, Poaceae and Polygonacea, two species of Chenopodiaceae, Labiatae and one species each of Caryophyllaceae, Brassicaceae, Convulvoulaceae and Plantaginaceae were found. Chenopodium sp. had highest density with 19 m^{-2} followed by Chenopodium album L.*, Convolvulus arvensis* L.*, Lamium amplexicaule and Fagopyrum tataricum (L.) Gaertn. with 4 m^{-2} each, and Prunella vulgaris and Setaria viridis* L. *with 3 m^{-2}. Cicer sp., Pisum sp. had lowest density i.e. 0.1 of each and Medicago sp. had a density of 0.2 m^{-2}. Frequency wise Chenopodium sp. had highest frequency (100) followed by Chenopodium album* L. (75)*, Lamium amplexicaule (65), Medicago sativa, Setaria viridis* L*. Fagopyrum tataricum (60) each, and Sonchus arvensis* L*. and Artemesia* sp*. with 55 and 50 respectively. Chenopodium* sp. and *Chenopodium album had highest IV value of 47 and 17, respectively. Lamium amplexicaule* L. and *Fagopyrum tataricum had 15 each. Whereas, the IV of Setaria viridis* (L.) P. Beauv. *Medicago sativa and Sonchus arvensis* L. was 13, *11 and* 10 respectively. The lowest IV value was found in *Medicago* sp*. (2), Cicer* sp (1), *Pisum* sp. (1), and *Eragrostis (1)*.

Key words: Gilgit-Baltistan, weed, density, frequency, IV, *Solanum tuberosum*.

INTRODUCTION

Northern Areas of Pakistan (now renamed as Gilgit-Baltistan) lie at latitude 72°-75° East and longitude 35°-37° North. Due to favorable climatic conditions and edaphic factors the whole area has become a potential potato seed growing area, locally some of which are used as food and the rest is sold as cash crop. Nazimabad, a

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potato growing village of Gojal valley is located near Sost at an elevation of 2720 m with summer temperatures ranging from 10°C to 30°C. The nights are usually cool. Apple and apricot are the main fruit trees of the area, wheat, maize and potato are main food and cash crops. Potatoes are grown in May-June and harvested in September-October, thus affording one crop in a year. The study area is shown in Fig.1. Potato (*Solanum tuberosum* L.) is an annual, herbaceous, dicotyledonous plant belonging to the family Solanaceae (Shah *et al.*, 2003). Developing countries grow this crop to meet high food demands. This crop is also important because of its short duration, nutritional superiority and high amount of food per unit area and time (Hashim *et al.*, 2003). In cold areas like Gilgit-Baltistan most of the farmers living at peripheries prefer to grow potato to meet food requirements as well as commercial purposes. Agro techniques were chosen on the basis of biology and ecology of weed species (Kojić and Šinžar, 1968; Mišović *et al.*, 1992).

Figure 1. Location map of Gilgit-Baltistan.

Weeds are undesired plants in a crop field. These may be annual, biennial and perennial (Boydston, 2008). Weeds cause a reduction in the yield of potato crops (Banaras, 1993; Hussain, *et al.*,

2004). The villagers cannot afford herbicides and fungicides due to their poor economic status. Hand weeding practice is common which is done in early stages of growth, but when the potatoes are mature weeding is not practiced. Hand weeding increases average tuber yield (Jan *et al.*, 2004). Similar results were also obtained by Danijela and Zoran (2004) reporting 51 weed species of potato crop in Montenegro with similar climatic conditions. Shah and Khan (2006) reported 63 weed species belonging to 23 families in four crops from Mansehra on the way of Karakorum Highway which has some resemblance with the present study. According to Riaz *et al.* (2007), 31 weed species belonging to 17 families were found growing in association with Gladiolus in which Asteraceae, Papillionaceae and Poaceae were dominant families. Ige *et al.* (2008) recorded six species of Asteraceae, three species of Convolvulaceae and 11 species of Poaceae in a similar study in Nigeria and these families were also recorded in our study. Frequency and density are important parameters for systematics of weeds (Alam *et al.*, 1991; Ghersa and Holt, 1995; Ige *et al.*, 2008) that is why we chose these parameters for our study. No literature is available from the study area focused on the topic as this is the first study of its kind on weeds in this area. This effort will help researchers in future to formulate weed management approaches.

MATERIALS AND METHODS

Ten random potato fields having size of 20m x 10m were selected and two quadrates measuring 1m x 1m (Hussain, 1989) in each field were laid down to list, count and measure their maximum cover and height of each species. Weed species were categorized into frequency and frequency class. Density and relative density of each species were noted. Plants were identified with the help of flora of Pakistan (Ali and Qaiser, 1995-2004) and with the help of an expert in Pakistan Museum of Natural History Islamabad. The weed specimens were kept in the Herbarium, Department of Biological Sciences, Karakoram International University Gilgit, Pakistan. It was observed that the matured potato fields shown dense vegetation as compared to the potato field in a later stage, which were dried as shown in Fig. 2.

RESULTS AND DISCUSSION

For potatoes the soil in the fields of Nazimabad was ploughed well with addition of organic manure and synthetic fertilizers. As the farmers cannot afford herbicides, these were not applied during early stages of growth; similarly, no insecticides and fungicides are used at the initial stage.

Figure 2. (A) Mature potato field (B) potato field in a later stage.

Instead, weeds are removed by hoeing only during the early stages of growth. However, when the crop gets mature, the weeds are not removed by hoeing. Thus, some weeds make their appearance when the crop is mature and the tubers are in various stages of development. The potato fields are irrigated twice in a week, as the soil structure is sandy loam; furrows are made for maximum water holding as shown in the Fig. 3.

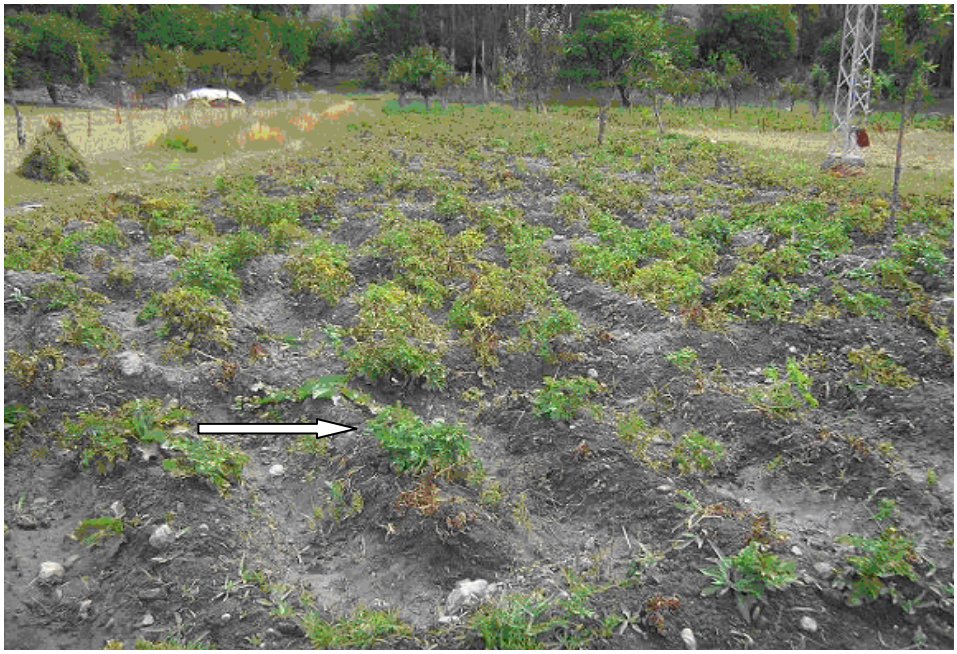

Figure 3. Furrows in potato fields.

The most frequent families were found as follows; Chenopodiaceae 100%, Labiatae 85%, Asteraceae, Papilionaceae, Poaceae, and Polygonaceae each 80%, Caryophyllaceae 50%, Convolvulaceae and Brassicacea 45 and 15%, respectively. There were 10 families and 25 species. Family Asteraceae, Papilionacea had five, Poaceae and Polygonaceae four, Caryophyllaceae, Chenopodiaceae and Labiatae two, Brassicaceae, Convolvulaceae and Plantaginaceae had one species each as shown in Table-1.

Table-1. Number of weed species, density, relative density, frequency, relative frequency, importance value (IV) and frequency classes.

Family	Spp. code	Species	Local Name	Total # of Ind.	Density	R.D.	Freq.	R.F	IV	F.Cl.
Asteraceae	*A*	*Sonchus arvensis* L.		49	2	4	55	7	10	C
	B	*Artemesia* sp.	Kumpa	27	1	2	50	6	8	C
	C	*Cirsium* sp.	Kiril	14	1	2	10	1	3	A
	D	*Taraxacum officinale* F.H. Wigg.	Tarlkhating	21	1	2	25	3	5	B
Brassicaceae	*E*	*Brassica* sp	Nivich	14	1	2	15	2	4	A
Caryophyllaceae	*F*	*Silene conoidea* L.		13	1	2	30	4	6	B
Chenopodiaceae	*G*	*Chenopodium* sp.	Khurda	371	19	34	100	13	47	E
	H	*Chenopodium album* L.	Shilit	82	4	7	75	9	17	D
Convolvulaceae	*I*	*Convolvulus arvensis* L.		74	4	7	10	1	8	A
Labiatae	*J*	*Lamium amplexicaule* L.		85	4	7	65	8	15	D
	K	*Prunella vulgaris* L.	Godonch	53	3	5	25	3	9	B
Papillionaceae	*L*	*Cicer* sp.		1	0.1	0	5	1	1	A
	M	*Medicago* sp.	Weshark	4	0.2	0	10	1	2	A
	N	*Medicago sativa*	Weshark	40	2	4	60	8	11	C
	O	*Pisum* sp.		1	0.1	0	5	1	1	A
Poaceae	*P*	*Avena sativa* L.		5	0.3	1	20	3	3	A
	Q	*Cenchrus ciliaris* L.	Sirshiqa	17	1	2	10	1	3	A
	R	*Eragrostis* sp.		4	0.2	0	5	1	1	A
	S	*Setaria viridis* (L.) P. Beauv.	Gooz	52	3	5	60	8	13	C
Polygonaceae	*T*	*Fagopyrum tataricum* (L.) Gaertn.	Birvi	71	4	7	60	8	15	C
	U	*Perisicaria nepalensis* (Meisn.)H. Gross		29	1	2	25	3	5	B
	V	*Polygonum* sp.		18	1	2	25	3	5	B
	W	*Rumex nepalensis* Spreng.	khafchogh	12	1	2	30	4	6	B
Plantaginaceae	*X*	*Plantago major* Aitch		28	1	2	20	3	4	A
			Total	**1085**	**55.9**	**100**	**795**	**100**	**200**	

Chenopodium sp. had the highest density and relative density (19 and 33, respectively) followed by *Chenopodium album* L. (4 and 7), *Convovulus arvensis* L. (4 and 6), *Lamiun amplexicaule* L. (4 and 7), *Fagopyrum tataricum* (4 and 6), *Prunella vulgaris* L. and *Setaria viridis* (L.) P. Beauv. (3 and 5 each), *Plantago major* L. (1 and 2 respectively), while *Cicer* sp., *Pisum* sp., had (0.1 and 0.1) and *Eragrostis* sp. (0.2 and 0) least density and relative density as shown in Fig. 4.

Chenopodium sp. and *Chenopodium album* had highest IV value i.e. 47 and 17 each respectively. *Lamium amplexicaule* L. and *Fagopyrum tataricum* had 15 each. *Setaria viridis* (L.) P. Beauv., *Medicago sativa* and *Sonchus arvensis* L. had 13, 11 and 10, respectively. While *Medicago* sp. *(2)*, *Cicer* sp. (1), *Pisum* sp. (1), and *Eragrostis (1)* had lowest IV value as shown in the Table-1. Thus *Chenopodium* sp. *Chenopodium album* and *Lamium amplexicaule* are the dominant species in the potato fields of Nazimabad.

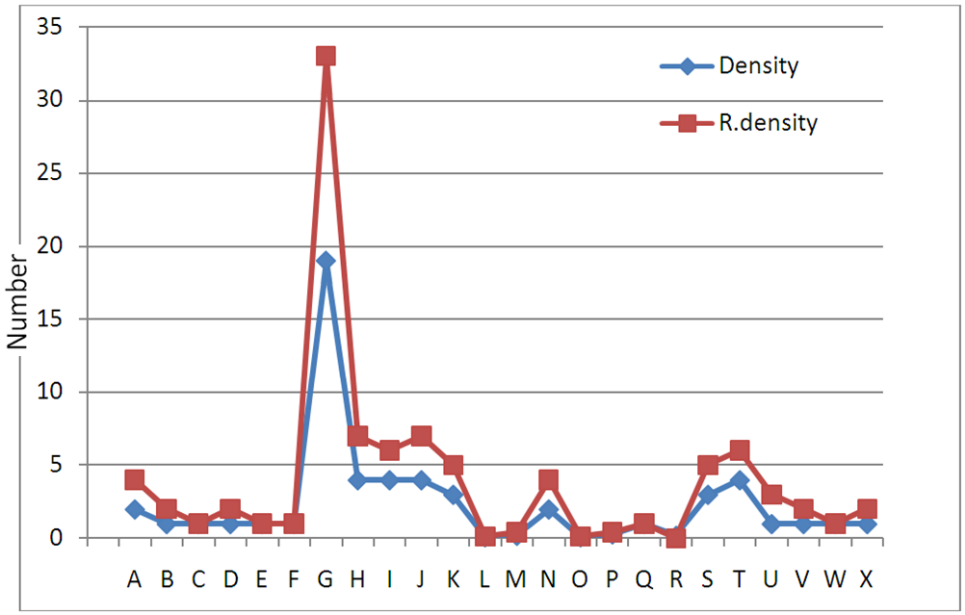

Figure 4. Density and relative density of the species. The alphabets indicate the species, presented in Table-1.

Frequency wise *Chenopodium* sp. had highest frequency with 100% followed by *Chenopodium album* L., with 75, *Lamium amplexicaule* L. with 65, *Medicago sativa*, *Setaria viridis* (L.) P. Beauv., *Fagopyrum tataricum* each with 60 and *Sonchus arvensis* L. and

Artemesia sp. with 55 and 50, respectively. *Pisum* sp. and *Cicer* sp. had the lowest frequency i.e. 5 as indicated in Fig. 5.

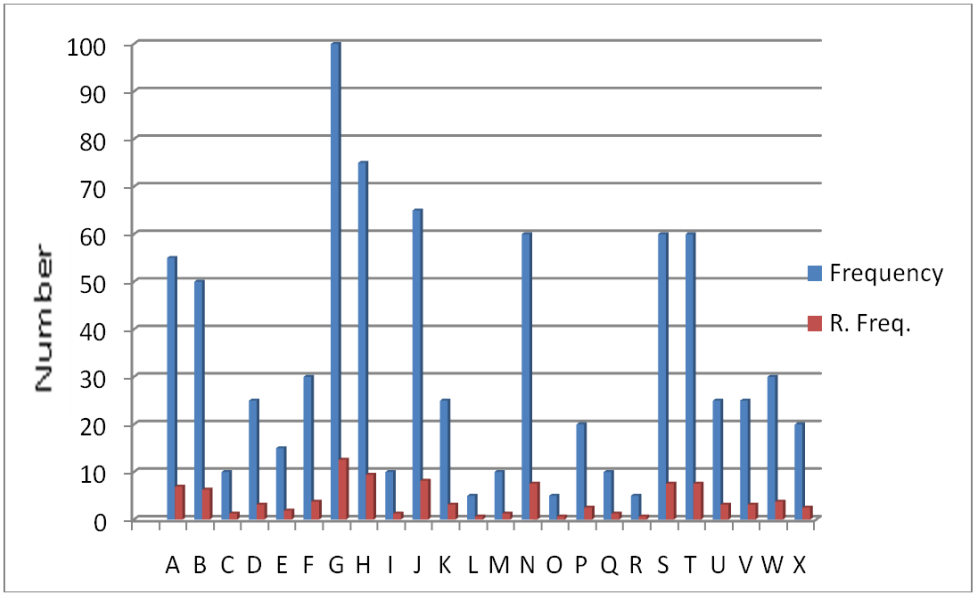

Figure 5. Frequency and relative frequency. The alphabets indicate the species, presented in Table-1.

Ten species fall in frequency class A, six in B, five in C, two in D and one species falls in frequency class E. These data show that *Chenopodium album* L. is the only dominant species of the area followed by *Convolvulus arvensis* L.

Some species are common in cold areas like Gilgit and Chitral which is due to similar climatic and edaphic conditions. For example *Convolvulus arvensis*, *Setaria viridis*, *Silene carroidia*, *Artemisia* sp., *Chenopodium album*, *Medicago sativa*, *Sonchus arvensis*, *Cirsium* sp., *Polygonium* sp., *Plantago major* and *Taraxacum officinale* were common, as those of Hussain *et al.*, (2004) in wheat crops of Chitral. Climatic conditions greatly affect the frequency of arid and semi arid weeds (Younesabadi, 2006).

The study was conducted in September. Density of *Chenopodium album* L. and *Convolvulus arvensis* L. were 4 each, and frequency 75 and 10 each respectively; while in a similar study, both the species had an average density as 3.65, 6.35 and frequency 1.96, 3.38, respectively in springs at harvest time (Shaikh *et al*., 2004). This difference is due to the variation in climatic and geographic conditions between these two areas.

As the study reveals that 24 four weed species found in ten fields the number is less and it is due to the hand weeding practice in the area, which is considered the most effective way of removing weeds and for maximum grain yield (Iqbal, *et al.*, 2010).

Chenopodium album L. and *Convolvulus arvensis* L. are the most commonly found weed species in potato fields. These both were recorded with a percentage frequency of 75% and 45%, respectively; while according to Danijela and Zoran (2004) these were recorded 5.3% and 21.6%, respectively in Montenegro in a similar climatic condition.

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