

## A CHECKLIST OF THE WEEDS GROWING IN THE MAIZE CROP AT MANKIAL VALLEY HINDUKUSH RANGE, PAKISTAN

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### ABSTRACT

*Distributions of 31 weed species belonging to 15 families were recorded in maize fields from five sites in Mankial valley from June to September, 2012. Poaceae was the leading family with 7 species, followed by Polygonaceae with 4 species and Amaranthaceae with 3 species. Asteraceae, Brassicaceae, Chenopodiaceae, Plantaginaceae and Lamiaceae had 2 species each. Balsaminaceae, Caryophyllaceae, Convolvulaceae, Equisetaceae, Malvaceae, Onagraceae and Portulacaceae were each represented by one species. The composition of the weed species differed at each site. Amaranthus was among the top three species at three sites; Portulaca, Pennisetum, Rumex and Equisetum were each among the top three species in two fields. Communities' formation was Fagopyrum-Portulaca-Amaranthus (with IVI of 56.02, 50.87 and 44.78 respectively), Pennisetum-Rumex-Portulaca (with IVI 40.41, 32.43, 30.63 respectively), Sorghum-Equisetum-Portulaca (with IVI 54.95, 46.26 and 34.95 respectively), Pennisetum-Rumex-Amaranthus (with IVI 63.87, 42.87 and 38.75 respectively) and Equisetum-Amaranthus-Malva (with IVI 99.05, 32.73 and 25.81 respectively).*

**Key words:** Distribution, Mankial valley, maize crop, weeds.

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### INTRODUCTION

Mankial valley is situated in the Upper Swat and is locally known as Sooko Sar or Kohee Shaheen. This area lies on 35° 12' 24'' N to 72° 32' 15'' E on the globe. Mankial has 32278 acres of land about 70 km north east of Swat valley with high glacial peaks. On the revenue index map of Swat District, the area is traced on Mozas (Settlement units) bearing S. No. 18 & 19 (Badai and Mankial) with the landholdings of 20620 and 11658 acres, respectively. The area has a very steep relief in a couple of Kilometers and varies from 1430 m at

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Mankial to 5726 m at Koohe Shaheen. The area represents a mountainous terrain of the high-glaciated peaks, perennial snowfields, glaciers, falls, pastures, river, stream and intact forests. Physically the area can be divided into mountains, valleys, pastures and the dendritic drainage network of the river Mankial. The %age share by area of mountains, valleys/pastures and river is estimated to be at 95%, 4.5% and 0.5% respectively. Pastures are located above 3000 m and have alpine conditions come under the alpine regions in nature with severe winters starting from mid September to the end of March and a mild summer from June till August.

After wheat and rice, maize (*Zea mays* L.) is the third cereal crop accounts for 4.8% of total cropped and 3.5% of the value of agricultural output in Pakistan. It is cultivated on 0.9 m hectares with annual production of 1.3 m tons in Khyber Pakhtunkhwa. With a share of 57% in the total production in the country, Khyber Pakhtunkhwa province is the leader in maize production in Pakistan. Maize is rich in protein and starch 70-80% (Muhammad, 1998). Weeds are plants growing in undesirable places. Weeds compete with crops resulting in reduction of yield. Generally 20-30% losses in grain yield are quite usual and may be as high as 50% if the crop management practices are not properly followed. Many workers have attempted studies on various weeds-crops interaction in various areas (Khan and Haq, 2004; Hamayun, 2003; Bhatti and Memon, 2003; Khan *et al.*, 2004; Hoffman and Regnier, 1993; Hussain and Rashid, 1989; Johnson and Deflice, 1993; Rashid and Hussain, 1989; Ullah and Rashid, 2007; Khan *et al.*, 2012; Khan *et al.*, 2013). For maize the critical weed crop competition period is 3-6 weeks after sowing that has adverse effects on the productivity (Chatta, 1988). Maize is the only cereal grown in Mankial valley. The inhabitants are dependent on it for food and fodder. Weeds reduce the productivity of the crops and are also a major component of natural ecosystem. Further, it is observed that the weeds growing in high elevation maize fields are different from those in the maize fields at lower altitudes. Some of the weed species reported are phytogeographically restricted to this particular area. The goal of this study was initiated to prepare a checklist and assess the relative importance of different weed species in maize fields of Mankial valley as the first step in developing better weed management strategies.

## **MATERIALS AND METHODS**

Studies were carried out at five maize growing sites of Mankial valley from June to September, 2012 viz. Mankial Bazar 1700 m., Mehnain 1730 m., Ghund Patai 1766 m., Bhadai Baba 1894 m., and Bhadai Patai 2075 m (Fig. 1 and 2). Plants were collected, preserved, documented and identified with the help of available literature (Stewart, 1972; Nasir and Ali, 1970-1989; Ali and Nasir, 1989-1991; Ali and Qaiser, 1993-2007). Voucher specimens were deposited in the University of Peshawar Herbarium (PUP). Botanical names, vernacular names and family of weeds were recorded (Table-1). The quadrates each measuring 0.5 x 0.5m were randomly examined from each site, while number of quadrates in all sites were 20 (Malik, 1986). The density, frequency, canopy coverage, relative density, relative frequency, relative canopy coverage and important value index of each weed species were determined by using the following formulae (Hussain, 1989).

$$\text{Density} = \frac{\text{Total No. of individuals of a species}}{\text{Total No. of quadrates}}$$

$$\text{Relative density} = \frac{\text{Density for a species} \times 100}{\text{Density for all species}}$$

$$\text{Frequency} = \frac{\text{No. of times in which a sp. occur} \times 100}{\text{Total no. of quadrates}}$$

$$\text{Relative frequency} = \frac{\text{Frequency value of species} \times 100}{\text{Total frequency for all species}}$$

### **Canopy Cover (C.C.)**

It is defined as the volume of space occupied (Oosting, 1956). Herbs coverage was calculated after cover classes of Daubenmire by the following formula (Daubenmire, 1959).

$$\text{C. C.} = \frac{\text{Total canopy cover of a species}}{\text{Number of quadrate} \times \text{Quadrate size}}$$

### **Relative Canopy Cover (R.C.C.)**

This was calculated from the cover value of a species as a proportion of the total cover values for all species (Brower and Zar, 1977).

$$\text{R.C.C.} = \frac{\text{Canopy cover of a species} \times 100}{\text{Total canopy cover of all species}}$$

### **Importance Value Index (IVI)**

It is the sum of all relative values of density, frequency and canopy coverage (Curtis and McLontosh, 1950).

I.V.I. = Relative density + Relative frequency + Relative canopy cover

## **RESULTS AND DISCUSSION**

Five communities of weed species were established in Mankial valley at five different sites (1, 2, 3, 4 and 5). Communities' formation was as follows: *Fagopyrum*, *Portulaca*, *Amaranthus* Community, *Pennisetum*, *Rumex*, *Portulaca* Community, *Sorghum*, *Equisetum*, *Portulaca* Community, *Pennisetum*, *Rumex*, *Amaranthus* Community and *Equisetum*, *Amaranthus*, *Malva* Community (Tables-2, 3, 4, 5 and 6). A total of 15 families were recorded, Poaceae was the leading family with 7 species, followed by Polygonaceae with 4 species; Amaranthaceae with 3 species. Asteraceae, Brassicaceae, Chenopodiaceae, Plantaginaceae and Lamiaceae with 2 species each. While Balsaminaceae, Caryophyllaceae, Convolvulaceae, Equisetaceae, Malvaceae, Onagraceae and Portulacaceae having one species each.

### **Density**

At site No. 1, density of *Fagopyrum esculentum* was 18%, *Portulaca oleracea* 9.6% and *Amaranthus gracilis* 9.2%. At site No. 2, density of *Pennisetum elatum* was 12.3%, *Portulaca oleracea* 9.6% and *Rumex hastatus* 9.5%. At site No. 3, density of *Sorghum halepense* was 24%, *Equisetum arvense* 16.3% and *Portulaca oleracea* 6.8%. At site No. 4, density of *Pennisetum elatum* was 16.2%, *Rumex hastatus* 10.1% and *Amaranthus viridis* 4.7%. At site No. 5, density of *Equisetum arvense* was 43.8%, *Portulaca oleracea* 5.7% and *Amaranthus viridis* 5.3%.

### **Frequency**

At site No. 1, frequency of *Portulaca oleracea* was 90%, *Bidens cernua* 80% and *Fagopyrum esculentum* 70%. At site No. 2, frequency of *Malva neglecta* and *Amaranthus viridis* was 90% each, *Chenopodium murale* & *Pennisetum elatum* 80% each and *Eragrostis poaeoides* and *Portulaca oleracea* 70% each. At site No. 3 frequency of *Portulaca oleracea* was 90%, *Sorghum halepense*, *Amaranthus viridis* and *Chenopodium botrys* 80% each and *Equisetum arvense* 70%. At site No. 4 frequency of *Amaranthus viridis* was 90%, *Pennisetum elatum* 80% and *Eragrostis poaeoides*, *Malva neglecta* and *Plantago major* 70% each. At site No. 5 frequency of *Amaranthus viridis* was 90%, *Malva neglecta* 80%, *Equisetum arvense* and *Impatiens thomsonii* 70% each.

### **Canopy Cover (C. C.)**

At site No. 1 C. C. of *Portulaca oleracea* was 40.5%, *Fagopyrum esculentum* 34.5% and *Pennisetum elatum* 31.5%. At site No. 2 C. C. of *Equisetum arvense* was 44%, *Pennisetum elatum* 40.2% and *Rumex hastatus* 36%. At site No. 3 C. C. of *Equisetum arvense* was 44%, *Sorghum halepense* 39.5% and *Amaranthus viridis* 28.5%. At site No. 4 C. C. of *Pennisetum elatum* was 42.04%, *Amaranthus viridis* and *Rumex hastatus* 33% each and *Eragrostis poaeoides* 21%. At site

No. 5 C. C. of *Equisetum arvense* was 77.5%, *Amaranthus viridis* 27% and *Malva neglecta* 21.5%.

#### **Relative Density (R. D.)**

At site No. 1 the R. D. of *Fagopyrum esculentum* was 25.74%, *Portulaca oleracea* 13.72% and *Amaranthus gracillis* 13.15%. At site No. 2 R. D. of *Penisetum elatum* was 18.24%, *Portulaca oleracea* 14.24% and *Rumex hastatus* 14.09%. At site No. 3 R. D. of *Sorghum halepense* was 28.03%, *Equisetum arvense* 19.04% and *Portulaca oleracea* 7.94%. At site No. 4 R. D. of *Pennisetum elatum* was 32%, *Rumex hastatus* 19.96% and *Amaranthus viridis* 9.28%. At site No. 5 R. D. of *Equisetum arvense* was 56.58%, *Amaranthus viridis* 7.36% and *Portulaca oleracea* 6.84%.

#### **Relative Frequency (R. F.)**

At site No. 1 R. F. of *Portulaca oleracea* was 18.36%, *Amaranthus gracilis* 16.32% and *Fagopyrum esculentum* 14.28%. At site No. 2 R. F. of *Amaranthus viridis* and *Malva neglecta* was 11.11% each, *Chenopodium murale* and *Pennisetum elatum* 9.87% each and *Eragrostis poaeoides* and *Portulaca oleracea* 8.64% each. At site No. 3 R. F. of *Portulaca oleracea* was 13.04%, *Amaranthus viridis*, *Chenopodium botrys* and *Sorghum halepense* 11.59% each and *Equisetum arvense* 10.14%. At site No. 4 R. F. of *Amaranthus viridis* was 14.75%, *Pennisetum elatum* 13.11% and *Eragrostis poaeoides*, *Malva neglecta* and *Plantago major* 11.47% each. At site No. 5 R. F. of *Amaranthus viridis* was 14.51%, *Malva neglecta* 12.90%, *Equisetum arvense* and *Impatiens thomsonii* 11.29% each.

#### **Relative Canopy Cover (R. C. C.)**

At site No. 1 R. C. C. of *Portulaca oleracea* was 18.79%, *Amaranthus gracillis* 15.31% and *Fagopyrum esculentum* 14.61%. At site No. 2 R. C. C. of *Equisetum arvense* was 13.37%, *Pennisetum elatum* 12.30% and *Rumex hastatus* 10.94%. At site No. 3 R. C. C. of *Equisetum arvense* was 17.08%, *Sorghum halepense* 15.33% and *Portulaca oleracea* 13.97%. At site No. 4 R. C. C. of *Pennisetum elatum* and *Amaranthus viridis* was 14.72% each and *Eragrostis poaeoides* 9.37%. At site No. 5 R. C. C. of *Equisetum arvense* was 31.18%, *Amaranthus viridis* 10.86% and *Malva neglecta* 8.65%.

#### **Important Value Index (I. V. I.)**

At site No. 1 the IVI of *Fagopyrum esculentum* was 56.02%, *Portulaca oleracea* 50.87% and *Amaranthus gracillis* 44.78%. At site No. 2 IVI of *Pennisetum elatum* was 40.41%, *Rumex hastatus* 32.43% and *Portulaca oleracea* 30.63%. At site No. 3 IVI of *Sorghum halepense* was 54.95%, *Equisetum arvense* 46.26% and *Portulaca oleracea* 34.95%. At site No. 4 IVI of *Pennisetum elatum* was 63.87%, *Rumex hastatus* 42.87% and *Amaranthus viridis* 38.75%. At site No. 5

IVI of *Equisetum arvense* was 99.05%, *Amaranthus viridis* 32.73% and *Malva neglecta* 25.81%.

## CONCLUSION

Maize is the only cereal crop in Mankial valley which is consumed as food and fodder. As compared to the world leading countries, the production of maize is less in Pakistan. It has been observed that the maize fields in Mankial valley are highly infested by various weeds including broad leaved herbs and grasses like other crops. It is also noted that the loss of yield is dependent upon weed infestation, growth habit, duration of competition, land type, soil fertility and soil moisture. The losses may vary from crop to crop and from farm to farm within a season (Tanveer and Ali, 2003).

Some of the weeds species like *Amaranthus viridis*, *Equisetum arvense*, *Fagopyrum esculentum*, *Portulaca oleracea*, *Pennisetum elatum*, *Rumex dentatus*, *Sorghum halepense* and *Malva neglecta* are frequent. It has also been noted that some of the weed species are known to be used for various purposes by the local inhabitants. Based on present findings biological control of the weeds is recommended for conservation of natural gene pool, enhanced yield of the crop and sustainable weed management practices.



**Figure 1.** Maize fields in the valley



**Figure 2.** Using quadrat method

**Table-1.** Checklist of families, botanical names and vernacular names of weed species collected from the research area

S #	Family	S #	Botanical name	V. name
1	Amaranthaceae	1.	<i>Amaranthus gracilis</i> Desf.	Ghata chalway
		2.	<i>Amaranthus viridis</i> L.	Wara chalway
		3.	<i>Fagopyrum esculentum</i> Moench.	Chalway
2	Asteraceae	4.	<i>Bidens cernua</i> L.	Zair guly
		5.	<i>Sonchus asper</i> (L.) Hill.	Shodapai
3	Balsaminaceae	6.	<i>Impatiens thomsonii</i> Hk. f.	Nazak boty
4	Brassicaceae	7.	<i>Cardamine hirsuta</i> L.	Tarukay
		8.	<i>Lepidium sativum</i> L.	Sharshamay
5	Caryophyllaceae	9.	<i>Arenaria neelgherrensis</i> W. & A.	Khar booti
6	Chenopodiaceae	10.	<i>Chenopodium botrys</i> L.	Skha booty
		11.	<i>Chenopodium murale</i> L.	Ganda booty
7	Convolvulaceae	12.	<i>Convolvulus arvensis</i> L.	Pairwaty
8	Equisetaceae	13.	<i>Equisetum arvense</i> L.	Bandakai
9	Labiatae	14.	<i>Mentha longifolia</i> (L.) Huds.	Wenaly
		15.	<i>Nepeta erecta</i> (Bth.) Bth.	Skha podina
10	Malvaceae	16.	<i>Malva neglecta</i> Wallr.	Pandirak
11	Onagraceae	17.	<i>Epilobium cylindricum</i> D. Don	Abi guly
12	Plantaginaceae	18.	<i>Plantago depressa</i> Willd.	Waroky sat

		19.	<i>Plantago major</i> L.	Ghat Sat
13	Poaceae	20.	<i>Dactylis glomerata</i> L.	Wakha
		21.	<i>Digitaria ciliaris</i> (Retz.) Koel.	Shamokha
		22.	<i>Eragrostis poaeoides</i> P. Beauv	Wakha
		23.	<i>Pennisetum elatum</i> L.	Wakha
		24.	<i>Piptatherum gracilis</i> Mez.	Wakha
		25.	<i>Sorghum halepense</i> (L.) Pers.	Wakha
		26.	<i>Setaria glauca</i> (L.) P. Beauv.	Wakha
14	Polygonaceae	27.	<i>Polygonum glabrum</i> Willd.	Soor palpoluk
		28.	<i>Polygonum plebejum</i> R.Br.	Palpoluk
		29.	<i>Rumex dentatus</i> L.	Shalkhy
		30.	<i>Rumex hastatus</i> D. Don	Tarooky
15	Portulacaceae	31.	<i>Portulaca oleracea</i> L.	Warkhare

**Table-2.** Ecological attributes of *Fagopyrum-Portulaca-Amaranthus* community at Mankial Bazar 1700 m (site 1)

No	Scientific name	Den.	Freq.	C. C.	R. D.	R. F.	R.C.C	IVI
1	<i>Amaranthus gracilis</i> Desf.	9.2	80	33	13.15	16.32	15.31	44.78
2	<i>Bidens cernua</i> L.	6	20	15.5	8.58	4.08	7.19	19.85
3	<i>Chenopodium murale</i> L.	3.2	60	18	4.57	12.24	8.35	25.16
4	<i>Equisetum arvense</i> L.	4	10	12.5	5.72	2.04	5.80	13.56
5	<i>Eragrostis poaeoides</i> P. Beauv.	7.1	40	21	10.15	8.16	9.74	28.05
6	<i>Fagopyrum esculentum</i> Moench.	18	70	34.5	25.74	14.28	16	56.02
7	<i>Nepeta erecta</i> (Bth.) Bth.	0.2	10	3	0.02	2.04	1.39	3.45
8	<i>Pennisetum elatum</i> L.	6.3	60	31.5	9.01	12.24	14.61	35.86
9	<i>Portulaca oleracea</i> L.	9.6	90	40.5	13.72	18.36	18.79	50.87
10	<i>Sorghum halepense</i> (L.) Pers.	6.2	50	6	8.86	10.20	2.78	21.84
Total		69.92	490	215.5				



**Table-3.** Ecological attributes of *Pennisetum-Rumex-Portulaca* community at Mehnain 1730 m (site 2)

No	Scientific name	Den.	Freq.	C. C.	R. D.	R. F.	R.C.C	IVI
1	<i>Amaranthus viridis</i> L.	4.8	90	28.52	7.12	11.11	7.27	25.5
2	<i>Arenaria neelgherrensis</i> W. & A.	1.3	40	12	1.92	4.93	3.64	10.49
3	<i>Chenopodium murale</i> L.	4.9	80	28.5	2.27	9.87	8.66	20.8
4	<i>Convolvulus arvensis</i> L.	3.6	50	19.5	5.34	6.17	5.92	17.43
5	<i>Dactylis glomerata</i> L.	6	20	15.5	8.90	2.46	4.71	16.07
6	<i>Eragrostis poaeoides</i>	2.9	70	25.5	4.30	8.64	7.75	20.69
7	<i>Equisetum arvense</i> L.	4.0	60	44	5.93	7.40	13.37	26.7
8	<i>Malva neglecta</i> Wallr.	4.4	90	23.5	6.52	11.11	7.14	24.77
9	<i>Mentha longifolia</i> (L.) Huds.	1.5	20	6	2.22	2.46	1.82	6.5
10	<i>Pennisetum elatum</i> L.	12.3	80	40.5	18.24	9.87	12.30	40.41
11	<i>Piptatherum gracilis</i> Mez.	1.3	40	12	1.92	4.93	3.64	10.49
12	<i>Portulaca oleracea</i> L.	9.6	70	25.5	14.24	8.64	7.75	30.63
13	<i>Rumex hastatus</i> D. Don	9.5	60	36	14.09	7.40	10.94	32.43
14	<i>Sonchus asper</i> (L.) Hill.	1.3	40	12	1.92	4.93	3.64	10.49
Total		67.4	810	329.0 2				

**Table-4.** Ecological attributes of *Saccharum-Equisetum-Portulaca* community at Ghund Patai 1766 m (site 3)

No	Scientific name	Den.	Freq.	C. C.	R. D.	R. F.	R.C.C	IVI
1	<i>Amaranthus viridis</i> L.	5.6	80	28.5	6.54	11.59	11.06	29.19
2	<i>Chenopodium botrys</i> L.	4.8	80	16.1	5.60	11.59	6.25	22.84
3	<i>Chenopodium murale</i> L.	1.5	30	9.0	1.72	4.34	3.49	9.55
4	<i>Digitaria ciliaris</i> (Retz.) Koel.	6	20	15.5	7.0	2.89	6.01	15.9
5	<i>Equisetum arvense</i> L.	16.3	70	44	19.04	10.14	17.08	46.26
6	<i>Eragrostis poaeoides</i> P. Beauv.	4.5	60	19.5	5.25	8.69	7.56	21.5

7	<i>Malva neglecta</i> Wallr.	2.2	40	16.5	2.57	5.79	6.40	14.76
8	<i>Pennisetum elatum</i> L.	4.5	30	9.0	5.25	4.34	3.49	13.08
9	<i>Polygonum glabrum</i> Willd.	3.2	60	18	3.73	8.69	6.98	19.4
10	<i>Portulaca oleracea</i> L.	6.8	90	36	7.94	13.04	13.97	34.95
11	<i>Sorghum halepense</i> (L.) Pers.	24	80	39.5	28.03	11.59	15.33	54.95
12	<i>Setaria glauca</i> (L.) P. Beauv.	6.2	50	6	7.24	7.24	2.32	16.8
Total		85.6	690	257.6				

**Table-5.** Ecological attributes of *Pennisetum-Rumex-Amaranthus* community at Bhadai Baba 1894 m (site 4)

No	Scientific Name	Den	Freq.	C. C.	R. D.	R. F.	R.C.C.	IVI
1	<i>Amaranthus viridis</i> L.	4.7	90	33	9.28	14.75	14.72	38.75
2	<i>Epilobium cylindricum</i> D. Don	3.6	50	19.5	7.11	8.19	8.70	24.0
3	<i>Equisetum arvense</i> L.	3.6	50	19.5	7.11	8.19	8.70	24.0
4	<i>Eragrostis poaeoides</i> P. Beauv.	4.0	70	21	7.90	11.47	9.37	28.74
5	<i>Malva neglecta</i> Wallr.	2.9	70	16	5.73	11.47	7.14	24.34
6	<i>Pennisetum elatum</i> L.	16.2	80	42.04	32.0	13.11	18.76	63.87
7	<i>Plantago depressa</i> Willd.	1.3	40	12	2.56	6.55	5.35	14.46
8	<i>Plantago major</i> L.	2.9	70	16	5.73	11.47	7.14	24.34
9	<i>Rumex dentatus</i> L.	3.6	50	19.5	7.11	8.19	8.70	24.0
10	<i>Rumex hastatus</i> D. Don	10.1	50	33	19.96	8.19	14.72	42.87
11	<i>Sorghum halepense</i> (L.) Pers.	1.3	40	12	2.56	6.55	5.34	14.45
Total		50.6	610	224.0				

**Table-6.** Ecological attributes of *Equisetum-Amaranthus-Malva* community at Bhadai Patai 2075 m (site 5)

No	Scientific name	Den.	Freq.	C.C.	R. D.	R. F.	R.C.C.	IVI
1	<i>Amaranthus viridis</i> L.	5.7	90	27	7.36	14.51	10.86	32.73
2	<i>Cardamine hirsuta</i> L.	3.6	50	19.5	4.65	8.06	7.84	12.71
3	<i>Chenopodium murale</i> L.	1.5	20	6	1.93	3.22	2.41	7.56
4	<i>Equisetum arvense</i> L.	43.8	70	77.5	56.58	11.29	31.18	99.05
5	<i>Impatiens thomsonii</i> Hk. f.	2.9	70	16	3.74	11.29	7.32	22.35
6	<i>Lepidium sativum</i> L.	3.6	50	19.5	4.65	8.06	7.84	20.55
7	<i>Malva neglecta</i> Wallr.	3.3	80	21.5	4.26	12.90	8.65	25.81
8	<i>Pennisetum elatum</i> L.	3.6	40	12	4.65	6.45	4.82	15.92
9	<i>Polygonum plebejum</i> R. Br.	1.5	20	6	1.93	3.22	2.41	7.56
10	<i>Portulaca oleracea</i> L.	5.3	30	13.5	6.84	4.83	5.43	17.1
11.	<i>Rumex dentatus</i> L.	2.6	60	18	3.35	9.67	7.24	20.26
12.	<i>Rumex hastatus</i> D. Don	1.3	40	12	1.67	6.45	4.82	12.94
Total		77.4	620	248.5				

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