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Densities and Importance Values of Weeds in Lentil Production

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Abstract: Based on the results of surveys that performed in Sanlİurfa and their districts, belonging 21 botanical families, 67 weed species were determined. The major families were Fabaceae, Asteraceae, Cruciferae, Apiaceae, Labiatae. The species densities were *Galium aparine, Hordeum spontaneum, Isatis tinctoria, Taxiera glastifolia, Lactuca serriola, Avena fatua, Scandix pecten-veneris, Vicia narbonensis* and *Orobanche aegyptiaca*. Additionally, *G. aparine, I. tinctoria, H. spontaneum, Taxiera glastifolia, L. serriola, Vaccaria pyramidata, Sinapis arvensis, Vicia narbonensis, Buglossoides arvensis, S. pecten-veneris, Matricaria chamomilla, A. fatua, Asperula orientalis, Orobanche aegyptiaca, Salvia spinosa, Cephalaria syriaca* and *Trifolium* spp. were top ranking in term of importance value and these species were most prevalent associated with lentil crop.

Key words: Species densities, weed, lentil production, Turkey

INTRODUCTION

Lentil (*Lens culinaris* Medik.) is important crop for the human consumption and Turkey is the second country in the world in term of lentil production and sowing areas[1]. However, Erman *et al.*[1] reported that yield of lentil is far below to the other countries when compare to the production areas so it is 13th ranks in the world.

Weeds affected the yield in lentil. The loss caused by weeds in lentil production is great for two reasons; first is lentil has slow rate of development and in the early stages is quickly overwhelmed by weeds[1]. The second reason is those lentils is growing in regions with little rainfall and have to share the limited soil moisture with weeds[1]. The losses due to weeds are varying from 30% up to 100%. These reductions also depend on the weed species and their densities.

In order to determine the amount of the yield losses of lentil related with weeds it is essential that determine the weed species and their densities. Weed survey are crucial to determine the occurrence and relative importance of weed species in crop production system[2]. If the mentioned aspect of weeds were known then this information could be used to the weed control strategies[3]. Proper weed management can significantly enhance the yield of crops[4].

In order to point out the serious and ecological adaptations of weeds it is important to document the distribution, density and their importance values. Due to significance of weed surveys this study was performed in lentil fields in Sanliurfa, Turkey and their districts. No such comprehensive study is available from the area.

This study will be provide basic information and these data can also facilitate the establishment of main aspect of weed control strategies for the future research.

MATERIALS AND METHODS

Lentil is commonly sown in Oct./Nov. and harvested in middle of May in Sanliurfa. A survey vas performed to determine the frequency, distribution and importance values of weeds in lentil fields in April 2001 when crop was full flowering stage.

Six lentil growing locations and 26 fields, roughly 5000 ha area, were surveyed all over the districts. Herbicide was not used in the surveyed fields throughout the growing season of crops.

Surveys were performed in four fields in Birecik, three fields in Central, Hilvan and Suruc. Seven fields in Siverek and six fields in Viransehir. These differences were due to different size of cultivated areas. Fields were selected randomly and were surveys following the methodology of Thomas[5] and McCully *et al.*[6] with some modifications.

Four 1x1 m quadrates were selected randomly along an inverted "W" pattern in each field. First quadrate was placed after walking 20 paces from one corner along the edge of field, turning 90° and moving 15 paces into fields. This was to avoid edge effect. The distances between

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each quadrate was dependent upon the size and shape of the field. The larger fields were the greater distance between quadrates.

The weed species, densities and abundance of each weed was recorded within each quadrate. Frequency, relative frequency, density and relative density, general coverage (GCS), relative coverage (RCS) and importance values of species (IVS) were calculated in related to Odum[7], Smith and Smith[8].

Frequency of species (FR) was calculated as below formula according to Odum[8].

$$FR = \frac{\text{Number of surveyed area where a species occurred}}{\text{Number of total survey}}$$

$$RF = \frac{\text{Frequency of species}}{\sum \text{Frequency of all species}}$$

$$\text{ensity} = \frac{\text{Density of individual species}}{\text{Number of total survey}}$$

$$RD = \frac{\text{Density of individual species}}{\sum \text{Density of all species}} \times 100$$

$$GCS = \frac{\sum \text{\%Coverage area of individual species}}{\text{Number of total survey}}$$

$$RCS = \frac{GCS}{\sum \text{GCS of all species}} \times 100$$

$$IVS = RF + RD + RCS$$

The data were subjected over all for the region. A maximum value of 300 would be possible if only one species found in all the fields that were surveyed.

RESULTS AND DISCUSSION

The results of study showed that 67 weed species belonging to 21 botanical families were recorded (Table 1). Only 7 species (4 of Poaceae and 3 Liliaceae) were monocotyledonous the rests were dicotyledonous. The major families were Fabaceae, Astereceae, Cruciferae, Apiaceae, Labiatae and Poaceae with 10, 9, 9, 6, 4, 4 species, respectively. Families Caryopyllacae, Liliaceae, Papaveraceae, Ranunculaceae had three species and Rubiaceae have two species and remaining families were represented by only single species (Table 1).

The maximum number of species in Fabaceae and Astereceae might be due to better dispersal mechanisms and high adaptability of weed species under present conditions. The same findings were reported by Nasir and Sultan[4]. According to Taylor [9]weeds are generally well establish in cultivated fields.

The most frequent species were *Galium aparine* (0.96), *Vaccaria pyramidata* (0.85), *Vicia narbonensis* (0.81), *Buglossoides arvensis* (0.73), *Sinapis arvensis* (0.73), *Isatis tinctoria* (0.62), *Asperula orientalis* (0.58), *Salvia spinosa* (0.54), *Hordeum spontaneum* (0.54) and *Cephalaria syriaca* (0.50).

The most densities species were *G. aparine* (40.69 plant m^{-2}), *H. spontaneum* (19.19 plant m^{-2}), *I. tinctoria* (12.08 plant m^{-2}), *Taxiera glastifolia* (7.15 plant m^{-2}), *Lactuca serriola* (6.81 plant m^{-2}), *Avena fatua* (5.38 plant m^{-2}), *Scandix pecten-veneris* (4.81 plant m^{-2}), *V. narbonensis* (4.00 plant m^{-2}). Although, some species such as *L. serriola*, *I. tinctoria*, *Orobanche aegyptiaca*, *A. fatua*, *H. spontaneum* and *G. aparine* had a low RF, but it had high density values. This might be due to large seed bank as density of a weed is directly proportional to it is seed bank provided the seeds are viable and conditions are favorable[4]. Uludağ and Demir[10] was reported that most of lentil fields were densely infested with Orobanche species and due to various crop infestation of Orobanche this problem may be continued.

The large seed bank ensures weeds dens population as species with high seed out put have high capacity to colonize and survive themselves[4]. Therefore density of weeds occupying a certain area depends upon many factors and varies according to season of year, type of crops, climatic conditions, soil type, fertilizer level and it is kind and methods of weed management[4]. Crop rotation and agricultural practices also influence the composition of weeds. The evidence of cropping system effects weed species had been observed for the *Xanthium strumarium* during study. It was observed that this species merely found in fields that previous year cotton was grown and in irrigated fields in previous years.

The species that had greater general coverage (GCS) were *Isatis tinctoria, G. aparine, T. glastifolia, L. serriola, H. spontaneum, S. arvensis* and *V. pyramidata.*

Species had high coverage depends upon growth stages and their growth ability. The ability of a certain species to utilize the available resources in prevailing environmental conditions depends on their high and efficiently use of environmental conditions. These species could grow faster. Hence the species with high coverage must have physiologically upper hand over other species.

Finally the importance value of each weed species was calculated. Based on the results, the species had higher importance value (IVS) were *G. aparine* (49.01), *I. tinctoria* (33.36), *H. spontaneum* (22.90), *T. lastifolia* (17.17), *L. serriola* (14.97), *V. pyramidata* (12.47),

Table 1: Weed species, frequencies, densities, coverages and their importance values

Weed species	FR	RF (%)	Density	RD (%)	GCS	RCS	IVS
Apiaceae							
Anethum graveolens L.	0.08	0.49	0.27	0.19	0.04	0.11	0.79
Conium maculatum L.	0.19	1.22	0.54	0.37	0.10	0.28	1.88
Daucus carota L.	0.19	1.22	0.65	0.45	0.15	0.45	2.12
Eryngium campestre L.	0.04	0.24	0.08	0.05	0.02	0.06	0.35
Scandix pecten-veneris L.	0.38	2.44	4.81	3.34	0.60	1.73	7.52
Turgenia latifolia (L.) Hoffm.	0.04	0.24	0.46	0.32	0.02	0.06	0.62
Aristolochiaceae							
Aristolochia maurorum L.	0.19	1.22	0.42	0.29	0.10	0.28	1.80
Araceae							
Arum sp.	0.19	1.22	0.31	0.21	0.10	0.28	1.71
Astereceae							
Bellis perennis L.	0.04	0.24	0.08	0.05	0.02	0.06	0.35
Centauria calcitrapa L.	0.08	0.49	0.12	0.08	0.04	0.11	0.68
Cirsium arvense (L.) Scop.	0.35	2.20	0.58	0.40	0.17	0.50	3.10
Lactuca serriola L.	0.27	1.71	6.81	4.74	2.94	8.52	14.97
Matricaria chamomilla L.	0.42	2.69	2.15	1.50	0.88	2.56	6.75
Senecio vernalis Waldst. and Kit.	0.08	0.49	0.08	0.05	0.02	0.06	0.60
Silybum marianum (L.) Gaertner	0.15	0.98	0.38	0.27	0.10	0.28	1.52
Tragopogon pratensis L.	0.15	0.98	0.50	0.35	0.06	0.17	1.49
Xanthium strumarium L.	0.08	0.49	0.12	0.08	0.04	0.11	0.68
Boraginaceae							
Buglossoides arvensis (L.) Johnston	0.73	4.65	3.27	2.27	0.63	1.84	8.76
Caryopyllaceae							
Silene colarata L.	0.15	0.98	0.35	0.24	0.08	0.22	1.44
Silene conoidea L.	0.15	0.98	0.31	0.21	0.08	0.22	1.41
Vaccaria pyramidata Medik.	0.85	5.38	4.42	3.08	1.38	4.01	12.47
Convolvulaceae							
Convolvulus arvensis L.	0.15	0.98	0.23	0.16	0.08	0.22	1.36
Cruciferae							
Conringia orientalis (L.) Andrz.	0.04	0.24	0.08	0.05	0.02	0.06	0.35
Chorispora syriaca Boiss.	0.12	0.73	0.96	0.67	0.21	0.61	2.01
Isatis tinctoria L.	0.62	3.91	12.08	8.40	7.27	21.05	33.36
Myagrum perfoliatum L.	0.08	0.49	0.12	0.08	0.04	0.11	0.68
Neslia apiculata Fisch. et May.	0.23	1.47	0.88	0.62	0.17	0.50	2.58
Raphanus raphanistrum L.	0.35	2.20	1.65	1.15	0.94	2.73	6.08
Sinapis arvensis L.	0.73	4.65	4.31	3.00	1.60	4.62	12.26
Taxiera glastifolia (DC) Jaub. et Sp.	0.38	2.44	7.15	4.98	3.37	9.74	17.17
Thlaspi arvense L.	0.04	0.24	0.08	0.05	0.02	0.06	0.35
Dipsacaceae							
Cephalaria syriaca (L.) Schrad.	0.50	3.18	1.00	0.70	0.38	1.11	4.99
Euphorbiaceae							
Euphorbia cyparissias L.	0.04	0.24	0.19	0.13	0.04	0.11	0.49
Fabaceae							
Coronilla scorpiodes (L.) Koch.	0.27	1.71	0.42	0.29	0.15	0.45	2.45
Hyppocrepis unisiliquosa L.	0.04	0.24	0.08	0.05	0.02	0.06	0.35
Lathyrus blepharicarpus Boiss.	0.19	1.22	0.54	0.37	0.10	0.28	1.88
Medicago sativa L.	0.08	0.49	0.73	0.51	0.06	0.17	1.16
Pisum elatius MB.	0.35	2.20	0.65	0.45	0.17	0.50	3.16
Trifolium sp.	0.08	0.49	1.27	0.88	0.83	2.39	3.77
Vicia cracca L.	0.19	1.22	0.23	0.16	0.10	0.28	1.66
Vicia hybrida L.	0.12	0.73	0.12	0.08	0.06	0.17	0.98
Vicia narbonenis L	0.81	5.13	4.00	2.78	0.79	2.28	10.20
Vicia sativa L.	0.12	0.73	0.12	0.08	0.06	0.17	0.98
Fumariaceae							
Fumaria officinalis L.	0.19	1.22	0.27	0.19	0.10	0.28	1.69
Geraniaceae							
Geranium dissectum L.	0.38	2.44	0.88	0.62	0.23	0.67	3.73
Guttiferae							
Hypericum perforatum L.	0.08	0.49	0.08	0.05	0.04	0.11	0.65
Labiatae							
Lamium amplexicaule L.	0.12	0.73	0.19	0.13	0.06	0.17	1.03
Marrubium remotum KIT	0.04	0.24	0.04	0.03	0.02	0.06	0.33
Molucella laevis L.	0.04	0.24	0.08	0.05	0.02	0.06	0.35
Salvia spinosa L.	0.54	3.42	1.50	1.04	0.31	0.89	5.36
Liliaceae							
Allium sp.	0.12	0.73	0.31	0.21	0.12	0.33	1.28

Table 1: Continue

Weed species	FR	RF (%)	Density	RD (%)	GCS	RCS	IVS
Muscari muscarimi Medic.	0.04	0.24	0.04	0.03	0.02	0.06	0.33
Ornithogalum narbonense L.	0.08	0.49	0.12	0.08	0.04	0.11	0.68
Orobancheaceae							
Orobanche aegyptiaca Pers.	0.38	2.44	3.73	2.60	0.48	1.39	6.43
Papaveraceae							
hypecoum imberbe Sibth and Sm.	0.08	0.49	0.08	0.05	0.04	0.11	0.65
Papaver rhoeas L.	0.27	1.71	1.73	1.20	0.48	1.39	4.31
Papaver hybridum L.	0.04	0.24	0.04	0.03	0.02	0.06	0.33
Poaceae							
Avena fatua L.	0.23	1.47	5.38	3.75	0.48	1.39	6.61
Cynodon dactylon (L.) Pers.	0.04	0.24	0.62	0.43	0.04	0.11	0.78
Hordeum spontaneum C. Koch.	0.54	3.42	19.19	13.35	2.12	6.12	22.90
Lolium multiflorum Lam.	0.12	0.73	1.54	1.07	0.15	0.45	2.25
Ranunculacea							
Adonis aestivalis L.	0.23	1.47	0.46	0.32	0.12	0.33	2.12
Delphinium albiflorum D C.	0.04	0.24	0.08	0.05	0.02	0.06	0.35
Ranunculus arvensis L.	0.23	1.47	0.54	0.37	0.13	0.39	2.23
Rubiaceae							
Asperula orientalis Bois. and Hohen.	0.58	3.67	2.46	1.71	0.42	1.22	6.61
Galium aparine L.	0.96	6.11	40.69	28.31	5.04	14.59	49.01
Scrophulariaceae							
Veronica anagolloides Guss.	0.04	0.24	0.04	0.03	0.02	0.06	0.33
Total	15.73	100.00	143.73	100.00	34.54	100.00	300.00

S. arvensis (12.26), *B. Arvensis* (8.76), *S. pecten-veneris* (7.52), *Matricaria chamomilla* (6.75), *A. orientalis* and *A. fatua* (6.61), *O. aegyptiaca* (6.43) and *S. spinosa* (5.36). The remaining species IVS were below 5. Species had higher IVS were best-adapted and exploit the unused resources of lentil cropping system.

It can be concluded that, lentil is important crop in Sanliurfa and 67 weed species are problem in lentil production system. Depend upon the density and environmental conditions such as heavy rain, fertilizer etc. weeds might be causes a huge amount of yield losses. To control of most of these weeds no herbicides is available. So cultural weed control methods and crop rotation should be implemented for prevent the weed suppression in this area in the future.

REFERENCES

1. Erman, M., I. Tepe, A. Yazlik, R. Levent and K. Ipek, 2004. Effects of weed control treatments on weeds, seed yield, yield components and nodulation in winter lentil. Weed Res., 44: 305-312.
2. Korres, N.E. and R.J. Froud-Williams, 2002. Effects of winter wheat cultivars and seed rate on the biological characteristics of naturally occurring weed flora. Weed Res., 42: 417-428.
3. Bukun, B., 2004. The weed flora of winter wheat in Sanliurfa, Turkey. Pak. J. Biol. Sci., 7: 1530-1534.
4. Nasir, Z.A. and S. Sultan, 2004. Survey of weeds in mustard fields of district Chakwal, Pakistan. Pak. J. Biol. Sci., 7: 279-286.
5. Thomas, A.G., 1985. Weed survey system used in Saskatchewan for cereal and oilseed crops. Weed Sci., 33: 34-43.
6. McCully, K.V, M.G. Sampson and A.K. Watson, 1991. Weed survey of Nova Scotia, Lowbush blueberry (*Vaccinium angustifolium*) fields. Weed Sci., 39: 180-185.
7. Odum, E.P., 1971. Fundementals of Ecology. W.B. Saunders Company, Philadelphia, pp: 574.
8. Smith, R.L. and T.H. Smith, 1988. Elements of Ecology. The Benjamin/Cummings Publishing Company, Inc. 2725 Sand Hill Road. Menlo Park., pp: 550.
9. Taylor, R.J., 1995. Northwest Weeds: The Ugly and Beautiful Villains of Fields, Gardens and Roadsides. Mountain Press Publishing Company, Misoula, Montana, pp: 177. In: Nasir, Z.A. and S. Sultan, 2004. (Eds). Survey of weeds in mustard fields of district Chakwal, Pakistan. Pak. J. Biol. Sci., 7: 279-286.
10. Uludağ, A. and A. Demir, 1997. Guneydogu Anadolu bolgesinde mercimek alanlarinda bulunan parazit yabanci otlar. Türkiye II. Herboloji Kongresi. Ayvalik, İzmir, Turkey, pp: 379-384.