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Floristic Composition of Weed Community in Turfgrass Fields of Bajgah, Iran

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ABSTRACT

A weed survey of turfgrass fields was conducted at Bajgah during 2008- 2009. The turfgrass fields had been covered with Sport turf. Quantitative measurements viz frequency (F), field uniformity (FU), mean field density (MFD), mean occurrence field density (MOFD) and relative abundance (RA) were recorded. Fourteen species of weeds of 9 families were recorded. Most of them were included in Asteraceae, Fabaceae, Poaceae, and Plantaginaceae. The most important broad leaved and narrow-leaved weeds were *Taraxacum officinale* L. and *Cynodon dactylon* [L.] Pers., respectively. Results indicated that the highest frequency (F) (100%), field uniformity (FU) (89.28%), mean field density (MFD) (58.43 m^{-2}) and mean occurrence field density (MOFD) (58.43 m^{-2}) belongs to *T. officinale* L. of the year 2008. Results were almost the same at year 2009. *Taraxacum officinale* L. showed the highest relative abundance in both years.

Key words: Lawn, population, survey, *Taraxacum officinale* L., weeds.

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INTRODUCTION

Turfgrass has been widely used by humans as soil covers for more than ten centuries (Beard, 1994). Lawn and turfgrasses are important for functional, recreational and ornamental uses (Beard, 1998). In turf area, weeds are the major problem, which can be often the result of improper and inappropriate management (Uddin *et al.*, 2009). Weeds compete with turfgrasses for light, soil nutrients, available water and physical space. They are also hosts for pests such as plant pathogens, nematodes and insects. Certain weeds are also irritants to humans as allergic reactions of pollen or chemicals. Turfgrasses have attractive green color, texture, density and uniformity (Emmons, 2000). Turf weeds may be grasses, grass-like plants (rushes or sedges), or broadleaf plants with annual, biennial, and/or perennial life cycles (Bennet, 2004). Therefore, to enrich aesthetic quality of turf, weeds must be eliminated from turfgrass area. However, in any place a plant community is rarely homogenous as to the species and distribution (Kim & Moody, 1980).

Whenever weeds appear in a turfgrass community, proper identification of the weed species is essential before economical and effective management practices (Dernoeden, 1999). Therefore, weed surveys are useful for determining the occurrence and importance of weed species in any production systems as well as turf area (Thomas, 1985; McCully *et al.*, 1991; Frick & Thomas, 1992; McClosky *et al.*, 1998). The objective of this study was to determinate density, frequency, and uniformity of weeds and weed prevailing species in climatic condition of Bajgah, Shiraz. There are many weed species with similar morphology to turfgrass, therefore, it is important to identify the species correctly and decide upon the practical weed control methods.

MATERIALS AND METHODS

A survey study was conducted in turfgrass fields of the Shiraz College of Agriculture, Shiraz University, Iran, located at Bajgah (1810 m above the mean sea level, 52° 32' E and 29° 36' N). Average maximum and minimum temperatures are 38 °C and –9 °C, respectively with the annual rainfall of 400 mm (Salehi & Khosh-Khui, 2004). The turf fields had been covered with sport turf (25% *Lolium perenne* 'Esquire', 30% *Lolium perenne* 'Keystone', 10%, *Festuca rubra* 'Maxima 1', 15% *Poa pratensis* 'Balin' and 20% *P. pratensis* 'Sobra'). Seven fields were selected randomly and samplings were performed in 0.5×0.5 m^2 plots (Figure 1), four samples from each plot. All weeds in each plot were identified, counted and recorded. Data were summarized using five quantitative measurements as outlined by Thomas (1985); frequency (F), field uniformity (FU), density (D), Mean field density (MFD), Mean occurrence field density (MOFD) and relative abundance (RA). Frequency (F) was calculated as the percentage of the total number of fields surveyed in which a species occurred in at least one quadrate.

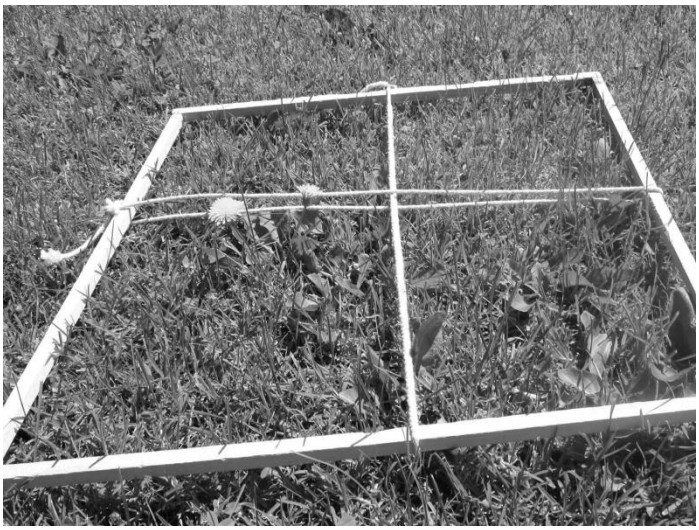

Figure 1. A scene of dominant weeds in a turfgrass field.

$$F_k = \frac{\sum_{1}^{7} Yi}{n} \times 100$$

where F_k = frequency value for species k

Y_i = presence (1) or absence (0) of species k in field i

n = number of fields surveyed.

Field uniformity was calculated as the percentage of the total number of quadrates sampled in which a species occurred.

$$FU_k = \frac{\sum_{1}^{n}\sum_{1}^{7} Xij}{7n} \times 100$$

where FU_k = field uniformity value for species k

X_{ij} = presence (1) or absence (0) of species k in quadrate j in field i

n = number of fields surveyed.

The field density (D) of each species in a field which was calculated as:

$$D_{ki} = \frac{\sum_{1}^{7} Zi}{Ai}$$

where D_{ki} = density (in numbers m^{-2}) value of species k in field i

Z_i = number of plants of a species in quadrate j (0.25 m^2)

A_i = area i (m^2) of 20 quadrates in field i.

Mean field density (MFD):

$$MFD_k = \frac{\sum_{1}^{n} Dki}{n}$$

where MFD_k = mean field density of species k

D_{ki} = density (in numbers m^{-2}) of species k in field i

n = number of fields surveyed.

Mean occurrence field density (MOFD):

$$MOFD_k = \frac{\sum_{1}^{n} Dki}{n-a}$$

where $MOFD_k$ = mean occurrence density of species k

D_{ki} = density (in numbers m^{-2}) of species k in field i

n = number of fields surveyed

a = number of fields from which species k is absent.

Relative abundance (RA) was used to rank the weed species in the survey and it was assumed that the frequency, field uniformity and mean field density measures were of equal value in describing the relative importance of a weed species. This value has no units but the value for one species in comparison to another indicates the relative abundance of the species (Thomas & Wise, 1987). The relative frequency (RF), relative field uniformity (RFU) and relative mean field density (RMFD) was calculated as:

Relative frequency for species k (RF_k):

$$RF_k = \frac{Frequency\ value\ of\ species\ k}{Sum\ of\ frequency\ values\ for\ all\ species} \times 100$$

Relative field uniformity for species k (RFU_k):

$$RFU_k = \frac{Field\ uniformity\ value\ of\ species\ k}{Sum\ of\ field\ uniformity\ values\ for\ all\ species} \times 100$$

Relative mean field density for species k ($RMFD_k$):

$$RMFD_k = \frac{Mean\ field\ density\ value\ of\ species\ k\ x}{Sum\ of\ mean\ field\ density\ values\ for\ all\ species} \times 100$$

The relative abundance of species k (RA_k) was calculated as the sum of relative frequency, relative field uniformity and relative mean field density for that species;

$$RA_k = RF_k + RFU_k + RMFD_k$$

Relative abundance is an index that was calculated using a combination of frequency, field uniformity and field density for each species, as described by Thomas (1985).

RESULTS AND DISCUTION

In the present survey on weed communities of turf fields in the College of Agriculture, Shiraz University, 14 weed species from 9 plant families were identified. Most of the weed species were included in the Fabaceae family (Table1). However, Asteraceae had the most frequency (F), uniformity (UF), mean field density (MFD) and mean occurrence density (MFOD) (Tables 1, 2, 3). In our study, 21.42% of observed weeds were classified as annuals, and 78.57% as perennials (Table 1).

Table 1. Distribution of observed weed species based on family and life cycle.

Familiy	Scientific name	Common name	Life cycle
Poaceae	*Cynodon dactylon* [L.] Pers.	Common bermudagrass	Perennial
Asteraceae	*Lactuca scariola* L.	Prickly wield lettuce	Annual
	Taraxacum officinale L.	Common dandelion	Perennial
Fabaceae	*Medicago sativa* L.	Alfalfa	Perennial
	Medicago lupulina L.	Black medic	Annual/Perennial
	Trifolium repens L.	Red clover	Perennial
Malvaceae	*Malva neglecta* Wallroth	Common mallow	Biennial/Perennial
Plantaginaceae	*Plantago lanceolata* L.	Buckhorn plantain	Herbaceous perennial
	Plantago major L.	Common plantain	Herbaceous Perennial
Chenopodiaceae	*Chenopodium album* L.	Common lambsquarter	Annual
Convolvulaceae	*Dichondra repens* L.	Kidney grass	Perennial
	Convolvulus arvensis L.	Field bin weed	Perennial
Rubiaceae	*Galium aparine* L.	Cleavers	Herbaceous annual
Ulmaceae	*Ulmus minor* Mill.	Elm	Perennial

In both years, the highest frequency belonged to *Taraxacum officinale* from the Asteraceae family (Tables 2 & 3). *T. officinale* is clearly the most important and abundant weed in turfgrass fields, known as a perennial plant that has deep roots if propagated via seeds. *T. officinale* seeds disperse by wind. The growth of weed species in different areas is influenced by several factors. For example, Xing *et al*., (2000) reported 74 weed species belonging to 24 families in turfgrass lands in Hangzhou, China. In a floristic survey in Brazil on *Paspalum notatum* Flugge cultures under sun light and shadow of tree canopy, 45 weed species belonging to 15 families were observed, among which Asteraceae, Poaceae, Cyperaceae, Euphorbiaceae and Fabaceae had the major species (Maciel *et al*., 2008). However, in our investigated fields the most weed species belonged to Fabaceae, Asteraceae, Convolvulaceae and Plantaginaceae. In the present survey number of perennial weed species was higher than annual weeds. Similarly, Al-Gohary (2008) reported that perennial weeds were more than annual weeds in eleven lands of Gebel Elba districts in Egypt.

Table 2- Frequency (F), field uniformity (FU), mean field density (MFD), and mean occurrence field density (MOFD) of weeds in turfgrass fields in the first year.

Scientific name	F (%)	FU (%)	MFD (m^{-2})	MOFD (m^{-2})
***Taraxacum officinale* L.**	100.00	89.28	58.43	58.43
***Medicago sativa* L.**	71.43	35.71	6.71	11.75
***Medicago lupulina* L.**	57.14	28.57	8.428	14.75
***Ulmus minor* Mill.**	42.86	17.86	3.14	7.33
***Trifolium repens* L.**	71.43	28.57	13.85	22.00
***Malva neglecta* Wallroth**	14.28	3.57	0.14	1.00
***Plantago lanceolata* L.**	57.14	25.00	1.14	2.00
***Plantago major* L.**	71.43	35.71	1.71	2.40
***Chenopodium album* L.**	14.28	3.57	0.14	1.00
***Lactuca scariola* L.**	14.28	3.57	0.43	3.00
***Dichondra repens* L.**	28.57	10.71	8.00	28.00
***Convolvulus arvensis* L.**	28.57	7.14	0.71	2.50
***Galium aparine* L.**	28.57	10.71	2.43	8.50
***Cynodon dactylon* [L.] Pers.**	71.43	35.71	18.14	25.40

Table 3. Frequency (F), field uniformity (FU), field density (MFD), and mean occurrence field density (MOFD) of weeds in turfgrass fields in the second year.

Scientific name	F (%)	FU (%)	MFD (m^{-2})	MOFD (m^{-2})
***Taraxacum officinale* L.**	100.00	82.14	86.86	80.57
***Medicago sativa* L.**	57.14	42.86	17.57	30.75
***Medicago lupulina* L.**	85.71	42.86	6.57	11.50
***Ulmus minor* (Mill.)**	57.14	28.57	6.14	10.75
***Trifolium repens* L.**	71.43	42.86	54.86	76.80
***Malva neglecta* Wallroth**	-	-	-	-
***Plantago lanceolata* L.**	57.14	14.28	0.71	1.25
***plantago major* L.**	57.14	35.71	1.71	3.00
***Chenopodium album* L.**	-	-	-	-
***Lactuca scariola* L.**	-	-	-	-
***Dichondra repens* L.**	28.57	7.14	5.00	17.50
***Convolvulus arvensis* L.**	-	-	-	-
***Galium aparine* L.**	28.57	14.28	4.71	16.50
***Cynodon dactylon* [L.] Pers.**	71.43	39.28	19.43	27.20

Uniformity is a quantitative measure of the spread of a weed species within a given field. For example, *T. officinale*, *Medicago sativa*, *Plantago major*, *Cynodon dactylon*, *M. lupulina*, *Trifolium repens*, and *P. lanceolata* were uniformly distributed throughout the fields (Table 2). In the first year, *T. officinale* was the most abundant weed with a density of 58.43 plants m^{-2}. In the second year, *T. officinale* and *T. repens* were the most abundant weeds with 86.8 and 54.86 plants m^{-2}, respectively**.**

Results of the experiment is similar to the report by Ghorsi-Anbaran *et al.*, (2006) who observed that the highest frequency belonged to Asteraceae in grasslands of Mashhad.

Younesabadi *et al.*, (2006) observed that Poaceae, Brassicaceae and Fabaceae had the highest Relative abundance (RA) in Golestan province and showed that 82% of the observed weeds were annual and the remaining were perennial. Furthermore, 87% of weeds were dicotyledonous and 13% were monocotyledonous. *Phalaris minor* Retz., *Melilitus officinalis* (L.) Lam., *Avena ludoviciana* Durieu., *Veronica persica* Poir., *Brassica* sp., *Polygonum aviculare* L. and *Sinapis arvensis* L. had the highest abundance in Golestan province. In our study, the highest RA belonged to weed species including: *T. officinale*, *C. dactylon*, *M. lupulina*, *T. repens*, and *M. sativa*. The RA values for these weed species were 99.39, 41.17, 39.31, 35.01, and 26.72, respectively (Table 2). The RA values of *T. officinale* were the highest in both years reflecting its respective highest values of frequency (F), field uniformity (FU) and mean field density (MFD) (Tables 2, 3, 4, 5).

Table 4. Relative abundance (RA) of weeds that occurred in seven fields in the first year.

Scientific name	RA
***Taraxacum officinale* L.**	99.39
***Medicago sativa* L.**	26.72
***Medicago lupulina* L.**	39.31
***Ulmus minor* Mill.**	16.94
***Trifolium repens* L.**	35.01
***Malva neglecta* Wallroth**	4.03
***Plantago lanceolata* L.**	20.46
***plantago major* L.**	12.77
***Chenopodium album* L.**	4.03
***Lactuca scariola* L.**	4.27
***Dichondra repens* L.**	15.81
***Convolvulus arvensis* L.**	8.42
***Galium aparine* L.**	11.14
***Cynodon dactylon* [L.] Pers.**	41.17

Table 5. Relative abundance (RA) of weeds that occurred in seven fields in the second year.

Scientific name	RA
***Taraxacum officinale* L.**	82.41
***Medicago sativa* L.**	30.18
***Medicago lupulina* L.**	29.43
***Ulmus minor* Mill.**	20.48
***Trifolium repens* L.**	50.82
***Malva neglecta* Wallroth**	-
***Plantago lanceolata* L.**	20.35
***plantago major* L.**	20.35
***Chenopodium album* L.**	-
***Lactuca scariola* L.**	-
***Dichondra repens* L.**	9.15
***Convolvulus arvensis* L.**	-
***Galium aparine* L.**	11.05
***Cynodon dactylon* [L.] Pers.**	32.39

Uddin *et al*., (2009) stated that *Cyperus aromaticus* (Ridley) Mattf & Kuk and *Fimbristylis dichotoma* (L.) Vahl are the most important two sedges in turfgrass areas. Two grass *Ischaemum indicum* (Houtt.) Merr., *Chrysopogon aciculatus* (Retz.) Trin. and two broadleaves *Desmodium triflorum* (L.) DC. and *Borreria repens* DC. were equally important and abundant species containing frequency ≥50% and RA value ≥ 12.

Diversity of weed species depended on different factors such as soil structure, pH, nutrients and water, crop type, weed control methods and field history especially in local geographical variation (Kim *et al*., 1983). Furthermore, diversity of weed communities will determine the nature of weed management strategies required and changes in diversity may be indicative of potential weed management problems (Derksen *et al*., 1995).

Relative abundance provides an indication of the overall weed problem posed by an species (Uddin *et al*., 2009). Overall, the weed species of turf are those that are adapted in some way to the continuous defoliation experienced in a turf field and well-adequate in that environment. However, the ranking of weed species differed in the lists based on frequency (F), field uniformity (FU) and mean field density (MFD) but, within the weed type (Uddin *et al*., 2009).

Generallly, *T. officinale* belonging to the Asteraceae family was the most abundant weed in turfgrass fields followed by *T. repens*, *M. sativa*, *M. lupulina* and *C. dactylon* [. This information would be important for further studies in the same fields and for the best integrated pest management (IPM) programs.

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چکیده

بررسی از علف های هرز زمین های چمن در دانشکده کشاورزی، دانشگاه شیراز در باجگاه در دو سال متوالی ۱۳۸۸-۱۳۸۷ انجام شد. در زمین های چمن با چمن اسپورت پوشش یافته، نمونه گیری از هر زمین صورت گرفت. اندازه گیری های کمی مانند فراوانی (**F**)، یکنواختی زمین (**FU**)، میانگین تراکم زمین (**MFD**)، میانگین وقوع تراکم زمین (**MOFD**) و فراوانی نسبی (**RA**) ثبت شدند. چهارده گونه علف هرز متعلق به ۹ تیره گیاهی ثبت گردید. اکثر آن ها شامل: مینا سانان، باقلا سانان، فریژسانان و بارهنگ سانان می باشند . مهم‌ترین علف های هرز پهن برگ و باریک بر گ، به ترتیب گل قاصد و چاپر می باشند . نتایج نشان داد که بیشترین فراوانی (**F**) (۱۰۰٪)، یکنواختی زمین (**FU**)(۸۹/۲۸٪)، میانگین تراکم زمین (MFD) (m^{-2}) ومیانگین وقوع تراکم زمین (MOFD) (۵۸/۴۳m^{-2}٪) متعلق به گل قاصد در سال ۱۳۸۷ می باشد. نتایج سال ۱۳۸۸ تقریباً مشابه سال ۱۳۸۷ بود. گل قاصد بالاترین فراوانی نسبی را در هر دو سال نشان داد.

کلمات کلیدی: چمن، جمعیت، بررسی، گل قاصد، علف‌های هرز