Advances in Bioresearch
Adv. Biores., Vol 8 (1) January 2017: 212-215

Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.8.1.212215

Advances in Bioresearch

ORIGINAL ARTICLE

Survey of weed composition in peanut (*Arachishypogaea* L.) fields at Astane Ashrafiye and Rasht counties of Gilan-Iran

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ABSTRACT
In this study, weed species in peanut (Arachishypogaea L.) fields at Astane Ashrafiye and Rasht of Gilan province were identified. Weed samplings were performed during 2014 from 50 peanut fields in two city of Gilan. The data were recorded on relative weed density, coverage, uniformity, and frequency (%) to find problematic and main weeds. Also relative diversity, density, and coverage of each plant family were calculated to find important families dominated in peanut fields. A total of 27weed species belonging to 27 genus, and 18 families were recorded. Ranking of the plant families according to family dominance index (FDI) showed that Poaceae, Cyporaceae and Solanaceae with 77.10, 45.58, and 39.87% were respectively most important families in peanut fields. Weed species ranking by relative dominance (RD) index showed that Cyperus rotundus L., Cynodon dactylon L., Solanum nigrum L.and Parietariadebilis Forsk with 73.95. 70.18, 27.8 and25.34%, respectively were dominant species in mentionfields. This study provided a very helpful knowledge to farmers, agronomy specialists and scientific communities to design a solid integrated weed management plain in peanut in Astane Ashrafiye and Rasht in Gilan of Iran.
Key words: Family dominance index, peanut, relative dominance, weed flora.

Received 21/05/2016 Revised 20/09/2016 Accepted 28/01/2017

How to cite this article:
S Hassannejad, M Movassaghi. Survey of weed composition in peanut (*Arachishypogaea* L.) fields at Astane Ashrafiye and Rasht counties of Gilan-Iran. Adv. Biores., Vol 8 [1] January 2017: 212-215.

INTRODUCTION

Peanut (*Arachishypogaea* L.) is the most widely cultivated legume crop in AstaneAshrafiye and Rasht counties of Gilan province (north of Iran) because of its adaptation to the climatic conditions. This crop can grow relatively well on poor soils [9]. Peanut is a major source of protein in human and livestock diets. Its seed oil is used for local consumption [7]. Biological nitrogen fixation by peanut cause that this plant is effective in rotation with rice in Gilan Province. According to Gascho and Davis [9], peanut is effective in rotation with corn and other cereals due to its nitrogen fixation.

Between the factors decreasing the peanut pod yields, weeds have an important role. These unwanted plants due to relatively slow initial growth of peanut, play a significant role in competition for sunlight, soil water and nutrients. According to Akobundu [1] research, average damages coming from the pretense of weeds in West Africa peanut fields was estimated 50 to 80%.

In order to found best weed management methods in peanut fields, survey of weed species distribution is needed. Weed flora surveys are useful for document the occurrence and relative importance of weed species in crop production systems (22, 12). Many studies about weed flora have been done in cereal, oil seed crops and some of annual crops in many countries such as Iran (13), Canada [22], Turkey [4], Pakistan [18], Bulgaria [16], Denmark [2], France [8], Hungary [19], the UK [20] and the US [5]. But there was a lack of information about weed species in peanut fields. Thus, the objective of this study was to found dominant weed species and plant families according to the relative dominance (RD) and family dominance index (FDI) indices using by their frequency, uniformity, density, and cover percentage in peanut fields of AstaneAshrafiye and Rasht counties.

MATERIALS AND METHODS

Weed samplings were performed during 2014 from 50 peanut fields at AstaneAshrafiye and Rasht counties of Gilan province (North of Iran). Geographical information of each field like longitude, latitude and elevation were recorded using Global Positioning System (GPS). Fields were surveyed following the methodology of Thomas [22] in which 20 quadrates of 0.25 m2 were randomly placed along a "W" pattern consisting of 5 quadrates in each one of 4 arms of the pattern, in each field.

All weeds in each quadrate were identified, counted (density and cover percent), and recorded for subsequent data entry and analysis. All weed species observed in the field condition were classified in three groups, including surpassing weeds (SW), underneath weeds (UW), and climbing weeds (CW) which includes climbing, twining, trailing and stoloniferous species. In order to distribution patterns, all weeds in surveyed peanut fields were classified into four categories; Assertive weeds (frequency over than 60%), ascendant weeds (frequency between 50% to 60%), average weeds (frequency between 30% to 49%), and below average weeds (frequency less than 30%). The data recorded in each quadrate (density and cover percentage), all quadrates of each fields (uniformity), and all fields of these county (frequency) were summarized using some quantitative measures (frequency, uniformity, density as outlined by Thomas [22] and cover percentage as outlined by Hassannejad and Porheidar-Ghafarbi [12]. The finale quantitative measure calculated was Relative dominance index (RD) that introduced by Hassannejad and Porheidar-Ghafarbi [12].

$$\text{RF}=\frac{frequency\ value\ of\ species\ K}{sum\ of\ frequency\ values\ for\ all\ species}\times 100$$

The frequency value indicates the percentage of fields infested by a species k. This measure is an estimate of the geographical extent of infestation by specific weed species.

$$\text{RU}=\frac{field\ uniformity\ value\ of\ species\ K}{sum\ of\ field\ uniformity\ values\ for\ all\ species}\times 100$$

The field uniformity value as the percentage of quadrates infested by a species k is an estimate of the area infestation by specific weed species.

$$\text{RMD}=\frac{mean\ field\ density\ value\ of\ species\ K}{sum\ of\ mean\ density\ velue\ for\ all\ species}\times 100$$

The mean field density value indicates the number of plants per m^2 for each species averaged over all fields sampled.

$$\text{RMC}=\frac{mean\ field\ coverage\ value\ of\ species\ K}{sum\ of\ mean\ field\ coverage\ values\ for\ all\ species}\times 100$$

The mean coverage value indicates the coverage of plants per m^2 for each species averaged over fields sampled.

The relative dominance (RD) index was calculated from the relative frequency, relative field uniformity, relative mean field density, and relative mean field coverage as follows:

$$\text{RD} = \text{RF} + \text{RU} + \text{RMD} + \text{RMC}$$

Family dominance index (FDI) was counted following the methodology of Hassannejad and Porheidar-Ghafarbi [12] in order to contrast the relative portion of each plant family to weed species combination. It was calculated as the sum of the relative diversity, relative density, and relative coverage, as follow:

$$\text{Relative Diversity}=\frac{Number\ of\ species\ in\ family}{Total\ number\ of\ species}\times 100$$

$$\text{Relative Density}=\frac{Number\ of\ individuals\ in\ family}{Total\ number\ of\ individuals}\times 100$$

$$\text{Relative Coverge}=\frac{Coverage\ of\ individuals\ in\ family}{Total\ coverage\ of\ individuals}\times 100$$

$$\text{FDI}=\text{Relative Diversity}+\text{Relative Density}+\text{Relative Coverage}$$

RESULTS AND DISCUSSION

A total, 27 weed species belonging to 18 plant families were recorded inpeanut fields at AstaneAshrafiye and Rasht counties of Gilan-Iranin 2014 (Table 2). Regarding their plant form, 66.66% of weed species were dicotyledonous, 29.62% monocotyledonous, and 3.7%of them were pteridophyte. Hyvonen et al. (2003) mentioned that low-input cultivations were expected to favor the species numbers and abundance of dicotyledonous. The underneath weeds (UW), surpassing weeds (SW), and climbing weeds (CW) have constituted 11.11, 66.66, and 22.22% of weeds in 2014, respectively. Only 9 weed species were found in more than 30% of fields. Between all recorded weeds, 66.66% of weeds were below average weeds (founded in less than 30% of fields), and 14.81% of them were average weeds (founded in 30-49% of fields). But only 3.70% of weeds (two species) as assertive ones were observed in more than 60% of fields. Higher values for the frequency of these weeds indicate a higher proportion of their climatic and soil conditions; like that Minbashi *et al*. [17] mentioned it in theirresearches. Four species of 9 dominant weed species (frequency more than 30%) belong to surpassing weeds.

Table 1. Order, Family Name, Richness, Relative Diversity, Relative Density, Relative Coverage, and Family Dominance Index (FDI) of weeds in peanut fields at AstaneAshrafiye and Rasht counties of Gilan-Iran.

Order	Family Name	Richness	Relative Density	Relative Diversity	Relative Coverage	FDI
1	Poaceae	6	22.22	31.10	23.77	77.10
2	Cyperaceae	1	3.70	32.35	9.52	45.58
3	Solanaceae	3	11.11	12.62	16.13	39.87
4	Hypericeae	1	3.70	3.76	19.38	26.84
5	Amaranthaceae	3	11.11	4.65	10.73	26.50
6	Malvaceae	1	3.70	1.24	8.24	13.19
7	Portulacaceae	1	3.70	1.02	7.22	11.96
8	Volanceae	1	3.70	5.39	2.16	11.26
9	Equisetaceae	1	3.70	4.85	0.64	9.21
10	Polygonaceae	1	3.70	0.79	0.69	5.18
11	Cnvolvulaceae	1	3.70	0.77	0.51	4.99
12	Asteraceae	1	3.70	0.67	0.54	4.92
13	Rosaceae	1	3.70	0.26	0.17	4.14
14	Cnvolvulaceae	1	3.70	0.10	0.10	3.90
15	Verbanaceae	1	3.70	0.13	0.05	3.89
16	Juncaceae	1	3.70	0.13	0.05	3.88
17	Brassicaceae	1	3.70	0.03	0.01	3.75
18	Adexaceae	1	3.70	0.03	0.008	3.74

Table 2. Scientific name, family name, relative frequency (RF), relative uniformity (RU), relative mean density (RMD), relative mean coverage (RMC), and relative dominance (RD) of 27 main weeds of peanut fields during 2014 in AstaneAshrafiye and Rasht counties of Gilan-Iran.

NO.	Scientific name	family name	Habit	RF	RU	RMD	RMC	RD
1	*Cyperusrotundus* L.	Cyporaceae	cw	11.96	20.1	32.37	9.521	73.95
2	*Cynodondactylon* L.	Poaceae	cw	11.3	17.36	21.53	19.99	70.18
3	*Solanumnigrum* L.	Solanaceae	sw	9.967	8.743	5.738	3.347	27.8
4	*Parietariadebilis*Forsk	Volanceae	uw	9.635	8.136	5.401	2.168	25.34
5	*Equisetumarvense* L.	Equisetaceae	sw	2.658	3.279	4.861	0.649	11.45
6	*Physalisalkekengi* L.	Solanaceae	sw	7.973	6.982	4.658	11.45	31.07
7	*Amaranthusretrolexus*	Amaranthaceae	sw	8.97	6.557	4.257	10.51	30.29
8	*Hypericumarmnum* L.	Hypericeae	sw	6.645	6.375	3.764	19.38	36.16
9	*Sorghumhalepense* L. pers	Poaceae	cw	4.983	4.311	3.241	1.264	13.8
10	*Setariaviridis* L.	Poaceae	sw	3.654	3.704	3.241	1.385	11.98
11	*Brachiaviareptans* L.	Poaceae	sw	1.329	1.943	2.7	1.022	6.994
12	*Datureastramonium* L.	Solanaceae	sw	5.316	3.643	2.236	1.335	12.53
13	*Abutilontheopharsti* medic	Malvaceae	sw	3.322	2.186	1.249	8.244	15
14	*Portulacaoleracae* L.	Portulacaceae	uw	2.99	1.882	1.03	7.229	13.13
15	*Atripexhastata* L.	Polygonaceae	sw	2.326	1.032	0.793	0.693	4.844
16	*Convolvulusarvensis* L.	Cnvolvulaceae	cw	0.664	0.607	0.776	0.512	2.56
17	*Seneciovulgaris* L.	Asteraceae	sw	0.664	0.85	0.675	0.546	2.736
18	*Setaria*italica L.	Poaceae	sw	0.664	0.364	0.338	0.098	1.464
19	*Rubusidaeusv* L.	Rosaceae	sw	1.329	0.425	0.27	0.171	2.195
20	*Amaranthusblitoides*	Amaranthaceae	uw	0.664	0.364	0.203	0.119	1.351
21	*Calamgrestisepigejos*	Amaranthaceae	sw	0.332	0.364	0.203	0.111	1.01
22	*Verbenaofficinalis* L.	Verbanaceae	sw	0.664	0.243	0.135	0.055	1.098
23	*Juncusarticulatus* L.	Juncaceae	cw	0.332	0.182	0.135	0.051	0.701
24	*Calystegiasepium* L.	Cnvolvulaceae	cw	0.664	0.182	0.101	0.102	1.05
25	*Echinochleacrusgalli* L.	Poaceae	sw	0.332	0.061	0.068	0.017	0.478
26	*Alliariapetiolata* L.	Brassicaceae	sw	0.332	0.061	0.034	0.019	0.445
27	*Sambucusebulus* L.	Adexaceae	sw	0.332	0.061	0.034	0.009	0.435

Plant family ranking with FDI showed that Poaceae, Cyperaceae and Solanaceae with 77.10, 45.58 and 39.87 FDI, respectively, were dominant plant families in peanut fields at Astaneashrafiye and Rasht counties of Gilan-Iran. The maximum richness, relative diversity, and relative coverage were found in Poaceae family (Table 1). Cyperaceae family due to maximum relative density for only its one species compare to Solanaceae and Amaranthaceae each one with three species was founded in second order according to FDI (Table 1).

Ranking all weeds showed that *Cyperus rotundus* L., *Cynodon dactylon* L., *Solanum nigrum* L. and *Parietaria debilis* Forsk with RD equal 73.95, 70.18, 27.8 and 25.34 respectively, were dominant weed species in peanut fields according to RD score (Table 2). High share of these four weed species from RD total (197.24:400) indicated that they are troublesome and hard controlling weeds in Astane Ashrafiye and Rasht peanut fields. *Cyperus rotundus* L.with mean uniformity 20.1 and mean density 32.37 plants m^2 had highest uniformity and density in these counties (Table 2). Higher values for the mean field uniformity and density for this weed species respectively shows it's tolerant to management methods used in the occurrence fields and its compatibility or propagation ability compare other weeds. Investigations show that *Cyperus rotundus* L. is considered by many to be the most aggressive weed in peanut fields. Gray *et al.* [10], in survey of peanut field weeds, reported the *Cyperus rotundus* L. as one of the dominant monocot weeds. Dominant of weeds in a specific area depends upon many factors such as climatic conditions, soil type, and management methods [3,11, 12,13, 14].

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