Iran Agricultural Research 7:39-51 (1988).

NOTE

WEED FLORA AND THEIR EFFECT ON RAIN-FED WHEAT IN FARS PROVINCE, IRAN[1]

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ABSTRACT

During 1983-85, weeds of rain-fed wheat fields in Kazeroon and Mamassani areas (Fars Province, Iran) were sampled, identified and the abundance of each species was evaluated. A total of 82 weed species belonging to 18 plant families were found in wheat fields. The average loss affected by mixed populations of weeds was assessed under the farmers' production practices. Trials conducted over a three year period showed that a mixed species population of 212 plants m^{-2} caused a 29% reduction in wheat yield.

تحقیقات کشاورزی ایران
۷:۳۹-۵۱(۱۳۶۷)

بررسی مجموعه علفهای هرز وخسارت ناشی از آنها به گندم دیم در استان فارس

فرها ددستغیب ،یدالله شجاعی وفریدون ترمه
به ترتیب پژوهشگر ودستیار پژوهش ،سازمان پژوهشهای علمی وصنعتی ایران ـ مرکز شیراز ورئیس بخش طبقه بندی گیاهی ،انستیتو بررسی آفات وبیماریهای گیاهی ،تهران، ایران .

خلاصه

درطی سالهای ۱۳۶۲ـ ۱۳۶۵ ،فلور علفهای هرز مزارع گندم دیم درنواحی کازرون وممسنی دراستان فارس جمع آوری ،شناسایی ومیزان فراوانی هریک ارزیابی شد .درمجموع ،۸۲ گونه علف هرز از هیجده خانواده گیاهی درمزارع گندم آن مناطق یافت شد .به علاوه ،میزان خسارت

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ناشی از جمعیت های مختلط علف های هرز در شرایط عمل زارعان نیز برآورد گردید. آزمایش های انجام شده در طی این سه سال نشان دادکه جمعیتی برابر با ۲۱۲ بوته در متر مربع از انواع مختلف علف های هرز سبب شده است تا محصول گندم آن مناطق به میزان ۲۹٪ کاهش یابد.

INTRODUCTION

Wheat is the mos important crop grown under rain-fed conditions in Iran. One of the most important subjects to be studied in wheat cultivation is the weed flora and their harmful effects upon the crop (1). Weed flora in wheat in the United States was reviewed by Wiese (14). In Iran, weed flora in wheat fields of certain areas and chemical methods for their control have been reported (3, 4, 9, 10, 11).

The assessment of yield loss due to weed competition is an essential step in making decisions for a weed control program. Most sudies regarding the crop yield loss due to weed competition concentrate on one or few selected species at pre-determined densities and under research plot conditions (2, 5, 12, 13). However, the results obtained under controlled conditions may not be valid when variable factors of the actual field environment are considered. In order to determine the total yield loss due to natural populations of weed species in an area, weed free plots may be compared with plots containing natural populations. A series of replicated trials in various typical locations of the area can provide meaningful information. This method has been reported only scarcely (6, 8).

The objective of this study was to survey the wheat fields of Kazeroon and Mamassani, two important areas of rain-fed wheat production in Fars Province, Iran. Weed flora and their percent occurrence were identified. In addition, the total wheat yield loss due to an average natural population of weeds was determined under conventional farming practices of the region.

MATERIALS AND METHODS

Identification of Weeds and Their Occurrence

Weed species were collected from wheat fields in the areas under survey during the growing seasons from 1983 to 1985. Plant specimens were press dried and preserved for further study. Identification of the weed species was performed with the assistance of Plant Pests and Diseases Research Institute of Forests and Ranges Research Institute of Iran. Weed species were given a rank of 1 (< 20%), 2 (20-40%), 3 (40-60%, 4 (60-80%) or 5 (> 80%) based on the percentage occurrence of each in the region.

Assessment of Population Density and Loss

First year. Typical wheat fields in different locations of the areas were selected and the number of broadleaf and grassy weeds were determined. Three readings were made in each field using 0.5 x 0.5 m quadrats.

Second year. A series of two-replicated trials using 3 by 5 m plots were set up in different locations of the areas. Each trial consisted of two treatments: weedy check and one hand weeding at the 5-leaf-stage of the crop.

Third year. Three treatments, namely weedy check, weed free, and chemical control were compared in a series of trials located in typical fields of the areas. In each trial plots were 1.5 x 2 m arranged in a randomized complete block design with four replicates. 2,4-D [(2,4-dichlorophenoxy)acetic acid] was applied in the chemical control plots at the rate of 0.5 kg a.i. ha^{-1} at the 5-leaf stage of wheat. Weeds were mostly small and at the rosette stage at the application time. At the same time, weeding started in weed-free plots and continued at weekly intervals up to three weeks before harvest when weeds did not germinate any more as the crop was maturing and the soil was dry. In order to avoid mechanical damage to wheat plants during weeding, alleys were established

between two neighbouring plots to provide access to all parts of the plots.

In all the above trials, data were collected on the number of weeds, weight of sheaf and grain yield of wheat. Data from all trials in each year were pooled. Analysis of variance followed by either LSD or Duncan's multiple range test was used for mean separation.

RESULTS AND DISCUSSION

Identification of Weeds and Their Occurrence

A total of 82 weed species belonging to 18 plant families were identified in rain-fed wheat fields of Kazeroon and Mamassani areas (Table 1). The most frequent weeds in the areas were wild radish (*Raphanus raphanistrum* L.), turnip weed (*Rapistrum rugosum* (L.) All.) and wild oat (*Avena fatua* L.) followed by corn cleavers (*Galium tricorne* With.) and blessed thistle (*Cnicus benedictus* L.). Other weeds occurred less frequently, however in certain fields minor species were found to comprise a major part of the natural population.

Assessment of Population Density and Loss

First year. Only the population density was measured in the first year. As an average of many field data, 195 (± 47) weeds m^{-2} was calculated for the areas, out of which 121 (± 36) were broadleaf plants and 74 (± 59 belonged to the grass family.

Second year. Effect of one weeding on grain yield and sheaf weight of rain-fed wheat in different fields is shown in Table 2. The figures represent the variation of all growing factors, but as an average, it could be concluded that only one weeding could increase both the grain yield and the sheaf weight of rain-fed wheat significantly. The reduction of grain yield in the weedy check was calculated to be 33.1% which is a result of competition offered by an average population of 254 weeds m^{-2} in different fields.

Table 1. Weeds of wheat fields in Fars Province.

Serial No.	Family and scientific names	Frequency rank
	BERBERIDACEAE	
1	*Leontice leontepatelum*	1
	CARYOPHYLACEAE	
2	*Silene conoidea*	2
3	*Vaccaria pyramidata*	3
	COMPOSITAE	
4	*Anthemis* sp.	1
5	*Calendula persica* C.A. may	3
6	*Carthamus glaucus* M.B.	2
7	*Centaurea bruguerіana* (D.C.) Hand-Maz	2
8	*C. iberica* Trev.	2
9	*C. solatitialis* L.	1
10	*Cichorium intybus* L.	1
11	*Cirsium bracteatum* D.C.	3
12	*Cnicus benedictus* L.	4
13	*Crepis sancta* Babc.	1
14	*Filango* sp.	1
15	*Matricaria chamomilla* L.	3
16	*Rhagodiolus stellatus* (L.) Gaestn.	1
17	*Senecio* cf. *vulgaris* L.	2
18	*Sonchus oleraceus* (L.) Gou.	2
	CONVOLVULACEAE	
19	*Convolvulus arvensis* L.	1
	CRUCIFERAE	
20	*Alyssum* cf. *minus* (L.) Rothm.	1
21	*A. stapfii* Vierh.	1
22	*Brassica deflexa* Boiss.	3
23	*Clypeola aspera* (Grauer) Turril.	1
24	*Eruca sativa* Mill.	2
25	*Erucaria hispanica* L. Druce.	1
26	*Lepidium draba* L.	3
27	*Malcolmia africana* L. Br.	2
28	*Neslia apiculata* Fish., C.A. May	3
29	*Raphanus raphanistrum* L.	5
30	*Rapistrum rugosum* (L.) All.	5
31	*Sinapis arvensis* L.	3
	DIPSACEAE	
32	*Scabiosa* cf. *palestina* L.	1

Table 1. (continued)

Serial No.	Family and scientific names	Frequency rank
	FUMARIACEAE	
33	*Fumaria* cf. *vaillantii* Loisel.	1
	GERANIACEAE	
34	*Geranium rotundifolium* L.	1
	GRAMINEAE	
35	*Avena fatua* L.	5
36	*Bromus danthoniae* Trin.	2
37	*B. japonicus* Thunb. var. *japonicus*	2
38	*B. scoparius* L. var. *scoparius*	2
39	*Digitaria sanguinalis* L. Scop.	1
40	*Lolium rigidum* Gand.	3
41	*Lophochloa phleoides* (willd.) R	3
42	*Phalaris brachystachis* Link.	2
43	*Ph. minor* Retz.	2
44	*Poa bulbosa* L.	1
45	*Polypogon monspeliensis* (L.) Desf.	1
	LEGUMINOSAE	
46	*Hymenocarpous circinnatus* L.	2
47	*Lathyrus aphaca* L.	2
48	*L.* cf. *cicera* L.	2
49	*L. sativus* L.	2
50	*Medicago orbicularis* (L.) Bart	3
51	*M. polymorpha* L.	3
52	*M. sp.*	3
53	*Melilotus indica* (L.) All.	1
54	*M. officinalis* (L.) Desr.	1
55	*Onobrychis caput-gali* L.	1
56	*Scorpiurus muricatus* L.	1
57	*Trifolium arvensis* L.	3
58	*T. campestre* Schreb.	3
59	*T. resupinatum* L.	3
60	*T. stellatum* L.	3
61	*T. tometosum* L.	3
62	*T. sp.*	3
63	*Vicia angustifolia* Grufb./Reichard	3
64	*V. ervilia* (L.) Willd.	3
65	*V. narbonensis* L.	2
66	*V. variabilis* Freyn & Sint.	3
	LILIACEAE	
67	*Ornithogalum persicum* Boiss. & Buhse	1

Table 1. (continued)

Serial No.	Family and scientific names	Frequency rank
	LYTHRACEAE	
68	*Ammania multiflorum* Roxb.	1
	PAPAVERACEAE	
69	*Papaver hybridum* L.	3
70	*Roemeria refracta* D.C.	3
	PRIMULACEAE	
71	*Anagalis arvensis* L.	1
	RANUNCULACEAE	
72	*Adonis flammea* Jacq.	1
73	*Ranunculus sp.*	2
	RUBIACEAE	
74	*Clypeltis cucularis*	1
75	*Galium tricorne* With.	4
	SCROPHULARIACEAE	
76	*Veronica sp.*	1
	UMBELLIFERAE	
77	*Ammi majus* L.	1
78	*Anethum graveolens* L.	2
79	*Bifora testiculata* Roth.	1
80	*Bupleurum lancifolium* Hornm.	1
81	*Falcaria sioides* (Web.) Aschers	3
82	*Turgenia latifolia* (L.) Hoffm.	2

Frequency rank: 1 = 20%, 2 = 20-40%, 3 = 40-60%, 4 = 60-80% and 5 = 80%.

Third year. Wheat grain yield and sheaf weight in six trials located in different parts of the areas are presented in Table 3. Both characteristics showed a similar trend and wheat growth and yield were the lowest in weedy check and the highest in weed free plots. The plots receiving the herbicide treatment showed a significant increase in growth and yield

Table 2. Effect of one weeding on grain yield and sheaf weight of rain-fed wheat in different trials in Fars Province in 1984.

	Treatment	Location								Average	Reduction (%)
		1	2	3	4	5	6	7	8		
Grain yield ($kg\ ha^{-1}$)	one weeding	206.5	2875	458.5	158	1389	875	1937.5	1375	1159.3	0.0
	weedy check	166.5	2125	208.5	118	833.5	625	1250	875	775.2	33.1
Sheaf wt. ($kg\ ha^{-1}$)	one weeding	875	7500	1870	1917	-	2500	3750	6562.5	3567.8	0.0
	weedy check	833.5	6040	1125	1562.5	-	1667	2812.5	4375	2630.8	26.3

LSD for grain yield at 1% level is 42.3.

LSD for sheaf weight at 1% level is 92.8.

Table 3. Effect of weed control by hand and by herbicide on grain yield and sheaf weight of rain-fed wheat in different trials in Fars Province in 1985.

	Treatment	Location						Average	Reduction (%)
		1	2	3	4	5	6		
Grain yield ($kg\ ha^{-1}$)	weed free	865	1136.7	910	2278.3	1458.3	1526.7	1362.5a	0.0
	2,4 - D	1001.7	1031.7	996.7	1798.3	1250	1675.5	1292.3a	5.2
	weedy check	766.7	851.7	810	1286.7	1025	1351.1	1015.2b	25.5
Sheaf wt. ($kg\ ha^{-1}$)	weed free	2933.3	3108.3	2600	8416.7	4750	3555.5	4227.3a	0.0
	2,4 - D	3175	3216.7	3008.3	6916.7	4433.3	3000	3958.3a	6.4
	weedy check	2666.7	2416.7	2450	5583.3	3833.3	2111.1	3176.8b	14.8

DMRT; for each characteristic, the means followed by the same letter are not significantly different at 1% level.

compared with weedy plots. Herbicide treatment produced less yield and sheaf weight than weed free treatment, but the differences were not significant. Competition by grass weeds which are not controlled by 2,4-D could have reduced the growth and yield in this treatment. The yield reduction in weedy check averaged at 25.5% as compared with weed free treatment. The average weed density of weedy check plots was 169 weeds m^{-2}.

In order to show the effect of different species of weeds on the yield of wheat, natural population densities of the most common weeds in different locations of the area and their respective effect on yield are shown in Table 4. The highest

Table 4. Number of the most common weeds m^{-2} in different trials in Fars Province in 1985 with their respective reduction in yield of rain-fed wheat.

Weed species	Locations					
	1	2	3	4	5	6
Convolvulus arvensis L.	-	-	-	13	-	-
Galium tricorne With.	-	49	-	-	64	140
Ranunculus sp.	46	12	-	-	-	-
Raphanus raphanistrum L.	-	-	-	107	-	-
Veronica sp.	-	15	24	-	-	-
Vicia angustifolia Grufb./Rchd.	11	23	2	-	112	-
Others	140	19	4	-	44	188
Total No. of weeds m^{-2}	197	118	30	120	220	328
Percent yield reduction	11.4	25.1	11	43.5	29.7	11.5

yield reduction of 43.5% was measured in trial location four, where majority of the weed population (120 weeds m^{-2}) comprised of wild radish (*R. raphanistrum* L.). On the other hand, location two, having a similar weed density (118 weeds m^{-2}) to location four, showed only 25.1% yield reduction. It can be seen from Table 4 that the weed composition in this location was quite different and there was no wild radish plants. This may explain in part the difference observed in the yield reduction due to weed competition and indicates that wild radish is a highly competitive weed. Reduction in wheat yield by up to 50% has been reported as a result of an infestation of 200 plants m^{-2} of wild radish (7). The above comparison also suggests that under natural and mixed-species populations of weeds, weed composition is probably a more important factor in determining yield loss than weed density. Many small weeds might not harm the crop as much as a few large ones.

In summary, the yield reductions due to weeds in two years of study can be averaged to give a mean yield loss of 29.3% for the areas under survey. This is a result of competition from an average natural population of 212 weeds per unit area. The above figure is a high value of loss to grain production in the areas and suggests that proper measures are necessary to reduce the weed competition. More research is needed to determine how cultural practices by farmers in these areas might affect weed population and distribution so that meaningful preventive and control methods could be proposed.

ACKNOWLEDGEMENTS

Thanks are expressed to Dr. Z. Kaffash and Mr. V. Mozaffarian from the Herbarium, Forests and Ranges Research Institute, for their assistance in identification of the weeds collected during the course of this study. Dr. A. Mazaheri from the Iranian Research Organization for Science and Technology has

made valuable remarks during the course of this study.

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