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NOTE

WEED FLORA AND THEIR EFFECT ON RICE IN FARS PROVINCE, IRAN[1]

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ABSTRACT

During 1983-85 the weed flora of paddy rice fields in Kazeroon and Mamassani areas (Fars Province, Iran) were sampled and identified and their effect on rice yield under the farmers' conditions was assessed. Seventeen weed species belonging to five plant families were found. The most common weeds in both areas were barnyardgrass [*Echinochloa crus-galli* (L.) P. Beauv.], and two sedge species; *Cyperus rotundus* L. and *C. difformis* L. It was estimated that a weed population of 128 plants m^{-2} caused a 19% reduction in rice yield.

تحقیقات کشاورزی ایران

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فلورعلف های هرزوخسارت واردازآنها به‌برنج دراستان فارس

فرهاد دستغیب ومهرداد بیگی

به‌ترتیب پژوهشگرودستیارپژوهشی ،سازمان پژوهشهای علمی وصنعتی ایران - مرکز شیراز

خلاصه

درطی سالهای ۱۳۶۲-۱۳۶۵ فلورعلفهای هرزمزارع برنج درنواحی کازرون وممسنی در استان فارس جمع‌آوری وشناسایی شد .درمجموع هفده‌گونه‌علف‌هرزمتعلق به‌پنج‌خانواده گیاهی دراین مزارع یافت‌شد . علف‌هرزعمده‌این مناطق *Echinochloa crus-galli* (L.) P. Beauv. است که‌درشیرازآن رادرگال ودرشمال کشورسوروف می نامند .علف‌هرزهای مهم‌دیگرشامل گونه‌های مختلف *Cyperus* به‌ویژه *Cyperus rotundus* L. و *Cyperus difformis* L. می‌باشند.به‌علاوه‌متوسط خسارت ناشی ازجمعیت طبیعی علف‌های هرز در شرایط عمل زارعان نیزبرآوردشد .آزمایش‌های‌انجام‌شده طی سه‌سال نشان دادکه وجود ۱۲۸ بوته‌درمترمربع ازعلف‌های هرزمذکورخسارتی برابربا ۱۹% به‌محصول برنج منطقه‌واردکرده‌است .

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INTRODUCTION

Rice provides staple food for half of the world's population (2). Paddy rice is an important crop in Iran covering up to 377,000 ha, most of which is hand-transplanted with a minor portion of direct-seeding (1). However, the average yield is rather low (3 t ha^{-1}), and weeds are among the important factors causing yield reduction. So far, there has been no report on the yield loss of rice fields due to weeds in Iran. Weed flora of the rice paddies and their chemical control in Northern Iran have been reported (3, 7), but no report has been published on weeds of rice fields in Fars Province.

A survey of the literature on rice yield loss due to weeds shows a wide range according to different conditions, and as pointed out by Smith (1968); plant veriety and density, weed type and population, competition period and fertility level of soils are the ruling factors involved (6). Moreover, cultural practices and methods of cultivation seem to be important. In India, yield reductions ranging from 42 to 65% have been measured in different years for direct-seeded upland rice (4), but yield losses were less in paddy rice fields of Sri Lanka and ranged from 21.6% in transplanted to 27.3% in direct seeded technique (5).

The objectives of this study were to identify weed flora of rice fields and to assess total yield caused by average population of weeds under farmers' conditions of Kazeroon and Mamasani, two important areas of rice production in Fars Province of Iran.

MATERIALS AND METHODS

Identification of Weeds

Rice fields of the area under survey were visited frequently during the growing seasons in 1983 to 1985. Weeds inside the fields as well as those in the irrigation canals and on the borders were collected, press-dried and preserved.

Identification of the weed species was performed with the assistance of Plant Pests and Diseases Research Institute and Forests and Ranges Research Organization of Iran.

Assessment of Yield Reduction Caused by Weeds

First Year. Three trials were conducted in the area comparing weedy check, weed free check, and chemical control using molinate (S-Ethyl hexahydro-1 H-azepine-carbothioate) as a post-emergence spray at 3.6 kg a.i. ha^{-1} at the 3-leaf stage of weeds. Each trial had three replications.

Second Year. Weedy check, one weeding, and weed free plots were compared in three trials each having four replications, set up in typical locations of the area. In all the above experiments, weed free plots were hand-weeded regularly at weekly intervals, and after eight weeks, no further weeding seemed necessary as a result of growth of rice plants. Data were collected on the number of weeds per unit area using three readings in each plot. At harvest time, weight of rice stem and panicles, termed rice sheaf weight, and yield of rice grain with hull were measured. Data from all trials in each year were pooled. Analysis of variance followed by Duncan's Multiple Range Test was used for mean separation.

RESULTS AND DISCUSSION

Identification of Weeds

A total of 17 weed species from five plant families were found inside the rice fields of Kazeroon and Mamasani areas (Table 1). The most important and widespread weed was barnyardgrass *Echinochloa crus-galli* (L.) P. Beauv. two varieties of which were found in the rice fields of the two areas. Different species of sedges, especially *Cyperus rotundus* L. and *C. difformis* L. were also important. Other weeds were less widely spread or less troublesome.

Weeds found in the irrigation canals and on the borders of paddy fields are listed in Table 2. They consist of nine

Table 1. Weed species found in paddy rice fields in Kazeroon and Mamasani.

1.	*Echinochloa crus-galli* (L.) P. Beauv. var. crus-galli	Gramineae
2.	*Echinochloa crus-galli* (L.) P. Beauv. var submutica	"
3.	*Eremopoa persica* (Trin) Roshev. var. *Sangarica* (Shrenk) Bor.	"
4.	*Eragrostis poaeoides* P. Beauv.	"
5.	*Eragrostis diplachnoides* Steud.	"
6.	*Dichanthium annulatum* (For) Stapif.	"
7.	*Cyperus rotundus* L.	Cyperaceae
8.	*Cyperus difformis* L.	"
9.	*Cyperus* sp.	"
10.	*Scirpus maritimus* L.	"
11.	*Scirpus tuberosus* Desf.	"
12.	*Lythrum junceum* Banks et. Soland	Lythraceae
13.	*Lythrum hysopifolia* L.	"
14.	*Ammania multiflorum* Roxb.	"
15.	*Veronica anagalis-aquatica* L.	Scrophulariaceae
16.	*Centaurium pulchellum* (SW). Druce	Compositae
17.	*Conyza bonariensis* (L.) Cronq.	"

Table 2. Weed species found in irrigation canals and on borders of rice fields in Kazeroon and Mamasani.

1.	*Paspalum distichum* L.	Gramineae
2.	*Pragmites australis* (cav.) Trin. & Steud.	"
3.	*Cyperus* cf. *glaber* L.	Cyperaceae
4.	*Cyperus* sp.	"
5.	*Juncus rigidus* Desf.	Juncaceae
6.	*Polygonum persicaria* L.	Polygonaceae
7.	*Cressa cretica* L.	Convolvulaceae
8.	*Corchorus olitorius* L.	Tiliaceae
9.	*Corchorus trilocularis* L.	"

species from six plant families. Knotgrass (*Paspalum distichum* L.) growing on the borders, and *C. glaber* L. growing in irrigation canals were more important than others.

Assessment of Yield Loss

First year. The average number of weeds per unit area, mainly barnyardgrass and nutsedge, was 206 (Table 3). Molinate at 3.6 kg a.i. ha^{-1} did not eliminate all the weeds but reduced their number significantly and produced the best rice growth and yield. Weedy check produced the lowest sheaf weight and grain yield. The yield reduction due to weed competition was 22%.

Second year. Table 4 shows the overall results of three trials conducted in 1985. Barnyardgrass was more populated than nutsedge. The density of both weeds was progressively reduced as more weeding was performed. Total fresh weight of weeds measured at harvest showed that even one weeding at the beginning of the season could reduce the weed biomass significantly, but still this was significantly higher than

Table 3. Effect of hand weeding and molinate application on sheaf weight and grain yield of paddy rice in Kazeroon and Mamasani in 1984.

Treatment	Number of weeds m^{-2}	Sheaf wt. (kg ha^{-1})	Grain yield (kg ha^{-1})	Yield loss (%)
Weedy check	206.0a†	1030b	3350b	22.0
Weed free	0.0c	1266ab	4280a	0.0
Molinate	96.0b	1360a	4320a	0.0

†Means followed by the same letter are not significantly different at the P = 0.05 level according to Duncan's Multiple Range Test.

Table 4. Effect of weed removal on sheaf weight and grain yield of paddy rice in Kazeroon and Mamasani in 1985.

Treatment	Number of weeds m^{-2}		Total fresh wt. of weeds ($g\ m^{-2}$)	Sheaf wt. ($kg\ ha^{-1}$)	Grain yield ($kg\ ha^{-1}$)	Yield loss (%)
	Echinochloa crus-galli	*Cyperus* spp.				
Weedy check	36.0A†	13.0a	190.0A	1747a	3667b	15.5
One weeding	18.0B	5.0a	53.0B	1694a	3929ab	9.5
Weed free	0.0C	0.0c	0.0C	1634a	4341a	0.0

†Mean separation in columns by Duncan's Multiple Range Test, 5% (lower case letters) level or 1% (upper case letters) level.

weed fresh weight of weed free plots. The effect of weeding on sheaf weight was not significant. This might have been due to more elongated growth under low light conditions of weedy plots. Grain yield was increased significantly by weekly weeding, and one weeding treatment could increase this criterion only slightly. The total reduction of yield due to weed competition was 15.5% in this year.

To summarize the data, the results of the two years of study are shown in Table 5. Barnyardgrass and nutsedge, with variable densities, were the major weeds in paddy fields of the areas causing serious yield reductions. An average of 128 weeds m^{-2} could cause up to 19% loss to the grain yield of rice. This figure is comparable to the results obtained in transplanted rice fields of Sri Lanka (4). Further study is needed to determine the contribution of each species to the total yield loss in rice.

Table 5. Yield loss in rice as caused by number of weed species m^{-2} in Kazeroon and Mamasani in 1984-85.

Year	Number of weeds m^{-2}			Yield loss
	Echinochloa crus-galli	*Cyperus* spp.	Total	(%)
1984	64	142	206	22.0
1985	36	13	49	15.5
Mean	50	78	128	19.0

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