

Relative Competition of Grasses, Broad Leaved and Mixed Weed Population with Wheat

Abdul Ghafoor and Rashid A. Shad

Weed Science Programme, National Agricultural Research Centre, Park Road, Islamabad, Pakistan.

ABSTRACT :

Relative competition of grasses, broad leaved and mixed weed with wheat (*Triticum aestivum* L.) was determined for two consecutive years during 1987-88 and 1988-89 at the experimental area of Crop Maximization Programme, Gujrat, Pakistan. Experiments were laid out in randomized complete block design with four replications. Weed competition by grasses, broad leaved alone or mixed weed population reduced grain yield of wheat significantly as compared to weed free plots. Maximum yield reduction of 33% and 29% were found in the plots where wheat was competing with a mixed weed population. The reduction in yield decreased to 30% and 26% with broad leaved weeds, and 25% and 17% with grass weed competition in 1987-88 and 1988-89, respectively.

Key words : Wheat (*Triticum aestivum* L.), Weeds, Broad leaves, Grasses, Yield reduction, Weed Competition.

INTRODUCTION

Weeds and crops usually have the same requirements, but weeds make their living at the expense of the crop by competing for nutrients, moisture, light and space. Competition may occur by a single species or a mixture of species (Maillette, 1986). In such competition, aggressive species are usually dominant (Martin and Field, 1987). This aggressiveness is associated with favorable growth habits such as tall, broad leaves and rapid growth leading to a foliar canopy that shades smaller plants from direct sun light, or that have a vigorous, rapidly spreading, efficient root system for absorbing and utilizing nutrients and moisture from the soil (Kadian et al., 1980, Shamsi and Ahmad, 1987). Hence the competition of weeds in crops varies among species. The average yield reduction of wheat by *Chenopodium album* L. and *Carthamus oxyacantha* Bieb. was found to be only 9.5%, while *Fumaria parviflora* L. reduced the yield

by 16.1% (Majid and Sandhum, 1984). In another study, Carlson and Hill (1985) reported that eleven plants of *Avena fatua* L. in a square meter reduced the grain yield of wheat by 18%, while *Phalaris minor* Retz. reduced it by 37% at a density of 350 plants/m (Godinho and Costa, 1982). Keeping in view the above situation, the present study was planned to determine the competitive effect of broad leaved and grass weeds alone and in the form of mixed weed population on the yield of ricebased irrigated wheat.

MATERIALS AND METHODS

Wheat (*Triticum aestivum* L.) cultivar "Pak-81" was used in this study. The experiments were carried out for two consecutive years i.e. 1987-88 and 1988-89 at the farmer's field in a rice-based irrigated area of Gujirat, (Pakistan). Experiments were laid out in a randomized complete block design with four replications. Sowing was done with tractor-mounted drill with a 20 cm row to row distance. Broad leaved weeds were controlled by applying bromoxynil (3,5-Dibromohydroxybenzotrile) +MCPA (2Methy 1-4- chlorophenoxyacetic acid) at the rate of 0.80 kg/ha (a.i) and grass weeds by tralkoxydin(2-{1-(ethoxyimino)propyl}-3-hydroxy-5-(2, 4, 6 trimethylphenyl) cyclohex - 2-2none) at 0.25 kg/ha (a.i.) after 30 days of crop emergence. Mixed weed flora were controlled by the tank mixture of these two herbicides. The remaining undesired weeds in each plot were removed by hand to ensure the absolute treatment effect. All other cultural practices and protection measures were applied uniformly.

In order to record weed ensity, weed samples were taken from five places in a plot with a quadrat measuring 0.5 m². The percentage of weed density of each species was calculated.

For grain yield evaluation, an area of 5 m² was harvested by hand from the center of each plot, and the yield was based on threshed grains which was further computed to tons/ha. Data were analyzed by analysis of variance and Duncun's Multiple Range Test was applied for treatment comparisons.

RESULTS AND DISCUSSION

Eleven weed species belonging to seven families were recorded in 1987-88, while in 1988-89 the number was reduced to nine belonging to six families. Among the grasses, *Phalaris minor* Retz. and *Avena fatua* L. infested the field during both years; whereas the broad leaved weeds namely *Anagalis arvensis* L., *Fumaria parviflora* L., *Latharus aphaca* L., *Medicago denticulata* Wild., *Melilotus indica* L., and *Vicia sativa* L. were recorded. *Cirsium arvense* Scop. and *Latharusaphaca* L. were absent in 1988-89 (Table 1). Total weed density in the plots of mixed weed population were recorded to be 196/m² in 1987-88. In plots consisting of only broad leaved weeds it was 152/m² and in plots of grass weeds it was 123/m² during the same year. In 1988-89, the total weed density in mixed weed plots was 166/m²; whereas it was 130/m² in broad leaved plots and 58/m² of grass weed plots (Table 1). This difference between the mixed weed population and the sum of both classes of weeds indicates that the absence of one class of weed species, by a flush of another class, helps to increase the density of the prevailing class population. Consequently, the total number of weeds in the plots of mixed weed spectrum was less than the sum of individual weed species (grasses and broad leaved) in both treatments.

In both years of experimentation, *Anagalis arvensis* L. and *Phalaris minor* Retz. were the dominant species with weed density of 38% and 21% in 1987-88 and 21% and 25% in 1988-89, respectively; whereas *Fumaria parviflora* L., *Medicago denticulata* Wild., *Avena fatua* L. and *Chenopodium album* L. were present in 11%, 11%, 9% and 7% in respectively. Other weed species such as *Cirsium arvense* Scop., *Convolvulus arvensis* L., *Latharus aphaca* L. and *Vicia sativa* L. occurred only in very low percentage.

Effect of competition of weeds on the grain yield of wheat is evident from Table 1 and 2. Wheat yield was generally lower in weedy plots than in weed-free ones. During both years, the highest (4.30 and 4.35 tons/ha.) crop yield was found in the treatments of weed-free, and the lowest (2.90 and 3.0 tons/ha.) in the mixed population. In 1987-88 yield, a reduction by mixed weed population was 83% where 196 plants/m² were competing. This reduction in the yield was decreased to 30% and 25%, respectively, when 152 plants/m² of only broad leaved and 123 Plants/m² of only grasses were

Table 1. Percentage density of weed species present in wheat fields at Gujrat (Pakistan)

Weed Species	Common name	Family	1987-88	1988-89
<u>Anagallis arvensis</u>	Pimpernel/searlet	Primulaceae	38	21
<u>Avena fatua</u>	Wild oat	Poaceae	9	19
<u>Chenopodium album</u>	Lambsquarters	Chenopodiaceae	7	5
<u>Cirsium arvensis</u>	Canada thistle	Compositae	0.4	NF
<u>Convolvulus arvensis</u>	Field bind weed	Convolvulaceae	1	2.4
<u>Fumaria perviflora</u>	Fumitory	Fumariaceae	11	8
<u>Latharus aphaca</u>	Peavine	Leguminosae	0.2	NF
<u>Medicago denticulata</u>	Burclover	Leguminosae	11	9
<u>Melilotus indica</u>	Sweetclover	Leguminosae	4	7
<u>Phalaris minor</u>	Little canary G.	Gramineae	21	25
<u>Vicia sativa</u>	Common vetch	Leguminosae	0.4	2.6

NF = Not Found

Table 2. Weed density, weed biomass and grain yield as affected by weed crop competition in rice-based irrigated wheat (1987-88).

Treatments	Weed density (No/m)	Weed biomass (Gm/m)	Grain yield (t/ha)
Broad-leaved weeds only	152 b	74.62 b	3.01 b
Grass weeds only	123 b	54.67 b	3.21 b
Mixed Weed flora	196 a	124.92 a	2.90 b
Weed free	0 c	0 c	4.30 a

Means followed by a common letter in a column are not significantly different

allowed to compete with the crop. In 1988-89, maximum yield reduction (29%) was obtained in the plots where 166 plants/m² of mixed weed flora were competing with the crop followed by only broad-leaved weed competition (26%) and then grasses (17%) (Fig.1).

During both years mixed weed population reduced the wheat yield significantly. As far as the comparison of the effect of broad leaved and grasses with mixed weed flora, the yield obtained as a result of broad leaved, grasses and mixed weed population treatments did not differ significantly in 1987-88. Similar trend was found in 1988-89 (Table 3) with an exception that the yield from mixed weed population treatment differed significantly from the treatment where grasses were allowed to compete.

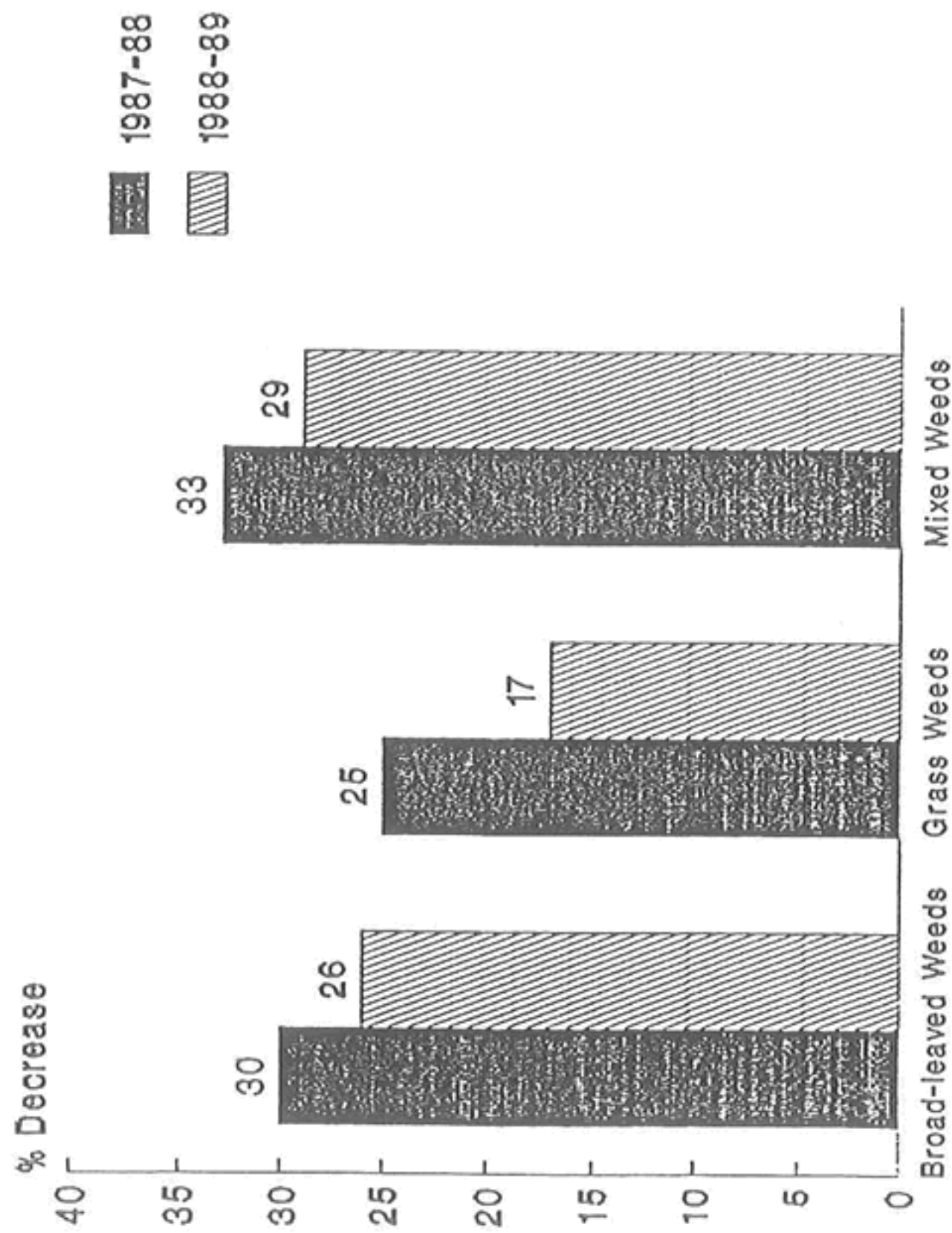
On the basis of these data it can be concluded that :

- i) Usually a mixed population consisting of broad leaved and grasses is prevalent in the wheat fields.
- ii) If one of the two component weeds is removed, the population of the other increases.
- iii) Broad leaved and grasses are equally competitive with wheat crop and reduce the yield significantly when present singly or in a mixed form.

REFERENCES

- Carlson, H. L. and J. E. Hill. 1985. Wild oat (*Avena fatua* L.) competition with spring wheat : plant density effects. *Weed Science* 33:176-181.
- Godinho, I. and J. C. A. Costa. 1982. Competition of *Phalaris minor* Retz. In wheat (abstract). *Wheat* 31(8):2528.
- Kadian, M. S., M. D. Upadhyay and H. O. Agarwal. 1980. Effect of intra and inter specific competition of various growth parameters of wheat variety Sonalika in pure and mixed stand with *Chenopodium album* L. *Indian J. of Ecology* 9(1):64-71.

- Maillette, L. 1986. Canopy development, leaf demography and growth dynamics of wheat and three weed species growing in pure and mixed stand. *J. of Applied Ecology* 23(3)929-944.
- Majid, A. and G. R. Sandhu. 1984. Effects of *Fumaria perviflora* on yield and yield components of wheat. *Pak. J. of Agri. Res.* 5(3) 141-143.
- Martin, M. P. L. D. and R. J. Field. 1987. Competition between vegetative plants of wild oat (*Avena Fatua* L.) and wheat (*Triticum aestivum* L.). *Weed Research* 27:119-124.
- Shamsi, S. R. A. and B. Ahmad. 1987. Studies on comparative and yield losses of wheat by some competing weeds. Proceeding of the Pak-Indo-US Weed Control Workshop, March 11-14, 1987. National Agricultural Research Centre, Islamabad, Pakistan. pp59-73.



Weed Flora Composition

Fig.1: Percent decrease in grain yield due to grasses, broad-leaved and mixed weed competition with wheat.

Table 3. Weed density, weed biomass and grain yield as affected by weed crop competition in rice based-irrigated wheat (1988-89).

Treatments	Weed density (No/m)	Weed biomass (Gm/m)	Grain yield (t/ha)
Broad-leaved weeds only	130 ab	63.81 b	3.21 bc
Grass weeds only	58 b	64.67 b	3.61 b
Mixed Weed flora	166 a	105.80 a	3.07 c
Weed free	0 c	0 c	4.35 a

Means followed by a common letter in a column are not significantly different

مدى منافسة الأعشاب الضارة رفيعة الأوراق وعريضة الأوراق والمختلطة في القمح

عبدالغفور ورشيد أ. شاد

برنامج علوم الأعشاب - المركز القومي للأبحاث الزراعية ، شارع بارك -
إسلام آباد - باكستان

ملخص :

أجريت دراسة مدى منافسة الأعشاب الضارة رفيعة الأوراق وعريضة الأوراق والمختلطة في محصول القمح خلال عامي ١٩٨٧-١٩٨٨ و ١٩٨٨-١٩٨٩ في مركز التجارب الخاص بزيادة إنتاج المحاصيل بمنطقة " قجرات " بالباكستان . استعمل تصميم القطع كاملة العشوائية بأربع مكررات في كل تجربة . أظهرت النتائج أن أعلى نسبة إنخفاض في إنتاج القمح كانت في معاملات الأعشاب المختلطة بمعدل ٣٣٪ و ٢٩٪ . أما الأعشاب عريضة الأوراق فقد خفضت الإنتاج بنسبة ٣٠٪ و ٢٦٪ ، بينما الأعشاب رفيعة الأوراق قد خفضت الإنتاج بنسبة ٢٥٪ و ١٧٪ خلال عامي ١٩٨٧-١٩٨٨ و ١٩٨٨-١٩٨٩ على التوالي .

كلمات مفتاحية : القمح ، الأعشاب الضارة ، عريضة الأوراق ، منافسة الأعشاب .