Vol. XV (1–2), 1978.

# EFFECT OF WEED—CROP COMPETITION ON WHEAT PRODUCTION

**Syed Akhtar Saeed, Muhammad Sadiq and Abid Nisar Ahmed***

Wheat yields were reduced by 16.03 and 9.50% by full season competition with *Chenopodium album* (Bathu)/*C. murale* (Karund) and *Carthamus oxyacantha* (Pohli) at densities of 23 and 7 plants per square foot respectively. *Asphodelus tenuifolius* (Piazi), *Euphorbia helioscopia* (Dhodak), *Cyperus rotundus* (Deela) and *Sorghum halepense* (Baru) did not produce significant effect on wheat production with densities of 14, 7, 17 and 1 plants per square foot, respectively.

## INTRODUCTION

The performance of the cultivated crops is the result of interactive reactions of their genetics and environment. Besides hazards of insect pests, plant diseases, floods, etc., the crops have to compete with weeds for water, mineral nutrients, light, space and other growth requirements, thus suffering substantial irreparable loss (Muzík, 1970).

Competition among plants may depend on many characteristics such as morphology, their capacity to extract nutrients or moisture from the soil, differential responses to temperature, or a variety of other factors. However, the competitive ability is considered to be dependent on the net capacity of a plant to assimilate carbon dioxide and use the photosynthate to extend its foliage or increase its size (Black *et al.*, 1969), which ultimately influences the productivity potential of the plant.

Though some work involving the morphological description of flora of Pakistan and weed control aspect has been reported by Kashyap (1936), Luthra (1938), Ahmad (1954), Khan (1964), Chatha (1973), Nasir (1973), etc., yet virtually no work has been undertaken on weed-crop competition in Pakistan. However, Carter *et al.* (1964) found that heavy stands of field pepperweed (*Lepidium compestre*) reduced wheat yield by 45% and lesser degree of infestations reduced the yield proportionately. Swan (1971) reported that winter wheat yields were decreased by competition with blue mustard (*Chorispora*

*Department of Botany, University of Agriculture, Faisalabad, (Pakistan).

*tenella*) and as the weed population increased, wheat production continued to decrease.

Weatherspoon and Schweizer (1971) observed that a given density of Kochia (*Kochia scoparia*) suppressed the yield of sugarbeet (*Beta vulgaris*) more than did a similar density of green foxtail (*Setaria viridis*) yellow foxtail (*Setaria glauca*), mustard (*Brassica* spp.) redroot pigweed (*Amaranthus retroflexus*) or common ragweed (*Ambrosia artemisifolia*). Ivy and Baker (1972) maintained that full season competition of prickly sida (*Sida spinosa*) populations significantly reduced seed cotton yield as compared to plots free of prickly sida. Crowley and Buchanan (1977) established that Morning glory (*Ipomoea purpurea*) reduced seed cotton yields by 23, 32 and 55% at densities of 8, 16 and 32 weeds per 15 m. of row respectively.

The objective of this study was to determine the amount of depression in yield of wheat crop caused by full season competition with *Chenopodium album*/*Chenopodium murale*, *Carthamus oxyacantha*, *Asphodelus tenuifolius*, *Sorghum halepense*, *Cyperus rotundus* and *Euphorbia heliosccpia*, respectively.

## MATERIALS AND METHODS

Wheat cultivar Chenab–70 (*Triticum aestivum*) was used in this experiment. The seed was obtained from Punjab Agricultural Research Institute, Faisalabad. The experiment was carried out for three consecutive years i.e., from 1972 to 1974, in the experimental area of the University of Agriculture, Faisalabad. The soil of this areagave pH value of 7.9 and electrical conductivity 8.90 m.mhos/c.m. Sowing was done with a Hand Rabi Drill. The experiment was laid out in randomized block design including 8 treatments and 4 replications. Each plot measured 17'×40'. Treatment Nos. 1 and 8 were kept as control in each replication, while the requisite weed seeds were sown in the other plots alongwith the crop. Only one specific competing weed was fetained in each plot, while all other weeds were removed by hand hoeing. The density of weeds was recorded in each plot and the mean number of weed plants in a plot for each year was calculated separately.

The data on grain and straw yield was obtained for each treatment and subjected to analysis of variance. Duncan's Multiple Range Test was applied to make multiple comparison of means (Buchanan, 1977).

## RESULTS AND DISCUSSION

The examination of Tables 1, 2 and 3 reveals that full season competition of *Chenopodium album*/*C. murale* and *Carthamus oxyacantha* with wheat caused highly significant adverse effect on grain and straw yields. The maximum adverse effect was brought about by *Chenopodium album*/*C. murale* depressing the grain and straw yields by 16.03 and 16.58% respectively at a density of 23 plants per square foot. The reduction in grain and straw yields by *Carthamus oxyacantha* competition was 9.50 and 7.73%, respectively with a density of 7 plants per square foot. These results corroborate the findings of Swan (1971). He observed that winter wheat yields were reduced by competition with blue mustard (*Chorispora tenella*) and as the weed population increased, wheat production continued to decrease.

*Asphodelus tenuifolius* and *Euphorbia helioscopia* stood next to the above mentioned two weeds in causing a decrease in yield, but it was not significant statistically. These two weeds had the same rankings with 6.68% depression in yield at densities of 14 and 7 plants per square foot, respectively.

*Cyperus rotundus* and *Sorghum halepense* caused negligible decrease in yield. The probable reason for this was that these weeds emerged very late when the crop was established to such an extent that it could overcome the influence of weed-crop competition.

## ACKNOWLEDGEMENTS

The present studies were carried out under PL–480 Research Project No. A17–CR–27 (Biology of Farm Weeds) and Grant No. FG–Pa–159. The authors gratefully acknowledge the inspiring help rendered by Dr. R.B. Taylorson, the counterpart scientist of USDA, during the course of this study.

## LITERATURE CITED

Ahmad, S., 1954. Grasses and Sedges of Lahore District. Punjab University Press, Lahore.

Black, C.C., T.M. Chen and R.H. Brown, 1969. Biochemical basis for Plant Competition. Weed Sci. 18: 338—343.

Buchanan, G.A., 1977. Weed Biology and Competition, Research Methods in Weed Science. Southern Weed Science Society: 25—40.

Carter, A.S., J.H. Lefforg and L.C. Shenberger, 1964. A study of the Effect of Infestations of Field Pepergrass on Yield of Wheat. Proc. Assoc. Offic. Seed Anal. 36: 103—105.

Chatha, M.A., 1973. Investigations into the Chemical Weed Control in Wheat. M.Sc. Thesis, Univ. of Agri., Lyallpur.

Crowley, R.H. and G.A. Buchanan, 1977. Competition of four morning glory species with Cotton. Proceedings Southern Weed Science Society, 1977-78.

Ivy, H.W. and R.S. Baker, 1972. Prickly Sida Control and Competition in Cotton. Weed Sci. 20: 137—139.

Kashyap, S.R., 1936. Lahore District Flora. The University of the Punjab, Lahore.

Khan, M.D., 1964. Efficiency of Selective Herbicides for the Control of Weeds in Wheat. W.P.J. Agri. Res. 2: 92.

Luthra, J.C., 1938. Punjab Weeds and their Control. Govt. Printing Press, Lahore.

Muzik, T.J., 1970. Weed Biology and Control. McGraw-Hill Book Co., N.Y.

Nasir, E., 1973. Flora of West Pakistan. Department of Botany, University of Karachi, Karachi.

Swan, D.G., 1971. Competition of Blue Mustard with Winter Wheat. Weed Sci. 19: 340—342.

Weatherspoon, D.M. and E.E. Schweizer, 1971. Competition Between Sugarbeets and Five Densities of Kochia, Weed Sci. 19:125—128

Table 3. *Density of Weed Plants in Wheat Plots.*

| Year/treatment No. | Mean No. of weed plants per treatment in quadrat size 1′×1′ | | | | | |
|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 |
| 1972–73 | 25.50 | 6.75 | 13.25 | 1.25 | 6.00 | 5.75 |
| 1973–74 | 22.25 | 7.00 | 14.50 | 1.75 | 14.25 | 6.75 |
| 1974–75 | 20.75 | 7.50 | 14.75 | 1.50 | 17.50 | 7.25 |
| Total | 68.50 | 21.25 | 42.50 | 4.50 | 37.75 | 19.75 |
| Average number of plants | 22.83 | 7.08 | 14.17 | 1.50 | 12.58 | 6.58 |

Table 2. *Straw Yield and its (%age) due to full season competition with various weeds*

| Treatment No. | 1972–73 Straw yield Lbs. | 1972–73 %age decrease over control | 1973–74 Straw yield Lbs. | 1973–74 %age decrease over control | 1974–75 Straw yield Lbs. | 1974–75 %age decrease over control | 1972—75 Mean Straw yield Lbs. | 1972—75 Mean %age decrease over control |
|---|---|---|---|---|---|---|---|---|
| Control 1 | 144.50 | | 120.25 | | 139.75 | | 134.83 | |
| 8 | 142.75 | | 120.75 | | 138.50 | | 133.83 | |
| 2 | 118.25 | 17.6 | 100.25 | 16.6 | 117.50 | 15.5 | 112.00 | 16.58 |
| 3 | 133.00 | 7.4 | 111.75 | 7.1 | 127.00 | 8.7 | 123.92 | 7.73 |
| 4 | 137.75 | 4.1 | 116.50 | 3.1 | 132.75 | 4.6 | 129.00 | 3.93 |
| 5 | 138.75 | 3.4 | 116.75 | 2.9 | 135.75 | 2.4 | 130.42 | 2.90 |
| 6 | 143.00 | 0.4 | 119.50 | 0.6 | 138.50 | 0.4 | 133.67 | 0.47 |
| 7 | 137.25 | 4.4 | 111.50 | 7.3 | 132.00 | 5.1 | 126.92 | 5.60 |

| 1972—75 Treatments | Control | 6 | 5 | 4 | 7 | 3 | 2 |
|---|---|---|---|---|---|---|---|
| Straw Yield | 134.33 | 133.67 | 130.42 | 129.00 | 126.92 | 123.92 | 112.00 |

Full season competition with:

2. *Chenopodium album* L./*C. murale* L.
3. *Carthamus oxyacantha* Bieb.
4. *Asphodelus tenuifolius* Cav.
5. *Sorghum halepense* L.
6. *Cyperus rotundus* L.
7. *Euphorbia helioscopia* L.

1, 8 Control

Table 1. *Grain yield and its decrease (%age) due to full season competition with various weeds.*

| Treatment | 1972–73 Grain yield Lbs. | 1972–73 %age decrease over control | 1973–74 Grain yield Lbs. | 1973–74 %age decrease over control | 1974–75 Grain yield Lbs. | 1974–75 %age decrease over control | 1972—75 Mean grain yield Lbs. | 1972—75 Mean %age decrease over control |
|---|---|---|---|---|---|---|---|---|
| Control 1 | 49.00 | - | 52.50 | — | 48.75 | .. | 50.08 | — |
| 8 | 48.00 | — | 54.00 | — | 48.50 | ... | 50.17 | — |
| 2 | 40.25 | 17.01 | 44.50 | 16.43 | 41.50 | 14.64 | 42.08 | 16.03 |
| 3 | 44.25 | 8.76 | 47.25 | 11.27 | 44.50 | 8.47 | 45.33 | 9.50 |
| 4 | 45.00 | 7.22 | 48.75 | 8.45 | 46.50 | 4.36 | 46.75 | 6.68 |
| 5 | 45.75 | 5.67 | 51.75 | 2.82 | 47.50 | 2.30 | 48.33 | 4.59 |
| 6 | 46.50 | 4.12 | 52.50 | 1.41 | 47.50 | 2.30 | 48.83 | 2.61 |
| 7 | 45.00 | 7.22 | 49.00 | 7.96 | 46.25 | 4.87 | 46.75 | 6.68 |

| 1972—75 Treatments | Control | 6 | 5 | 4 | 7 | 3 | 2 |
|---|---|---|---|---|---|---|---|
| Yield | 50.12 | 48.83 | 48.33 | 46.75 | 46.75 | 45.33 | 42.08 |

Full season competition with:

2. *Chenopodium album* L/*C. murale* L.
3. *Carthamus oxyacantha* Bieb.
4. *Asphodelus tenuifolius* Cav.
5. *Sorghum halepense* L.
6. *Cyperus rotundus* L.
7. *Euphorbia helioscopia* L.

1, 8 Control