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Growth and Yield Losses in Wheat Due to Different Weed Densities

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Abstract: The field experiment was conducted at Students Farm, Sindh Agriculture University, Tandojam, Pakistan during 2004-05. Weed densities tested were: weedy check (control), wheat + Natural weeds (weedy for full season), wheat + mixed weeds (*Chenopodium album*, *Melilotus alba*, *Avena fatua*, *Phalaris minor*) (2:1), wheat + *Chenopodium album* (2:1), wheat + *Melilotus alba* (2:1), wheat + *Avena fatua* (2:1) and wheat + *Phalaris minor* (2:1). Among the tested weed densities, *Chenopodium album*, *Avena fatua*, *Phalaris minor*, and *Melilotous alba* were found common and serious weeds in wheat crop and reduced the tillers production, height of plants, seed index, wheat biomass and grain yield. The highest effect of *Chenopodium album* was recorded which reduced the grain yield by 39.95%, followed by *Avena fatua* (36.48%), *Phalaris minor* (35.33%), natural weeds for full season (34.96%), mixed weeds (32.14%) and *Melilotous alba* (24.01%). It was concluded that weeds exhibit the economic yield losses to the wheat crop, which may range from 24-39.95% and these must be controlled during the full growing season of the crop for achieving satisfactory crop yields.

Key words: Weeds, densities, *Chenopodium album*, *Melilotus alba*, *Avena fatua*, *Phalaris minor*, growth, losses, grain, yield

INTRODUCTION

Weeds are plant which compete for nutrients, space, light and exerts lot of harmful effects by reducing the quality as well as quantity of the crop, if, the weed populations are left uncontrolled (Arnold *et al*., 1988; Halford *et al*., 2001). Weeds cause diseases in crops and support the insect pests. In agricultural term weeds are called pests because they cause damage to the crop. Weeds may reduce about 40-50% grain yield in wheat crop. Among the factors, which adversely affect the yield of wheat crop, weed infestation is the most harmful one but less noticeable. Weeds comprise the most undesirable, aggressive and troublesome element of world's vegetation. Weeds are plants, which grow out of their proper places and whose virtue has not yet been discovered. Weeds also act as reservoir for multitude of pest and diseases, which use them as alternate hosts for food and shelter during the off season period. Weed density under both rained as well as irrigated conditions were studied for yield losses due to various densities of *Melilotus indica*. It was concluded that the grain yield of wheat declined with the increase in weed density (Siddiqui and Shad, 1991). Bilalis *et al.* (2003) suggested that there is the need to adopt weed control practices that precisely, both for economic and environmental reasons. Froud-Williams (2002) in order to predict the consequences of failure to control weeds in any single season, it is proposed that knowledge of the population dynamics of the species concerned is essential. While a wealth of literature is available, but the number of areas requires further investigation with regard to reproductive output considering the losses caused by weeds and their impact on crop growth, this study was conduct in the field on post emergence weed control in wheat. Nesterove and Chukanova (1981) recorded the deduction in grain yield of wheat caused by different population of weeds and greatest reduction was found by the presence of *Convolvulus arvensis* and *Amaranthus retroflexus*. Jalis (1987) studied the predominating influence of *Phalaris minor* and *Avena fauta* in wheat. Siddiqui and Shad (1991) observed that the grain yield of wheat declined with the increase in weed density both in rainfed as well as in irrigated conditions. Looking the adverse effects of the weeds and investigation was made to determine the weed affects and density in wheat at Tandojam, Pakistan.

MATERIALS AND METHODS

The study was conducted at the Students Farm, Sindh Agriculture University Tandojam Pakistan to find out the effect of different weed densities on the growth, yield and economics of wheat crop. The experiment was laid out in the randomized complete block design having four replications. The experimental details are given below:

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Treatments

T1 = Weedy check (control)
T2 = Wheat + Natural weeds (weedy for full season)
T3 = Wheat + mixed weeds (*Chenopodium album*, *Melilotus alba*, *Avena fatua*, *Phalaris minor*) (2:1)
T4 = Wheat + *Chenopodium album* (Jhil) (2:1)
T5 = Wheat + *Melilotus alba* (Sinjh) (2:1)
T6 = Wheat + *Avena fatua* (Jangli Jai) (2:1)
T7 = Wheat + *Phalaris minor* (Dhanak) (2:1)

Cultural practices: The land was prepared by two plowing followed by land leveling to achieve fine seedbed. However, more emphasis was given to the precisely leveling of land, preparation of bunds and channels around the field, which were made by manual. The seed of wheat variety TJ-83 was sown with single coulter hand drill at the depth of 3 cm. The 360 counted numbers of wheat seeds were sown in each plot. The first irrigation was applied at the crown root initiation stage i.e., after three weeks of sowing. The subsequent irrigation was applied according to the need of crop. The fertilizer was applied at the recommended dose i.e., 120 N kg ha^{-1} and 75 P_2O_5 kg ha^{-1} in the form of urea and DAP, respectively. The full dose of phosphorus and one-third of urea were applied at the time of seedbed preparation. The remaining nitrogen was applied with subsequent irrigation in equal splits.

Weedy check: In weedy check plots weeds were removed from the fields three times. First removing was done after 30 days of sowing by hand pulling, second removing was done after 45 days of sowing and last removing was done after 60 days of sowing.

Weed flora of wheat: Different weed species infesting the experimental area were counted throughout the season.

Weed density: Weed densities of different weed species were recorded after 50 days of sowing, weed density was counted throughout all the plots separately.

Weed biomass: At the wheat maturity stage weeds were harvested separately and dried in the oven for 72 h at the 60°C and weighted.

Statistical analysis: The data recorded were analyzed by using statistical package MSTATC.

RESULTS AND DISCUSSION

Weed observations

Weed flora of wheat: Six weed species found infesting the wheat crop that is presented in Table 1. Such weed flora includes broad leaved weeds and grass or narrow leaved weeds. The weed species such as *Chenopodium album*, *Avena fatua*, *Phalaris minor* and *Melilotus alba* were weeds of annual nature and erect in growth habit. The weeds like *Convolvulus arvensis* and *Cynodon dactylon* were perennial in nature. Abbasi and Makhdoom (1984) reported more than one dozen weeds of wheat; such weeds were similar as reported in this study. Cheema *et al.* (1988) reported that all weed control methods increased yield of wheat crop as compared to weedy check for full season.

Table 1: Weed flora of wheat crop

English name	Botanical name	Family	Duration
Sweet clover	*Chenopodium album*	Chenopodiaceae	Annual
Bind weed	*Convolvulus arvensis*	Convolvulaceae	Perennial
Wild oats	*Avena fatua*	Graminae	Annual
Canary grass	*Phalaris minor*	Graminae	Annual
Meal weed	*Melilotus alba*	Leguminasae	Annual
Lawn grass	*Cyndon dactylon*	Graminae	Perennial

Table 2: Weed density (m^{-2}) and biomass (g m^{-2}) in wheat crop

Treatments	Weed density (m^{-2})	Weed biomass (g m^{-2})
Wheat + Natural weeds (weedy for full season)	89.50b	305.00d
Wheat + mixed weeds (*Chenopodium album*, *Melilotus alba*, *Avena fatua*, *Phalaris minor*) (2:1)	147.25a	508.75b
Wheat + Chenopodium album (2:1)	156.25a	522.50b
Wheat + *Melilotus alba* (2:1)	156.25a	361.00c
Wheat + *Avena fatua* (2:1)	153.00a	680.00a
Wheat + *Phalaris minor* (2:1)	151.75a	542.50b
SE	12.72	9.937
LSD (5%)	38.34	29.95
LSD (1%)	53.00	41.41

Mean values with the same letter(s) are not significantly different

Weed density (m^{-2}): It was observed that the mean weed density ranged from 89.50 to 156.25 m^{-2}. The maximum and non significant weed density values were exhibited in plots having Wheat + *Chenopodium album* (156.25), wheat + *Melilotus alba* (156.25), wheat + *Avena fatua* (153.00), wheat + *Phalaris minor* (151.75) and wheat + mixed wheat (147.25) grown at the ratio of 2:1, however, minimum weed density values were noted in the treatment where wheat + natural weeds emerged (Table 2).

Weed biomass (g m^{-2}): It was observed that the weed biomass ranged from 305.00 to 680.00 g m^{-2}. The maximum weed biomass 680.00 g m^{-2} was recorded in the treatment having wheat + *Avena fatua* and non-significant values of wheat + *Phalaris minor*, Wheat + *Chenopodium album* and Wheat + Mixed weeds grown at the ratio of 2:1 (wheat + weeds). The minimum weed biomass was exhibited in the area where the wheat + natural weeds (Table 2).

Wheat crop observations: The effect of different densities on the growth and yield of wheat revealed the significant effects of various weed flora and their densities on the tiller production, plant height, seed index, wheat biomass

Table 3: Wheat crop characters as affected by different weed densities

Weed densities	Tillers plant^{-1}	Plant height (cm)	Seed index 1000 grain weight (g)	Wheat biomass (g m^{-2})	Grain yield (kg ha^{-1})	Yield decrease over weedy check (%)
Weedy check (control)	11.16a	89.58a	45.40a	1111.25a	5412.50a	-
Wheat + Natural weeds (weedy for full season)	06.66cd	69.66bc	35.90bc	710.00cd	3525.00d	34.96
Wheat + mixed weeds (*Chenopodium album, Melilotus alba, Avena fatua, Phalaris minor*) (2:1)	06.83cd	71.41bc	38.85b	736.75c	3672.50c	32.14
Wheat + *Chenopodium album* (2:1)	05.58d	66.99c	34.43c	653.00e	3250.00f	39.95
Wheat + *Melilotus alba* (2:1)	09.33b	75.41b	39.52b	824.75b	4112.50b	24.01
Wheat + *Avena fatua* (2:1)	07.24cd	68.99bc	36.64bc	689.25d	3437.50e	36.48
Wheat + *Phalaris minor* (2:1)	08.16bc	71.07bc	38.77b	703.00cd	3500.00d	35.33
SE	0.441	1.543	0.81	8.617	1.543	
LSD (5%)	1.31	4.58	2.43	25.61	4.58	
LSD (1%)	1.79	6.28	3.33	35.00	6.28	

Mean values with the same letter(s) are not significantly different

and grain yield of wheat crop. Among the tested weed densities of various weeds, it was observed that wheat + *Chenopodium album*, followed by wheat + *Avena fatua*, wheat + *Phalaris minor* (grown at the ratio of 2:1) and wheat + natural weeds produced significantly maximum adverse effect by reducing the crop parameters.

The range values of different wheat parameters as affected by different weed densities were as: number of tillers 5.58 to 11.16, plant height 66.99 to 89.58 cm, Seed index 34.43 to 45.40 g, wheat biomass 653.00 to 1111.25 g plot^{-1} and grain yield 3250.00 to 5412.50 kg ha^{-1}. However, the maximum values of the crop parameters were recorded in weedy check treatment, followed by wheat + *Melilotus alba* (2:1) and minimum values were recorded in wheat + *Chenopodium album* where wheat was grown at the ratio of 2:1 with *Chenopodium album.* Harvest index recorded different results, which exhibited maximum and non significant values in plots having wheat + *Avena fatua,* (49.86%), wheat + *Melilotus alba* (49.85%), wheat + mixed weeds (49.84%), wheat + *Phalaris minor* (49.78%), wheat + *Chenopodium album* (49.76%), wheat + natural weeds (49.64%) and weedy check (48.75%) (Table 3). Bhatti and Soomro (1994) reported that *Avena fauta*, *Phalaris minor* and *Chenopodium album* were the major weeds of irrigated areas of wheat in Pakistan. The findings of the study are supported by Dhima and Elefthrohorinos (2003) studied the effect of *Phalaris minor* in wheat and reported that wheat ear heads, seed index were severely affected by reducing yield upto 48%. Nesterove and Chukanova (1981) recorded the reduction in grain yield of wheat caused by different population of weeds. Oad *et al.* (2003) reported that *Chenopodium album* was most densely populated and adversely affected the wheat growth and yield due to its high frequency and density. Jalis (1987) studied the predominating influence of *Phalaris minor* and *Avena fauta* in wheat. Siddiqui and Shad (1991) observed that the grain yield of wheat declined with the increase in weed density under both rainfed as well as irrigated conditions, thus, Siddiqui *et al.* (2004) suggested that weed extend their less adverse effects if the wheat crop is managed at proper planting density.

Yield decrease: The various weed densities decreased grain yield over weedy check. Among the tested weed densities, *Chenopodium album*, *Avena fatua*, *Phalaris minor* and natural weeds, mixed weeds and *Melilotus alba* decreased grain and chaff yields (kg ha^{-1}) by recording 2165.50 (39.95%), 1975.00 (36.48%), 1912.00 (35.33%), 1892.50 (34.96%), 1740.00 (32.14%) and 1300.00 (24.01%), respectively.

These results agree with the previous findings of Buriro *et al.* (2003) that weeds reduce the economic yield and maintenance of cultivation are increased and soil fertility are degraded due to weed problem. The control in weeds can increase the wheat yields upto 50% or more. Gill *et al.* (1979) reported that yield losses occurred due to weed infestation which varies from 15-50% depending upon weed density, however, Tanji (1987) supported the present research by reporting that weed competition resulted in grain yield losses up to 35% and straw up to 23%.

CONCLUSIONS

The field investigations for various weed densities concludes that *Chenopodium album*, *Avena fatua* and *Phalaris minor* grown in the field severely affected wheat crop by reducing 39.95, 36.48 and 35.33% grain yields, respectively as compared to weedy check for full season. Therefore, it is suggested that *Chenopodium album*, *Avena fatua* and *Phalaris minor* and other emerging weeds must be controlled during the wheat-growing season because these weeds have adverse effects on crop and its economics.

REFERENCES

Abbasi, M.K. and M.U. Makhdoom, 1984. Response of weeds and wheat crop to some herbicides. Sindh J. Agric. Res., 4: 50-59.

Arnold, R.N., M.W. Murray, E.J. Gregory and D. Smeal, 1988. Effects of herbicides on weeds in field corn grown on coarse-textured soils. J. Applied Agric. Res., 3: 121-123.

Bhatti, I.M. and A.M. Soomro, 1994. Agricultural inputs and field crop production in Sindh (Technical Report), pp: 105-106.

Bilalis, D., N. Sidiras, G. Economou and C. Vakali, 2003. Effect of different levels of wheat straw soil surface coverage on weed flora in *Vicia faba* crops. J. Agron. Crop Sci., 189: 233-241.

Buriro, U.A., F.C. Oad, S.K. Agha and G.S. Solangi, 2003. Post emergence weed control in wheat. Pak. J. Applied Sci., 3: 424-427.

Cheema, M.S., M. Afzal, M.S. Ahmed and M. Saleem, 1988. Efficiency of different methods of weed control in wheat. Pak. J. Weed Sci. Res., 1: 24-28.

Dhima, K. and I. Eleftherohorinos, 2003. Nitrogen effect on competition between winter cereals and little seed canarygrass. Phytoparasitica, 31: 252-264.

Froud-Williams, 2002. Effects of winter wheat cultivars and seed rate on the biological characteristics of naturally occurring weed flora. Weed Res., 42: 417-428.

Gill, H.S., U.S. Walia and L.S. Brar, 1979. Chemical weed control in wheat with particular reference to *Phalaris minor* Retz. and wild oats. Pesticides, 13: 15-20.

Halford, C., A.S. Hamill, J. Zhang and C. Doucet, 2001. Critical period of weed control in no-till soybean (*Glycine max*) and corn (*Zea mays*). Weed Technol., 15: 737-744.

Jalis, A., 1987. Weed problems in wheat. Progressive Farming, 7: 20-30.

Nesterove, Q.N. and C.V. Chukanova, 1981. The harmfulness, predominant weed species in wheat. Field Crops Abst., 38: 3332.

Oad, F.C., S.K. Agha, G.H. Jamro and G.S. Solangi, 2003. Weed spectrum, frequency and density in wheat (*Triticum aestivum* L.) under Tandojam conditions. Pak. J. Applied Sci., 3: 170-172.

Siddiqui, S.S. and R.A. Shad, 1991. Interference of various densities of Indian sweet clover *Melilotus indica* Linn. in wheat. Pak. J. Weed Sci. Soc., 49: 69-75.

Siddiqui, M.H., F.C. Oad, G.H. Jamro and F. Subhan, 2004. Effect of planting time, planting density and weed control on the grain yield of bread wheat-Mehran-89. Indus J. Plant Sci., 1: 188-191.

Tanji, A., 1987. On farm evaluation of wheat production as affected by three weeding systems and top-dressed nitrogen in chaousa (semi arid zone of Morocco). M.Sc. Thesis, Kensas Stat Univ., Manhattan, Kensas, USA.