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Weed-crop Combination in Wheat (*Triticum aestivum* L.) By Nitrogen Levels and Herbicide Doses

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Abstract: The study to evaluate the effect of nitrogen levels and herbicide doses on wheat growth and yield was carried out. The data revealed that the herbicide, Topik @ 300 g ha^{-1} gave an effective weed control which reduced weed-crop competition, exhibited positive effect on development of productive tillers, ear length and grain number per ear. All these attributes contributed to higher yield. Application of nitrogen @ 125 kg ha^{-1} also resulted in higher grain yield over 100 kg N ha^{-1} application rate.

Key words: Wheat, weed-crop competition, herbicide, weed control, nitrogen, fertilizer

Introduction

Besides many other factors limiting wheat yield, weed infestation had emerged as one of the major factors causing reduction in yield. Weeds are known to be plants of negative value, which compete with main crop for space, water, nutrients and carbon dioxide for photosynthesis. Weeds decrease yield up to 17.2% (Bareradia *et al*., 1993) and in most serious cases may lead to complete failure of crop (Gill and Wallia, 1979). It has been reported that the crops yield may be increased by about 37% by complete eradication of weeds (Jalis and Shah, 1982). Moreover, the weed problem is getting from bad to worst in irrigated areas where cropping intensity is rapidly increasing with the result that weed management through fallowing, hoeing, harrowing and cultivation practices has become impossible and use of weedicides has become inevitable for obtaining higher yield and better quality produce.

Agrawal and Singh (1985) stated that nitrogen requirements of wheat could be reduced by 67% to produce the same yield if weeds were controlled by applying 1.4 kg ha^{-1} Tribunil at pre-emergence stage. Hooda *et al.* 1986 studied nutrient uptake by weeds in wheat as influenced by three weed control treatments and two nitrogen rates. Semenov and Goncharaov (1985) studied the effect of application of 0.3 kg ha^{-1} Simazine reemergence and 30-180 kg ha^{-1} each of NPK and reported that Simazine treatment in plots fertilized @ 120 kg ha^{-1} gave the highest yield. Velva (1989) reported that cholorotoluron and nitrogen fertilizer had a synergistic effect on the growth and yield of wheat. The best result was obtained with a single application of N @ 180 kg ha^{-1} coupled with Milron 75 WP@ 1.25 kg ha^{-1} favorably affected all the yield components like fertile tillers m^{-2}, number grains per spike, 1000-grain weight and subsequently gave the highest grain yield 48.55 q ha^{-1} in wheat.

Yadav *et al.* (1995) evaluated the herbicide and fertilizer compatibility for weed control in wheat under different levels of nitrogen and four methods of isoproturon application. Pre-emergence spraying of isoproturon effectively controlled weeds upto 64 percent and increased yield of wheat which was attributed to increase in number of grains per spike and 1000-grain weight. Pandey *et al.* (1998) applied 50, 57 and 100 kg N ha^{-1} to wheat. The crop was hand weeded 30 days after sowing or was treated with pendimethalin and isoproturon. Singh and Prasad (1998a) applied 0-80 kg N ha^{-1} to wheat and treated it with 1.0 kg fluchloralin ha^{-1} (pre-emergence) and/or 1.0 kg isoproturon ha^{-1} (post-emergence). Nitrogen application significantly increased weed dry matter and grain yield as compared with the control. Weed control treatments reduced weed infestation by 27-58% compared with the unweeded control. Kumar (1998) treated wheat with tralkoxydium by weeds was highest in untreated weedy control.

The present study was therefore conducted to investigate the effect of herbicide doses at different levels of nitrogen on wheat growth and yield under agro-climatic conditions of Faisalabad.

Materials and Methods

The study to evaluate the effect of different nitrogen levels and herbicide doses on wheat yield and weed control in wheat was carried out at the research area of Agronomy department, University of Agriculture, Faisalabad during the year 2001-2002. A commercial wheat variety 'Chenab-2000' was used as a test crop and was sown on 7th November, on a well prepared seed bed. With the help of single row hand drill in 25 cm apart rows

using a seed rate of 125 kg ha^{-1}. A basal dose of phosphoric fertilizer @ 100 kg ha^{-1} was applied at the applied at the time of sowing. The experiment was laid out in randomized complete block design (RCBD) with split plot arrangement, having four replications. The main plot treatments included the application of 100 kg N ha^{-1} (N_1) and 125 kg N ha^{-1} (N_2) and sub plot treatments were weedy check (D_0), Topik (Clodinofop 15 WP) @ 200 g ha^{-1} and Topik (Clodinofop 15 WP) @ 300 g ha^{-1} (D_2). The net plot size measured 2x5 m. All other treatments including irrigation were kept constant. The crop was harvested on 20th April. From each plot a unit area of one square metre was taken at random to record observations on number of tillers per unit area (m^2), spike length (cm) number of grains per spike, 1000-grain weight, grain yield (t ha^{-1}) and weed biomass per unit area (g m^{-2}) by following the standard procedure. Data collected were analyzed statistically using least significance difference test at 0.05 probability level (Steel and Torrie, 1984).

Results and Discussion

The maximum number of productive tillers per unit area (454.50 m^{-2}) were produced by the application of 125 kg N ha^{-1} (N_2) which were statistically higher than that of 100 kg N ha^{-1} (N_1) application rate (Table 1). Among herbivide doses maximum number of productive tillers per unit area (467.75m^2) were produced by the application of Topik @ 300 g ha^{-1} (D_2) where as minimum number of productive tillers per unit area (392 m-2) were produced where no weeds were controlled (D_0). As regard the interaction of nitrogen and herbicide maximum numbers of productive tillers per unit area (512.25 m^{-2}) were obtained by the application of treatment combination of N_2D_2 which were statistically higher from all other treatments under study.

Minimum numbers of productive tillers per unit area (388.25 m-2) were obtained by N_1D_0 which were statistically similar to N_2D_0 these results are in agreement with those of Iqbal (1991) who reported that application of 185kg N ha^{-1} coupled with herbicide (Milron 75 WP @ 1.25 kg ha^{-1}) favourably affected all the yield components like number of fertile tillers, spike length, number of grains per spike etc.

As regards ear length, maximum ear length (15.14 cm) was obtained with N_2 which was statistically higher than N_1. Among herbicide doses maximum ear length (15.81 cm) was produced by D_2 where minimum ear length (12.24 cm) was produced where no weeds were controlled D_0. The interactive effect of nitrogen and herbicide was non significant. These results are in confirmation with those of Velva (1989) and Iqbal (1991). The number of grains per ear were also affected significantly due to different levels of nitrogen application. Maximum numbers of grains per ear (53.58) were obtained by N_2 which were statistically higher than N_1. Among herbicide doses maximum number of grains per ear (51.37) were produced by D_2 which were statistically similar D_1 Minimum numbers of grains per ear (44.50) were produced whereno weeds were controlled (D_0). Numbers of grains per ear were not affected significantly for the interaction between nitrogen and herbicide. These results are in the line with those of Agrawal and Singh (1985), Hooda *et al.* (1986), Velva (1989) and Yadav *et al.* (1995).

Different levels of nitrogen exhibited non significant effect on 1000-grain weight. Among herbicide doses maximum 1000-grain weight (48.92 g) was obtained by D_2 while minimum 1000-grain weight (38.09 g) was produced with D_0. The 1000-grain weight was not affected significantly by the interaction between nitrogen and herbicide. These

Table 1: Effect of nitrogen levels and herbicide doses on weed growth and yield

	Productive tillers per unit area (m^2)	Ear length (cm)	Grain per ear	1000-Grain weight (g)	Grain yield (t ha^{-1})	Weed biomass at harvest
Nitrogen (N) means:						
N_1 (100 kg ha^{-1})	408.25b	12.86b	43.25b	43.85	5.47b	15.68
N_2 (125 kg ha^{-1})	454.50a	15.14a	53.58a	43.17	5.74a	16.20
LSD (0.05)	4.57	1.34	4.18	NS	0.14	NS
Herbicide (H) means:						
D_0 (Weedy check)	392.00c	12.24c	44.50b	38.09c	5.10c	21.42a
D_1 (Topik @ 200 g ha^{-1})	434.37b	13.95b	49.37a	43.52b	5.62b	16.21b
D_2 (Topik @ 300 g ha^{-1})	467.75a	15.81a	51.37a	48.92a	6.09a	10.20c
LSD (0.05)	7.12	1.30	4.01	4.33	0.41	4.03
Interaction (N×H) means:						
N_1D_0	388.25d	10.78	38.00	38.10	5.03	21.07
N_1D_1	413.25c	12.49	44.50	44.14	5.52	15.64
N_1D_2	423.25c	15.31	47.25	49.31	5.87	10.33
N_2D_0	395.75d	13.97	51.00	38.08	5.17	21.78
N_2D_1	455.50b	15.42	54.25	42.90	5.72	16.77
N_2D_2	512.25a	16.31	55.50	48.53	6.32	10.05
LSD (0.05)	10.06	NS	NS	NS	NS	NS

results confirm the findings of Semenov and Goncharov (1985), Velva (1989), Yadav *et al.* (1995), Singh and Prasad (1998b) and Kumar (1998).

Different levels of nitrogen affected the grain yield significantly and maximum grain yield (5.74 t ha^{-1}) was obtained by N_2 which was significantly higher than N_1. Similarly hericide doses exerted significant effect on grain yield. The data revealed that application of D_2 because of effective weed control, produced maximum grain yield (6.09 t ha^{-1}) while minimum grain yield (5.10 t ha^{-1}) was produced in control treatment (D_0). The interaction between nitrogen and herbicide was non significant (Table 1).

Weed biomass produced is an indicator of weed-crop competition. The effect of nitrogen on weed biomass was non significant. However, different doses of heribicide had significant effect on weed biomass at harvest. The plots where D_2 was applied produced minimum weed biomass (10.20 g m^{-2}) which means that maximum weed control was achieved by this treatment was applied (D_0). The interaction between nitrogen and hericide was non significant (Table 1).

It was concluded that the benefits of added fertilizer can only be realized if it is coupled with an appropriate weed control approach. The results also reveal that a proper dose of herbicide should be applied to control the weeds effectively which vary with the given environmental and soil conditions. Application of Topik herbicide @ 300 g ha^{-1} proved to be optimum dose at the soil conditions where the study was conducted.

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