Nitrogen Uptake Efficiency in Wheat (*Triticum aestivum* L.) as Influenced by Nitrogen Level and Weed-crop Competition Duration

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Abstract: Nitrogen uptake efficiency in wheat (*Triticum aestivum* L.) as influenced by nitrogen level and weed-crop competition duration was determined at the Agronomic Research Area, University of Agriculture, Faisalabad during 1998-99. The data showed that yield, yield parameters of wheat, weed growth and nitrogen uptake by weeds increased with increased nitrogen application levels while weed population was not affected significantly. On the other hand yield and yield parameters in wheat decreased with an increase in the weed-crop competition durations while weed growth and nitrogen uptake by weeds increased by increasing the competition duration.

Key words: Wheat, nitrogen level, weed-crop competition, Pakistan

Introduction

Wheat occupies key position in Pakistan’s economy but its yield is only 2.2 tones ha\(^{-1}\) which very low as compared to other developed countries like France (7 t ha\(^{-1}\)) and America (4.2 t ha\(^{-1}\)). Although the evolution of short statured, fertilizer responsive and disease resistant high yielding varieties have brought about a real breakthrough in wheat production yet there is a wide yield gap between actual and potential yields of existing wheat varieties. Weeds are usually more aggressive and strong competitors for growth resources than crop plants. The benefits of applied inputs are not fully realized unless weeds are timely controlled. Weed-crop competition is more severe when a particular growth factor is limited in quantity. Our soils are generally deficient in nitrogen, so for raising a good wheat crop, application of artificial nitrogen is essential as application of variable doses of nitrogen increase the growth and yield of wheat crop (Malik, 1981; Nazir et al., 1988). The N, P and K fertilizers can not give the expected benefit in the presence of weed infestation.

Margin et al. (1983) noted that in low density stands, nitrogen application increased dry matter production and made weed control measures essential. Agarwal and Singh (1985) reported that wheat nitrogen needs can be reduced by 67% to obtain similar yield if weeds are controlled timely. They also observed that weeds could take away more than 50% of applied nitrogen. Farabakhsh and Murphy (1988) reported that with increase in nitrogen application in high weed density wheat crop the weeds were benefited more than the crop itself and weeds caused yield losses up to 32%. Bhagwati et al. (1989a) reported that dry weight of weeds and wheat crop increased with increasing the nitrogen rate. The increase in plant height and leaf area resulting from nitrogen was higher for wild oats than for wheat. Bhagwati et al. (1989b) studied that nitrogen uptake by broad-leaved weeds was less than the wild oats and at higher nitrogen levels, there was more uptake by wheat where broad-leaved weeds dominated the weed flora than where wild oats dominated. Anderson (1991) found that weed interference prevented the winter wheat from responding positively to nitrogen and thus caused yield losses up to 9%. Akhtar (1997) reported that magnitude of weed-crop competition was reduced with successive increase in nitrogen application. In order to check losses due to weeds, it is important that weed population in the cultivated crops should be controlled at appropriate stage.

Materials and Methods

An experiment to study the nitrogen uptake efficiency in wheat as influenced by nitrogen application levels and weed-crop competition duration was conducted at Agronomic Research Area, University of Agriculture, Faisalabad during 1998-99. A split plot design with three replications was used. Nitrogen levels and weed-crop competition durations were randomized in main and subplots, respectively. The treatments consisted of three nitrogen application levels (control, 100 and 150 kg ha\(^{-1}\)) and six weed-crop competition durations (No competition, competition for 4, 6, 8 and 10 weeks after sowing and for full season). Net application was measured as 1.25 m\(^2\) x 3 m\(^2\). Wheat variety Inqlab was sown in 25 cm apart single rows with the help of single row hand drill on a well-prepared seedbed. Seed rate of 100 kg ha\(^{-1}\) was used. Nitrogen, as urea, was applied in two splits, half at the time of sowing and remaining half with first irrigation. In addition a basal dose of 100 kg P\(_2\)O\(_5\) and 100 kg K\(_2\)O was applied at the time of sowing. Weed control after prescribed periods was done by hoeing and after this period plots were kept free of weeds upto harvest. The data on weed density (m\(^{-2}\)), dry weed biomass (g), nitrogen uptake by weeds (g m\(^{-2}\)), number of fertile tillers (m\(^{-2}\)), number of grains per spike, 1000-grain weight (g), grain yield (t ha\(^{-1}\)) and nitrogen contents of wheat grains (%) was recorded by following the standard procedures. The data collected were analyzed statistically by using Fisher’s analysis of variance technique and differences among the treatment’s means were tested at 5% probability level, using LSD test (Steel and Torrie, 1984).

Results and Discussion

The data regarding weed density shows that it was not affected significantly by different nitrogen levels while different weed-crop competition durations had significant effect on the weed density. Maximum number of weed were found in the plots with full season weed-crop competition while minimum number of weeds was found in weed free plots. The data show that the interaction between nitrogen levels and weed-crop competition durations was non-significant. The data indicate that significantly higher weed biomass (53.218 g m\(^{-2}\)) was recorded in the treatment N\(_2\) with nitrogen application level of 150 kg ha\(^{-1}\) and was followed by N\(_1\) producing weed biomass of 48.093 g m\(^{-2}\) (Table 1). Weed biomass was also significantly affected by weed-crop competition durations and maximum was recorded in the treatment with full season weed-crop competition, which was significantly higher than rest of the treatments. The data in Table 2 shows that the interaction between nitrogen levels and weed-crop competition durations was significant and highest biomass was recorded in the treatment combination with nitrogen application level of 150 kg ha\(^{-1}\) and weed-crop competition for whole growing season. The data regarding nitrogen uptake by weeds in Table 1 indicate that nitrogen application levels significantly affected it and maximum nitrogen was taken up by weeds in N\(_2\) with 150 kg ha\(^{-1}\) while minimum was removed from control. The effect of different weed-crop competition durations on nitrogen uptake by weeds was also found to be significant and maximum was removed from C\(_5\) with full season weed-crop competition. Interaction between nitrogen levels and competition durations was also significant and maximum amount of nitrogen was removed by weeds from the treatment interaction N\(_2\)C\(_5\) with nitrogen 150 kg ha\(^{-1}\) and weed-crop competition for full season.
while minimum was removed from control. Table 1 indicates that different nitrogen application levels affected the number of fertile tillers and significantly higher number of fertile tillers were recorded in the treatment N2 with 150 kg ha⁻¹. Significant effect of different weed-crop competition durations was also noted and greater number of fertile tillers were recorded in plot where weeds were controlled throughout the season while minimum in the treatment C5. The interaction between nitrogen levels and competition was found to be significant and highest weed-crop competition while minimum in C5 with full season weed-crop competition. The interaction between nitrogen levels and weed-crop competition durations was found to be significant.

### References


