

Influence of Nitrogen and Phosphorus on Wheat Productivity and Weed Infestation



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Abstract

Pakistan fundamentally requests sustained agricultural development to cope with the social and economic obligations that are the normal consequences of the continued high rates of population growth. An experiment was carried out to check the effect of nitrogen and phosphorus application on weed infestation and wheat productivity at Agronomy Research Farm, the University of Agriculture Peshawar, Khyber Pakhtunkhwa during rabi 2015-2016. The experiment was laid out in Randomized complete block design with factorial arrangement having four replications. The experiment was consisted of two factors i.e. nitrogen levels (80, 120, 160 kg ha⁻¹) and Phosphorus at the rate of (50, 90, 130 kg ha⁻¹) with one control treatment. Results of the study revealed that weeds density were not significantly affected by nitrogen and phosphorus application rates. Weed fresh biomass and dry biomass were found maximum with N and P application at the rate of 160 and 130 kg ha⁻¹, respectively, while grain yield of wheat were found maximum with N and P application at the rate of 120 and 90 kg ha⁻¹, respectively. So, it is suggested that wheat should be cultivated under the application of nitrogen and phosphorus at the rate of 120 kg ha⁻¹ and 90 kg ha⁻¹, respectively in the agro ecological condition of Peshawar.

Introduction

Pakistan fundamentally requests sustained agricultural development to cope with the social and economic obligations that are the normal consequences of the continued high rates of population growth. This urgent need requires continuous scientifically based implementation of effective agricultural practices. Wheat (*Triticum aestivum* L.) is the most important cereal crop in Pakistan. The gap between production and consumption could be filled by increasing wheat production. Nitrogen is a constituent of proteins, enzymes, coenzymes, nucleic acids, phytochromes and chlorophyll; it plays an important role in the biochemical processes of the plant. Therefore, it is one of the most required nutrients by wheat crops. Nitrogen is usually the most limiting nutrient for wheat production inadequate nitrogen supply can greatly reduce yield and profit. Too much nitrogen can result in lodging, decreased yield and reduced profits. Determining the optimum rate of nitrogen fertilizer is the key to maximum economic yields. Phosphorus is a component of the complex nucleic acid structure of plants, which regulates protein synthesis. Phosphorus is, therefore, important in cell division and development of new tissue. Phosphorus is also associated with complex energy transformations in the plant. Adding phosphorus to soil low in available phosphorus promotes root growth and winter hardiness, stimulates tillering, and often hastens maturity. For sustainable crop production weeds control is the most important. Its infestation caused serious reduction in the yield of crops due to higher competitive ability.

Weeds compete for space, light, nutrients, water and other resources. It reduces the quantity and quality of crops. Weeds interfere seedling establishment, development of canopy reduce accumulation of dry matter [1]. The establishment of diseases in the field is also easy due to dense crop stand of crop as well weeds. The nutrients requirement of the crops and weeds is almost similar but they shows different manner in responses [2]. The aim of the present study is to find out suitable amount of nitrogen and phosphorus to reduce weeds infestation and increasing wheat productivity to fulfill the demand of increasing population on sustainable basis.

Materials and Methods

An experiment was carried out to check the effect of "Effect of nitrogen and phosphorus application on weed infestation and wheat productivity" at Agronomy Research Farm, the University of Agriculture Peshawar, Khyber Pakhtunkhwa during rabi season 2015-2016. The experiment was laid out in Randomized Complete Block Design (RCBD) having four replications. The experiment was consisted of two factors i.e. nitrogen levels (80, 120, 160 kg ha⁻¹) and Phosphorus at the rate of (50, 90, 130 kg ha⁻¹) with one control treatment. Urea and SSP were utilized as a source of nitrogen and phosphorus, respectively. Nitrogen was used in split dose half at sowing time and half at first irrigation as per treatment requirements. Data were recorded on the following parameters.

Statistical Analysis

The collected data were statistically analyzed according to the method appropriate for RCB designs. Differences among means were compared using LSD at 5% probability level when the F-test is significant [3].

Results and Discussion

Weeds Density (m^{-2})

Data regarding weed density (m^{-2}) are presented in Table 1. Statistical Analysis of the data indicated that various nitrogen as well as phosphorus has no significant ($p \leq 0.05$) effect on weeds density. The interactive effect of nitrogen and phosphorus was also found non-significant. The possible reason might be that the germination is the integral property of seed and cannot be altered by amendments of nitrogen and phosphorus.

Weed Fresh Biomass (gm^{-2})

Fresh biomass of weeds (gm^{-2}) was significantly ($p \leq 0.05$) affected by nitrogen and phosphorus application (Table 1). No significant variations were observed in fresh biomass of weeds for the combine effect of nitrogen and phosphorus. Maximum ($419.8 gm^{-2}$) fresh biomass of weeds was found with the application of $160 kg N ha^{-1}$, while minimum ($316.4 gm^{-2}$) fresh biomass of weed was recorded with $40 kg N ha^{-1}$. The increments

in P application enhanced the fresh biomass of weeds, as the P application increase the fresh biomass of weeds gradually increase. It is due to the fact that better utilization of available nutrient by the weeds as compare to tests crop. Our results are in line with [4] observed that nitrogen application improved weeds fresh biomass.

Weeds Dry Biomass (gm^{-2})

The data regarding dry biomass of weeds (gm^{-2}) affected by nitrogen and phosphorus are given in Table 1. Analysis of the data revealed that dry biomass of weeds significantly ($p \leq 0.05$) varied with changing nitrogen and phosphorus rates. The combine effect of N and P was found non-significant for weeds dry biomass. The increments in weeds dry biomass ($40.8-52.3 gm^{-2}$) were observed with changing N application in the range of $80-160 kg ha^{-1}$. In case of P, the maximum application of P at the rate of $130 kg ha^{-1}$ produces maximum dry biomass of weeds ($53.5 gm^{-2}$). The fact behind that the nitrogen is efficiently utilized by the weeds species and develop canopy which leads to efficient utilization of solar radiation, resulted maximum dry biomass accumulation. These results conformed the findings of [5] reported maximum dry biomass of weeds with higher N application. Similarly, [6] also reported increase in dry biomass of weeds with increasing N application.

Table 1: Weed density (m^{-2}), weed fresh biomass ($g m^{-2}$), weed dry biomass ($g m^{-2}$) and grain yield ($kg ha^{-1}$) as affected N and P levels.

Nitrogen ($kg ha^{-1}$)	Weed density (m^{-2})	Weed fresh biomass ($g m^{-2}$)	Weed dry biomass ($g m^{-2}$)	Grain yield ($kg ha^{-1}$)
80	27.5	316.4 c	40.8 c	3310 c
120	28.2	373.7 b	46.6 b	3873 a
160	29	419.8 a	52.3 a	3451 b
Lsd _(0.05)	Ns	40.76	5.06	85.87
Phosphorus ($kg ha^{-1}$)				
50	26.9	318.4 c	40.3 c	2594 c
90	27.7	370.6 b	45.9 b	3159 a
130	28.2	421.6 a	53.5 a	2945 b
Lsd _(0.05)	Ns	41.2	5.3	55.99
Interaction	Ns	Ns	ns	Ns

Grain Yield ($kg ha^{-1}$)

Data related grain yield as affected by N and P levels are specified in Table 1. Statistical analysis of the data revealed that N and P levels had significant ($p \leq 0.05$) effect on grain yield of wheat. Higher grain yield ($3873.0 kg ha^{-1}$) was achieved in plots treated at N at the rate of $120 kg ha^{-1}$, while lower grain yield ($2310 kg ha^{-1}$) was received in plots fertilized with $60 kg N ha^{-1}$. In case of P fertilizers maximum grain yield ($3159.0 kg ha^{-1}$) were achieved from the plots fertilized with $90 kg P ha^{-1}$, while lower grain yield ($2594 kg ha^{-1}$) was recorded from plots fertilized with $50 kg P ha^{-1}$. An optimum using of NP improve the growth development and yield and boost up nutrient uptake in wheat. N alter the growth of plant compared any other essential mineral

element. In wheat contribute of N source can radically reduce dry matter and consequently grain yield, while lodging, disease incidence and lower grain quality may cause by oversupply of N source.

Conclusion

From the above results it is concluded that higher nitrogen and phosphorus application enhance the weeds fresh as well as dry biomass, however nitrogen ($120 kg ha^{-1}$) and phosphorus ($90 kg ha^{-1}$) increased the wheat yield. So it is suggested that wheat should be cultivated under the application of nitrogen and phosphorus at the rate of $120 kg ha^{-1}$ and $90 kg ha^{-1}$, respectively in the agro ecological condition of Peshawar.

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