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Effect of Phosphorus Regimes on Yield and Weed Infestation of Flax (*Linumusitatissimum L.*) Under Climatic Conditions of Peshawar

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Abstract

To study the response of Flax (*Linumusitatissimum* L.) to phosphorus levels (0, 30, 60, 90 kg ha^{-1}), an experiment was conducted at the Agronomy Research farm, The University of Agriculture, Peshawar during Rabi season 2015-16. Flax cultivar LS 49 was sown in a randomized complete block design (RCBD) having three replications. Phosphorus was applied as soil. DAP was used as a source of phosphorus. Phosphorus has a substantial effect on all yield of flax. Phosphorus application has significantly increased weed fresh biomass (g m^{-2}), weed dry biomass (g m^{-2}) and grain yield of flax. Maximum weed fresh biomass (436.8 g m^{-2}), weed dry biomass (39.8 g m^{-2}) and grain yield (602 kg ha^{-1}) of flax was recorded with P application of 90 kg ha^{-1}, while weed density were not significantly affected by P application rates. The grain yield produce with 60 kg P ha^{-1} were statistically similar with the yield produce with 90 kg ha^{-1}of P application. So it is suggested that flax should be cultivated under the application of phosphorus at the rate of 60 kg ha^{-1}

Keywords: Phosphorus; Weed Density; Weed Fresh Weight; Weed Dry Weight

Theoretical Basis and Methodology

Flax, with the binomial name (*Linumusitatissimum L.*) is a member of the genus linum in the family lineaceae. It is cultivated in the subtropical region of the world for an oil and fiber purposes. It is an annual erect plant. It has up to 60 cm plant height, having a tender stem containing irregular green leaves which are 20 to 40mm long and 3mm broad. It has a blue color flower, 15 to 25mm diameter which contains five petals. 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 phosphorus to reduce weeds infestation and increasing wheat productivity to fulfill

Material and Method

Field experiment on the response of flax (*Linumusitatissimum* L.) to different phosphorus rates was conducted at Agronomy Research Farm, The University of Agriculture Peshawar, Khyber Pukhtunkhwa, Pakistan, during Rabi Season (2015-2016). The experiment was structured in randomized complete block design having three replications. A plot size of 3×2m having five rows, 40 cm row to row and 7 cm plant to plant distance were maintained in each plot. Flax cultivar, LS-49 was sown with a seed rate of 25 kg ha^{-1}. DAP was the source of phosphorus. The effect of four levels, phosphorus (0, 30, 60 and 90 kg ha^{-1}) on weeds infestation and yield of flax was studied in this trail.

Data Recording Procedure

Weeds density was recorded in one meter row length at three random places in each plot, uprooted weeds were count, averaged and converted in to m^{-2}. Uprooted weeds were separated and weighed with electronic balance and then converted in to g m^{-2} to record data on weeds fresh biomass. For weed dry biomass (g m^{-2}) data, the uprooted weeds from each plot were oven dried at 72 0c for 24 hours and weighed with electronic balance. Grains yield (kg ha^{-1}) were obtained by harvesting all rows, dried and then weighted to obtained grain yield in experimental units and was converted in to kg ha^{-1}.

Statistical Analysis

Collected data were analyzed using analysis of variance appropriate for randomized complete block design. Least significant difference (LSD) test at 5% level of probability were perform after getting significant variations [3].

Results and Discussion

Weeds Density (m^{-2})

Data regarding weed density (m^{-2}) as affected by P application rates is presented in Table 1. Statistical Analysis of the data indicated that phosphorus levels have no significant ($p \leq 0.05$) effect on weeds density. The possible reason might be that the germination is the integral property of seed and cannot be altered by amendments of nitrogen and phosphorus.

Table 1: Weed Density (m^{-2}), Weed Fresh Weight (g m^{-2}), Weed Dry Weight (g m^{-2}) and Grain Yield (kg ha^{-1}) of flax as affected by different phosphorus levels.

Phosphorus Levels (kg ha^{-1})	Weed Density (m^{-2})	Weed Fresh Weight (g m^{-2})	Weed Dry Weight (g m^{-2})	Grain Yield (kg ha^{-1})
0	34	252.8 d	24.2 d	322c
30	35.2	330.8 c	30.4 c	513b
60	35.4	382 b	35.1 b	598 a
90	36.8	436.8 a	39.8 a	602 a
LSD(0.05)	NS	42.1	2.5	53.9

Means of the same category followed by different latters are significantly different from each other using LSD test at 0.05 level of probability.

NS = Non-significant, * = Significant

Weed Fresh Biomass (g m^{-2})

Fresh biomass of weeds (gm^{-2}) was significantly ($p \leq 0.05$) affected by phosphorus application (Table 1). The increments in P application enhanced the fresh biomass of weeds, as the P application increase the fresh biomass of weeds gradually increases. Maximum application of P at the rate of 90 kg ha^{-1} produces maximum dry biomass of weeds (436.8 g m^{-2}), while minimum fresh biomass was recorded in control plots (252.8 g m^{-2}). It is due to the fact that better utilization of available nutrient by the weeds as compare to tests crop.

Weeds Dry Biomass (g m^{-2})

The data regarding dry biomass of weeds (g m^{-2}) affected by phosphorus are given in Table 1. Analysis of the data revealed that dry biomass of weeds significantly ($p \leq 0.05$) varied with changing phosphorus rates. In case of P, the maximum application of P at the rate of 90 kg ha^{-1} produces maximum dry biomass of weeds (39.8 g m^{-2}). The fact behind that P is efficiently utilized by the weeds species and develop canopy which leads to efficient utilization of solar radiation, resulted maximum dry biomass accumulation.

Grain Yield (kg ha^{-1})

Mean value of the available data indicated that various levels of phosphorus have a promising effect on the grain yield of flax. Among different phosphorus levels, maximum (602 kg ha^{-1}) grain yield were obtained with 90 kg p ha^{-1} phosphorus application, which did not vary than 60 kg ha^{-1} P application. Control plots showed statistically ($p<0.05$) minimum (322 kg ha^{-1}) grain yield. This is due to early fortification of soil with P fertilizer improved the dry matter portioning at late development stage to the flax grains, hence resulted more protein contents of seed, and thus increased seed yield plant^{-1}. Furthermore, P supply in early growth stage has much promising effect on grain yield as compared to P supply in the later growth stages of crops. These results are similar to those of [4].

Conclusion

From the above results it is concluded that phosphorus application enhance the weeds fresh as well as dry biomass, however phosphorus (60 kg ha^{-1}) increased the flax yield. So it is suggested that flax should be cultivated under the application of phosphorus at the rate of 60 kg ha^{-1} in the agro-ecological condition of Peshawar.

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