

Effect of Phosphorus Application Methods on Yield of Wheat

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Abstract

Studies pertaining to increase phosphatic fertilizer use in wheat production was assessed by adopting intra row drilling technique at Adaptive Research Farm Shekhupura during two consecutive years 2000-2001 and 2001-2002. Wheat cultivar MH-97 was used as a test variety, using seed rate of 125 kg/ha. Five treatments were designed in randomized complete block design with 3 replications. Treatments Comprised of, broadcasting of phosphorus @ 114 kg/ha., intra-row drilling of phosphorus @ 114 kg/ha, intra-row drilling of 2/3 phosphorus @ 76 kg/ha, intra-row drilling of 1/2 phosphorus @ 57 kg/ha, and intra-row drilling of 1/3 phosphorus @ 38 kg/ha. Maximum grain yield was recorded in treatment where phosphorus was applied @ 114 kg/ha by intra row drilling techniques during the both years of study. This technique not only influenced the yield parameters (germination count, productive tillers m⁻²) but also increased the grain yield as compared to control plots where whole dose of phosphorus was applied by broadcast method .The rest of the treatments did not differ significantly from the treatments, broadcasting of phosphorus @ 114 kg/ha and intra-row drilling of phosphorus @ 114 kg/ha. This increase in economic yield may be due to better availability and uptake of phosphate fertilizer by drilling method. This proposed management would improve both profitability and economic yield of wheat crop when compared with traditional practice of broadcasting.

Key Words: Wheat, Phosphorus-application methods, Grain yield.

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Introduction

Fertilizer use has played a vital role in increasing crop yield in Pakistan. The use of fertilizer has increased considerably from as low as 5 kg/ha in 1965-66 over 91kg/ha during year 1989-90 (NFDC, 1990). At national level, 250500-ton phosphate is being used in wheat cultivation, which amounts to Rs.4500 million. Fertilizers applied to soils are not fully utilized by the growing crops and large proportional of applied fertilizer goes waste (Saleem, 1992). Application of phosphatic fertilizer as major element in crop production is well established. As per practice in vogue, phosphatic fertilizer is broadcasted in the field. For a good crop production, phosphorus and nitrogen should be applied in 1:2 while it is 1: 4 in Pakistan. On the other hand, applied phosphatic fertilizer is not totally available to plant. Phosphatic fertilizer can hardly move 3 to 5cm in soil. Resultantly, it is hardly available to the extent of 15-20% to plant. The rest goes to waste from the immediate crop being fixed in soil. Due to alkaline and calcareous nature of Pakistani soils, most of the native and applied phosphorus becomes unavailable at the growing plants (Sharif, 1985). Any measure, which helps reducing the activity of calcium, would ensure the enhanced availability of phosphorus to plants. The efficient use of phosphatic fertilizer also depends on rate, time, method of application and crops requirements (El-Baruni and Olsen, 1979). However, by drilling technique fertilizer can be placed at uniform depth and close to the seed and efficiency of the dissolved phosphorus can easily be enhanced up to 65-70%. The relative efficiency of placement was 1-4 times that of broadcast application (Vig & Singh, 1983). Drilling of phosphorus at 3-4cm below the seed gave higher yield than applied with farmyard manure, pre-soaking irrigation and broadcast application (Uriyo *et al*, 1983). So the study was undertaken to improve the efficiency of phosphatic fertilizer in wheat through different application techniques.

Methodology

Field experiment was conducted during 2000-2001 and 2001-2002 at Adaptive Research Farm, Sheikhpura. The experiment comprised of the following treatments:

Recommended practice i.e.; broadcasting of phosphorus @ 114 kg/ha.

Intra-row drilling of recommended phosphorus @ 114 kg/ha.

Intra-row drilling of 2/3 phosphorus @ 76 kg/ha

Intra-row drilling of 1/2 phosphorus @ 57 kg/ha.

Intra-row drilling of 1/3 phosphorus @ 38 kg/ha.

The trial was laid out in randomized complete block design with three replications. Wheat cultivar MH-97 was used as a test crop. Crop was sown with the help of single row hand drill using a seed rate of 125 kg/ha. Full K and 1/3 N @ 62 and 43 kg/ha was applied as basal dose along with P, respectively. Rest of 2/3 N was applied with 1st and 2nd irrigation.

However, all other agronomic practices were kept normal and uniform for all treatments. The crop was harvest at physiological maturity and data regarding yield & yield parameters were collected and analyzed statistically. LSD test was employed to see the significance of the treatment's means at 5% probability level (Steel and Torrie, 1984).

Results and Discussion

It is quite evident from the data presented in table that phosphorus applied by intra row drilling

techniques influenced the growth parameters positively and resulted in better grain yield as compared to the recommended practice where whole phosphorus (114 kg/ha) was applied by broad cast method during two years of study.

This increase in yield was mainly attributed to higher number of germination count and productive tillers/m² that might be ascribed to increased solubility of phosphorus and its increased uptake by Intra row drilling techniques. In treatments where 1/2 dose of phosphorus was applied @57 kg/ha and 1/3 dose of phosphorus was applied @ 38 kg/ha produced similar results. Similar trend was observed during the 2nd Year of study (2001-2002) where, maximum number of productive tillers and grain yield was recorded in treatment where intra-row drilling of phosphorus @ 114 kg/ha was used which did not differ from other treatments when compared statistically. Maximum germination count was recorded in treatment where intra-row drilling of phosphorus @ 114 kg/ha was used during 2000-2001 but during 2001-2002 the maximum germination count was recorded in treatment where broadcasting of phosphorus @ 114 kg/ha was used.

It is evident from the data presented in table that intra-row drilling of P@ 114 kg/ha increases wheat yield. Even then, intra-row drilling of 1/2 P @ 57 and 1/3 P @ 38 kg/ha increases yield that is statistically at par with recommended phosphorus dose 114 kg/ha

Table: Effect of phosphorus application methods on yield of wheat

Treatments	Germination count m ⁻²		Productive tillers m ⁻²		Grain yield gm ⁻²	
	2000-01	2001-02	2000-01	2001-02	2000-01	2001-02
Recommended practice i.e. broadcasting of P@ 114 kg/ha	186.7 ^{NS}	223.7 ^{NS}	348.3 ^{NS}	27.8 ^{NS}	338.3 ^{NS}	315.0 ^{NS}
Intra row drilling of recommended P@114 kg/ha	246.3	217.7	365.0	292.7	341.6	325.0
Intra row drilling of 2/3 P @ 76 kg/ha	214.7	216.7	361.3	269.7	320.3	309.9
Intra row drilling of 1/2 P @ 57 kg/ha	200.0	207.3	341.3	264.9	316.7	305.0
Intra row drilling of 1/3 P @ 38 kg/ha	219.3	206.7	334.3	245.7	291.6	304.0

NS = Non significant

On the basis of two years study results it is recommended that phosphorus incorporated in soil 3-4 cm below seed by intra-row drilling technique has increased phosphorus availability to the plant roots and reduced losses due to fixation as phosphorus can hardly move 3-5 cm in soil.

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