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Studies on nitrogen and phosphorus management in Wheat (*Triticum aestivum* L.emend Fiori & Paol) under rainfed conditions of Jammu and Kashmir

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ABSTRACT

A field experiment was conducted to evaluate the effect of three levels each of nitrogen (0, 60 and 120 kg/ha) and phosphorus (0, 40 & 80 Kg/ha) on Wheat (Triticum aestivum L.emend Fiori & Paol) cultivar 'VL 907' during Rabi 2013-14 and 2014-15 at Regional Agricultural Research Station Rajouri, SKUAST-Jammu under rainfed conditions of Jammu and Kashmir. Application of graded levels of nitrogen and phosphorus progressively improved growth and yield attributes but in a decreasing order. There was a progressive increase in grain yield of wheat with each increment from 60 to 120 kg N ha-1 from the crop fertilized being maximum from 120 kg P ha-1. Similarly, application of 80 kg/ha resulted higher grain yield than the yield obtained in control. Lowest plant height, number of effective tillers per plant, panicle length, dry matter per plant, number of grains per panicle, weight of grains per panicle, grain yield, straw yield and biological yield was observed in 0 and 50 per cent nitrogen and phosphours. Various crop traits such as number of fertile tillers, 1000-grain weight and number of grains per spike were significantly influenced by nitrogen and phosphorus application. Similarly, fertilization with at 120 kg N ha-1 and 80 kg P ha-1 maximally improved all these traits in both the years.

Key Words: Wheat; Nitrogen levels; Phosphorus levels; yield

INTRODUCTION

In the state about 4% area is under cultivation; 4% of this is irrigated and the rest is rainfed. And it has 13% area under forest and fruit trees. Maize and paddy are the principal crops, occupying 53% of the gross cropped area, followed by wheat (24%), oilseeds (7%) and pulses (4%); the remaining area is under barley, millets and other cereal crops.

Next to rice, wheat (Triticum aestivum L.emend Fiori & Paol) is the most important cereal crop of India. Wheat production in India was about 6.46 million tonnes in 1950-51and touched its peak of 76.37 million tonnes during 1999-2000.During the year 2006-07 its production was around 74.0 million tones. About 91% of the Indian wheat is produced in six states viz. U.P., Punjab, Haryana, M.P. Rajasthan and Bihar. Uttar Pradesh with 25.6 million tonnes in 2013 -14 continues to be the highest producer of wheat.

Wheat (*Triticum aestivum* L.) is the world's leading cereal crop cultivated over an area of about 651 million tons making it the third most-produced cereal after maize and rice. India achieved remarkable progress in wheat production during the last four decades and is the second largest wheat producer in the world with the production touching a record level of 93.90 mt an area of around 28.40 m ha during 2011-12 (Anonymous, 2012), production has increased tremendously but is still far below the potential yield (11.2 tonnes/ha) (Singh *et al.,* 2010). Although, India is well placed in meeting its needs for food grains the major objective of food and nutritional secretary for its entire population has not been achieved. The demand for food grains is expected to rise not only as a function of population growth but also as more and more people cross the poverty line with economic and social development.

Wheat grains are comparatively better source of protein consumed in India. About 10-12% protein requirement is met by wheat. Maneuvering the application of different fertilizers could increase the productivity of the wheat crop and the protein content.

Besides this, phosphorus fertilization in wheat is sometimes of greater importance than nitrogen under late sown conditions .It provides resistance to plants, maintains cell permeability, formation of cytoplasm & water balance of plant reflecting balance growth of plants. It is main component of protoplasm and chlorophyll which accelerates the photosynthetic activities by helping synthesis of carbohydrates in plants and their conversion into plant lipids. Generally, the farmers of rajouri district get delayed in wheat sowing due to late harvesting of crops like maize, mustard, pulse etc under aberrant

weather conditions. Keeping this in view, the present investigation was carried out to influence of growth and yield attributes of wheat variety "VL – 907" by inorganic sources of nutrients under different fertility levels.

MATERIALS AND METHODS

A field experiment was conducted during winter season (Rabi) 2013-14 and 2014-15 at Regional Agricultural Research Station Rajouri, SKUAST-Jammu under rainfed conditions of Jammu and Kashmir. The soil of the experimental field was clay loam in texture with pH 7.2, EC 0.10 ds/m, organic carbon 0.68%, alkaline permanganate oxidizable available nitrogen 430 kg/ha, Olsen's available phosphorus 18.4 kg/ha and available potassium 246 kg/ha. The treatments consisting of combination of three levels of nitrogen (0, 60 & 120 kg/ha.) and three levels of phosphorus (0, 40 & 80 Kg/ha) were laid down in complex Randomized Block Design with four replications of each treatment. Wheat variety VL-907 was grown as per recommended cultural practices at a line spacing of 22 cm. Plant samples were taken from sampling rows at harvesting stage. Soil physico-chemical and biological properties were determined as per (Black, 1965). Nitrogen use efficiency was calculated as per Moll et.al.,1982. Recording the photosynthetically active radiation during flag leaf initiation stage with a spectral radiometer and dividing the ICPAR with biomass calculated the radiation use efficiency in wheat.

RESULTS AND DISCUSSION

Plant growth and yield attributes

Data presented in Table1 indicated that plant height, number of leaves / plant, no of grains/ear, no of grains/plant and grains & straw yield of wheat variety VL-907 increased significantly with increasing levels of nitrogen and phosphorus. However, effective number of tillers showed no significant variation at all levels of nitrogen and phosphorus applied. These results corroborate with the findings of Cheema et al (2003) and Xing *et. al* (2005).

Yield

The data on seed yield of wheat are presented in Table 2. In general all the treatments showed significant increase in seed yield over the control. Maximum seeds yield was recorded with Nitrogen @ 120 kg/ha (41.84 q/ha) and Phosphorus @ 80 kg/ha (42.07 q/ha) had significant as comparable to other treatments. The increase in yield in these treatments might be due to the positive effect on yield attributing factors such as no. of branches/plant, dry matter accumulation, no. of siliqaue/plant, wt. of siliqaue/plant, no. of seeds/siliqaue, seed wt. /plant and 1000 seed weight of Indian mustard. Similarly the different treatments produced significant higher straw and stick with Nitrogen @ 100 kg/ha (41.84 and 76.32 q/ha) or Phosphorus @ 80 kg/ha (42.07 and 77.67 q/ha) as compared to other treatments which was mainly because of significantly more number of filled grains/ tiller over the rest of the treatments.

CONCLUSION

The two years study on the research investigation on various treatments in wheat, the maximum grain yield and Harvest index (41.84 q/ha and 35.41%) was obtained under higher doses of nitrogen 120 kg/ha. Similar trend was observed highest grain yield and Harvest index (42.07 q/ha and 35.13%) was obtained under higher doses of phosphorus 80 kg/ha treatments

Table1. Effect of Nitrogen & Phosphorus on growth characters and yield attributes of wheat (VL-907) under rainfed conditions of Jammu and Kashmir *{Pooled Data of Two Years}***.**

Treatments	Plant height at 120 DAS	No. of effective tillers/plant at 120 DAS	No. of Leaves/ plant	No. of grains / ear	No. of grains/ plant
Nitrogen (Kg/ha)					
0	60.55	5.32	11.32	27.84	145.15
60	64.99	6.94	13.24	32.62	219.20
120	67.72	7.12	15.42	35.86	250.19
Phosphorus (Kg/ha)					
0	61.44	5.35	11.28	27.55	144.64
40	64.68	6.84	13.29	33.14	218.96
80	67.14	7.18	15.44	35.63	250.94
CD(P=0.05)	2.42	1.37	1.64	2.45	24.21

Table2. Effect of Nitrogen & Phosphorus on yield of wheat (VL-907) under rainfed conditions of Jammu and Kashmir *{Pooled Data of Two Years}***.**

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Treatments	Grains yield (q/ha.)	Straw yield (q/ha.)	Biological yield (q/ha)	Harvest index (%)
Nitrogen (Kg/ha)				
0	30.15	60.84	90.99	33.13
60	36.52	69.75	106.27	34.36
120	41.84	76.32	118.16	35.41
Phosphorus (Kg/ha)				
0	29.96	59.86	89.82	33.36
40	36.48	69.38	105.86	34.46
80	42.07	77.67	119.74	35.13
CD(P=0.05)	4.82	6.25	11.06	1.01

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