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Research Article

Performance of Cold Tolerance Rice Under Different Levels of Nitrogen Application

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Abstract

Rice, the major staple food crop and ranked first as cultivated crop in Nepal, has productivity of 3.36 t ha^{-1}. Nitrogen (N) is one of the most important factors limiting its yield. A field experiment was conducted in Lumle, Kaski, Nepal from June-November 2016 to investigate Performance of temperate rice under different levels of nitrogen application in rice variety (Lumle-2). The experiment was laid out in randomized complete block design with five treatments (0, 50, 100, 130, 150 Kg N ha^{-1}) and replicated four times. The yield attribute, number of seeds per panicle was significantly higher when soil was applied with 130 Kg N ha^{-1} leading to higher grain yield. At N level 150 Kg ha^{-1}, plant height, number of tillers per meter square and panicle length were found to be higher than the lower levels leading to higher straw yield. So, the productivity of rice can be significantly increased by applying optimum level of N fertilizer i.e. 130 Kg N ha^{-1}.

Keywords: Nitrogen; Rice; Yield Attributes; Yield

Introduction

Major macronutrient Nitrogen (N) often limits growth and yield of rice crop. There is a close association between the amount of N fertilizer applied to rice and the yield level. The main problem of temperate rice farming is lack of proper N - fertilizer. N increases the cell division; cell elongation and nucleus formation thus increase vegetative growth. Insufficient N results yellowing (chlorosis) of leaves, reduced tailoring and disturbance of normal cell growth division and finally results in reduced yield When N is at sub-optimal, growth is reduced [1]. Rice plants require N during vegetative stage to pro-mote growth and tailoring, which in turn determines potential number of panicles. Nitrogen contributes to spikelet production during early panicle formation stage and contributes to sink size during the late panicle formation stage. Nitrogen also plays a role in grain filling, improving the photo-synthetic capacity, and promoting carbohydrate accumulation in culms and leaf sheaths. It is necessary to know what the best dose is for each variety as well as its influence on components of yield and other agronomic parameters such as the cycle, plant height, lodging and moisture content of the grain, in order to obtain better knowledge of said productive response. Increased rates of nitrogen fertilizer may increase the yield but reduce the quality of the grain. Some of these fertilizers, like urea, are substantially cheaper than others, and their use may be justified on economic grounds.

The present study was conducted to study the effect of different dose of N on yield and yield attributing character of cold tolerant rice.

Materials and Methods

Experiment was conducted on Lumle, Thimi Block at Kaski district 2016 with RCBD design where 5 different Nitrogen level of treatment (0, 50, 100, 130, 150 Kg N ha^{-1}) were replicated fourth times and Potassium and Phosphorous were kept at constant amount i.e. 30 Kg ha^{-1}. 3m*4m plot of each were made. There were 20 plots. Rice verity Lumle - 2 was planted on 15*15 cm spacing. Plantation of seedling was done on 21st June 2016. Weeding, top dressing was also done on certain intervals. Harvesting was done on 24th October.

Plant height, number of tiller m-2, number of seed per panicle, length of panicle, straw yield and grain were measured at the time of harvesting. Data entry and analysis was done with the help of Ms-EXCEL and SPSS.

Results and Discussion

Plant Height

The plant height showed significant difference with different dose of Nitrogen. Highest height was found at 150 Kg ha 1 and lowest was in control. It was statistically similar with 50 Kg ha-1 and 100 kg ha-1 and control. Higher dose of nitrogen increases the cell division, cell elongation and nucleus formation thus account for increase in height. Gaism (2001) indicated that the increase in height with nitrogen fertilizer is due to the fact that promotes plant growth, increase the number of internodes and length if the internodes which results in progressive increase in plant height.

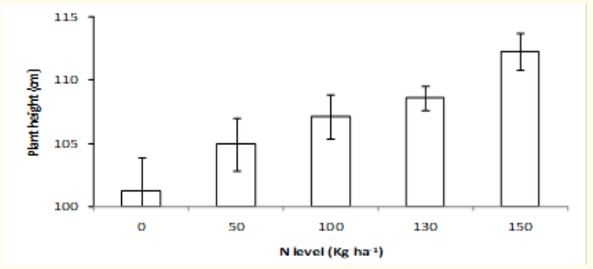

Figure 1: Plant height (cm) on different dose of N.

Number of Seed per panicle

Statistically significant difference was found in effective number of seed per panicle. The highest no. of seed was found in 130 Kg ha-1 followed by 150 Kg ha^{-1}. Statically similarity was seen between 150 Kg ha^{-1} and 140 Kg ha^{-1}. The productive tiller, panicle length and number of filled grain per panicle increased with increase in N level [2]. Panicle length was significantly influenced by nitrogen treatment [3] (Figure 2).

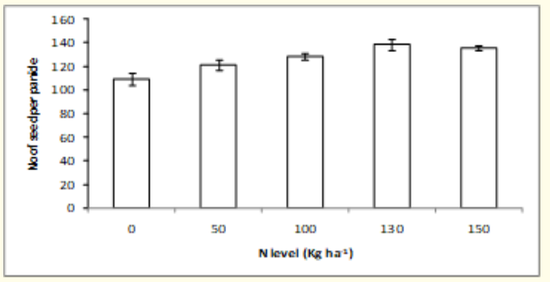

Figure 2: Number of seeds in rice as affected by different level of Nitrogen.

Number of tiller per meter square

Statistically significant difference was found in effective tillers per square meter. Those treatment which have higher number of effective tillers produced higher final grain yield compared to less number of tillers producing treatments. Mirza., *et al.* 2010 reported increase in number of tillers in rice due to influence of different fertilizer combination. These results are in agreement with those obtained by Mesquita and Pinto [4] (Figure 3).

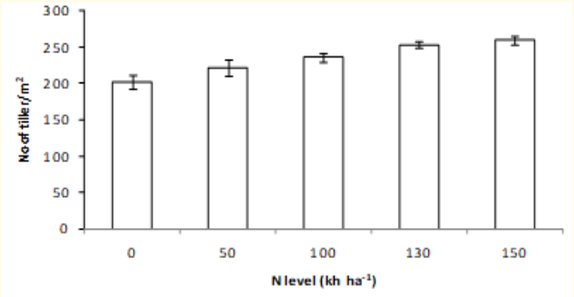

Figure 3: Number of tiller on different dose of N.

Rice Yield per Hectare

Result showed that different levels of nitrogen application significantly effect on grain yield in rice. The yield was significantly higher at 130 kg ha-1 N application and further increment, however, reduced the grain yield. Number of chaffy grains or unfilled or sterile spikelet increased with excess application of nitrogen and show relatively higher response to N fertilization as compared with optimum N level [5] (Figure 4).

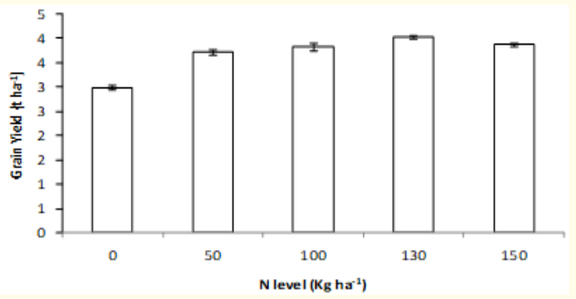

Figure 4: Rice yield (t ha^{-1}) on different level of N.

Straw yield per Hectare

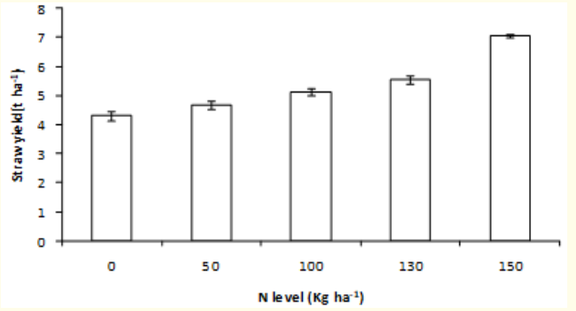

Figure 5: Straw yield (t ha^{-1}) on different level N.

Statistically significant differences found on straw yield in different included treatment. The maximum straw yield was produced from 130 kg ha^{-1} and minimum yield was in Control treatment. Statistically treatment control and 50 kg ha^{-1}N are similar. Straw yield is directly related to no. of tiller per m^2.

Discussion and Conclusion

Nitrogen, a key element to increase productivity. It is vital plant nutrient and major yield determining factor required for rice production. N is an integral component of many compounds essential for plant growth processes including chlorophyll and many enzymes. Different level of nitrogen has different effect on plant. This experiment was conducted at RARS, Lumle Kaski to analyze the different dose of nitrogen in rice during 2016. The experiment was set up in randomize complete block design with five treatments (0, 50, 100, 130 and 150 kg N ha^{-1}).

Different nitrogen levels significantly affect the yield and yield parameters of rice. The straw yield was found higher (7.05 t ha^{-1}) at application of nitrogen at 150 kg ha^{-1} as compared to other N levels while the grain yield was found higher (4.03 t ha^{-1}) at application of N at 130kg ha^{-1}.

The findings of this study show that the soil application of N enhances the total seed per panicle but with increase in higher dose it deceased in seed due to ineffective tiller while the straw yield had increased with increase in nitrogen dose since N increases

the cell division, cell elongation and nucleus formation leading to higher straw yield.

One trial is not enough so for the validation of these result multi location and multiyear trial must be done.

Bibliography

1. Haque MA and Haque MM. "Growth, Yield and Nitrogen Use Efficiency of New Rice Variety under Variable Nitrogen Rates". *American Journal of Plant Sciences* 7.3 (2016): 612-622.

2. Kaushal AK., *et al*. "Response of levels and split application of nitrogen is gerrn manured wetland rice (Oryza sativa L.)". *Asian Journal of Agricultural sciences* 2.2 (2010): 42-46.

3. Bahmanyar MA and S Soodaei Mashaee. "Influences of nitrogen and potassium top dressing on yield and yield components as well as their accumulation in rice (Oryza sativa)". *African Journal of Biotechnology* 9.18 (2010): 2648-2653.

4. Mesquita EE and JC Pinto. "Nitrogen Levels and Sowing Methods on Forage Yield Produced after Harvesting of Millet Seed (Pennisetum glaucum (L.) R. Br.) [Portuguese]". *Revista Brasileira de Zootecnia* 29.4 (2000): 971-977.

5. Srividya A., *et al*. "Identification and mapping of landrace derived QTL associated with yield and its components in rice under different nitrogen levels and environments". *International Journal of Plant Breeding and Genetics* 4.4 (2010): 210-227.

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