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Effect of different levels of nitrogen and biofertilizers on growth and yield of barley (*Hordeum vulgare* L.)

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ABSTRACT : Nitrogen at different levels and biofertilizers effects were studied on growth and yield of barley. An experiment was conducted in a factorial Randomized Block Design with three replications. Treatments included 3 levels of nitrogen (40, 60 and 80 kg ha⁻¹) and bio-fertilizers on four levels (not inoculation, *Azotobacter*, *Azospirillum* and *Azotobacter* + *Azospirillum*). The results revealed that fertilizer N @ 80 kg/ha with both (*Azotobacter* + *Azospirillum*) inoculations was found to be the most responsive, with significantly increased in the growth parameters viz., plant height, maximum number of tillers and grain yield of barley. *Azospirillum* inoculation, *Azotobacter* inoculation and uninoculated control significantly differed between each other.

Key Words : *Azotobacter*, *Azospirillum*, Inoculations, Biofertilizers

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Barley (*Hordeum vulgare* L.) is the world's fourth most important cereal after wheat, rice and maize. The major use of barley is in brewing industries for manufacturing malt. Both barley grains and straw are highly digestible compared to wheat because they do not contain gluten. Barley ranks next to wheat both in acreage and production among *Rabi* cereals in India. In order to find out some alternative for fertilizer nitrogen economy, the use of diazotrophic bacteria has been evaluated. *Azotobacter* is a well known free-living heterotrophic bacterium which plays a beneficial role in crop production. Studies on biological nitrogen fixation have mainly emphasized the role of *Rhizobium* and *Azotobacter*. However, with the discovery of free-living N₂-fixing bacterium *Spirillum lipoferum* (now *Azospirillum brasilense*) form associative symbiosis with wheat. It has been suggested that the plant growth response may be attributed to the hormone production by these bacteria or to an increased nutrient uptake by inoculated roots. Generally the yield increases in different crops have been obtained in soils rich in organic matter. However, the increased cost of organic matter and fertilizer nitrogen prevents its use at higher levels by small and marginal farmers in India. It was, therefore, felt essential to find out the correct and compatible level of fertilizer nitrogen with these inoculations in barley production.

RESEARCH PROCEDURE

Field experiment was conducted during *Rabi* season of 2010 at central research farm, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad. The soil of the experimental site was sandy loam with pH (7.7) and medium in organic carbon (0.4%). The initial status of available N, P₂O₅ and K₂O of the experimental site was 220.0, 18.8 and 250.0 kg ha⁻¹, respectively. The experiment was laid out in a factorial Randomized Block Design with twelve treatments replicated thrice. The treatments included 3 levels of nitrogen (40, 60 and 80 kg ha⁻¹) and bio-fertilizers on four levels (not inoculation, *Azotobacter*, *Azospirillum* and *Azotobacter* + *Azospirillum*). Observations were recorded for various growth and yield attributes.

RESEARCH ANALYSIS AND REASONING

The results of the present study as well as relevant discussions have been presented under following sub heads:

Growth attributes :

The different growth indices like plant height, number of tillers, crop growth rate and relative growth rate of barley was significantly influenced by various treatments (Table 1).