

# FOLIAR FEEDING OF RICE WITH FREE-LIVING NITROGEN FIXERS AND BORON AND N MANAGEMENT UNDER TEMPERATE CONDITIONS OF KASHMIR VALLEY

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## INTRODUCTION

Nitrogen, one of the most limiting factors for achieving higher rice yield in all types of soils. Rice needs adequate N supply throughout the growth period. Thus, proper N management is decisive for successful rice production. Rice crop requires large amounts of N and responds faster. Excessive and improper timing of N application leads to inefficient N acquisition and poor fertilizer-N use efficiency by rice crop. Excessive use of N may lead to contamination of surface and ground water through leaching, volatilization of ammonium and emission of green house gases viz., nitrous and nitric oxides to the atmosphere. That also leads to excessive vegetative growth following susceptibility to the incidence of diseases and insect pest. Consequently, inadequate N supply results in reduced yield and profit (Peng *et al.* 2006). To overcome these tribulations, application of nitrogen at proper time with adequate amount as per requirement is highly advocated to achieve higher efficiency. Moreover, foliar application of free-living nitrogen fixers viz. *Azotobacter* and *Azospirillum*, which have phyllospheric effect, ability to fix atmospheric nitrogen, act as bio-control agent etc. that transform in grain yield and enhanced use efficiency (Roy *et al.* 2013). Further, boron is vital for the synthesis of N-bases such as uracil, which is essential component of RNA. Uracil affects synthesis of ribosomes thus affecting the synthesis of amino acid, protein and incorporation of P into the nucleotides, promote cell growth and development of the panicle (Subbaiah and Mitra 1997). Moreover, B-deficiency in rice are sometimes difficult to detect visually in the field. Boron deficiency symptoms in rice begin with a whitish discoloration and twisting of new leaves. Severe deficiency symptoms from rice include thinner stems, shorter and fewer tillers, and failure to produce viable seeds (Yu and Bell, 1998). Combined application of nitrogen and boron have synergistic effect on growth and yield of some crops but meager information is available on delayed application of nitrogen along with foliar spray of free-living diazotrophs and boron on growth, yield and uptake of nutrients by rice. Keeping this in view, the present investigation was carried out with the objective to evaluate the effect of foliar application of free-living nitrogen fixers, boron and delayed application of N in irrigated rice under temperate conditions.

## ABSTRACT

Field experiment conducted at Regional Research Station (SKUAST-K), Wadura, Kashmir to study the influence of integration of foliar spray of free-living diazotrophs and boron with N on yield, nutrient uptake and N economy of rice for two consecutive years. Application of 100% N + boron recorded maximum grain yield (6.72 t/ha), additional net income (₹18, 902/ha), total N uptake (107.54 kg/ha), total B uptake (50.8 g/ha) and N use efficiency indices. Application of 100% N + boron registered higher grain and straw yield by 3.70 and 2.69% over 100% alone. Further, application of 50% N (two split) at 15 and 30 DAT + *Azotobacter* + boron being on par with 100% N had considerably higher grain and straw yield over 50% N (one split at 30 DAT) + *Azotobacter* + boron and 50% N (one split at 30 DAT) + *Azospirillum* + boron. Foliar spray of *Azotobacter* was more effective over *Azospirillum*, which enhanced grain yield by 2.21-3.42% irrespective of N splitting. Under temperate conditions of Kashmir valley higher grain yield, profitability and N use indices viz. physiological efficiency of N (20.2%), agronomic efficiency of N (27.1%), relative efficiency of N (58.9%) and factor productivity for applied N (84.0%) could be realized with the application of 100% N + boron.

## KEY WORDS

*Azospirillum*, *Azotobacter*  
 Boron, N use efficiency