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The potential of *Nostoc* cultivated in parboiled effluent as a biofertilizer for paddy cultivation

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Abstract

Paddy cultivation predominantly depends on inorganic fertilizers due to the limited availability of high-quality organic alternatives. Cyanobacteria have emerged as a widely accepted tool in the agriculture sector, due to their macro and micronutrient profiles. Among these *Nostoc* stands as a popular nitrogen fixing cyanobacteria, capable of surviving in both terrestrial and aquatic environments. In this study, a pot experiment was conducted to find the potential of *Nostoc* grown in parboiled water, in combination with either organic or inorganic fertilizers, on the growth, yield and residual nutrient content in soil. The experimental design was CRD with five treatments, namely T1 – control, T2- 100 % IF (inorganic fertilizers), T3- 100 % OF (organic fertilizers = compost), T4- *Nostoc* + 50 % IF except N, + *Nostoc* foliar application (NF), T5- *Nostoc* + 50 % compost + NF and three replicates. Data was analyzed by SAS with LSD mean separation at P=0.05. Various growth parameters, such as plant height, leaf numbers per plant, number of effective tillers and grain yield were measured. Additionally residual nitrogen, phosphorus, potassium and carbon content of the soil was measured after paddy harvesting. The results revealed that *Nostoc* combination treatments (T4 & T5) exhibited significantly higher values in leaf numbers (T4-31.99 and T5-32.11 @ 6th week), effective tillers (T4-5.44 and T5-5.56), and residual nutrient content of available nitrogen (T4-12.96 ppm and T5-16.83 ppm), phosphorus (T4-11.26 µg/g and T5-17.37 µg/g), potassium (T4-509.45 µg/g and T5-501.25 µg/g) and total carbon (T4-3.75 µg/g and T5-3.84 µg/g) compared that of sole inorganic (T2-26.99, 4.56, 5.329ppm, 3.09µg/g, 461.17µg/g, 3.47µg/g respectively) or organic treatments (T3-30.34, 4.44, 7.61ppm, 18.83µg/g, 413.59µg/g, 3.93µg/g respectively). Notably T4 (11.22g/plant) recorded the highest grain yield while T2 (10.36) and T5 (10.02g/plant) yielded comparably. The results therefore highlighting the potential of *Nostoc* to substitute the inorganic nitrogen application and to cut down 50% of P and K inorganic fertilizers in paddy cultivation. In addition, 50% of the compost also could be substituted by *Nostoc* in the organic paddy cultivation. Further, Field level studies are suggested in different agroecological conditions, to find the suitability of *Nostoc* as a biofertilizer.

Keywords: Biofertilizer, Cyanobacteria, *Nostoc*, Paddy cultivation

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