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DO LOW LAND RICE VARIETIES PREFER AMMONIUM OR NITRATE?

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Almost 70% of applied nitrogen (N) in rice fields is lost under the present agronomic practices in Sri Lanka. Supply of N to match the plant requirement is one strategy to enhance N use efficiency. Rice assimilates N in the form of ammonium (NH_4^+) and nitrate (NO_3^-). Conflicting findings on the preferred form of N by lowland rice is reported in recent literature. A study was conducted at the Regional Rice Research and Development Center, Bombuwala with the aim of determining preferred N forms (NH_4^+ and/or NO_3^-) of three rice varieties bred for lowland rice cultivation in Sri Lanka.

Three varieties of rice, Bw 272-6b, Bw 363 and Bw 267-3, were grown with three different NH_4^+: NO_3^- ratio (100:0, 50:50, 0:100) to supplement N in hydroponic growth medium and maintained until 40 days after germination (DAG). At 40 DAG shoot N content and dry biomass were measured. In another experiment, soil collected from a rice field was amended with urea or KNO_3 with or without a nitrification inhibitor (Dyciandiamide – DCD) and the same varieties were grown. At 40 DAG plants were harvested to measure dry biomass. Data were statistically analyzed using SAS software.

Differences in NH_4^+:NO_3^- in growth medium affected plant performance differently for the three varieties when grown hydroponically. Only Bw 267-3 showed higher biomass accumulation under only NH_4^+ treatment (100:0) compared to the other two N treatments. Bw 272-6b and Bw 363 varieties were indifferent to the form of N available in the medium when plants were grown hydroponically. Shoot N content was highest in plants that received dual N forms for all three varieties. The highest N uptake for Bw 272-6b and Bw 363 were observed at dual N forms treatment (14.46 and 15.05 mg/plant, respectively). Bw 267-3 showed the highest N uptake under only NH_4-N treatment (15.92 mg/plant). The least uptake of N was observed under only NO_3-N treatment (0:100) for all three varieties. When plants were grown in soil, application of Urea without DCD, which facilitates a NH_4^+ and NO_3^- containing medium, resulted in higher biomass accumulation irrespective of the variety in comparison to the other N-fertilizer treatments that facilitate either a NH_4^+ dominating (Urea+DCD) or NO_3^- dominating (KNO_3+DCD and KNO_3) environment. The least biomass accumulation was observed in plants fertilized with KNO_3+DCD. Bw 363 and Bw 272-6b can be grown in NH_4^+ and NO_3^- dual N forms but Bw 267-3 prefers NH_4^+ only.

It is concluded that the magnitude of response to NH_4^+:NO_3^- in the growth medium is dependent on the variety of rice.