

Application of Hydrogel and Urea in Paddy Cultivation to Overcome Low Soil Moisture Stress and to Increase Fertilizer Use Efficiency

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Soil moisture is an essential factor for urea hydrolysis and hence, water-limiting conditions would hinder the uptake of nitrogen by plants. Hydrogel can be used as a potential solution for this problem due to its ability to absorb significant amounts of moisture and uniformly release 95% of the stored moisture in dry soil conditions. Hydrogel can also release soil-dissolved nutrients slowly to the plants. However, application of urea could lower the efficiency of the hydrogel. Therefore, this study evaluated the efficacy of application of Hydrogel and urea in paddy cultivation under water deficit conditions. A pot experiment was conducted using *Oryza sativa* var. Bg300 as the test plant, in a completely randomized design with 6 replicates under greenhouse conditions. Treatments T1 and T2 were maintained without Hydrogel but with urea only (0 and 100% of recommended level, respectively). Treatments T3 to T7 consisted of Hydrogel incorporated into top 5 cm of soil at 1.5 g/kg soil dry weight, and urea mixed to the same soil depth at 0, 25, 50, 75 and 100% of the recommended level, respectively. All plants were subjected to moisture stress by complete withholding of irrigation at 25 days after planting (DAP). Plant growth and soil conditions were measured from 4 weeks after planting (WAP). The highest plant growth was observed in T7 and the lowest in T1. Nitrogen uptake efficiency (NUpE) was low in T1 and T2 and the highest in T3 ($P < 0.05$). Similar NUpE was recorded in T4 to T7, which was higher than T1 and T2 but, lower than T3 ($P < 0.05$). Hydrogel increased soil moisture levels and NUpE of paddy plants compared to the control, although urea reduced its moisture retention efficiency. Hydrogel could be an effective tool in conserving soil moisture and increasing NUpE in paddy cultivation under low moisture conditions.

Keywords: Hydrogel, Moisture stress, Nitrogen uptake efficiency, Urea

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