Yield responses of native *Oryza* species to plant density and nitrogen rate in Northern Australia

Australian native *Oryza* can produce nutritious grains that could be sold in local restaurants or offered as a unique product for tourists. However, we don't know much about how to grow them. So, we did an experiment in a greenhouse to see how different amounts of nitrogen and planting densities affect the amount of rice grains produced. We found that using 150 kg of nitrogen per hectare and planting the rice closer together resulted in the best grain yield. Adjusting the planting density could be a way to use less nitrogen fertilizer while still getting a good amount of rice.

Abstract

Australian native *Oryza* species produce nutritious grains for which there is a potential market as a local gourmet product in restaurants, and as a novelty product for tourists. However, the presence of appropriate agricultural management practices for cultivating native *Oryza* species has not yet been developed. Hence, a two-season greenhouse experiment was conducted during the dry season 2022, and the rainy season 2023. Two Australian native species, *O. meridionalis,* and *O. rufipogon* were used to investigate the effects of the nitrogen (N) rate and planting density on the above-ground biomass, grain yield, and yield components. In both seasons, a planting density × N treatment factorial design experiment was arranged in a split-plot design with three replicates. Four different spacing patterns were applied (20 cm X 20 cm; 15 cm X 15 cm; 20 cm X 10 cm; 10 cm X 10 cm) combined with two N fertilizer rates: a locally recommended rate of 150 kg ha^{-1}, and an increased N rate of 250 kg ha^{-1}. The results revealed that transplanting at 150 kg N ha^{-1} at a hill density of 10 cm × 10 cm proved better yield performance (i.e. produced higher grain yield over the rest of the treatments) in the dry season trial. That's because there are more tillers per unit area, a larger total above-ground biomass, and a larger leaf area index. Hence, adjusting the hill density could be an efficient method to reduce the amount of nitrogen fertilizer in growing native *Oryza*, without sacrificing rice productivity.