Optimization of Planting Spacing and Nitrogen Fertilizer Types for the Growth and Yield of Edamame (Glycine max (L).)

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ABSTRACT

Increasing edamame productivity can be achieved through proper management of planting spacing and fertilization. This study aimed to analyze the effects of planting spacing and nitrogen fertilizer types, as well as their interaction, on the growth and yield of edamame plants. The research was conducted from July to October 2025 in Krajan Village, Slawu, Jember Regency, East Java, Indonesia (latitude: -8.140997, longitude: 113.697992), at an altitude of 146 meters above sea level. The experiment was arranged using a factorial Randomized Complete Block Design (RCBD) with two factors and three replications. The first factor was planting spacing, consisting of 20 cm × 15 cm, 20 cm × 30 cm, 30 cm × 40 cm, and 40 cm × 15 cm. The second factor was nitrogen fertilizer type, consisting of urea at 200 kg/ha, ZA at 150 kg/ha, and a combination of urea at 100 kg/ha + ZA at 75 kg/ha. The results showed a significant interaction between planting spacing and nitrogen fertilizer type. The combination of a planting spacing of 40 cm × 15 cm and urea at 100 kg/ha + ZA at 75 kg/ha significantly increased the number of pods per plant, reaching 36.25 pods. A planting spacing of 20 cm × 15 cm resulted in the highest plant height (27.00 cm) and fresh pod weight per plot (7.43 kg). The application of urea at 100 kg/ha + ZA at 75 kg/ha resulted in the highest plant height (26.16 cm), stem diameter (5.00 mm), and fresh pod weight per plant (79.87 g). Narrower planting spacing increased productivity per unit area, while the combination of urea and ZA enhanced vegetative growth and pod formation through a more balanced supply of nitrogen. The combination of appropriate planting spacing and nitrogen fertilization can therefore be recommended as an effective strategy for increasing edamame productivity.

Keywords: *edamame, planting spacing, cultivation management, nitrogen fertilizer*