

Myint Myint Maw 2011: Effects of Nitrogen Fertilizer on Dry Matter Accumulation, Seed Yield and Seed Composition of Soybean Cultivars. Doctor of Philosophy (Tropical Agriculture), Major Field: Tropical Agriculture, Interdisciplinary Graduate Program. Thesis Advisor: Mr. Sutkhet Nakasathien, Ph.D. 120 pages.

The effect of nitrogen (N) fertilizer on the soybean cultivars was evaluated based on the physiological responses that are specific leaf weight (SLW), dry matter (DM) accumulation related to seed yield and seed composition. Field experiments were established during the wet season (June to October) and the dry season (November to March) in 2008-2009. SJ5 cultivar was grown at the National Corn and Sorghum Research Center, Thailand. Four levels of plant population density (PPD) (20, 30, 40, 60 plants m⁻²) were assigned in the main plots and four N fertilizer rates (0, 25, 50, 75 kg ha⁻¹) were applied in the sub-plots. A greenhouse experiment was conducted hydroponically at the Department of Agronomy, Kasetsart University from September to November in 2009. Three levels of NO₃⁻ (5, 10, 15 mM) were main plots and three soybean cultivars (CKB1, SJ5, CM60) were sub-plots. Each experiment was conducted in a randomized complete block (RCB) split plot design with three replications.

In the field experiments, the importance of starter N fertilizer application in increasing seed yield was consistent in two different seasons. Relative to control (0 kg ha⁻¹), the highest N rate (75 kg ha⁻¹) had a significant greater seed yield by an average of 31 and 57% in the wet and dry season, respectively. This increase in seed yield could be due to an increase in SLW and total dry matter (TDM), which responded strongly to the N application and growth stage. The optimum PPD for maximizing seed yield was lower in the wet season (20 plants per m⁻²) than in the dry season (30 plants per m⁻²). Seed oil content was not significantly different among N treatments or PPD in any growing seasons. The highest N rate increased seed protein content by an average of 4% compared to the control in the wet season. However, the increment was not statistically different from the result of 50 kg ha⁻¹ N treatment. In the greenhouse experiment, NO₃⁻ application had a significant effect on SLW and TDM, reflecting on a higher seed yield in all of the observed cultivars. The maximum seed yield was obtained from the 15 mM NO₃⁻ treatment which mainly associated with the significant higher number of pod per plant. Of three cultivars, SJ5 had the highest response in TDM, leaf N content at R5 and final seed yield to NO₃⁻ treatment. Relative to control, 15 mM NO₃⁻ increased the seed protein content by an average of 10% but this increment was not significant different from the result of 10 mM NO₃⁻. Seed yield and protein content was likely to be related to the extent of TDM and N content in the leaves at R5 stage of the soybean cultivars.

Student's signature

Thesis Advisor's signature