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Abstract

Growth analysis of soybean cv. KKU.35 under water stress condition at vegetative and reproductive stages was conducted at the Faculty of Agriculture, Khon Kean University. Soybeans were grown during the dry season (December 2001 to April 2002) and wet season (June 2002 to September 2002). A completely randomized design (CRD) with four replications was employed for the two experiments conducted. The first experiment was aimed at studying the effect of water deficit at vegetative stage. The plants were irrigated throughout the vegetative stage (control) and non irrigated (stress) for each of the following phases ; at second node stage (V2) , third node stage (V3) , fourth node stage (V4) , fifth node stage (V5) and sixth node stage (V6) , respectively. The second experiment was aimed at studying the effect of water stress at reproductive stage. The plants were irrigated throughout the reproductive stage (control) and non irrigated (stress) for each of the following phase ; at the beginning bloom (R1) , full bloom (R2) , beginning pod (R3) , full pod (R4) , beginning seed (R5) and full seed (R6). Growth analysis parameters computed include relative growth rate (RGR), net assimilation rate (NAR) and leaf area ratio (LAR). Yield and yield components were also investigated.

The results from experiment I indicated significant differences in RGR and NAR at V4 and V5 stages (dry season). The values of RGR at V5 stage were $0.08 \text{ g.g.}^{-1}\text{day}^{-1}$ for the stressed plants and $0.24 \text{ g.g.}^{-1}\text{day}^{-1}$ for the control plants. The NAR values of stressed plants ($0.03 \text{ g.m}^{-2}.\text{day}^{-1}$) were significantly lower than those of the control plants ($0.09 \text{ g.m}^{-2}.\text{day}^{-1}$) at V5 stage. No significant differences in the LAR values due to moisture regimes were found at any vegetative stages. In wet season, there were no significant differences in RGR and NAR values between the control and stressed soybeans

at any vegetative stages except at V2 and V5 stages, respectively. The LAR values of the stressed soybeans ($1.33 \text{ cm}^{-2} \cdot \text{g}^{-1}$) were significantly lower than those of the control plants ($1.70 \text{ cm}^{-2} \cdot \text{g}^{-1}$) at V5 stage. Additionally, the water deficit during vegetative stages had a significant effect on number of pods per plant but not on seed weight per plant and harvest index. At V4 stage, number of pods per plant was significantly lower than the value of the control soybean.

The results from experiment II revealed that there were significant differences in RGR values at R4 and R5 stages (dry season). At R4 stages, this value was $-0.004 \text{ g} \cdot \text{g}^{-1} \cdot \text{day}^{-1}$ for the stressed plants which was significantly lower than those of the control plants ($0.05 \text{ g} \cdot \text{g}^{-1} \cdot \text{day}^{-1}$). At R1 and R4 stages, differences in NAR values were significant. The NAR values of the stressed plant ($-0.02 \text{ g} \cdot \text{m}^{-2} \cdot \text{day}^{-1}$) were significantly lower than those of the control plants ($0.03 \text{ g} \cdot \text{m}^{-2} \cdot \text{day}^{-1}$) at R1. Moreover, the LAR values were significantly decreased at all reproductive stages except at R1 and R3 stages. During the wet season, no significant differences in RGR and NAR values due to moisture regimes were found at any reproductive stages except RGR values at R4 stage. In addition, the water stress exhibited adverse effects on yield and yield components, particularly those the pods per plant and seed weight per plant during R2 to R6 stages were significantly decreased.