

Three adjacent experimental plots differing in soil pH and %Mg saturation at Mae Hia Agricultural Research and Training Center, Faculty of Agriculture, Chiang Mai University were used in the study during 1990-2000. The objectives were to examine the influence and interaction of soil K, Ca, and Mg as well as fertilizer applications on growth and yield performance of soybean, Chiang Mai 60 cultivar.

A split-split plot in a randomized complete block design with four replications was used in the experiment. Two rates of calcium sulfate ($\text{CaSO}_4 \cdot 7\text{H}_2\text{O}$) (0 and 34 kg/rai) were assigned for the main plot. Whereas three rates of potassium chloride (KCl) (0, 17 and 34 kg/rai) and three rates of magnesium sulfate ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$) (0, 25 and 50 kg/rai) were designated for the sub- and sub-sub plot, respectively.

Responses of soybean to the applied Mg were noted in the soil with Mg saturation lower than 10%. The application of 25 kg/rai of magnesium fertilizer resulted in 12.21% grain yield increase and 4.13% increase in leaf-Mg content. Nevertheless, Mg concentrations in the leaves were still relatively low (0.22%Mg) and Mg-deficiency symptoms on soybean leaves were widespread throughout the experimental plots. On the contrary, the application of K-fertilizer did not have any influence on leaf-K content but tended to decrease grain yield. This was probably due to the high level of soil exchangeable K accompanied with a low Mg saturation. Thus with a rate of 17 kg/rai of potassium chloride, the application of 25 kg/rai of magnesium fertilizer resulted in 22.56% increase in soybean grain yield.

For the soil with higher than 10% Mg saturation, nonsignificant responses of soybeans to the applied magnesium, calcium, and potassium were observed. Similarly to the soil with low Mg, the application of potassium fertilizer in the soil with high percentage of Mg saturation tended to decrease soybean grain yield.