

## Tillage practices and fertilization management effects on growth and nitrogen efficiency in soybean

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### [Introduction]

Tillage practices and fertility management play important roles in both the nutrient and soil moisture dynamics of soil-plant systems and affect the nutrient use efficiency of cropping systems. Tillage enhances the mineralization of soil organic C and N by incorporating crop residues, disrupting soil aggregates, and increasing aeration. Nitrogen fertilization can not only improve the crop production and soil quality attributes, but it can also increase the potential for NO<sub>3</sub>-N leaching. Additionally, soil quality can be improved over time in a no-tillage system, greatly increasing the yield benefits over time. An appropriate nitrogen management regime in combination with a proper tillage system is expected to sustain soil fertility. Soybean planted in fields with different soil types and drainage properties responds differently to tillage practices.

### [Materials and Methods]

Seeds of *Glycine max* (L.), Merrill were collected from the Rural Development Administration. The seeds were planted on June 24, 2014, in the experimental field of Chungbuk National University, Cheongju-si, Korea and repeated it again on June, 2015. The soil properties of the experimental plot were mentioned in the Table 1. The planting distance was maintained at 75 cm 25 cm. Hairy vetch (*Vicia villosa* Roth) was used for green manure and was applied using the broadcasting method at the rate of 8 kg/10a on March 24, 2014. For green manure (green fertilizer) reduction, the hairy vetch was cut during plow tillage, and for NT practices, cutting was performed just before seed sowing.

### [Results and Discussions]

A field experiment was performed to evaluate the effects of tillage systems and fertilizer management on yield and nutrient uptake in Soybean. The plant height, fresh weight and dry weight of conventional tillage (CT) were much higher those observed for no-tillage (NT). The highest plant height (128.47 cm) was observed in CT with chemical fertilizer. The plant nitrate concentration was higher (2.29%) in NT with green manure than chemical fertilization. However, nitrogen increased steadily in all treatments, and the highest quantity of total nitrogen (476.7 Kg/ha) was observed in NT with green manure. The NO<sub>3</sub>-N content in the soil decreased gradually just after the vegetative stage. Tillage practices and additional fertilizer application had an adverse effect on the uptake of N, P and K in soybean seeds. NT with green manure exhibited the highest N, P and K concentrations in seed, and no significance was found between additional treatment and green manure. The results postulated that NT strategies with fertilizers may influence the growth characteristics and mineral uptake in soybean. Taken together, no-till systems may be more helpful in enhancing soil chemical properties and soil fertility compared to tillage practices.

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