

Effect of organic manure on the fate of N and green soybean yield in upland soil

Edaphology Ye Jing

Green soybean (*Glycine max L.*) is the most important vegetable crop which is harvested before mature in Japan. Low production and soil sickness due to continuous cultivation of green soybean have occurred, and might be caused by low application rate of organic manure. However, N supply from manure is not enough to meet the early growth of soybean due to slowly decomposition. Therefore, combined use of organic and inorganic fertilizers is considered as one of the good method for maintaining and improving soil fertility and crop production. Little information is available in the effects of combined use of organic and inorganic fertilizers on N use efficiency and growth of green soybean. The objective of this study is to evaluate the effect of combined use of manure and chemical fertilizer on green soybean production and N use efficiency using different manures. **Materials and Methods:** A) Incubation experiment: Soil: top 15 cm soil of the Yamagata Univ. farm. Treatments: cattle manure (CM), sewage sludge compost (SSC), poultry manure (PM), organic mixed manure (including soybean meal and rapeseed meal, OMM). Application rate of organic manure: 20g matter kg⁻¹ soil. Incubation conditions: 25°C for 90 days and 60% of WHC. B) Field experiment: Site: Yamagata University farm. Crop: Green soybean (*c.v. Dadacha-mame*). Treatments: same as incubation and chemical fertilizer (CF) was added in 2005. In 2006, 6 treatments were same as those in 2005 and CMh (high dose of chemical fertilizer application) and SSCh (high dose of manure application) were added. Application rate of organic manure and fertilizer: 10 Mg matter ha⁻¹ and 20kg N ha⁻¹ as ammonium sulfate. Measurement: Amount of KEON (extracted with 2M KCl), PEON (extracted with 0.07M H₃PO₄) in manures, N content in plant. **Results:** 1) The amount of N mineralized from organic manure was closely related to the amount of KEON and PEON in the manures. A large amount of available N was observed in the soils amended with OMM and PM due to large amounts of KEON and PEON. The rate of N immobilization was higher in CM amendment soil than in other treatment soils. 2) Application of PM or OMM in combination with chemical fertilizer to green soybean improved plant growth, yield and quality of green soybean. High N-use efficiency in PM and OMM application plot was recognized. 3) The amount of KEON or PEON in manure was closely related to N mineralization from manure, N uptake by plant and N-use efficiency.

The correlation coefficients between amounts of PEON, KEON in manure and N mineralized from manure, N uptake by plant, and N -use efficiency was observed (Table).

	N mineralized from manure	N uptake by plant	N -use efficiency
KEON	0.96**	0.65** (2005)	0.98** (2005)
PEON	0.99**	0.88** (2006)	0.77** (2006)
		0.72** (2005)	0.84** (2005)
		0.88** (2006)	0.67** (2006)