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M. C. Kim
Cheju National University, South Korea

K. J. Hwang
Cheju National University, South Korea

S. T. Song
Cheju National University, South Korea

C. H. Hyun
Cheju National University, South Korea

T. H. Kang
Cheju National University, South Korea

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The effects of fermentation and split application of liquid swine manure on dry matter yield of Italian ryegrass and subsequent soil quality

M.C. Kim, K.J. Hwang, S.T. Song, C.H. Hyun, T.H. Kang

Cheju National University Jeju, 690-756, Korea, E-mail: kimmch@cheju.ac.kr; Jeju Special Self-Governing; National Institute of Subtropical Agriculture, Institute of Health & Environment, Jeju Special Self-Governing.

Key words : dry matter yield, soil quality, Italian ryegrass

Introduction Liquid swine manure is a low-price organic fertilizer. According to Song et al. (2006), the application of unfermented liquid swine manure (ULSM; high DM %) to winter crop increased dry matter yield more than that of fermented liquid swine manure (FLSM; low DM %), although there was no difference in soil quality between two DM concentrations. One time application of too much animal manure resulted in unbalanced soil base, salt contamination, and soil nutrient loss (Bracker, 1982). Studies were carried out to evaluate the effect of fermentation and split application of liquid swine manure fertilizer on the dry matter yield of Italian ryegrass and subsequent soil quality.

Material and methods Experiments were conducted in a forage crop field in Jeju Livestock Institute for Promotion, from November 2005 to May 2006, using split plot design. The main-plots consisted of two kinds of liquid swine manure fertilizer such as the unfermented LSM and the fermented LSM, while the sub-plots were composed of two times fertilizer application such as 100% basal fertilizer (BF) and the 50% BF and 50% top dressing (SA).

Table 1 Dry matter yield and crude protein content as affected by application of liquid swine manure.

TRT	DMY kg/ha	Crude protein Content(%)
Fermented		
BF*	2.538	10.1
SA**	2.583	10.4
Mean	2.561	10.3
Unfermented		
BF	9.662	9.6
SA	7.914	10.6
Mean	8.788	10.1
Main	0.010	0.770
Sub.	0.263	0.292
M×S	0.242	0.628

BF* : basal fertilizer SA** : split application

Table 2 Soil characteristics as affected by application of liquid swine manure in the pasture plot.

TRT	OM %	TN	Ava. mg/kg	Exch. Cation (cmol/kg)	K	Ca	Mg	Na
Fermented								
BF*	5.6	136.9	0.80	57.3	0.79	2.62	1.41	0.23
SA**	5.5	134.2	0.75	44.3	0.82	2.58	1.39	0.19
Mean	5.6	135.6	0.78	50.8	0.81	2.60	1.40	0.21
Unfermented								
BF	5.6	134.2	0.76	36.9	0.71	2.51	1.20	0.20
SA	5.6	134.5	0.71	33.3	0.66	2.67	1.08	0.18
Mean	5.6	134.4	0.74	35.1	0.69	2.59	1.14	0.19
Main	0.838	0.075	0.004	0.254	0.266	0.680	0.096	0.103
Sub.	0.452	0.013	0.211	0.395	0.863	0.991	0.748	0.167
M×S	0.181	0.007	0.982	0.627	0.630	0.881	0.827	0.502

Results and discussion Italian ryegrass showed a significantly higher DM yield (70%) with the application of ULSM (Table 1) than with FLSH application (1.8 DM %) ($p < 0.01$). A similar result was obtained by Song et al. (2006). It is likely due to higher total nitrogen and total phosphorus contents of ULSM than in FLSH. The total N content of the soil in the field treated with FLSM (Table 2) was significantly higher than that with ULSM treatment ($p < 0.01$). The split application of LSM significantly increased the soil OM contents, higher than with 100% BF application ($p < 0.05$).

Conclusions The application of unfermented swine liquid manure with a high DM content resulted in significant increases in Italian ryegrass DM yield, but the total N content of soil was lowered in the field applied with unfermented swine liquid manure than in the field applied with fermented swine liquid manure with a low DM content. The split application of liquid swine manure increased the soil OM contents, higher than with 100% basal fertilizer application.

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