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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

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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 .	Exch .Cation(cmol/kg)			
		—% —		mg/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 .8DM %) ($p<0.01$) . 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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