

**THE EFFECT OF FERMENTED SAW-DUST PIG MANURE ON FORAGE  
MINERAL CONTENTS AND SOIL FERTILITY IN CHEJU VOLCANIC ASH SOIL**

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**Abstract**

Studies were carried out to investigate the change of soil characteristics and pasture minerals as affected by fermented saw-dust pig manure(FSM) applied to mixed pasture of a brown volcanic ash soil during the period from October 1996 to October 1998. Pasture mixed with orchardgrass(*Dactylis glomerata* L.) and white clover(*Trifolium repens* L.) was treated with N 200kg/ha + P 300kg/ha +K 200kg/ha(T1), N 100kg/ha + 10 ton/ha FSM(T2), FSM 10 ton/ha(T3), 20ton/ha FSM(T4), 40ton/ha FSM(T5) or 80ton/ha FSM(T6). K and P contents of mixed pasture in the 3rd year after sowing increased significantly with increasing levels of FSM(P<0.01). P and Ca contents of pasture applied with FSM was higher than those of pasture applied with chemical fertilizer(P<0.05), while K was opposite. Soil pH, available phosphorus, exchangeable Ca and exchangeable Mg contents increased significantly with FSM application(P<0.05).

**Keywords:**Soil fertility, pasture minerals, fermented saw-dust pig manure, chemical fertilizer.

## **Introduction**

Most pastures on Cheju, South Korea consist of volcanic ash soil and have pH, 5.0-5.3, 7.8-19.0% organic contents, and 20-30 ppm available phosphorus contents(Lee and Lee, 1975). Chemical fertilizer application on this area reduces soil fertility and increases pasture maintenance costs. Pig manure produced by Cheju pig farmers causes environmental pollution, but can be used to improve soil fertility. Sommerfeldt and Chang(1987) reported that soil organic matter and total N content increased with the increasing rates of manure application. Crops growing on volcanic ash soil in New Zealand were observed to be deficient of phosphorus, potassium and boron, while animals being deficient of Cu, Se and Co (During, 1964).

The objective of this study was to investigate the change of soil characteristics and pasture mineral contents as affected by application of FSM on mixed pasture of Cheju volcanic ash soil.

## **Material and Methods**

The experiment was carried out from October 1996 to October 1998 on a brown volcanic ash soil, Cheju, South Korea. Pasture planted with a mixture of orchardgrass(*Dactylis glomerata* L.) and white clover(*Trifolium repens* L.) was applied with N 200kg/ha + P 300kg/ha + K 200kg/ha(T1); N 100kg/ha + 10ton /ha FSM(T2); 10 ton/ha FSM (T3); 20ton/ha FSM(T4); 40ton/ha FSM(T5); 80ton/ha FSM(T6). Mineral contents of mixed pasture(K, P, Ca, Mg, Na, Cu and Zn) and physical and chemical characteristics( pH, OM, available phosphorus, total N, and exchangeable K, Ca, Mg and Na) were determined in the last year 1998.

## Results and Discussion

K and P contents of mixed pasture (Table 1) in the 3rd year increased significantly with increase in application rate of FSM ( $P < 0.01$ ). Na contents of pasture was shown to be the highest in T3 ( $P < 0.01$ ). Ca and Mg contents of pasture tended to increase with increase in FSM level. To compare the effect of pig manure application with that of chemical fertilizer at the same N application level (T1, T2 and T4), P and Ca contents in pasture applied with FSM was higher than in that applied with chemical fertilizer ( $P < 0.05$ ), while K contents was opposite.

When investigated the change of pasture soil-characteristics as affected by FSM (Table 2), soil pH, available  $P_2O_5$ , exchangeable Ca and Mg contents increased significantly with the increase of FSM rate ( $P < 0.05$ ). At the same N 200kg/ha application (in comparison with T1, T2 and T4), total N contents in pasture soils applied with chemical fertilizer was higher than in those applied with FSM only ( $P < 0.01$ ). Exchangeable K and Na contents in soil applied with FSM were higher than those in the soil applied with chemical fertilizer ( $P < 0.05$ ).

In Cheju volcanic ash soil, P and Ca contents in mixed forages and soil fertility increased with FSM application compared with chemical fertilizer application.

## References

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**Table 1** - Mineral contents in mixed pasture as affected by FSM application in the 3rd year.

Treatment	K	P	Ca	Mg	Na	Cu	Zn
	-----Mg/g-----				-----ppm-----		
T1	26.94a	3.91cd	3.56b	2.54	4.17b	12.08	24.07
T2	20.79d	3.66d	4.67ab	2.28	5.33b	16.57	27.73
T3	22.09cd	4.14bcd	6.86a	2.67	8.90a	14.44	30.99
T4	23.27c	4.39abc	7.03a	2.81	5.04b	13.11	28.97
T5	24.20bc	5.04a	7.14a	2.88	5.61b	14.75	33.29
T6	26.32ab	4.65ab	3.27b	2.47	3.14b	13.99	31.31
<i>P</i>	0.001	0.013	0.023	0.606	0.009	0.632	0.517

\* a,b,c,d: Means not sharing the same superscript in the same column are different at P levels indicated.

**Table 2** - The physical and chemical properties of soil as affected by FSM application.

Treatment	pH	OM(%)	Av.P <sub>2</sub> O <sub>5</sub>	T-N (%)	Exchangeable cation(cmol/kg)			
					K	Ca	Mg	Na
T1	5.15c	15.57	7.80b	0.40 ab	0.24b	1.61b	0.69c	0.173b
T2	5.38bc	16.32	12.91b	0.43 a	0.31b	4.02b	1.52c	0.203b
T3	5.18c	14.75	8.28b	0.41 ab	0.21b	1.63b	0.68c	0.173b
T4	5.41bc	15.83	12.69b	0.29 c	0.44ab	4.02b	2.23bc	0.273a
T5	5.61ab	18.77	23.91b	0.30 c	0.27b	4.67b	3.64b	0.206b
T6	5.97a	16.48	62.90a	0.36 b	0.72a	9.41a	6.74a	0.231ab
<i>P</i>	0.013	0.170	0.000	0.001	0.048	0.007	0.000	0.043

\* a,b,c: Means not sharing the same superscript in the same column are different at P levels indicated.