Chapter 8

CHEMICAL COMPOSITION OF ORGANIC MATERIALS

INTRODUCTION

Knowledge of the chemical composition of organic materials is quite necessary in predicting or interpreting their decomposing patterns. Therefore, analysis of the proximate constituents of organic materials used in the main experiment were conducted.

MATERIALS AND METHODS

Rice straw, rice straw compost and green manure (Gliricidia sepium) were air dried and ground to pass through a 2 mm sieve. Same materials were used in the main experiment. Chemical components were determined by sequential extraction followed by weighing, using methods by Harper and Lynch (1981) who modified the method of Allen et al (1974). Crude fat, lignin, and soluble carbohydrate contents were checked further by the original method of Allen et al (1974).

RESULTS AND DISCUSSION

When chemical compositions of rice straw and green manure were compared, rice straw had higher hemicellulose and cellulose contents than green manure as shown in Table 15. Lignin contents of rice straw was less than that of green manure when they were corrected for protein and ash contents (Table 16). Green manure was higher in the contents of hot water solubles, soluble carbohydrates, ether extracts, 0.5% H_2SO_4

extracts, and protein than rice straw. Rice straw was lower in the content of 0.5% H_2SO_4 extracts, but higher in the content of 72% H_2SO_4 - 3% H_2SO_4 extracts. Higher biological decomposability of green manure than rice straw may be due to its large contents of water, ether, and dilute acid extractable components.

In cases of compost which contains large amount of ash and green manure which contains large amount of protein, the amounts of chemical components determined by the method of Harper and Lynch (1981) are larger than real value due to the contamination by ash and protein. However, in the case of rice straw, lignin contents by this method and by the original method (Allen et al., 1974) gave similar values, though the former was slightly larger than the latter.

From Tables 15 and 16, it is obvious that considerable part of ash in compost was solubilized by sequential extractions with water, acid, alkali and an oxidizing reagent. The contents of crude fat and soluble carbohydrates were very low in compost, but protein, lignin and cellulose were enriched when their amounts were converted to ash free basis.

LITERATURE CITED

Allen, S. E., H. M. Grimshaw, J. A. Parkinson, and C. Quarmby. 1974. Pages 239-254 in Chemical analysis of ecological materials. A Halsted Press Book, John Wiley and Sons, New York, 565p.

Harper, S. H. T. and J. M. Lynch. 1981. The chemical components and decomposition of wheat straw leaves, internodes and nodes. J. Sci. Food Agric. 32:1057-1062.

Table 15. Chemical components of organic materials by the method of Harper and Lynch (1981).

	Rice straw	Compost	Green manure
	----- % of oven dry weight ------		
Hot-water-soluble	7.8	11.7	21.3
Lignin	14.8	15.0	25.7
Hemicelluloses	36.8	42.5	29.8
Cellulose	37.4	5.0	22.3
Ash*	3.2	25.8	0.9
Protein (N% x 6.25)	3.5	10.6	20.0
Carbon	39.6	14.2	45.8
Total Ash	21.6	73.2	10.5

*Ash remained after sequential extractions.

Table 16. Chemical components of organic materials by the method of Allen et al. (1974).

	Rice straw	Compost	Green manure
	% of oven dry weight		
Ether-extracts (crude fat)	1.80	0.69	3.71
0.5% H_2SO_4-extracts	57.8	45.8	69.2
72% H_2SO_4-3% H_2SO_4 extracts	25.9	4.8	8.9
Lignin (corrected for protein) and ash)	8.1	8.7	14.3
protein contained in lignin fraction	0.82	1.50	3.84
ash contained in lignin fraction	5.54	38.5	0.02
Soluble carbohydrates	1.4	0.7	5.4