EVALUATION OF COMPOSTED FERTILIZERS BY MICROBIOLOGICAL METHODS OF ANALYSIS[1]

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In the course of fermentation composts undergo progressive changes during which they increase their microbial population, narrow the C/N ratio, lose inhibitory effects, and thus become nutritive and safe fertilizers. These changes are influenced by a whole complex of factors and cannot be determined by ocular examination. Therefore, an attempt was made to detect the degree of "ripeness" of composts by the determination of several microbiological characteristics. The rate of cellulose and protein decomposition was determined by the cord tension method (Richard, 1945), the consumption of carbohydrates on the basis of the C/N ratio (A.O.A.C., 1950), the population of aerobic organisms by the use of molecular membrane filters (Clark *et al.*, 1951), and the nature of compost-emitted volatile substances through the growth of excised root tips (Cholodny, 1951; Persidsky and Wilde, 1954).

The study was conducted with decay resistant sawdust which was subjected to drastic chemical treatments and inoculated with a highly effective cellulose-decomposing fungus, *Coprinus ephemerus* (Davey, 1953a; 1953b). The analyses were performed on composted material in four stages of decomposition: untreated sawdust, composted for two months; similar sawdust treated with anhydrous ammonia, potassium sulfate, and phosphoric acid, ten days after treatment; similar, chemically treated sawdust, inoculated with *Coprinus ephemerus,* 30 days after inoculation; and similar chemically treated sawdust, inoculated with *Coprinus ephemerus,* 90 days after inoculation. For sake of comparison, analyses included hardwood-hemlock leaf mold which is known to be a highly active and excellent fertilizer (Wilde, 1937). The microbiological population and effect of volatile substances on excised roots were also determined on microbiologically inactive moss peat.

The results of analyses given in Table 1 indicated that in the process of fermentation chemically treated sawdust loses its alkaline reaction and reduces its C/N ratio. Hand-in-hand, fermentation greatly stimulates both cellulolytic and proteolytic

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TABLE 1

CARBON-NITROGEN RATIO, AND MICROBIOLOGICAL CHARACTERISTICS OF SAWDUST COMPOST AT FOUR STAGES OF DECOMPOSITION AND OF HARDWOOD-HEMLOCK LEAF MOLD

NATURE OF ORGANIC MATERIAL	CARBON-NITROGEN RATIO	CELLULOLYTIC ACTIVITY	PROTEOLYTIC ACTIVITY	MICRO-POPULATION FILTER COUNTS IN THOUSANDS	EFFECT OF VOLATILE SUBSTANCES ON EXCISED ROOTS OF BLUE LUPINE
		Loss of cord's strength	Loss of cord's strength		
		pct.	pct.	cells per cc.	growth in mm.
Untreated sawdust, composted for two months; pH 5.4	384.1	36.02	28.92	200	1.29
Similar sawdust treated with anhydrous ammonia, potassium sulfate, and phosphoric acid; te days after treatment, pH 8.1	56.8	38.88	37.30	35	none
Similar chemically treated sawdust; 30 days after inoculation with *Coprinus ephemerus*, pH 7.4	39.2	45.41	39.89	1,050	2.78
Similar chemically treated sawdust; 90 days after noculation with *Coprinus ephemerus*, pH 6.1	18.7	55.51	43.51	1,450	4.00
ardwood-hemlock leaf mold; pH 5.6	26.8	35.92	38.65	800	7.00

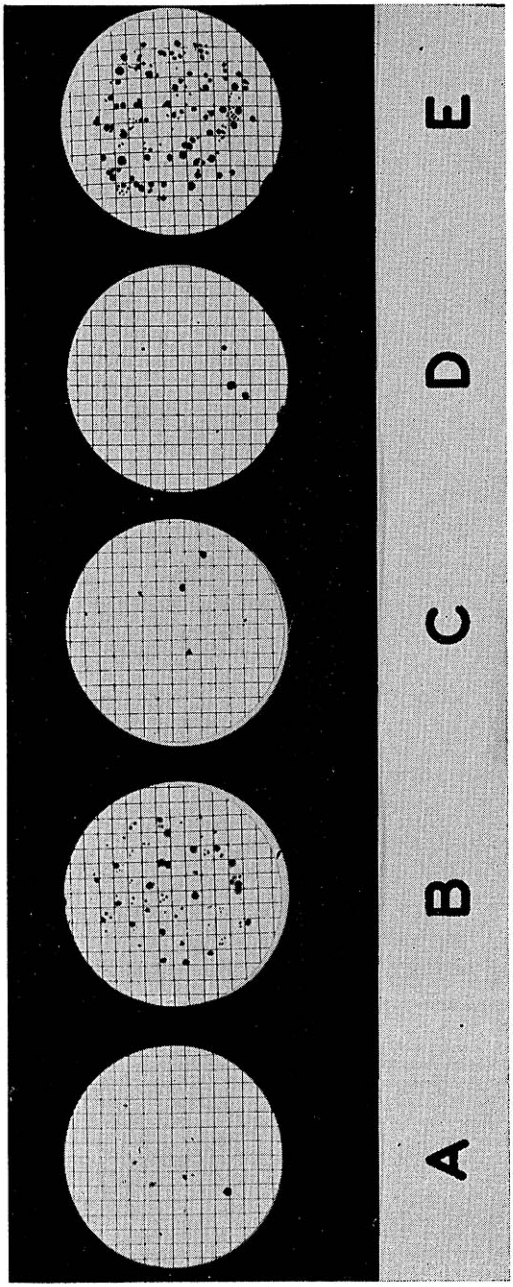

FIGURE 1. Number of colonies on molecular filter membranes obtained from 1 : 5,000 suspensions of different incubated organic materials: A—moss peat; B—hardwood-hemlock leaf mold; C—fresh hard maple sawdust; D—sawdust treated with anhydrous ammonia and phosphoric acid; E—chemically-treated sawdust decomposed by *Coprinus ephemerus*.

activity. It increases the population of aerobic organisms, and removes the inhibitory effects of toxic volatile substances. Judging from the results of analysis, fully fermented sawdust compost compares favorably with hardwood-hemlock leaf mold.

Figure 1 shows colonies developed on molecular filter membranes by 1:5,000 suspensions prepared from different sources. Figure 2 illustrates the growth of excised roots of blue lupine under the influence of volatile substances emitted by different organic materials.

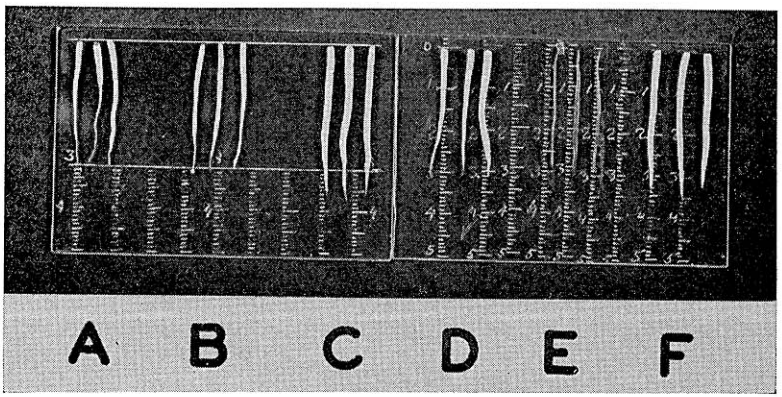

FIGURE 2. Effect of volatile substances emitted by different organic materials on excised roots of blue lupine: A—distilled water; B—moss peat; C—hardwood-hemlock leaf mold; D—fresh hard maple sawdust; E—sawdust treated with anhydrous ammonia and phosphoric acid; F—fermented sawdust.

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