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Effect of Addition of Sewage Sludge on the Distribution of Microbial Population During Decomposition of Waste Materials

The usefulness of sewage sludge especially in its ability to enhance the nitrogen enrichment of agricultural wastes has since been established. (Alpert, 1978). The wastes accumulating out of various agricultural operations, weed plants etc., when treated properly with adequate quantity of sewage could help not only in improving the rate of decompostion but also in permitting rapid and prolific development of various types of microorganisms. An attempt has been made in this laboratory to study the effect of addition of sewage and its impact on the various microbial population during different stages of decompostion of various types of organic waste materials.

The effect of addition of sewage sludge and its influence on the distribution of various microbial population during different stages of decomposition of organic waste materials are presented in Table 1. Ford and Eckenfelder (1967) have shown that organic loading of waste materials can lead to excess growth of microorganisms. The bacterial population varied not only with waste materials, but also in the materials treated with sewage. Similar trend was observed with respect of other microorganisms. Significant increse in the bacterial population may be attributed to optimum moisture, changes in pH and temperature The constituents of the added carbonaceous materials might have also favoured preferential stimulation of bacteria. (Forsyth and Webby, 1950. Guar *et al*, 1971 Dindal, 1978).

Considerable variations in the distribution of fungal population due to the addition of sewage sludge was observed. In control the population is less compared to the materials treated with sewage sludge. These variations may be attributed to changes in pH observed during various stages of decomposition The result obtained by Narasimha Rao and Rajagopalan (1978) lends support to this view. Maximum fungal population was found in sugarcane (18.0×10^4/g) followed by water hynacinth, (16.3×10^4/g) Parthenium (16.3×10^4g) and maize cob. ($12 3 \times 10^4$/g). The various fungi identified were *Aspergillus*; sp, *Penicillium* sp; *Fusarium* sp and *Rhizopus* sp. Similar organisms were noted by Patil (1978) and by Wani and Shinde (1976) during the sugarcane waste decomosition.

Significant increase in the actinomycetes population at various stages of decompsition were observed due to the addition of sewage sludge to the waste materials. The maximum actinomycete population was noted in the maize cob ($8 3 \times 10^8$/g). Factors like temperature, succession of various organisms and their activities etc. might have influenced the distribution of actinomycete population. Similar reports by severar authors, (Desai and Dhala, 1966. Gual *et al* 1971) lend support to this finding.

In general, the addition of sewage sludge did not favour an increase in *Azotobacter* population. In control, though they were found during the initial period (upto 15th day) did not survive later on. In treated waste materials. *Azotobacter* was found upto 60th day except parthenium. The declining trend may be due to lack of carbon source, as well as heavy competition of other microorganism for their survival. Supression of *Azotobacter* population by other organisms like bacteria, fungi and actinomycetes which occur in larger numbers might also be possible Enrichment of the ready to use compost with *Azotobacter* has been found to. of value not only in improving microbial activity, but also in enhancing the nitrogen status of the decomposed material (Singh *et al*, 1975).

It is well known that mineralizing action of microorganism is inseparably related to organic matter content of various materials (Alexander, 1961. The addition of sewage sludge favoured the decompostion of waste materials causing reduction in the carbon and enrich ing the nitrogen content. The sewage sludge behaved as a very good 'starter' material and has increased the rate of decomposition. It served not only as a nutrient, but also as a moistening agent This study provides evidence that sewage sludge if combined properly with various organic wastes might help in bringing about maximum activity of desired type of microorganisms which can bring about effective decompostion. This will not only help alleviating the pollution problems but also provide good manure for application to fields.

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TABLE 1: Addition of sewage sludge on the distribution of various microbial population during different stages of decomposition.
(Population expressed on oven dry basis)

Organic waste materials	Period of incubation in days	Bacteria ($\times 10^6$/g)		Fungi ($\times 10^4$/g)		Actinomycetes ($\times 10^3$/g)		Azotobacter ($\times 10^3$/g)	
		C*	TSS*	C	TSS	C	TSS	C	TSS
Maize cob	15	47.0	60.0	10.0	12.0	2.5	2.6	0.6	1.6
	30	56.3	65.3	12.0	15.0	3.3	3.3	0.6	0.6
	60	60.0	72.0	9.3	12.3	6.3	7.3	0.3	0.3
	90	68.0	80.0	7.0	12.0	8.0	8.3	...	...
Sugarane trash	15	48.0	58.0	8.0	10.3	3.3	4.3	1.0	1.6
	30	54.0	58.0	10.0	12.3	5.0	5.0	0.3	0.3
	60	60.0	68.0	12.0	13.0	6.0	6.6	—	0.3
	90	70.0	76.0	12.0	18.0	7.3	7.5	—	—
Water hyacinth	15	54.6	56.6	10.0	11.3	6.0	5.0	0.3	0.6
	30	56.0	62.2	12.3	13.0	6.0	5.3	—	0.3
	60	65.0	78.0	10.0	14.0	7.0	7.3	—	0.3
	90	72.0	84.0	8.4	16.3	8.0	8.0	—	0.3
Parthenium	15	49.0	56.0	4.3	11.3	3.6	3.8	0.6	0.6
	30	55.3	58.0	5.0	13.0	4.3	4.3	—	0.3
	60	63.0	68.0	3.0	14.0	5.3	5.6	—	—
	90	68.0	80.0	2.0	16.3	6.6	7.3	—	—

C*=Control TSS*...Treated with Sewage Sludge