Effective Decomposition of Tobacco *(Nicotiana Tabacum)* Waste Using Bacteria Earth Worm Combination

D.S. Peragasthenna, H.M.S.K. Herath, G. Chandrasena
Uva Wellassa university, Badulla, Sri Lanka

and

N.N.R. Abeysekara
Ceylon Tobacco Company, P.O. Box 62, Kandy, Sri Lanka

Introduction

Compost preparation is the promising tool for solve the waste accumulation of most industries. Synthetic fertilizer is the most crucial factor for the bad health infection of the human diet balance. Compost production is the best solution against for the synthetic fertilizer usage at commercial crop cultivation industries (Wijewardane. 2008). Production of compost under home garden level and commercial level has increased as attached by new rules and regulation. Certain productions have been adopted against the chemical or the synthetic fertilizer utilization and thus minimized the health hazard and environment pollution. It is also expected to cater the year round farmer requirement through usage of socially acceptable fertilizer. Commonly Sri Lankan farmers used to practices different traditional methods for the compost production. This research little deviated due to utilization of tobacco waste as agro industrial surrogate for compost production considering nutritional value. Therefore tobacco waste should not be burnt anymore without having a proper use due to its inherent conversion ability to compost (Akehurst. 1981). As an industrial waste, tobacco dust and stem are cheaper materials, which are produced from through the manufacturing process of cigarette blenders. Tobacco waste, which has a potential to use as an alternative growing medium or composting matrix, is readily available. Hence, this research was conducted to evaluate the decomposing performance of tobacco waste which could be used as a growing medium or composting matrix following heap method and vermi composting method.

Methodology

Five different composting types were considered as five treatments (1) treatment 1 (T1); Paddy straw; cow dung; *Gliricidia*; old compost with top soil; grass and dried leaves mixed in the ratio of 2:3:1.5:1.5:1:1,(2) treatment 2 (T2); tobacco dust; tobacco stems; cow dung; green leaves and paddy straw mixed in the ratio of 7:1.5:0.5:0.5:0.5, (3)treatment 3 (T3); tobacco waste; paddy straw; molasses; cow dung; top soil; grass; and rock phosphate mixed in the ratio of 5:3:0.5:0.5:0.4:0.4:0.2,(4)treatment 4 (T4); tobacco waste; green leaves; paddy straw; dried leaves; grass; and CaO mixed in the ratio of 6.5: 1: 1: 0.5: 0.5: 0.4: 0.1, and (5)treatment 5 (T5); tobacco waste; effective microorganisms; cow dung; and paddy straw in the ratio of 8.5: 0.5: 0.5: 0.5.

In second experiment different combination of composting arrangement were consider as four treatments including; treatment 1 (T1); Tobacco waste with *Eisenia fetida*, treatment 2 (T2); Tobacco waste with *Eisenia fetida* + *pseudomonas sp* (5 g), treatment 3 (T3); Tobacco waste with *Eisenia fetida* + *pseudomonas sp* (10 g), Tobacco waste with *Eisenia fetida* + pseudomonas *sp* (15 g). In third experiment which useful for the microbial breakdown of nicotine compounds in tobacco waste and isolated by microbes which are available in tobacco plant parts and five different parts were used for isolation. Such as leaf parts, stem parts, tips, waste and leachates.

During the composting, the pH and temperature at different locations of the heap was monitored every 2 days in the first week and every 7 days thereafter. The temperature of each heap was measured in the following locations: top of the heap, 130cm from the base of the pile; middle of the heap, 75 cm from the base of the heap; bottom of the pile, 30 cm from the base of the pile; surface of the heap, and 5 cm from the surface of the heap.

10 g of composite solid sample was extracted with de-ionized water, at a sample to water ratio 1:5 (volume/volume). After an equilibration time of 30 min, with occasional stirring, the pH was measured using a pH meter. The ratio was used for electrical conductivity determination. But the mixture was kept as an equilibration time of 1 hour, with electrical shaker. The EC was measured with an EC meter (Black. 1986).

The total nitrogen content of the 10 g of compost sample was determined using the regular Kjeldahl method. Kjeldahl nitrogen was quantified by mineralization within a strong acid medium, containing 98% sulfuric acid, followed by steam distillation and titrimetric determination of NH_4^+/NH3.

Amount of different base cations (Ca $^{+2}$, Mg $^{+2}$, Na+, K+) was quantified using an atomic absorption spectrophotometer. About 5 g of sieved compost was extracted with ammonium acetate solution, at a sample to ammonium acetate 1:20 (weight/volume). Having diluted using distilled water 1:100 (volume/volume), and above measurements were conducted following the standard procedure (Chapman. 1965).

The Moisture content of composting heaps was determined by the weight loss of 50 g compost samples, which were dried for 48 h at 105°C in an incubator (Chapman and pratt. 1961). Bulk density in the composting heaps was determined by the weight loss of core samples, which were dried for two hours in an oven (Blake and Hartge.1986).

Results and Discussion

In the first experiment, complete randomized block design (RCRD) was used as the experimental design with four replicates. The compost heaps were prepared at the same time and different composting of parameters in each treatment were evaluated with a predetermined time. The results reveal of that, out of the five different composting matrixes, the inherent nutritional value in T4 was better compared in the other four methods. As such, significantly higher ($P<0.5$) total nutritive value with good quality compost compared to other four media, Therefore, it was appear at that incorporation of CaO could be used to produce high quality compost with minimum time duration.

In the second experiment complete randomized design (CRD) was used as the experimental design with three replicates. The vermi composting units were prepared at the same time and different composting parameters in each treatment were evaluated with the applicable time period. The results of the second experiment (vermicomposting) revealed that, out of four different combination of vermi composting matrixes tested, the nutritional value in T4 shows greater performances by providing significantly higher total nutritious value with significantly good quality compost at 5% significance level compared to other four media. Therefore, an incorporation of 15 g of *pseudomonas sp* with *Eisenia fetida* could be used to produce high quality vermi compost with minimum time duration on behalf of other three treatments.

In the third experiment, Descriptive statistics were used with five different tobacco samples. Out of five samples, five different bacterial strains (100 series) and three different fungal strains (200 series) which are resistant to the nicotinic compounds available in tobacco plants, Un – washed leaf – UWUTBDS 100, washed leaf – UWUTBDS 101, stem – UWUTBDS 102, roots – UWUTBDS 103, leachate of leaves - UWUTBDS104, tobacco waste leachates - UWUTBDS 201, UWUTBDS 202, UWUTBDS 203

Conclusions

CaO incorporated heap method and vermi compost preparation were the best alternative solution for waste minimization within short period of time. Effective microorganism and molasses incorporated methods were next best alternative solution for preparing compost from the tobacco waste. Least effects from the CTC method for the preparation compost from the tobacco waste.

With regard to vermi compost preparation method, tobacco waste with *Eisenia fetida* + *Pseudomonas sp* (15 g) was the best combination for composting tobacco waste, followed by tobacco waste with *Eisenia fetida* + *pseudomonas sp* (10 g).

Finally composting of tobacco waste using above methods are suggested for minimizing environmental hazard excluded by tobacco.

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