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Small Scale Household Solid Waste Composting

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ABSTRACT

This study was conducted at the Western Philippines University, Aborlan, Palawan from December 2003 to February 2004, to identify the combination of household solid waste and the type of waste container that would promote faster decomposition process.

The containers used (wicker basket, rubber flowerpot, milk can) had no significant effect on decomposition of most waste combinations (paper alone, kitchen waste alone, paper + kitchen waste, paper + leaf litter, leaf litter + kitchen waste) except for leaf litter alone, and paper + kitchen waste + leaf litter combination, which were significantly lower in milk can container than in wicker basket and rubber flowerpot.

Among the waste mixtures, kitchen waste decomposed the fastest while paper was the slowest. When kitchen waste was added to other type of wastes, decomposition process significantly increased.

Key words: *household solid waste, composting, waste containers, decomposition*

INTRODUCTION

In Palawan, household composting is not a popular practice because most housewives do not have time for the said activity. Palasigue (1998) reported that majority of the housewives in Aborlan, Palawan, regardless of educational attainment and economic status burned their wastes because according to them it is the easiest and the most convenient way of disposing it. However, burning of wastes contributes to the destruction of ozone layer and the global warming.

Environmentalists are campaigning to reduce the generation of wastes, reuse things that are still useful and recycle those that are still valuable to keep things from entering into the waste stream. Composting is one way of recycling household wastes and should be promoted to protect the environment.

One important aspect in household composting that needs scientific investigation is the identification of the correct composition of solid wastes as well

as the appropriate containers that promote decomposition process. This paper attempted to answer such concerns.

METHODOLOGY

Preparation of Materials for Composting

Common household wastes *i.e.* kitchen wastes, leaf litter and newspapers were collected and chopped into small pieces. These were then placed in waste containers (wicker baskets, rubber flowerpots and milk cans) with 6 inches bottom diameter. Milk cans were perforated at the bottom to provide drainage.

Composting Process

Previously chopped wastes were thoroughly mixed following different ratios and placed in the prepared containers with 250 grams soil at the bottom. The different waste mixtures used as treatments were as follows:

T_1	750 g paper alone
T_2	750 g kitchen waste alone
T_3	750 g leaf litter alone
T_4	375 g paper + 375 g kitchen waste
T_5	375 g paper + 375 g leaf litter
T_6	375 g leaf litter + 375 g kitchen waste
T_7	250 g paper + 250 g kitchen waste + 250 g leaf litter

Each treatment was replicated 3 times and arranged in Completely Randomized Design (Plate 1). The set up was placed in area not disturbed by animals or affected by rain. Watering was done when needed using the same volume for each treatment.

Separation of Decomposed from Undecomposed Material

All experimental units were harvested after two months. Using a sieve with 2 mm opening, undecomposed materials were separated from the decomposed ones and weighed using a triple beam balance (Plate 2).

RESULTS AND DISCUSSION

Evidently, decomposition of leaf litter alone and paper + kitchen waste + leaf litter waste combinations was significantly lower in milk can container than in wicker basket and rubber flowerpot (Table 1). Slow decomposition of such wastes is implicated to the high water retention in milk can, rendering the wastes to be wetter than those in wicker basket and rubber flowerpot. The presence of high moisture content in a compost pile, according to Polprasert (1996), will more or less inactivate pathogen metabolism in the compost pile and too much water blocks the passage of air, which is needed by the decomposer. Finstein *et al.* (1990) stated that degradation of organic matter depends on the presence of oxygen because organic matter generally degrades rapidly and completely if oxygen is plentiful.

Surprisingly, all containers used had no significant effect on decomposition of the rest of the waste combinations, which means that other waste mixtures decomposed at the same rate regardless of the container used. The reason for this is uncertain. Literature on solid waste composting is limited and those available ones discussed general knowledge only. Clearly, there are information gaps in this area and researchers should do more studies to fill in the knowledge gaps.

Table 1. Average weight of undecomposed household waste mixtures placed in different containers.[1]

	Weight of Wastes (g)[2]						
container	paper alone	kitchen waste alone	leaf litter alone	paper + kitchen waste	paper + leaf litter	leaf litter + kitchen waste	paper + kitchen waste + leaf litter
wicker basket	$740.1^{a(e)}$	$29.2^{a(a)}$	$350.2^{b(c)}$	$344.4^{a(c)}$	$503.0^{a(d)}$	$129.8^{a(ab)}$	$210.0^{b(bc)}$
rubber flowerpot	$746.4^{a(e)}$	$32.9^{a(a)}$	$238.3^{b(bc)}$	$355.7^{a(cd)}$	$489.7^{a(d)}$	$173.4^{a(b)}$	$303.1^{b(bc)}$
milk can	$747.0^{a(d)}$	$28.3^{a(a)}$	$509.0^{a(c)}$	$372.9^{a(c)}$	$493.8^{a(c)}$	$182.8^{a(b)}$	$446.6^{a(c)}$

[1] Average of 3 replications in 2- month decomposition period

[2] Weight with the same letter superscripts outside and inside parenthesis, which are due to the influenced of containers and the waste mixtures, respectively, are not significantly different at 0.01 level

On the other hand, it was observed that kitchen waste alone decomposed the fastest, while paper alone was the slowest among all waste combinations. This is influenced by the carbon-nitrogen or C:N ratio. Splittstoeser (1990) pointed that kitchen garbage has C:N ratio of 30:1 while leaf litter has 70:1. Deficient supply of N will render the decay of organic materials to be delayed because N is needed to support the growth of decomposers (Brady and Weil 1999). In addition, waste with high C:N ratio decomposes slowly because the oxidation of carbon by decomposers inhibits nitrification (Nahuet and Schneider 1999). Moreover, a research on old landfills has shown that even materials formerly assumed to be

biodegradable e.g. newspaper, wood, and so on, are degraded very slowly if at all (Nebel and Wright 2000).

However, decomposition was hastened whenever kitchen waste was added to other types of wastes. When paper (known to degrade very slowly) was added with kitchen waste, its decomposition was significantly faster than when it was decomposed alone and statistically similar to other waste combinations known to have fast rate of decomposition. This is confirmed by the report of Brady and Weil (1999) which stated that high C:N ratio materials (brown leaves and papers) could be mixed with low C:N ratio materials for best results compost.

With all these findings, it is recommended that kitchen waste must be added to any biodegradable waste pile as it hastens decomposition. In addition, further studies must be conducted to validate the true influence of containers on solid waste decomposition. Lastly, identification of decomposers as well nutrient analysis of composted materials should be done before a large scale solid waste composting could be ventured.

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Plate 1. The different household wastes in different waste containers.

Plate 2. Separation of decomposed materials from undecomposed ones using soil sieve.