

Composting of *Calotropis gigantea* Leaves using Mix Dung of Buffalo, Cow, Goat and Sheep

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ABSTRACT

Under shed at Biogas Research and Extension Centre, Gujarat Vidyapith, Sadara, District-Gandhinagar, Gujarat, India, a composting pit was prepared by bricks and filled with mixture of 10 kg dung (2.5 kg each of cow, buffalo, sheep and goat) and 2 kg leaves of *Calotropis gigantea*. The mixture was well mixed at 15 days interval and samples were analysed for various physico-chemical properties at monthly interval of composting upto 90 days. Results show that compared to values of various physico-chemical parameters before composting the values of available phosphorus, available potassium and total nitrogen increased by 2.89, 2.18 and 3.15 times whereas content of pH, electrical conductivity, chloride, total organic carbon and ratio of C:N decreased by 1.12, 4.13, 2.68, 2.38 and 8.13 times after composting. The study highlights the conversion of leaves of *C. gigantea* into valuable compost.

Key words: Animal manure, Mixed cattle dung, Organic fertilizer.

INTRODUCTION

The population of buffalo, sheep, goat and cattle in 2012 in India is 105, 71.6, 140.5, and 199.1 Million¹. They produce a huge amount of dung per day which is a good fertilizer but it is not managed in a scientific manner. Use of raw dung as such or in the form of farm yard manure causes nutrients loss. The nutrient's content of this dung can be increased by composting. Composting is a process in which the microflora and macroflora of dung degrades the material used for composting and causes nutrients transformation by which nutrients are converted into plant available forms. When this compost is applied to soil as fertilizer then plants absorb easily the nutrients from it and hence nutrients loss can be saved. The micro- and macroflora of composting obtain their nutrients through degradation of composite materials of composting material. *Calotropis gigantea* is a shrub of Family- Apocynaceae and Order- Gentianales. Although the plant has many medicinal properties

and used to treat fever, cough, cold, diarrhea etc but its leaves and stem produce toxic milky juice due to which it remains unutilized. In India the plant is grown at almost each and every type of lands in its wild form and its leaves have no use due to toxicity.

Based on above facts we decided to utilize the leaves of *C. gigantea* for composting with mixed dung obtained from buffalo, cow, goat and sheep with the aim to obtain a good quality of compost.

MATERIALS AND METHODS

Compost preparation

Pits (2x2x2 feet) of bricks were prepared on cemented floor under shed at Biogas Research and Extension Centre, Gujarat Vidyapith, Sadara. Composting mixture comprises 10 kg mixed dung (2.5 kg dung each of buffalo, cow, goat and sheep) and 2 kg green leaves of *Calotropis gigantea*. The composting mixture was mixed well and then added into the pit. Sufficient amount of water was

sprinkled during mixing of composting mixture so that no portion of material should remain dry. Filling of material in pit was recorded as zero days. After every 15 days the composting material was mixed thoroughly. Watering was done in pit to make the composting material moist.

Analysis

At 30, 60 and 90 days composting mixture was mixed well and a composite sample was taken to laboratory for its chemical analysis to determine pH (by pH meter); electrical conductivity (by conductivity meter), calcium and magnesium (EDTA titration method²), chloride (Mohr's method²), total organic carbon³, total nitrogen⁴, available phosphorus⁵ and available potassium⁶.

RESULTS AND DISCUSSION

The results of present study showed that values of pH and electrical conductivity, decreased at 30, 60 and 90 days of composting whereas the

content of calcium and magnesium remains almost same (Table 1). Degradation of organic matter produces various types of acids which results into decreased value of pH. Reduction in pH of composting material is observed by a number of workers^{7,8}. Decreased value of EC is related with increased concentration of various form of nitrogen like nitrate and nitrite⁹. Presence of various salts like sodium, chloride, potassium, nitrate, sulphate and ammonia in compost are reported earlier^{10,11}.

With composting time the content of phosphorus and potassium increased and at the end of composting the phosphorus and potassium content increased by 189.66 and 118.18%, respectively compared to their values before composting (Table 1). Transformation of minerals during composting and vermicomposting is reported earlier also¹².

Total organic carbon is lost by 58.04% at maturity compared to before composting (Table 1). Carbon of composting material is lost by

Table 1: Changes in various Physico-chemical characteristics before and after composting

Characteristics	Values			
	Before composting	30 days of composting	60 days of composting	90 days of composting
pH	8.21	7.89	7.78	7.28
Electrical conductivity (mS/cm)	0.91	0.83	0.62	0.22
Ca ²⁺ (%)	0.027	0.024	0.028	0.028
Mg ²⁺ (%)	0.032	0.017	0.037	0.033
Cl ⁻ (%)	0.11	0.020	0.041	0.041
P ₂ O ₅ (kg/ha)	162.4	67.2	100.8	470.4
K ₂ O (kg/ha)	308.0	492.8	560.0	672.0
Total organic carbon (%)	17.97	16.8	14.3	7.54
Total Nitrogen (%)	0.9	0.98	1.12	2.84
C:N ratio	19.96	17.14	12.76	2.65

Table 2: Changes in C:N with composting time

Days of composting	C:N	Difference of C:N between compost and initial mixture	% decrease over initial content
0	21.56	—	—
30	17.14	4.42	20.50
60	12.76	8.80	40.82
90	2.65	18.91	87.70

mineralization^{13,14}. Microbial-oxidation of carbon produces carbon dioxide and mineralization occurs. The results showed that total nitrogen content increased during composting. Before composting its content was 0.9% which increased by 215.56% and reached to 2.84% at maturity of compost (Table 1). Higher loss of nitrogen through volatilization is reported at higher pH¹⁵ so these results support our findings and with decreased pH, losses of nitrogen decreased at maturity of compost. Increased nitrogen during microbial decomposition of wastes is also reported earlier⁹.

The outcome of increased nitrogen and decreased carbon content during composting is decreased C:N ratio at the end of composting than before (Table 1&2). Results are in tune with¹¹.

CONCLUSION

The present study concluded that leaves of *C. gigantea* can be converted successfully to nutrient enriched compost along with mixed dung from cow, buffalo, goat and sheep. During composting of *C. gigantea* leaves its pH becomes neutral and content of major nutrients (nitrogen, phosphorus and potassium) increased whereas organic carbon and C:N decreased.

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