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Mini Review

Use of Paper as an Alternative Fiber Source in the Composing Process

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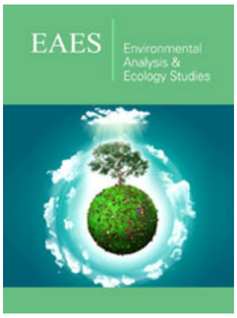
ISSN: 2578-0336



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Submission: October 9, 2020

Published: April 30, 2021

Volume 8 - Issue 3

How to cite this article: Tiago Soares Vitor, Verner Marinho Da Silva Neto, Mateus Costa de Aguiar, Walcones Miguel Abreu Magalhães, Daniel Rocha Pereira , Osman José de Aguiar Gerude Neto. Use of Paper as an Alternative Fiber Source in the Composing Process. Environ Anal Eco stud. 8(3). EAES. 000688. 2021.
DOI: 10.31031/EAES.2021.08.000688

Introduction

Composting is a practice of aerobic decomposition of organic matter, which in addition to reducing the use of inorganic fertilizers, also contributes to the maintenance of soil microbial flora. Composting is capable of being developed in numerous conditions, being done in systems above or below ground, and in closed containers [1]. Paper is rich in fibrous material and cellulose, so it has great potential to be characterized as a good substitute for traditional fibers in the composting process, as it has a low ratio (C/N), and in addition, it helps to retain water, maintaining the humidity in the process, which is essential for the reproduction of microorganisms responsible for the decomposition of the windrow material. Therefore, the objective of this work is to use paper as an alternative fibrous source in the substitution of conventional fibrous sources (leaves, grasses and pruning remains) in the composting process, for the production of a quality organic fertilizer.

Methodology

The present work was developed at the Environmental Practices Laboratory of the CEUMA University, at Campus Turu, São Luís - MA. The experiment lasted 50 days, outlined as follows: 6 treatments, divided into windrows of 1.5kg each, constituted respectively: 50% of organic material (remains of food and bovine feces) and 50% of fibrous material (leaf and grass)) (Table 1).

Table 1: Constitution of experimental treatments.

Treatment	Fibrous Material (50%)	Organic Material (50%)
T1 - CONTROL	750g leaf + grass	750g leftover food + bovine feces
T2 - 20% PAPER	150g paper + 600g sheet + grass	750g leftover food + bovine feces
T3 - 40% PAPER	300g paper + 450g leaf + grass	750g leftover food + bovine feces
T4 - 60% PAPER	450g paper + 300g leaf + grass	750g leftover food + bovine feces
T5 - 80% PAPER	600g paper + 150g sheet + grass	750g leftover food + bovine feces
T6 - 100% PAPER	750g paper	750g leftover food + bovine feces

Source: Authors (2019).

At the end of the experimental period, the samples were sieved bagged, and the chemical analyzes of the treatments were performed at the Soil Chemistry Laboratory - LABQLS of the State University of Maranhão - UEMA. To prepare the samples for analysis, they were identified with their respective treatments, being dried at room temperature for 24 hours. After this period, the material was passed through a 2mm sieve for uniformity and then subjected to chemical attack of the samples, made individually with specific rates for each parameter. The parameters analyzed were: pH; Organic Matter (MO); phosphorus (P); Potential acidity (H + Al); Potassium (K); Calcium (Ca) and Magnesium (Mg), all based on the Soil Analysis Methods Manual of the Brazilian Agricultural Research Corporation - EMBRAPA [2].

Result and Discussion

The chemical analyzes of the soil Table 1 show values that affirm the efficiency of the process, since the OM in all treatments (T-1 to T-6) had an average of 11%, which implies that the quality of the final compost was certified, taking into account standard values of maximum organic matter content in the soil, described in the literature, which is 6.0%. The levels of Phosphorus (P), all remained at an average of 613Mg/dm^3.

Where all treatments obtained high levels of this element, high levels of phosphorus help the soil and plants in their recovery in terms of fertility and vegetative growth [3]. The pH values maintained an average of 7.8%, proving the low acidity. For parameter K, the treatments had an average of 13.7mmol/dm^3 respectively, this demonstrates that the soil is characterized as saline, but due to its characteristics of pH values there will not be a large release of these salts for plants. This is combined with aluminum contents above 5.0mmol/dm^3, which indicates that it is not necessary to correct it with the presence of limestone. Ca ions were higher than those described in the literature, which is 7.0mmol/dm^3, whereas Mg showed an average of 42.8mmol/dm^3, confirming the characteristics in the T1 and T5 treatments in sandy loams, T2, T3 and T6 in silt franc, T4 as frank, from the analyzed soils. These results corroborate the organic matter indices and the high CTC presented in the fertilizers analyzed, as soils with high OM tend to have high Mg loads for the plants [4].

For the parameters of CA, H + Al and SB presented an average of 92.6mmol/dm^3, 8.1mmol/dm^3 and 149.2mmol/dm^3, which means that they are in high levels of hydrogen, with characteristics most basic. According to Coelho & França (1995) the more hydrogen ions are retained by the exchange complex of a soil in relation to the basic ions (Ca, Mg, K), the greater the acidity of the soil. Aluminum (Al) also contributes to soil acidity, but the discussion on soil acidity will be limited to H as the cause of soil acidity (Table 2).

Table 2: Result of the chemical parameters analyzed.

Treatments	M.O. g/dm^3	pH	P Mg/dm^3	K	Ca	Mg	S.B.	H+Al	CTC	V	K/CTC	Mg/CTC
				Mmol/dm^3						%		
T1	12	8,0	613	23,3	80	45	148,3	7	155,3	95	15,0	29,0
T2	10	7,9	613	18,5	79	50	147,5	8	155,5	95	11,9	32,2
T3	10	7,8	613	13,9	86	46	145,9	9	154,9	94	9,0	29,7
T4	12	7,7	613	10,2	95	44	149,2	8	157,2	95	6,5	28,0
T5	11	7,8	613	7,8	93	41	141,8	8	149,8	95	5,2	27,4
T6	11	7,6	613	8,6	123	31	162,6	9	171,6	95	5,0	18,1

Source: Authors (2019).

Conclusion

Paper as a fibrous source in the composting process brings positive results, as it establishes an alternative option for the disposal of this waste, in addition to producing a quality organic fertilizer. It provides the return of nutrients to the soil, being a possible alternative to improve the productive conditions in agricultural systems in general.

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