Soil attributes and vegetative performance of *Acosmium nitens* VOG.YAKOVLEV (Itaubarana) with organic compost

Atributos do solo e desempenho vegetativo de *Acosmium nitens* VOG.YAKOVLEV) (Itaubarana) com composto orgânico

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Manoel de Jesus de Souza Miranda
Professor Mestre em Ciências Florestais e Ambientais
Instituição: IFAM campus Manaus Zona Leste,
Endereço: Avenida Cosme Ferreira Nº 8.045, São José Operário, CEP: 69.083-000, Manaus/AM, Brasil
E-mail: manoel.souza@ifam.edu.br

Luís Gustavo Marcolan
Professor Especialista em Metodologia de Ensino de Ciências da Natureza
Instituição: IFAM Campus São Gabriel da Cachoeira
Endereço: Estrada BR 307, Km 03, Estrada do Aeroporto, - S/Nº. Cachoeirinha
CEP: 69.750-000, São Gabriel da Cachoeira/AM, Brasil
E-mail: luis.marcolan@ifam.edu.br

Kleber de Souza Miranda
Professor Especialista em Educação
Instituição: IFAM campus São Gabriel da Cachoeira, Estrada BR 307, Km 03, estrada do aeroporto, S/Nº
Endereço: Cachoeirinha, CEP: 69.750-000, São Gabriel da Cachoeira/AM, Brasil
E-mail: kleber.miranda@ifam.edu.br

Josiane Celerino de Carvalho
Mestre e Doutoranda no Programa de Pós-Graduação em Ciências de Florestas Tropicais
Instituição: Instituto Nacional de Pesquisas da Amazônia/ Laboratório de Fisiologia e Bioquímica Vegetal
Endereço: Avenida da Lua, Bairro Aleixo, CEP: 69011-970, campus III- V8, S/N, Manaus/AM, Brasil
E-mail: josiane.celerino@gmail.com

Elias Brasilino de Souza
Professor Mestre em Sociedade e Cultura na Amazônia
Instituição: IFAM campus São Gabriel da Cachoeira, Estrada BR 307, Km 03, estrada do aeroporto, - S/Nº
Endereço: Cachoeirinha, CEP: 69.750-000, São Gabriel da Cachoeira/AM, Brasil
E-mail: sailebras@yahoo.com.br

Bruno Vinícius Castro Guimarães
Professor Doutor em Fitotecnia
Instituição: IFAM campus São Gabriel da Cachoeira, Estrada BR 307, Km 03, Estradado Aeroporto, S/Nº
Endereço: Cachoeirinha, CEP: 69.750-000, São Gabriel da Cachoeira/AM, Brasil.
E-mail: bvinicius20@yahoo.com.br

ABSTRACT
Organic compost (OC) is a product of the decomposition of solid waste that can be used to correct the active acidity of the soil and also as a source of nutrients for plants. Thus, we sought to understand the influences of OC on soil pH during the incubation period, as well as its effects on the growth and development of the *Acosmium nitens* seedlings. The treatments consisted of natural soil (control) and three different dosages of organic compost (10, 30 and 50%). The effect of OC on soil pH was evaluated using a mixed design of repeated measurements, consisting of four treatments, six repetitions and four measurements during the study period. At 148 days after transplantation, the growth and development of *Acosmium nitens* seedlings were arranged in an completely randomized design, with four treatments and six repetitions, with the variables: total dry mass, dry aerial mass, dry root matter, diameter of lap, plant height, ratio of height/ diameter of lap and Dickson quality index. The OC significantly affected the active acidity of the soil, and caused significant interactions in the treatments during the incubation period of the substrate. The growth and development of plants were significant in relation to the dosages of OC in the substrate. Therefore, the OC from urban organic solid waste improved the degree of fertility and corrected the active acidity of the soil. The nutritional sufficiency for *Acosmium nitens* seedlings was achieved in the combination of 30% OC and 70% soil.

Keywords: Amazonian Soils, Urban Solid Waste, Sustainable Technological Solutions.

RESUMO
O composto orgânico (CO) é um produto da decomposição dos resíduos sólidos que pode ser utilizado na correção da acidez ativa do solo e fonte de nutrientes para as plantas. Desta forma, buscou-se entender as influências do CO sobre o pH do solo durante o período de incubação, como também, seus efeitos no crescimento e desenvolvimento de mudas de Acosmium nitens. Os tratamentos foram constituídos de solo natural (testemunha) e três dosagens de compostagem orgânica (10, 30 e 50%). O efeito do CO sobre o pH do solo foi avaliado pelo delineamento misto de medidas repetidas, constituído de quatro tratamentos, seis repetições e quatro medidas no tempo. Aos 148 dias após o transplantio, o crescimento e desenvolvimento das mudas de Acosmium nitens foram avaliadas pelo delineamento inteiramente casualizado, com quatro tratamentos e seis repetições, com as variáveis: massa seca total, massa seca da parte aérea, matéria seca da raiz, diâmetro do colo, altura da planta, relação diâmetro do colo/altura e índice de qualidade de Dickson. O CO afetou significativamente na correção da acidez ativa do solo e causou interações significativas nos tratamentos durante o tempo de incubação do substrato. O crescimento e o desenvolvimento das plantas foram significativos às dosagens de CO no substrato. Portanto, o CO de resíduos sólidos orgânicos urbanos melhorou o grau da fertilidade e corrigiu a acidez ativa do solo. A suficiência nutricional para as mudas de Acosmium nitens foi alcançada na combinação de 30% de CO adicionado e 70% de solo.

Palavras-Chave: Solos Amazônicos, Resíduos Sólidos Urbanos, Soluções Tecnológicas Sustentáveis.

1 INTRODUCTION

Amazonian soils are naturally known for their high acidity, high exchangeable Al^{3+} content (Silva et al., 2008), low natural fertility and widespread deficiency of essential nutrients (Bonfim-Silva et al., 2013), which can be considered a limiting factor in the production and cultivation of plant species (Vieira e Weber, 2017). Given this deficiency, research points to the efficiency of the action of organic compost (OC) in fertilization and correction of soil acidity. As such, the use of organic compost has been gaining visibility in research, since it is a promising alternative for environmental management of urban solid waste (USW), and has been adopted by communities in many urban centers around the world (Oliveira et al., 2014).

Organic compost is one of the oldest environmental management practices for USW recycling (Orrico et al., 2007) and is considered a low-cost technique, since the production process is initiated by the biological action of the decomposers of organic material (Mickan et al., 2019). The availability of functional groups of organic acids in the soil solution neutralizes the exchangeable aluminum toxicity (Diehl et al., 2008) and, consequently, optimizes base saturation indices, improves cation exchange capacity (Oliveira et al., 2014) and interacts in the multiple rhizosphere-plant and soil biota mechanisms (Singh et al., 2020).

In recent years in Brazil, the concentration of inhabitants in urban areas has increased from 81.46% in 2010 (Brazil, 2011) to 84.72% in 2015 (Brazil, 2017) and, as a result, has led to the daily production of 214.868 tons of USW, with a national average of 1.035 kg/inhabitants/day, registered in 2017 (Abrelpe, 2018). Notwithstanding, the daily quantity of USW is also a growing problem on a global scale, since its management and final destination has become increasingly more complex due to the huge increase of USW in recent years (Silva et al., 2021). Much of this problem is a result of sales marketing, whose effects have caused changes in habits and values and promote the culture of consumerism in all social classes (Mccracken, 2007) and at all economic levels (Godecke et al., 2012).

The use of industrialized fertilizers and correctives is becoming increasingly present in large and small crop plantations, food production and forest plantations (Miranda e Machado, 2014). Nevertheless, studies show that 50% of USWs can be reused for OC production (Cestonaro e Barros, 2019, Menezes et al., 2019). According to the scenario presented, as well as the importance of the reuse of USW and its positive impacts on soil biology, it is important to study the use of renewable materials for substrate formulation, given the growing need for seedling production (Santos et al., 2013).

The species under study Acosmium nitens Vog.Yakovlev, popularly known as "Itaubarana", belongs to the Leguminosae family Caesalpinoideae, and is a little studied species of plant that is found in flooded tropical and sub-tropical areas (Souza e Souza, 2011). The main method of propagation of the species is sexual, that is, via seeds, both in its natural environment and in plantations, and it has a high germination rate (Varela et al., 2005). Native to the Neotropic realm, it is commonly found in Brazil in the states of Amazonas, Para, Roraima, Amapa and Mato Grosso, as well as in several countries in northern South America, such as Colombia, French Guiana, Guyana, Suriname and Venezuela (Marimon e Lima, 2001).

This species is recommended for the restoration of degraded areas and is also commonly used for civil construction (sleepers, pickets), shipbuilding, charcoal, and firewood (Souza e Souza, 2011). It also has potential for soil recovery since it has good nodulation and nitrogen fixation capacity. It is an important ingredient in organic compost and contributes to the increase in agricultural productivity and agricultural ecosystems.

Given the needs presented here in relation to USW and the few studies that describe the dynamics of OC, as well as the compost's influences on soil acidity correction and seedling growth, we researched the relevant literature for methods regarding how to monitor the effect of compost addition on soil pH during the incubation and growth period of A. nitens. Thus, our research aimed to evaluate the effect of different dosages of organic compost on the acidity of a Yellow Latosol and the growth of A. nitens seedlings in a controlled environment.

2 MATERIALS AND METHODS

The experiment was conducted under controlled conditions in the greenhouse at the Federal Institute of Education, Science and Technology of Amazonas, Campus São Gabriel da Cachoeira (IFAM - CSGC), in the period from June 2016 to May 2017. The experimental area is located in the extreme northwest of Brazil (00° 07' 48" S and 67° 05' 20" W) (Miranda et al., 2015). According to Köppen and Geiger the climate classification is Af (Silva et al., 2016), with precipitation, altitude and average annual temperature of 3,100 mm, 90 m and 25 ºC, respectively (Guimarães, et al., 2020).

The material used as a substrate was made up of a soil mixture and organic compost. The soil used in the composition of the substrate was obtained under the vegetation cover of a secondary forest of over 22 years of age that is located in the grounds of IFAM - CSGC. The soil was removed at a depth of 0 to 20 cm, which corresponds to the horizon Bw (surface), and is classified as yellow latosol of clayey texture.

After collection, the soil was ground, air-dried, and sieved through a 4.0 mm mesh. The samples of this material were submitted to chemical and granulometric analysis, according to the Embrapa protocol (Donagema et al., 2011).

Table 1 Chemical characteristics of the organic compost.

pH	C	OM	N	P	K	Ca	Mg	Al	H+Al
(H_2O)	g/kg			mg/dm^3		cmol$_c$/dm^3			
6.66	316.21	543.88	15.20	891	1020	8.26	3.64		2.49

SB	t	T	V	m	Fe	Zn	Mn	Cu
cmol$_c$/dm^3			%		mg/dm^3			
15.29	15.29	17.78	85.99	-	56	37.4	45.08	0.67

pH – hydrogen potential in water in the ratio 1: 2.5, p – phosphorus, K – potassium, Ca – calcium, Mg – magnesium, Al – aluminum, H – hydrogen, SB – sum of exchangeable bases, t cationic exchange capacity (CEC), (CECe) – effective cationic exchange capacity, T – cationic exchange capacity (CTC) at pH 7.0, V – base saturation index, m – aluminum saturation index, OM – organic matter = C – organic carbon, N – nitrogen.

The organic compost used in the substrate was produced with organic waste from the production units (PUs) at IFAM - CSGC, as proposed by the Solid Waste Management Plan (SWMP) at IFAM - CSGC (Miranda e Machado, 2014). According to the indicators for OC production (Nozhevnikova et al., 2019), the main sources of carbon were wood sawdust, grass, branches from tree and bush pruning, and fallen leaves. The sources of nitrogen (N) were bird manure (in the form of bedding from aviaries) and sheep manure (*in natura*) (Miranda e Machado, 2014). With the combination of these groups, aerobic conditions were maintained during the decomposition of organic material (Matos et al., 2012), which reached its maturity point at 132 days. After this period, OC samples were collected for analysis of the chemical composition, acidity and fertility (Table 1), following the Embrapa protocol (Donagema et al., 2011).

Evaluation of the effect of organic compost on substrate acidity

The effect of the organic compost on the pH of the substrate was evaluated during the incubation period, under controlled conditions. The experimental design used was the two-way mixed repeated measurement model (MRMM) (Field, 2009), consisting of four treatments, six repetitions and four repeated measurements over the incubation time. The treatments were: control (natural soil) (T1), and soil mixtures with OC in the following proportions: (T2) 90% soil + 10% OC, (T3): 70% soil + 30% OC and (T4) 50% soil + 50% OC.

Substrate incubation monitoring occurred for eight weeks, with a measurement interval of 14 days, according to the methodology of Silva et al. (2008) with modifications, and the collection of 60 g of substrate in the periods of 14, 28, 42, and 56 days, using the procedures for repeated measurements in time (Gomes at al., et al., 2018). Throughout the incubation period, substrate moisture levels were maintained at ~80% of field capacity (FC). The acidity levels were determined using the pH method in the water, and in the soil a solution ratio of 1:2.5 (Donagema et al., 2011).

The results for substrate acidity were submitted to ANOVA (Two-Way) of mixed models of repeated measurements and a Bonferroni test to an accuracy of up to 5% probability, using the SPSS statistical programs (Field, 2009) and the R software R 3.6.0 (R Core Team, 2019).

Evaluation of the effect of organic compost on *A. nitens* seedlings

The effects of the compost on the development and growth of *A. nitens* seedlings were evaluated using a completely randomized design (CRD), containing four treatments and six repetitions, totaling 24 experimental units (pots), with one plant per pot.

After the substrate's incubation period, the experimental units were packed in plastic pots with a capacity of 6 liters and placed in a greenhouse.

All substrates corresponding to their respective treatments were air dried, ground, screened with 4.0 mm mesh and chemically analyzed, according to the Embrapa protocol (Donagema et al., 2011), for the purpose of evaluating the fertility and acidity of the substrate (Table 2).

Table 2 The chemical characteristics of the substrates under the effect of the organic compost after the incubation period.

TREATMENTS	pH (H_2O)	C (g.kg^{-1})	OM (g.kg^{-1})	P (mg.dm^{-3})	K (mg.dm^{-3})	Ca (cmol$_c$.dm^{-3})	Mg (cmol$_c$.dm^{-3})	Al (cmol$_c$.dm^{-3})	H+Al (cmol$_c$.dm^{-3})
T1: Control	3.99	28.11	48.35	2	32	0.24	0.13	1.05	6.65
T2: 90% S+10% OC	5.10	35.93	61.80	29	62	4.16	1.16	0.09	8.46
T3: 70% S+30% OC	6.12	54.94	94.50	208	132	8.84	2.94	0.0	5.43
T4: 50% S+50% OC	6.24	74.09	108.91	403	184	10.68	3.98	0.0	2.99

TREATMENTS	EB	t	T	V	m	Fe	Zn	Mn	Cu
	cmol$_c$.dm^{-3}			%		mg.dm^{-3}			

T1: Control	0.40	1.45	7.05	5.66	72	832	0.92	1.71	0.17
T2:90% S+10% OC	5.55	5.64	14.01	39.59	1.60	460	4.79	7.22	0.32
T3: 70% S+ 30% OC	12.31	12.31	17.74	69.40	0.0	206	15.28	19.74	0.49
T4: 50% S+50% OC	14.65	14.65	17.63	83.06	0.0	146	27.00	28.90	0.58

pH – hydrogen potential in water at 1: 2.5 ratio, P – phosphor, K – potassium, Ca – calcium, Mg – Magnesium, Al – aluminum, H – hydrogen, EB – total exchangeable bases, t - cation exchange capacity, (CEC) – effective cation exchange capacity (CECe), T – cation exchange capacity (CEC) at pH 7.0, V – base saturation index, m – aluminum saturation index, OM – organic matter, C – organic carbon, OC- organic compost and S- Soil.

Acosmiun nitens seeds were obtained from the Center for Native Seeds of the Amazon (CSNAM) at the Federal University of Amazonas (UFAM). The seeds were subjected to a soaking process for 24 h at room temperature, sown in sand that was washed with 0.01% sodium hypochlorite solution and packaged in 250 ml disposable cups. Germination began at 7 days and, after 37 days of development, the seedlings, with an average 13 cm in height, were transplanted into the pots with their respective treatments (Table 2). During the evaluation of plant growth and development, the moisture of the substrates was maintained at 60% of the total pore volume, through daily irrigation.

At 148 days after transplantation, the biometric variables of height (H) and diameter of lap (DL) of the plants were measured. Then, the seedlings were sectioned between the aerial and root part and conditioned in paper bags. The plant material was dried in a greenhouse at 70 ºC and with forced air circulation, until constant mass was obtained.

The morphological parameters of the seedlings were evaluated in relation to total dry matter (TDM), dry matter of the aerial part (DAM), dry matter of the root (DRM), height (H), diameter of lap (DL), ratio of height/diameter of lap (H/CD) and Dickson quality index (DQI) (Cardoso 2016). The results were submitted to ANOVA (One-Way) and a Tukey test, adjusted to an accuracy of up to 5% probability, using the Agricolae package (Mendiburu, 2020) in the statistical program R 3.6.0 (R Core Team, 2019).

3 RESULTS

Effect of organic compost on the pH of the substrate

The organic compost exerted influences on the correction of active acidity, with significant effect on the incubation time of the substrate ($p<0.001$), whose best pH neutralization results occurred in measurement times 1 and 3 ($p< 0.001$) and the lowest effects were recorded in times 2 and 4 ($p>0.05$) (Table 3).

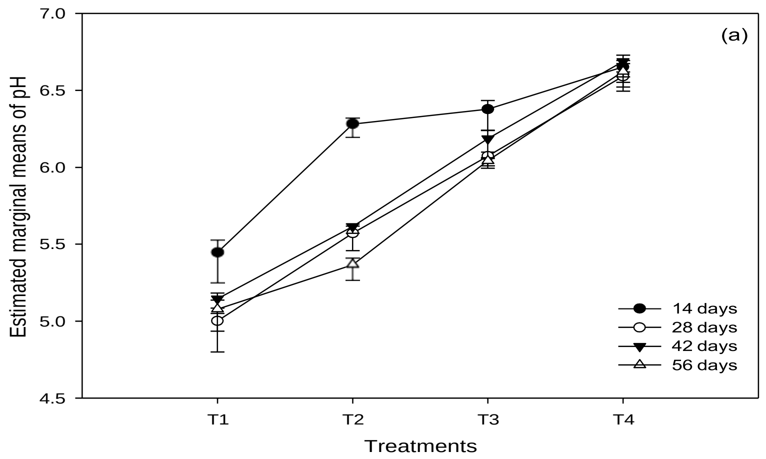
Table 3 Effect of organic compost on active acidity in the substrate incubation period.

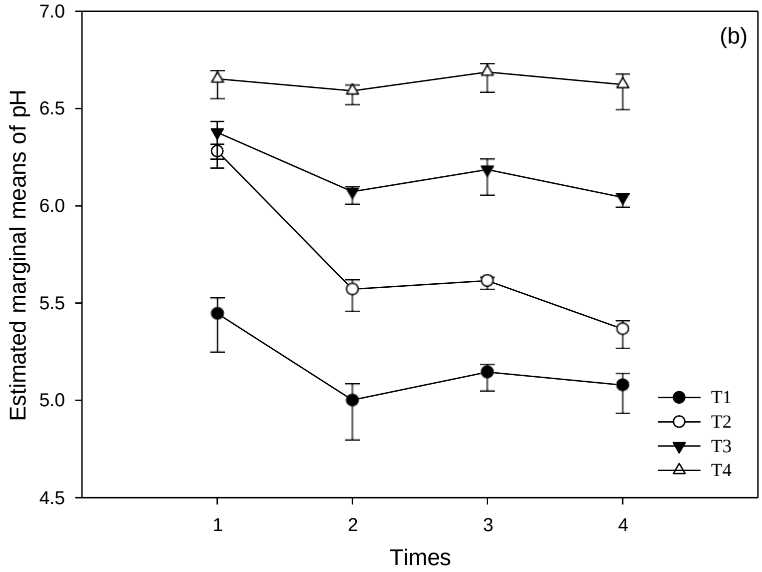
Times (I)	(J)	Mean Difference (I-J)	Standard Error	*p*-value	95% Confidence Interval[a] Lower Bound	Upper Bound
1	2	0.380**	0.043	0.000	0.255	0.506
	3	0.281**	0.037	0.000	0.172	0.391
	4	0.412**	0.039	0.000	0.299	0.525
2	1	-0.380**	0.043	0.000	-0.506	-0.255
	3	-0.099*	0.028	0.013	-0.182	-0.016
	4	0.032	0.035	1.000	-0.072	0.135
3	1	-0.281**	0.037	0.000	-0.391	-0.172
	2	0.099*	0.028	0.013	0.016	0.182
	4	0.131*	0.028	0.001	0.049	0.212
4	1	-0.412**	0.039	0.000	-0.525	-0.299
	2	-0.032	0.035	1.000	-0.135	0.072
	3	-0.131**	0.028	0.001	-0.212	-0.049

Based on estimated marginal means. The mean difference is significant at the 5% (*) and 1% (**) level. (a) Adjustment for multiple comparisons: Bonferroni. I, J: peer comparison. Times: (1) 14 days, (2) 28 days, (3) 42 days and (4) 56 days.

Among the treatments, there was also a statistical difference ($p<0.001$) in the effect of the OC on the pH elevation of the substrate, as well as a significant interaction ($p<0.001$) in the incubation time with the treatments (Figure 1). It was also found that the amount of organic matter (OM) provided by the OC in the treatments (Table 3) resulted proportionally in the highest neutralization values of the active acidity of the substrate. The T4 treatment showed better results, for which values were characterized by the higher and more stable pH neutralization effect (above 6.5) during the entire incubation period of the substrate (Figure 1 a.b).

Figure 1 Longitudinal profile of the effects of the organic compost on the correction of the active acidity of the substrate during the incubation period. (a) Effect of the treatments on the elevation of substrate pH and (b) interactions of the treatments during the period.





Legend: (1) 14 days, (2) 28 days, (3) 42 days and (4) 56 days.
T1: Control, T2: 90% of soil + 10% organic compost, T3: 70% soil + 30% organic compost and T4: 50% soil + 50% organic compost.

On the other hand, it was observed in the T3 and T2 treatments that the reduction in the amount of OM directly affected the neutralizing power of the substrate pH. In addition, the control treatment (T1), containing a low OM index (Table 2), presented the same pH oscillation trends in the incubation time of the substrate, but tended to stabilize at the natural acidity values recorded in the yellow latosol used in the present study (Figure 1 a.b and Tables 1, 2 and 3).

Other attributes of the substrate were also influenced by the action of the organic compost, such as an increase in carbon levels from 28.11 to 74.09 g kg^{-1}, organic matter from 48.35 to 74.09 g kg^{-1}, sum of exchangeable bases from 0.40 to 14.65 $cmolc.dm^{-3}$, total cation exchange capacity from 7.05 to 17.63% $cmolc.dm^{-3}$ and effective cation exchange capacity from 1.45 to 14.65 $cmolc.dm^{-3}$ and the base saturation index from 5.65 to 83.06% (Table 2).

Therefore, with regard to nutritional aspects, the OC provided considerable amounts of macronutrients (P, K, Ca and Mg) and micronutrients (Fe, Zn, Mn and Cu) in the substrate, as well as promoting the availability of these nutrients to plants by neutralizing H^+ Al^{+3}, as their concentration increased in the substrate (Table 2).

Effect of organic compost on plant growth and development

In dry mass increments of the aerial part, root system, growth in neck diameter and height of the aerial part, the growth and development of *Acosmiun nitens* seedlings showed significant responses to OC dosages. Thus, when compared, such responses had significant results via ANOVA ($p<0.001$), between treatments, in the TDM ($p<0.001$), SDM ($p<0.001$), DRM ($p<0.001$), CD (<0.005), H ($p<0.001$), H/DP ($p<0.05$), and DQI ($p<0.001$). These differences were then classified by Tukey's test at a 95% confidence level (Table 4).

Table 4. Average production of total dry matter (TDM), shoot dry matter (SDM), dry root matter (DRM), diameter of lap (DL), height (H), relationship of height by diameter of lap (H/DL) and Dickson Quality Index (DQI) of *A. nitens* seedlings subjected to the effect of organic compost.

TREATMENTS	TDM	SDM	RDM	DL	H	H/DL	DQI
		(g)		(mm)	(cm)	-	
T1: Control	2.077c	1.535b	0.542c	3.533b	23.95 c	6.926 b	0.214 b
T2: 90% S+10% OC	3.930b	2.683a	1.246b	4.073ab	38.25 b	9.503 ab	0.338 ab
T3: 70% S+30% OC	4.978ab	3.086a	1.893a	4.778a	44.333ab	9.379 ab	0.462 a
T4: 50% S+50% OC	5.326a	3.359a	1.967a	4.937a	48.733a	10.268 a	0.466 a
C.V. (%)	16.53	24.89	14.49	14.82	13.47	22.36	22.18

Means followed by the same letter are equal to each other according to Tukey’s test at a 95% confidence level, CV % - coefficient of variation, OC - organic compost, S – soil

The seedlings that were evaluated according to total dry matter production (TDM) showed significant differences ($p<0.05$) among the treatments constituted by the different formulations of soil and organic compost (Table 3), with the highest values being associated with the treatments with the highest amount of OC, following the Tukey order ($p<0.05$): T4≥ T3≥ T2> T1 (Table 4).

In the aerial part (shoot dry matter - SDM), treatments containing OC (T2, T3 and T4), did not present statistical differences among the treatments containing OC ($p>0.05$), and only differed ($p>0.05$) from T1 (control). However, in dry root mass (DRM) development, among the treatments containing OC, only T2 showed statistical difference from the others ($p<0.05$).

The greatest heights (~48.7 to 38.2 cm) and diameters of lap (~ 4.9 to 4.07 mm) also had proportional responses to the highest amounts of OC contained in the treatments (Table 3). It was observed that in height growth (H) only T2 differed among the other treatments by the Tukey test ($p<0.05$) while, for the growth in diameter of lap (DL), the results showed that T4 and T3 differed statistically from T1 (Table 4).

In the evaluation of the quality of the seedlings of *A. nitens*, which were performed by analyzing the relationship of the variables for height of the aerial part and diameter of the lap (H/DL), variation of between 9.5 and 10.3 was observed in the substrates containing OC, and only T4 differed statistically ($p<0.05$) between the other treatments, T4 > T3, T3 = T2 and T2 > = T1. Whereas, using the Dickson quality index (DIQ), the quality of these seedlings, expressed in their indices (~from 0.47 to 0.34) masses proportional to the amounts of OC provided in the treatments (T3), according to the Tukey test. Only treatment 4 differed statistically from treatment 1 by the Tukey test at 5% probability (Table 4).

4 DISCUSSION

Effect of organic compost on pH of the substrate

The results showed that the organic compost (OC) acted as a corrective agent of the acidity, a source of organic matter (OM), a conditioner of chemical attributes and a source of nutrients in the substrate. These influences are directly related to the qualities and quantities of organic material incorporated into the soil (Silva e Mendonça, 2007), since these transformations of the chemical, physical and biological properties of the soil caused by OM are vital for the functioning of the terrestrial ecosystem (Reis e Rodella, 2002).

The pH variation in the evaluated times may be related to the chemical composition of the materials used in the production of OC. This is because the C/N ratio directly influences the rate of decomposition and mineralization of soil's OM (Reis e Rodella, 2002) and, consequently, contributes to the variation in and elevation of pH values (Kopittke et al., 2020). Just as with the increase in pH levels in the substrate (soil + organic compost), it is also related to the concentrations of carboxylic acids (with pH values less than 6.0), phenol groups and alcohols (with pH values less than 7.0) present in the organic compost (OC) that, at the end of the decomposition of organic matter (OM), electrons (OH^{-2}) are released by oxidation and consequently the neutralization of H^{+} and Al^{+3} occurs (Franchini et al., 1999).

The increase in the quality indices of the chemical attributes of the substrate and the availability of essential nutrients were proportional to the amounts of OC added in the treatments. Thus, the materials derived from plant residues and animal excrement, used in the production of OC for the present study, provided the same influences that the OM naturally exert on the physical, chemical and biological properties of the soil (Silva e Mendonça 2007), not only by the direct effects on the quality and quantity of the OM (Chivenge et al., 2011), but also by the products of the interactions among the numbers of components of the system (Grugiki et al., 2017).

In the natural environment, the decomposition of OM is still poorly understood, since several simultaneous chemical reactions are involved at different stages (Wickings et al., 2012). In addition, there are direct influences of environmental factors such as precipitation, temperature, humidity (Petraglia et al., 2019) and the biological action of decomposers (Yue et al., 2018). Furthermore, OM is composed of numerous biomolecules of varying degrees of resilience (Angst et al., 2018) and consists of lignin, lipids/aliphatic (Rumpel et al, 2004) and carbohydrates (Rumpel et al, 2010). Furthermore, organic material from the soil is composed of OM particles, grains of sand, silt, clay and mineral-bound fractions (Angst., 2017), and these have fundamental roles in OC stabilization (Li et al., 2018) in the carbon cycle (C) (Petraglia et al., 2019) and in all terrestrial ecosystems (Kopittke et al., 2020).

However, in other studies that evaluated the effects of different organic residues in the soil, the authors noted that they occur simultaneously in the neutralization of H^+ and $Al^{+\ 3}$ and the saturation of CEC by K, CA and Mg cations (Boechat et al., 2020, Yin et al., 2018). In the same manner, the availability of macro and micronutrients in the soil occurs gradually and synchronously to the stages of decomposition of OM in the system *(*Kopittke et al., 2020, Fehmberger et al., 2020, Silva e Mendonça, 2007).

Effect of organic compost on plant growth and development

The increases in dry mass of the roots, of the aerial part, in the diameter of lap and in the height of the *A. nitens* plants (Table 3) may be related to the increase of the pH and improvements in the degree of fertility of the soil due to the effects of the OC (Table 4). This is because the absorption of essential nutrients by plants is conditioned to the minimization of acidity and neutralization of aluminum in the soil (Silva e Mendonça, 2007), with greater availability of these elements in the pH range between 6.0 and 6.5 for most plant species (Franchini et al., 1999).

In addition to improving soil fertility, the effects of nutritional sufficiency for the production of *Acosmiun nitens* seedlings occurred between 30 and 50% OC in the composition of the substrate, although there were statistical differences in some variables that measure the growth and development of the species under study (Table 4). The proportion of 30% OC (T3) was more suitable for the formulation of the substrates compared to the greater optimization of the inputs. However, studies point out that organic residues naturally present imbalance in nutrient concentrations (Boechat et al., 2020), thus, the diversification of the sources of these residues for a balanced production of OC is paramount, and this should contain adequate amounts of nutrients for the production of seedlings of native species (Siles-Castellano et al., 2020, Marco et al., 2019).

However, in the literature it is reported that the quality of the substrate can vary according to the organic material previously present (Stewart-Wade, 2020) and, also, that its effect can be observed in the growth and development of plants (Damasceno et al., 2019). Boechat et al. (2020) evaluated different regional materials for use in the production of *Copaifera langsdorffii* Desf. seedlings, and found that carnauba residues and animal excrement (goat manure) were the most preferable. In the production of *Swieteniam acrophylla* King seedlings, Viera e Weber (2017) concluded that the highest performance occurred when the substrate consisted of 50% soil and 50% poultry manure, coming from poultry bedding.

Thus, studies show that the addition of organic compost in the formulation of substrates used for the production of forest seedlings exerts effects of fertilization and can be a corrective agent of soil acidity. However, the extent of these effects is still unknown during the incubation period of the substrate. In addition, it is also essential to understand the influence of organic compost on the growth of *Acosmiun nitens* seedlings, since there are still no studies in the literature regarding the potential of seedling production of this species.

On the other hand, in the Amazon, this supply chain of nutrients for plants is naturally supplied by the primary production of the forest (Urquhart, 2020), through the process of cycling and decomposition of this material in the layer of burlap and rhizosphere (Mickan et al., 2019, Yue, et al., 2018).

5 CONCLUSION

The use of organic compost from municipal solid waste increased fertility and corrected the soil active acidity. The biometric parameters indicated that the nutritional sufficiency to meet the demand of *Acosmiun nitens* seedlings occurred from the composition of 30% organic compost and 70% soil.

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