Preface

To cite this article: 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **372** 011001

Preface

The Faculty of Animal Science, Universitas Jenderal Soedirman, Purwokerto organized the Animal Science and Technology Conference Series (ANSTC 2019) on 6-8 August 2019 in Purwokerto, Central Java, Indonesia. The ANSTC 2019 aims to exchange knowledge and research finding among academicians, researchers, profesionals, policy makers, and postgraduate students.

The countries in the tropics have a variety of local animals playing an important role and being extensive industry prospects. The ANSTC 2019 seeks to raise the question on how to develop animal industries for sustainable rural and environmental development facing the era of Industry 4.0. The right perspective on challenges and opportunities have been discussed under the themes: 1) General animal production and husbandries (ruminants and non-ruminants), 2) Post-harvest handling and processing of meat, milk, eggs, wools, and by-products, 3) Emerging and prospective animals, 4) Animal biotechnology, 5) Animal health, diseases, and welfare/ethics, 6) Edu-tourism and ecotourism involving animals, 7) Feeds, feeding, and animal nutrition, 8) Animal physiology, reproduction, and breeding/genetics, 9) Halal aspects of animal products, 10) Environmental issues of animal farming, and 11) Other aspects related to animal science and technology.

ANSTC 2019 was attended by 125 participants, and a total of 83 papers were presented and discussed. The papers were authored by researchers from Australia, Timor Leste, Malaysia, The Philippines, Thailand, and Indonesia. All papers have been scrutinized by a panel of reviewers who provide critical comments and corrections, and thereafter contributed to the improvement of the quality of the papers. Based on the reviewer's reports, 72 papers were selected and eligible to be published in the proceeding and 11 papers were assigned for further submission to the Journal of Animal Production, the scientific journal accredited by DGHE of Indonesia (S2).

We sincerely express our gratitude to the international/national advisory committee, presenters, organizing committee members, session chairs, the Dean and all members of the Faculty of Animal Science Jenderal Soedirman University, student volunteers, participants, contributors and all the members ANSTC 2019. Last but not the least, we are thankful to IOP JPCS for producing the proceeding.

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2019
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The 1st Animal Science and Food Technology Conference (AnSTC) 2019 6–8 August 2019, Purwokerto, Indonesia

Accepted papers received: 11 October 2019
Published online: 07 November 2019

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Physiological Conditions of Decomposition Process and Quality of Compost Based on Beef Cattle Feces Enriched with *Azolla sp.*

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IOP Conference Series: Earth and Environmental Science, Volume 372, The 1st Animal Science and Food Technology Conference (AnSTC) 2019 6–8 August 2019, Purwokerto, Indonesia
Citation A Setyaningrum *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* 372 012038
DOI 10.1088/1755-1315/372/1/012038

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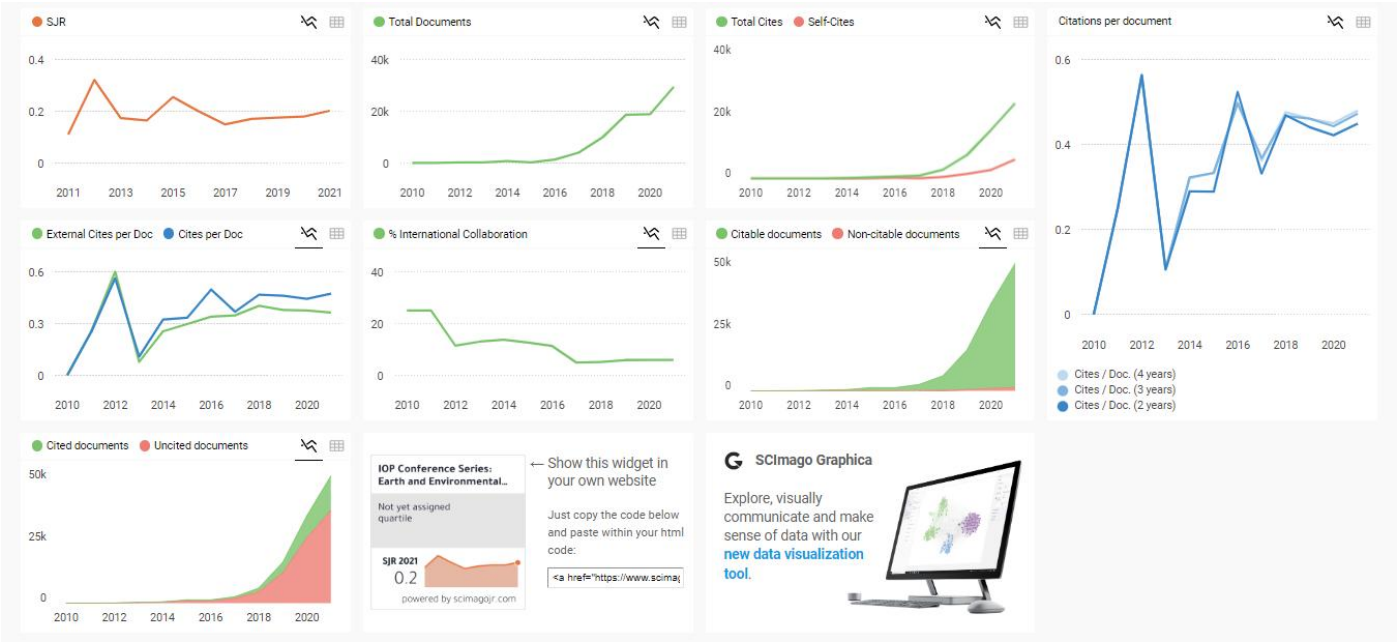

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IOP Conf. Series: Earth and Environmental Science **372** (2019) 012038 doi:10.1088/1755-1315/372/1/012038

Physiological Conditions of Decomposition Process and Quality of Compost Based on Beef Cattle Feces Enriched with *Azolla sp*.

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Abstract. The research was aimed to determine the effect of the addition of *Azolla sp*. on physiological conditions, the kinetics of temperature, and the quality of compost which includes carbon content, and compost organic matter. The method used was experimental with A Completely Randomized Design (CRD). There were three treatments that were the addition of *Azolla sp*. 0% (P0), 10% (P1), and 20% (P2). Each treatment was repeated 6 times, so that the number of experimental unit was 18 mounds of compost. Variables measured were temperature kinetics, levels of organic carbon and compost organic matter. Observations of temperature were carried out on days 0, 4, 8, 12, 16, 20, 24 and 28 at 01.30 – 02.30 pm. The carbon content and compost organic matter of the final compost product were analyzed in the laboratory. Data on the kinetics of temperature were analyzed using Repeated Measure Analysis of variance (RMA), while those of the levels of organic carbon and organic matter compost were analyzed using Analysis of variance (ANOVA). The results of the variance analysis showed a significant interaction ($P < 0.05$) between the treatment and the days of observation on the kinetics of temperature. The highest temperature kinetics observed for P2 and P1 were achieved on day 4 (54.00˚C and 50.50˚C, respectively), while the highest temperature for P0 was achieved on day 8 (50.33˚C). The temperature of P0, P1 and P2 ranged 27.17-50.33˚C; 28.17-50.50˚C and 30.00-54.00˚C, respectively. Least Significance Different (LSD) results showed significant variations in temperature kinetics. Enrichment of compost with *Azolla sp* had no significant effect ($P > 0.05$) on the levels of organic carbon and compost organic matter.

Keywords: physiological conditions, decomposition, feces, *azolla* sp, compost quality

1. Introduction

The development of livestock business definitely produces waste. The biggest waste from livestock business, especially feedlot is feces. Feces can be left as disruptive waste or processed into compost, a very useful to improve soil quality organically and permanently.

Compost or organic fertilizer has the disadvantage of being low in nutrients, especially macro nutrients. Fresh fecal material is inefficient as a single ingredient in composting because of its low carbon content.To meet the C / N ratio of compost raw materials, it is necessary to add a source of fiber as a carbon source. Therefore, it needs to fortify by the addition of carbon elements. In addition to being rich in N, using certain plants can be N fixation. Plant that could be utilized as N source, namely *Azolla sp*. It is hoped to improve the quality of decomposition conditions. Therefore, the current research is to investigate whether the addition of *Azolla sp.* could improve the physiological conditions, namely conditions during the decomposition process, the kinetics of temperature, and the quality of compost which includes carbon content, and organic matter of compost.

2. Methodology

Compost was made with following procedures: For treatment P0, to begin with 100 kg of feces was added other ingredients, namely; 10% (10 kg) of sawn wood dust, 10% (10 kg) of ash, 2% (2 kg) of dolomite and 0.25% (0.25 kg) of activator. For treatment P1, the ingredients was added 10% (10Kg) *azolla sp* and for treatment P2 the ingredients was added 20% (20 kg) *azolla sp*. All the ingredients were mixed until homogeneous for one unit of experiment. The homogenized materials were made up mounds with one meter high. The reversal of mounds was carried out on days 7, 14 and 21. Then, they were flatten with thickness of 10 cm and leaved until day 28. Samples were taken from each experimental unit for analysis of carbon content and compost organic matter.

The research method used was experimental using basic ingredients of beef cattle feces fortified with *Azolla sp* with different levels. The variables measured were conditions during the decomposition process, namely the kinetics, as well as the quality of compost, namely carbon and organic matter content. A completely Randomized Design (CRD) was applied [1]. There were three treatments with six replicates for each treatment, so that there were 18 experimental units. The treatments were consisted of P0 (control) without *Azolla sp*, P1 (P0 + 10% *Azolla sp*) and P2 (P0 + 20% *Azolla sp*.). Observations of temperature was carried out 8 times during the decomposition process, namely; on days 0, 4, 8, 12, 16, 20 24 and 28. Samples of compost for carbon and organic matter content were analyzed in the soil laboratory of the Faculty of Agriculture, General Soedirman University.

The kinetics of temperature was analyzed with the following linear model:

$$Y_{ijk} = \mu + \rho_{j(i)} + \alpha_i + \beta_k + \alpha\beta_{ik} + \varepsilon_{(ijk)}$$

Where μ is overall mean, α_i is effect of treatment, $\rho_{j(i)}$ is random effect from replication j on the treatment I, assumed normally distributed (0, $\sigma 2\rho$), β_k is effect of days of observation, $\alpha\beta_{ik}$ is effect of interaction treatment and days of observation and $\varepsilon_{(ijk)}$ is random error.

The linear models used to analyze carbon and organic matter content was:

$$Y_{ij} = \mu + \alpha_i + \varepsilon_{ij}$$

Where μ is overall mean, α_i is effect of treatment and ε_{ij} is random error

Data on temperature were analyzed using Repeated Measure Analysis of Variance (RMA) [2]. Data on carbon content and organic matter were analyzed using Analysis of Variance (ANOVA) [1]. When the results of data analysis showed significant effect then further analyzed by the Least Significance Different (LSD) test [2].

3. Result and Discussion

Temperature kinetics

Observations of temperature kinetics were carried out every four days, namely; in the decomposition phase (days 0 to 20) and post-decomposition phase (days 24 to day 28) at 13: 30-14: 30 PM. During the composting process, the temperature underwent varying changes (kinetics). The average temperature kinetics based on treatment and the days of observation in the decomposition phase ranged between 29.33-50.33ºC (P0); 30.50-50.50ºC (P1); and 31.83-54.00º C (P2), while during the post-decomposition phase temperature were relatively stable, namely; 27.17^0 C (P0); 28.17ºC (P1); and 30.0 ºC (P2). These results showed a higher maximum temperature compared to the results of a study by [3] stated that in the decomposition process changed in temperature ranging from 30-45ºC. According to Kusuma [3] the effective temperature needed by microorganisms to decompose rapidly was around 160ºF (71.11ºC).

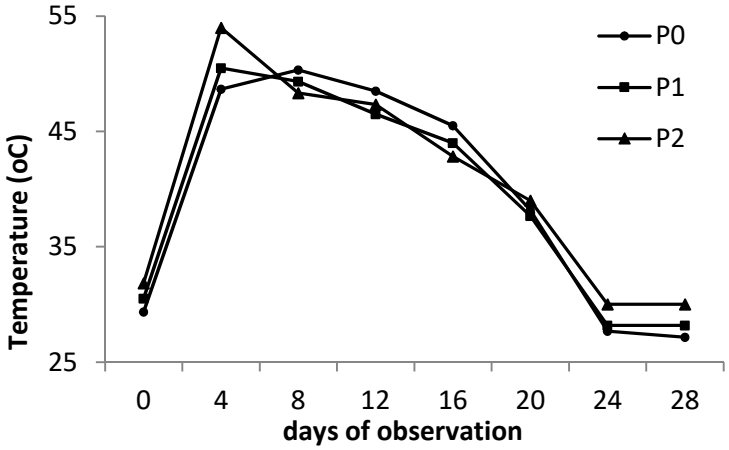

Figure 1. Temperature kinetics of each treatment in days of observation

Based on the temperature kinetics (**Figure 1**), the increase in temperature up to the highest temperature occurred from observations of days 0 to 4 for P1 (30.50ºC to 50.50ºC) and P2 (31.8ºC - 54.00ºC), whereas in P0 (29.33ºC to 50.33ºC) was reached slower on day 8. The drastic increased in temperature occurred at the beginning of decomposition due to the high activity of microorganisms to break down organic material easily decomposed to release CO_2 and heat. The peak temperature in P2 was achieved faster and higher compared to the other two treatments due to the addition of organic material derived from *Azolla sp* of 20%, especially its high crude fiber, thus increasing microorganism activity. According to Raras et al. [4] *Azolla microphylla* has a crude fiber content of 23.16%, while Noferdiman and Zubaidah [5] stated that *Azolla* crude fiber content was 19.52%, especially cellulose 14.08% and lignin 21.42%. Then, temperature decreased from the days 8 to20 in P1 and P2, while it decreased from days 12 to 20 in P0.

The decrease in temperature was caused by the reduced availability of decomposed organic matter and the release of heat into the environment. According to Kusuma [3] the occurrence of a steep

increase in temperature up to the maximum temperature was called the active phase. This condition would continue to occur until the concentration of easily decomposed organic matter has been exhausted due to the decomposition process. A decrease in temperature indicated that the decomposition process would be completed, then entering the post-decomposition phase or the ripening process that occurred on day 24 to day 28 indicated by the stable temperature and closed to room temperature. In accordance with Simamora and Salundik [6] stated that mature compost was characterized by the temperature of the compost that was near to room temperature (27-30^{o}C). Decreasing temperatures close to room temperature were caused by organic materials that have been decomposed by microorganisms and the release of heat into the environment. Based on the results of the Repeated Measures Analysis of Variance (RMA) on temperature kinetics, it was found that in a 8-days of observations there were very significant differences with P value <0.01 and there were very significant differences in the three treatments with P value <0.01, as well as very significant difference in the interaction between the days of observation and the treatments with value of P <0.01.

Leat Significant difference (LSD) according to the treatment in each of the days of observation (**Table 1**) showed that on days 0 to 4 there was no significant difference between P0 and P1 , but it was significantly different with P2. On days 8 to 12 showed no significant differences between P1 and P2. It was significantly different with P0. On day 16, there were significant differences in the three treatments. Observations of days 20 to 28, there were no significant differences between P0 and P1, but it was significantly different with P2.

Table 1. Least Significance Different (LSD*)* on temperature kinetics of the treatment in each day of observation

Treatment	Days of observation							
	0	4	8	12	16	20	24	28
P0	29.33 ^{a}	48.67 ^{a}	50.33 ^{b}	48.50 ^{b}	45.50 ^{c}	38.17 ^{a}	27.67 ^{a}	27.17 ^{a}
P1	30.50 ^{a}	50.50 ^{a}	49.33 ^{a}	46.50 ^{a}	44.00 ^{b}	37.67 ^{a}	28,17 ^{a}	28.17 ^{a}
P2	31.83 ^{b}	54.00 ^{b}	48.33 ^{a}	47.33 ^{a}	42.83 ^{a}	39.00 ^{b}	30.00 ^{b}	30.00 ^{b}

Mean values with different superscripts in the same column show significantly different (P <0.05)

Carbon content

Data on organic carbon content of compost were 20, 23 to 23.24% (P0); 22.11 to 24.32% (P1) and 20.59 to 30.98% (P2). The average results of organic carbon levels were 21.14%±1.43 (P0); 23.25% ± 1.04 (P1) and 24.05% ± 4.74 (P2). The results of the variance analysis indicated that the addition of *Azolla sp.* up to level of 20% had no significant effect on the levels of organic carbon of compost, although the source of the carbon in the raw material has been added to improve the C/N ratio of raw materials. This indicated that the decomposition process ran ideally. The organic carbon content produced was in accordance with the compost quality standards according to SNI: 19: -7030-2004 which was 9.80 - 32%. This organic carbon level was lower than the results of a study by Walidaini et al. [7] with the addition of urea to compost of 29.16%.

Compost Organic Material

Data on compost organic matter were 34.87 to 40.07% (P0); 38.12 to 41.93% (P1) and 35.51 to 53.41% (P2). The average yields of organic matter were 36.44%±2.46 (P0); 40.08%±1.80 (P1) and 41.46% ±8.16 (P2). The results of the variance analysis indicated that the addition of *Azolla sp.* up to level of 20% had no significant effect on the levels of organic matter, although the source of the carbon in the raw material has been added to improve the C/N ratio of raw materials. This indicated

that the decomposition process ran ideally. The level of organic matter was in accordance with compost quality standards according to SNI: 19: -7030-2004 [8], namely 27-58%.

4. Conclusion

Addition of *azzola sp* of 20% increases the temperature decomposition and speeds up the time to reach maximum temperature. Besides that compost is still in quality standards, therefore this research recommends adding *azzola sp* up to 20%.

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