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Preface

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Preface

The 4th Annual Applied Science and Engineering Conference (AASEC) 2019 is hosted by Technical and Vocational Education study program, School of Postgraduate Studies, Universitas Pendidikan Indonesia (UPI), UPI Publication Center, in collaboration Warmadewa University, Bali, Indonesia. The conference is also co-hosted by other twelve institutions as follows Universitas Islam Negeri Sunan Gunung Djati, Universitas Negeri Jakarta, Universitas Wijaya Kusuma Surabaya, Institut Pendidikan Indonesia, Sampoerna University, Sekolah Tinggi Teknologi Garut, Trisakti University, Politeknik Negeri Malang, Universitas Muhammadiyah Sidoardjo, Universitas Kanjuruhan Malang, Universitas Garut, and Universitas Komputer Indonesia.

This year's theme is "Integrating Innovations in Science and Engineering among Young Researchers" as a follow-up discussion topic from last year's theme "Ideas for Sustainable Energy". To bring up insightful knowledge, two keynote speakers were invited. The first speaker was Assoc. Prof. Abdulkareem Shafiq Mahdi Al-Obaidi, a lecturer at Taylor's University, Malaysia who has also been a member and chief of editorial board of several journals as Journal of Manufacturing and Industrial Engineering, International Journal of Computer Science and Communication Engineering, and Journal of Engineering Science and Technology (JESTEC). The other speaker was Prof. dr. Dewa Putu Widjana, DAP&E.Sp. Park., a professor of medicine who is currently the rector of Universitas Warmadewa, Bali, Indonesia, as well. In addition to keynote speakers, we have two invited speakers from Indonesia and abroad. The first invited speaker is Assoc. Prof. Asep Bayu Dani Nandiyanto, an expert of chemical engineering from Universitas Pendidikan Indonesia who is also an executive editor of Indonesian Journal of Science and Technology (IJOST), a Scopus-indexed journal published by Universitas Pendidikan Indonesia. The other invited speaker is Dr. Eng. Muhammad Aziz, an associate professor at the Department of Mechanical and Biofunctional Systems, Institute of Industrial Science, The University of Tokyo, Japan.

This year, the conference was divided into four sessions; plenary, parallel, roundtable, and oral presentation sessions. There are 875 papers published in the proceedings of the 4th AASEC 2019. The papers discuss several fields comprising mathematics, physics, computer science, material science, chemistry, mechanical engineering, chemical engineering, civil engineering, electrical engineering, electronics engineering, material engineering, environmental engineering, industry engineering, information engineering, computer and communication engineering, and architecture. All the published papers have been through a series of rigorous review process to meet the requirements and standards of international publication.

We would like to thank each co-host for the efforts to give significant contribution particularly on paper selection. We would also like to acknowledge vice rector on research, business, and partnership affairs of Universitas Pendidikan Indonesia for the endless support to the conference. Last but not least, we would like to express our most sincere gratitude to the international advisory board, scientific committee, steering committee, organizing committee, and everybody taking parts in the success of the conference. We hope to see you in the 5th AASEC 2020.

The Editors,

Dr. Ade Gafar Abdullah
Dr. Eng. Asep Bayu Dani Nandiyanto
Dr. Isma Widiaty
Ari Arifin Danuwijaya, M.Ed.
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CONFERENCE PHOTOGRAPH


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TABLE


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EXIT


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ABS-427
ABS-45
ABS-447
ABS-76
Adoption of Cloud Computing Types of Software as a Service

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Peer review statement

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Peer review statement

All papers published in this volume of *Journal of Physics: Conference Series* have been peer reviewed through processes administered by the proceedings Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.

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Aston Hotel Denpasar Bali, 24 April 2019
Website: http://aasec.conference.upi.edu/2019
Email: aasec@upi.edu

Date: 13 August 2020

Letter of Invitation

Dear Authors: Hortencio Domingos Dos Reis Amaral (a), Yohanes Parlindungan Situmeang (a*), Made Suarta (a)

We are pleased to inform you that your paper, entitled:

"The effects of compost and biochar on the growth and yield of red chili plants"

has been reviewed and accepted to be presented at AASEC 2019 conference to be held on 24 April 2019 in Bali, Indonesia.

We cordially invite you to attend our conference and present your research described in the paper.

Please make the payment for registration fee before the deadlines, visit our website for more information.

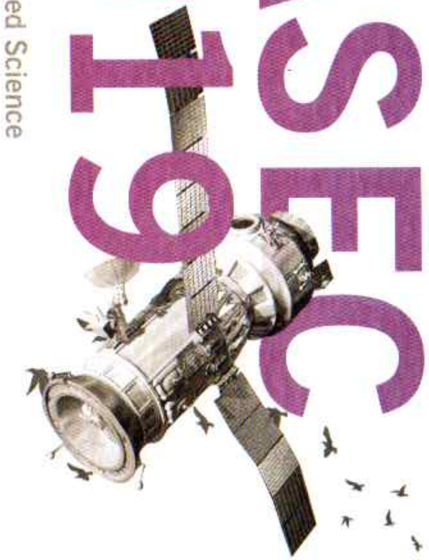
Thank You.

Best regards,

Dr. Ade Gafar Abdullah
AASEC 2019 Chairperson

AASEC 2019

The 4th Annual Applied Science and Engineering Conference
Bali, 24 April 2019



CERTIFICATE

This certificate is awarded to

Hortencio Domingos Dos Reis Amaral, Yohanes Parlindungan Situmeang and Made Suarta

as

Presenter

The effects of compost and biochar on the growth and yield of red chili plants

in the 4th **Annual Applied Science and Engineering Conference (AASEC) 2019**
"Integrating Innovations in Science and Engineering among Young Researchers"
Bali, Indonesia, April 24, 2019.

Prof. Dr. Didi Sukyadi, MA
Vice Rector for Research, Partnership, and Business
Universitas Pendidikan Indonesia

Prof. dr. I Dewa Putu Widjana, DAP&E.Sp. Park.
Rector of Universitas Warmadewa

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The effects of compost and biochar on the growth and yield of red chili plants

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The effects of compost and biochar on the growth and yield of red chili plants

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Abstract. This research was conducted to examine the effect of compost and biochar on the growth and yield of red chili plants. This research is a factorial experiment using Randomized Block Design (RBD), which consists of two factors: compost (0, 10, 20, and 30 tons ha^{-1}) and the type of biochar (bamboo and coconut shell). The interaction between compost and biochar did not have a significant effect on all variables observed in this study. The dosage of compost has a significant effect on fruit length, fresh fruit weight, and fresh weight of roots. The biochar treatment does not have a significant effect on the observed variables except for the number of fruits that have a significant effect. The treatment of various dosage levels did not show any significant difference, but the application of 30 tons ha^{-1} compost produced the highest fresh fruit weight of 185.35 g or increased by 20.94% when compared to the treatment without compost of 153.26 g. The treatment of this type of biochar only had a significant effect on the number of chili fruit, namely coconut shell biochar which gave the highest value of 17.17 chilies and was significantly different from bamboo-based biochar which produced 15.00 chilies.

1. Introduction

Chili plants are one of the fruit vegetables that have good business opportunities. The amount of domestic and foreign demand makes chili a promising commodity. The high demand for chili for cooking needs, the food industry, and medicine is the potential to reap profits. No wonder if chili is a horticultural commodity that experiences the highest price fluctuations in Indonesia. In general, chili has many nutrients and vitamins. Among them are calories, protein, fat, carbohydrates, calcium, vitamin A, B1, vitamin C and contain essential oils of capsaicin, which causes a spicy taste [1]. Chili can be planted easily so that it can be used for daily needs without having to buy it on the market [2]. Apart from being used for household needs, chilies can also be used for industrial purposes such as the spice industry, food industry, and medicine or herbal industries.

Compost is the fertilizer that comes from the remnants of organic matter that can improve the physical properties of the soil, among others, solid soil becomes loose, the ability of soil to hold water and nutrients increases. Improving the physical properties of this soil will slowly improve the chemical and biological properties of the soil. Sources of compost fertilizer include organic waste such as plant debris (straw, stems, branches), household waste, livestock manure (cattle, goats, chickens, ducks), husk charcoal, kitchen ash, and others. The use of compost or organic fertilizer on the soil provides benefits including increasing soil fertility, improving soil structure to be more crumbly and loose, improving soil chemical properties, so that nutrients available in the soil are more easily absorbed by plants, improving water and air in the soil, so that will be able to keep the temperature in the soil more stable, enhance the binding capacity of the soil to nutrients, so that it is easily dissolved by water and improves the life of microorganisms that live in the soil. To obtain good compost quality, it should be considered in the composting process and compost maturity, with mature compost the compost frequency will poison the plant, will be low and the nutrients in compost will be higher than the immature compost [3].

Biochar is a black solid material formed from the combustion process of agricultural biomass. This combustion is generally carried out anaerobically (pyrolysis) to get charcoal. The making of biochar has been known since 2000 years ago on Amazon (*Terra Preta*). This activity converts agricultural waste into soil enhancers that can bind carbon, improve food security and reduce forest clearance. This pyrolysis process produces porous charcoal which can increase the ability of the soil to retain nutrients and water [4]. Research and publication of the application of biochar in horticultural plants, especially red chili plants are still very limited. Research on the application of biochar and compost on agricultural land, especially on dry land which is nutrient-poor, can increase soil fertility and increase yields of agricultural crops, especially the characteristics that can retain nutrients and water so that the availability of nutrients and water. can be maintained in the soil. Growth response, crop yield, and the best soil quality were obtained by application of 10 tons ha^{-1} bamboo biochar and 20 tons ha^{-1} compost [5-8]. However, the application of the biochar dose of 6-9 tons ha^{-1} has provided the best fresh weight of economic yields on vegetable crops [9,10]. The combination of 15 tons ha^{-1} biochar with 5 tons ha^{-1} manure gave a significant effect on the number and weight of red chili [11]. Based on the above, a study was conducted to determine the effect of the application of biochar and compost in increasing the growth and yield of chili plants.

2. Materials and methods

This research was conducted at the Experimental Station of the Faculty of Agriculture, Warmadewa University. The research took place from February to May 2018. Research material includes soil, chili seeds of Darmais F1 variety, NPK fertilizer, compost, bamboo biochar, and coconut shell. The tools used in this study are writing instruments, sprayers, polybags of 10 kg size, scales, ropes, scissors, Paranet, wire, bamboo, machetes, axes, meters, hoes, buckets, sieves, and other documentation tools.

This experiment was a factorial experiment using a randomized block design (RBD). The details of the treatment: The first factor (compost dose) consists of 4 levels, namely: C0 = 0 tons ha^{-1}, C1 = 10 tons ha^{-1}, C2 = 20 tons ha^{-1} and C3 = 30 tons ha^{-1}. The second factor is biochar (B) which consists of two levels, namely: B1 = Biochar bamboo (10 tons ha^{-1}) and B2 = Biochar coconut shell (10 tons ha^{-1}). Thus there are 8 combination treatment plants, each of which is repeated 3 times so that 24 experimental pots are needed.

3. Results

The results of statistical tests were the treatment of compost (C) and biochar (B) doses and their interactions (CxB) and their effect on the variable chili plants as shown in Table 1.

Table 1. The significance of the effects of treatment of compost and biochar doses and their interactions (CxB).

No	Variable	Treatment		
		Compost (C)	Biochar (B)	Cx B
1.	Plant height (cm)	ns	ns	ns
2.	Fruit length (cm)	*	ns	ns
3.	Number of chili fruit (chili)	ns	*	ns
4.	Fresh weight of fruit (g)	ns	ns	ns
5.	Fresh root weight (g)	*	ns	ns

ns = not significant, * = significant

Based on Table 1, the results showed that the interaction between compost and biochar did not have a significant effect on all observed variables. The treatment of compost doses has a significant effect on fruit length and fresh root weight. However, the biochar treatment did not have a significant effect on all observed variables except for the number of fruits which had a significant effect.

Table 2. Effect of compost and type of biochar on growth and yield of red chili plants.

Treatment	Plant height (cm)	Fruit length (cm)	Number of chili fruits (chili)	Fresh weight of fruit (g)	Fresh root weight (g)
Compost					
0 tons ha^{-1}	60.12 a	10.93 b	15.00 a	153.26 a	10.93 a
10 tons ha^{-1}	66.70 a	11.58 b	14.50 a	161.23 a	14.19 a
20 tons ha^{-1}	66.20 a	13.10 a	17.33 a	171.77 a	8.08 b
30 tons ha^{-1}	66.48 a	12.50 ab	17.50 a	185.35 a	8.63 b
LSD 5%	-	1.50	-	-	4.29
Biochar type					
Bamboo	64.08 a	12.46 a	15.00 b	162.83 a	10.32 a
Coconut shell	65.67 a	11.60 a	17.17 a	172.98 a	10.60 a
LSD 5%	-	-	2.11	-	-

Description: The average value followed by the same letter in the same treatment and column, is not significantly different from the LSD test level 5%.

3.1. Plant height

Based on Table 2, the effect of the treatment of 10 tons ha^{-1} compost fertilizer (C1) tended to give the highest plant value of 66.70 cm which was not significantly different from the compost dose of 20 tons ha^{-1} (C2) which was 66.20 cm and compost 30 tons ha^{-1} (C3) 66.48 cm and with the lowest plant height in the treatment without compost (C0) which is 60.12 cm. In the biochar type treatment, the maximum plant height in coconut shell biochar (B2) 65.67 cm was found, which was not significantly different from the type of biochar from coconut shell 10 tons ha^{-1} (B2) which was 64.08%.

3.2. Fruit length

The treatment of compost doses of 20 tons ha^{-1} (C2) gives the highest fruit length of 13.10 cm which is not significantly different from the compost dose of 30 tons ha^{-1} (C3) which is 12.50 cm and is significantly different from the dose compost 10 tons ha^{-1} (C1) with a fruit length of 11.58 cm and significantly different from the treatment without the dose of compost 0 tons ha^{-1} (C0) which is 10.93 cm. However, on the type of bamboo 10 ton ha^{-1} (B1) biochar the highest value was obtained with 12.46 cm fruit length which was not significantly different from the coconut shell biochar type 10 ton ha^{-1} (B1) which was 11.60 cm (Table 2).

3.3. Number of chili fruit
The effect of the treatment of 30 tons ha^{-1} compost fertilizer (C3) gave the highest number of chili fruit as many as 17.50 chili, which was not significantly different from the compost dose of 20 tons ha^{-1} (C2) which was 17.33 chili, and significantly different from the compost dose of 10 tons ha^{-1} (C1) with the number of chili fruits as much as 10.50 chili and significantly different from the treatment without the dose of compost 0 tons ha^{-1} (C0) as much as 15.00 chili (Table 2). In the biochar type of coconut shell 10 tons ha^{-1} (B2) the highest value was obtained with the number of chili fruits as much as 17.17 chili, which was significantly different from the biochar type of bamboo 10 tons ha^{-1} (B1) which was 15.00 chili.

3.4. Fresh weight of fruit (g)
The effect of the treatment of 30 tons ha^{-1} compost fertilizer (C3) gave the highest fresh fruit weight which was 185.35 g which was not significantly different from the compost dose of 20 tons ha^{-1} (C2) which was 171.77 g and significantly different with compost 10 tons ha^{-1} (C1) with fresh fruit weight that is 161.23 g and significantly different from the treatment without 0 tons ha^{-1} (C0) compost dosage which is 153.26 g. However, the biochar type of coconut shell 10 tons ha^{-1} (B2) obtained the highest value with fresh fruit weight 172.98 g which was not significantly different from bamboo biochar 10 tons ha^{-1} (B1) which was 162.83 g (Table 2).

3.5. Fresh root weight
The application of 10 tons ha^{-1} compost (C1) gave the highest fresh weight value of 14.19 g which was not significantly different from the dose without compost (C0) which was 10.93 g. In coconut shell biochar (B2) the highest value obtained with fresh root weight 10.60 g was not significantly different from bamboo biochar (B1) which was 10.32 g (Table 2).

4. Discussion
The results of this study showed that the highest fresh fruit weight tended to be obtained in the treatment of 30 tons ha^{-1} compost ie 185.35 g which increased by 20.94% when compared with the lowest fresh fruit weight obtained from treatments without compost namely 153.26 g.

The highest yield of fresh fruit weight in the treatment of 30 tons ha^{-1} compost dosage was suspected because compost can improve soil structure and increase soil organic matter, increase the activity of microorganisms in the soil, and improve the ability of soil to bind nutrients and water in the soil. The results of the regression analysis between compost doses and the fresh weight of fruit showed a linear relationship with the equation: $\hat{Y} = 151.9 + 1.068X$ with a coefficient of determination (R^2) of 98.60% (Figure 1). From the regression equation, it can be explained that the given of various levels of compost fertilizer has not yielded the maximum total fresh fruit weight of the plant, therefore to obtain the optimum compost dosage and yield the fresh weight of the total fruit plant the compost dosage level needs to be increased.

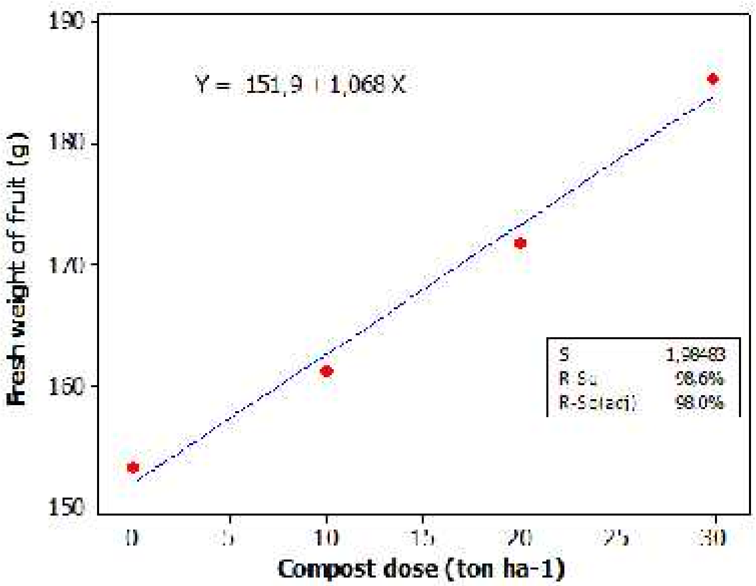

Figure 1. Effect of compost doses on fresh weight of fruit.

The use of compost fertilizer as soil enhancer can increase the content of soil organic matter so as to maintain and increase soil fertility. The general characteristics of compost include nutrients in the type and amount varying depending on the original material, providing long-term nutrients and in limited quantities and having the main function of improving soil fertility.

This is in line with Indriani, that compost has several properties that can improve the physical and chemical properties of soil, among others improve the structure of clay soils do not become dense, increase the binding capacity of sand so that the soil does not break, increase the binding capacity of groundwater, improve porosity so that drainage and air conditioning become good in the soil, enhance soil binding capacity to nutrients, contain complete nutrients, help with weathering process minerals, provide the availability of food ingredients for microbes, and reduce the activity of harmful microorganisms [12].

Organic fertilizers in composted or fresh forms play an important role in improving the chemical, physical and biological properties of soils and sources of plant nutrients [3]. The use of organic fertilizers, especially compost on the soil provides benefits including increasing soil fertility, improving soil structure to be more crumbly and loose, improving soil chemical properties, so that nutrients available in the soil are more easily absorbed by plants, improving water and air in the soil, so that it will be able to keep the temperature in the soil more stable, enhance the binding capacity of the soil to nutrients, so that it is easily dissolved by water and improves the life of microorganisms that live in the soil.

The results showed that the type of biochar from coconut shell obtained the highest value with a fresh fruit weight of 172.98 g which was not significantly different from the type of bamboo biochar which was 162.83 g. However, the treatment of the type of biochar from coconut shells of 10 tons ha^{-1} obtained the highest value in the number of chili fruits as much as 17.17 chili, which significantly increased by 14.47% when compared to bamboo types of biochar 10 tons ha^{-1} ie 15.00 chili fruit. The high number of chili fruit in the treatment of coconut shell biochar on the results of chili plants is due to the nature of biochar which can retain nutrients and water, increase nutrient and water availability, improve soil structure, and improve soil fertility, overall improving soil physical, chemical, and biological properties. The results of the study by Sukartono and Utomo, corn plants showed a positive response to the application of 15 tons ha^{-1} of coconut shell biochar, obtained by corn seed yield in three cycles of the growing season reaching 5.54 tons ha^{-1} [13]. In addition, the application of biochar can increase the availability of phosphorus, total N and CEC land which ultimately increases crop yield because it can prevent the risk of potassium and N-NH_4 washing [14]. Biochar can also improve quality and quantity water with increasing soil storage for nutrients and agrochemicals used by plants [4].

5. Conclusion

The interaction between compost and biochar on all observed variables did not have a significant effect. The dosage of compost has a significant effect on fruit length and fresh weight of roots. The biochar treatment does not have a significant effect on all plant variables except for the number of fruits that have a significant effect. The treatments at different dosage levels were not significant, but the compost dose of 30 tons ha-1 had the highest fresh fruit weight of 185.35 g, which increased by 20.94% compared to without compost of 153.26 g. The treatment of this type of biochar only had a significant effect on the number of chili fruit, namely coconut shell biochar which gave the highest value of 17.17 chilies and was significantly different from bamboo-based biochar which produced 15.00 chilies.

Acknowledgments

Thank you to the Head of the Experimental Station of the Faculty of Agriculture, Warmadewa University who facilitated this research. Thanks also to students who have helped this research a lot.

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