VOLUME 15, NOMOR 3 SEPTEMBER 2021
ISSN: 1907-8056
e-ISSN: 2527-5410

AGROINTEK

JURNAL TEKNOLOGI INDUSTRI PERTANIAN

JURUSAN TEKNOLOGI INDUSTRI PERTANIAN
UNIVERSITAS TRUNOJOYO MADURA

Volume 15 No 3 September 2021 ISSN : 1907 –8056
e-ISSN : 2527-5410

AGROINTEK: Jurnal Teknologi Industri Pertanian

Agrointek: Jurnal Teknologi Industri Pertanian is an open access journal published by Department of Agroindustrial Technology,Faculty of Agriculture, University of Trunojoyo Madura. Agrointek: Jurnal Teknologi Industri Pertanian publishes original research or review papers on agroindustry subjects including Food Engineering, Management System, Supply Chain, Processing Technology, Quality Control and Assurance, Waste Management, Food and Nutrition Sciences from researchers, lecturers and practitioners. Agrointek: Jurnal Teknologi Industri Pertanian is published four times a year in March, June, September and December.
Agrointek does not charge any publication fee.

Agrointek: Jurnal Teknologi Industri Pertanian has been accredited by ministry of research, technology and higher education Republic of Indonesia: 30/E/KPT/2019. Accreditation is valid for five years. start from Volume 13 No 2 2019.

Editor In Chief
Umi Purwandari, University of Trunojoyo Madura, Indonesia

Editorial Board
Wahyu Supartono, Universitas Gadjah Mada, Yogjakarta, Indonesia
Michael Murkovic, Graz University of Technology, Institute of Biochemistry, Austria
Chananpat Rardniyom, Maejo University, Thailand
Mohammad Fuad Fauzul Mu'tamar, University of Trunojoyo Madura, Indonesia
Khoirul Hidayat, University of Trunojoyo Madura, Indonesia
Cahyo Indarto, University of Trunojoyo Madura, Indonesia

Managing Editor
Raden Arief Firmansyah, University of Trunojoyo Madura, Indonesia

Assistant Editor
Miftakhul Efendi, University of Trunojoyo Madura, Indonesia
Heri Iswanto, University of Trunojoyo Madura, Indonesia
Safina Istighfarin, University of Trunojoyo Madura, Indonesia

Alamat Redaksi
DEWAN REDAKSI JURNAL AGROINTEK
JURUSAN TEKNOLOGI INDUSTRI PERTANIAN
FAKULTAS PERTANIAN UNIVERSITAS TRUNOJOYO MADURA
Jl. Raya Telang PO BOX 2 Kamal Bangkalan, Madura-Jawa Timur
E-mail: Agrointek@trunojoyo.ac.id

p-ISSN: 1907-8056
e-ISSN: 2527-5410
AGROINTEK
Jurnal Teknologi Industri Pertanian
journal homepage: journal.trunojoyo.ac.id/agrointek

KATA PENGANTAR

Salam,

Dengan mengucap syukur kepada Allah Tuhan Yang Maha Esa, kami terbitkan Agrointek edisi September 2021. Di tengah pandemi yang berkepanjangan ini, ilmuwan Indonesia masih tetap berkarya. Pada edisi kali ini 32 artikel hasil penelitian, yang terdiri dari 11 artikel dari bidang pengolahan pangan dan nutrisi, sistem manajemen, rantai pasok, dan pengendalian kualitas; 3 artikel tentang rekayasa pangan, dan 2 artikel tentang manajemen limbah. Para penulis berasal dari berbagai institusi pendidikan dan penelitian di Indonesia.

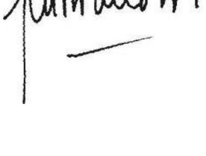
Kami mengucapkan terima kasih kepada para penulis dan penelaah yang telah bekerja keras untuk menyiapkan manuskrip hingga final. Kami juga berterimakasih kepada ibu dan bapak yang memberi kritik dan masukan berharga bagi Agrointek.

Untuk menyiapkan peringkat jurnal Agrointek di masa depan, kami mengharap kontribusi para peneliti untuk mengirimkan manuskrip dalam bahasa Inggris. Semoga kita akan mampu menerbitkan sendiri karya-karya unggul para ilmuwan Indonesia.

Selamat berkarya.

Salam hormat

Prof. Umi Purwandari



Agrointek Volume 15 No 3 September 2021: 839-844

p-ISSN: 1907-8056
e-ISSN: 2527-5410
AGROINTEK
Jurnal Teknologi Industri Pertanian
journal homepage: journal.trunojoyo.ac.id/agrointek

QUALITY ANALYSIS OF "KOSMOS" TKKS COMPOSE USING SELULOTIC MICROORGANISM

Angga Pramana[1*], Anthony Hamzah[2], Ahmad Haitami[3], Deno Okalia[3]

[1]*Teknologi Industri Pertanian, Universitas Riau, Pekan baru, Indonesia*
[2]*Agroteknologi, Universitas Riau, Kota Pekan baru, Indonesia*
[3]*Agroteknologi, Universitas Islam Kuantan Singingi, Kota Taluk Kuantan, Indonesia*

Article history
Received:
10 March 2021
Revised:
12 March 2021
Accepted:
16 July 2021

Keyword
Compost; TKKS; Cellulolytic Microorganism

ABSTRACT

Indonesia is the largest palm oil-producing country in the world. Riau Province is a province with the largest oil palm plantation area in Indonesia. The area of oil palm plantations in Riau province is 2.21 million hectares, or 17.84% of Indonesia's total area of oil palm plantations. TKKS waste has been used to fertilize young oil palm plants by spreading it around the oil palm trees, but empty bunches have become a comfortable place for oil palm pests such as oil palm beetles to develop. Empty bunches of solid waste are also processed into compost. This study aimed to determine the comparison of the chemical composition of oil palm empty friut bunches compost using cellulolytic microorganisms and TKKS compost. This research is a descriptive study that describes the chemical composition of compost with cellulolytic microorganisms. The treatments used in this study were the differences in the ratio of TKKS and cow dung KM1 (100: 0), KM2 (90:10), KM3 (80:20), KM4 (70:30), KM5 (60:40) and KM6 (50:50). This study's results were the selected treatment, namely KM5 with an N content of 0.73%, C-Organic 9.28%, C / N ratio 12.29%, P 0.42%, K 3.99%, while the TKKS content only. N 6.28%, C-Organic 14.19%, C / N ratio 2.26%, P 1.88%, K 2.51% and Mg 1.61%.

© all right reserved

* Penulis korespondensi
Email : pramana.angga@lecturer.unri.ac.id
DOI 10.21107/agrointek.v15i3.10149

INTRODUCTION

Indonesia is the largest palm oil-producing country in the world. Riau Province is a province with the largest oil palm plantation area in Indonesia. The area of oil palm plantations in Riau province is 2.21 million hectares, or 17.84% of Indonesia's total area of oil palm plantations (BPS, 2019). One of the districts that have oil palm plantations is Kuantan Singingi Regency. The area of oil palm plantations in 2019 was 133,982.21 ha and production of 406,721.96 tonnes (Direktorat Jenderal Perkebunan, 2020).

The largest producer of palm oil can produce commercial products in palm oil and its derivatives. The production process generates substantial solid and liquid waste. Oil palm mills with a capacity of 60 tonnes of fresh fruit bunches (Tandan Buah Segar) / hour produce 220 kg/day of empty palm fruit bunches (Tandan Kosong Kelapa Sawit), while palm oil mill effluent is 650 m3 / day (Wardiani, 2013). For each processing of 1 ton of FFB, 22 - 23% of EFB will be produced or as much as 220-230 kg of TKKS (Lukas et al., 2018)

So far, TKKS waste has been used to fertilize young oil palm plants by spreading it around the oil palm trees, but empty bunches have become a comfortable place for oil palm pests such as oil palm beetles to develop. Empty bunches of solid waste are also processed into compost *(Faisal* et al., 2010)

The chemical components of TKKS are 33.25% cellulose, 23.24% hemicellulose, 25.83% lignin, 8.56% water, and 4.19% extractives (Dewanti, 2018). This content can be used in the composting process as an effort to reduce TKKS waste. TKKS contains organic material, which is difficult to degrade. Lignin in oil palm empty bunches is relatively difficult to degrade. Efforts are made to accelerate composting by adding organic material and activating cellulolytic microorganisms (Rahmadanti et al., 2019).

Gusmawartati et al. (2013), cellulolytic microorganisms (MOS) are microorganisms capable of enzymatically degrading cellulose through cellulase enzyme activity. Cellulolytic microorganisms break down cellulose to produce glucose that other heterotrophic microorganisms can use as a carbon source to decompose organic matter (composting).

In composting TKKS, organic materials such as livestock manure and other organic materials can also be added. According to Harapan, (2000), Cow dung is a type of ruminant livestock that is relatively more favored by the general public. A rotting pile of cow dung is a turning point in the nitrogen cycle. Cow dung contains large amounts of nitrogen linked to proteins present in the plant parts that cows eat. Various bacteria release this nitrogen by breaking down proteins into simpler compounds and finally into nitrates that plants can absorb through roots.

Cellulolytic microorganisms are microorganisms capable of producing cellulase enzymes. Cellulase enzymes play a role in degrading cellulose into glucose (Aiman dan Astuti, 2012). Usually, the cellulolytic microorganisms used are *Bacillus* and *Trichoderma*. Therefore, to speed up composting, it is necessary to add organic matter (cow dung) with cellulolytic microorganisms to produce fully matured compost.

Compost can be applied to land or plants if it meets the compost quality standard, according to SNI 19-7030-2004. The importance of knowing the nutrients contained in compost will determine the results of plant growth (Rahmawati, 2017). This study aimed to determine the comparison of the chemical composition of TKKS compost using cellulolytic microorganisms and TKKS compost.

METHOD

Research location

This research was conducted in Taluk Kuantan, Kuantan Singingi Regency, for four months.

Materials and Research Tools

Preparation of the place

Composting site is done in a building with a flat floor and is free from standing water, and a roof that protects it from the sun and rain and is close to sources of organic matter such as empty oil palm bunches and cow dung. Each experimental unit was made in sizes 0.5 × 0.5 m with a distance between the plots of 1 m.

Materials

The materials used in this research were chopped empty fruit bunches with 5 - 10 cm, which were obtained from PT. Duta Palma, cow dung, *isolates* selected were Carrier

/*isolate* (CMC liquid), Mushrooms Waste Wood Origin Perawang, Bacteria Waste Wood Origin Siak). The tools used in this research are scratching, scale, chopper machine, bucket, shovel, rope, 50 kg plastic sack, and other writing tools.

Random Sampling is chosen to determine the sample that will be the source of the data. Then the data was obtained from several treatments carried out in the field, and then the data were then analyzed to obtain quantitative data. This study had six treatment levels, each repeated three times to obtain 18 experimental units. Following are the treatment levels of this research:

KM1 = 100% oil palm empty bunches (20 kg) + Trichoderma (100 gr) + Bacillus bacteria (100 ml)
KM2 = oil palm empty bunches 90% (18 kg) + Trichoderma (100 gr) + 10% cow manure (2 kg) + Bacillus bacteria (100 ml)
KM3 = 80% oil palm bunch (16 kg) + 20% cow manure (4 kg) + Trichoderma (100 gr) + Bacillus bacteria (100 ml)
KM4 = Oil palm empty bunches 70% (14 kg) + 30% cow manure (6 kg) + Trichoderma (100 gr) + Bacillus bacteria (100 ml)
KM5 = Oil palm empty bunches 60% (12 kg) + 40% cow manure (8 kg) + Trichoderma (100 gr) + Bacillus bacteria (100 ml)
KM6 = 50% empty oil palm bunches (10 kg) + 50% cow manure (10 kg) + Trichoderma (100 gr) + Bacillus bacteria (100 ml)
KM= Kompos Mikroorganisme Selulolitik

Data analysis

The data analysis used is quantitative analysis with *Microsoft excel*. This analysis is used to describe the result of the compost content by cellulolytic microorganisms.

Observation parameters

The observation parameters in this study were the analysis of chemical properties of KOSMOS and TKKS compost, N content, C-Organic content, C / N ratio, P content, K content, and Mg content.

RESULT AND DISCUSSION

Cellulolytic microorganism compost (Kompos Mikroorganisme Selulolitik/KOSMOS) is compost made from oil palm empty bunches (TKKS) with cellulolytic microorganisms. This compost is analyzed at the PT Panca Surya Garden Laboratory. Following are the results of the analysis of KOSMOS nutrient content.

The results of this study were to compare the nutrient content of KOSMOS and TKKS compost only. Table 1 shows that the content of N, C-Organic, and P elements in KOSMOS is lower than TKKS alone, while the C / N ratio in KOSMOS is higher than TKKS compost only.

Content of N

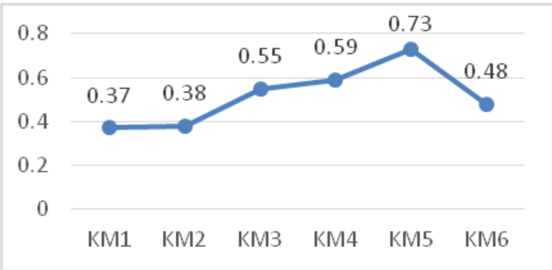


Figure 1 Content of N

Based on the chart shows that the N nutrient in KOSMOS is lower than the TKKS compost only. The N nutrient content in KM1 and KM2 treatments did not meet the Indonesian National Standard (SNI), namely 0.4%. Nutrient N increased with the addition of cow dung in each KOSMOS treatment. Cow manure contains ammonia which plays a role in the composting process. According to Ratna et al. (2017), the amount of N nutrient during the composting period has increased due to the decomposition process of organic matter by microorganisms by converting ammonia to nitrite. Besides, the renovation of N nutrients is assisted by microorganisms, namely Trichoderma sp. This was also stated by Hasibuan et al. (2012)stated that the increase in the number of nitrogen nutrients was due to the renovation process carried out by Trichoderma sp.

Table 1 Results of analysis of KOSMOS nutrient content and TKKS COMPOST

Nutrient content	Treatment of						TKKS only
	KM1	KM2	KM3	KM4	KM5	KM6	
N	0.37	0.38	0.55	0.59	0.73	0.48	6.28
C-Organik	7.28	6.79	11.06	13.33	9.28	7.39	14.19
Rasio C/N	20.09	17.84	20.40	24.21	12.29	15.27	2.26
P	0.20	0.27	0.32	0.34	0.42	0.36	1.88
K	1.59	2.35	3.72	5.53	3.99	3.33	2.51
Mg	0.14	0.30	0.34	0.35	0.55	0.39	1.61

Cellulolytic microorganisms also play a role in composting. These microorganisms can decompose organic matter into simpler ones. Wardati et al. (2017), accelerating organic matter decomposition needs to be done with microorganisms that can remodel organic materials, for example, cellulolytic microorganisms. Cellulolytic microorganisms, namely Bacillus sp. require the element N to form bacterial cells and nutrients for bacteria during the composting process. This causes a decrease in N in KOSMOS due to the use of N elements by cellulolytic microorganisms. The same thing was stated by Purnomo et al. (2017), during the fermentation process, elemental N is needed for nutrition for bacteria in maintaining and forming body cells. The more nitrogen content, the faster the organic matter will break down. The N content is very beneficial for plants, increases plant growth, produces chlorophyll, and accelerates leaf growth (Pramana and Heriko, 2020)

Content of C-Organic

Figure 2 shows that the C-organic content of KOSMOS is lower than TKKS compost only. According to SNI 19-7030-2004, C-Organic's minimum content is 9.80%, and the maximum is 32%. KM1, KM2, KM5, and KM6 are not following the Indonesian National Standard on Compost. The amount of C-Organic elements varies, this is because microorganisms need carbon to degrade organic matter. According to Ratna et al. (2017), carbon content is an energy source for microbes to break down organic matter. Carbon dioxide will evaporate in the composting process so that the amount of C-Organic can be reduced.

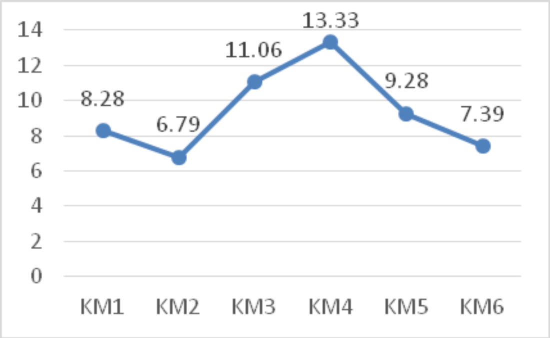


Figure 2 Content of C-Organic

Cellulolytic microorganisms carry out the change of carbon in organic matter. These microorganisms can degrade cellulose and hemicellulose in empty oil palm bunches. According to Saskiawan (2015), the composting process with cellulolytic microbes will accelerate the breakdown because these microbes release enzymes to degrade cellulose. Cellulase enzymes will hydrolyze cellulose into glucose.

Content of C/N ratio

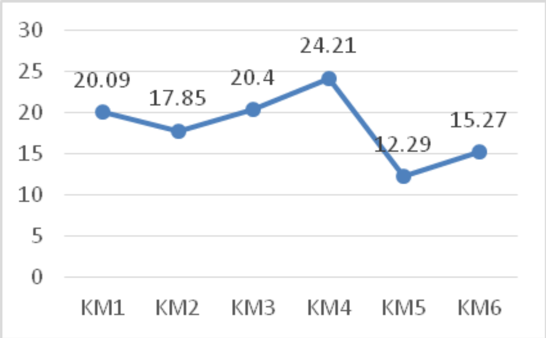


Figure 3 Content of C/N ratio

Based on the chart, the C / N ratio in KOSMOS is higher than the C / N ratio in TKKS compost only. The Indonesian National Standard on compost shows a minimum C / N ratio of 10 and a maximum of 20. KM1, KM3, and KM4 do not meet SNI 19-7030-2004, while KM2, KM5, and KM6 meet the Indonesian National Standard.

The C-Organic content influences the C / N ratio, the higher the C-Organic content, the higher the C / N ratio. The same thing was stated by Pane et al. (2014) an increase in the C / N ratio is influenced by the C-Organic content in compost and will affect the rate of decomposition. If the C / N ratio is higher, it needs to be decomposed to become rotten.

Content of P

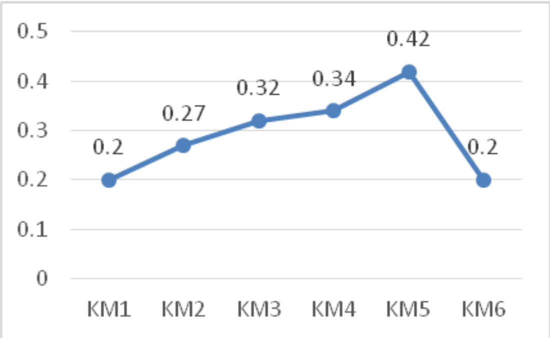


Figure 4 Content of P

Based on the chart, the treatment of KM1 and KM6 on KOSMOS is lower than that of TKKS Compost only, while KM2, KM3, KM4, KM5, and KM6 are the same or higher than TKKS Compost. Based on the SNI, the drinking P content is 0.10%. The N content influences the phosphorus content in KOSMOS. The higher the Nitrogen content, the higher the phosphorus content. According to Purnomo et al. (2017), N content influences the composting process. The same thing is supported by Hidayati et al. (2010) the phosphorus content is related to the N content in organic matter, the higher the nitrogen content, the higher the multiplication of microorganisms, and the higher the amount of phosphorus.

Content of K

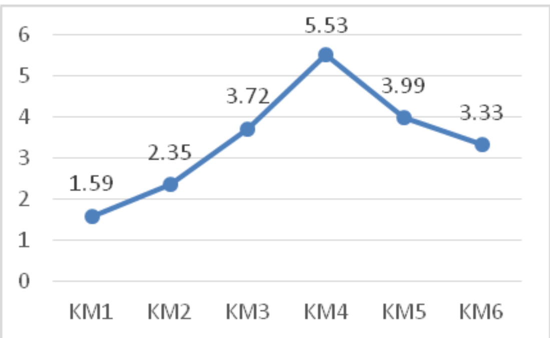


Figure 5 Content of K

The content in KOSMOS was mostly higher than TKKS compost only. KM1 treatment has the lowest K content, this is because the nutrient N in the treatment is lower than the others. There is no cow dung addition in this treatment, which can be used as a source of energy for microbes. Ratna et al. (2017) the amount of K content is influenced by microorganisms that break down organic matter.

Content of Mg

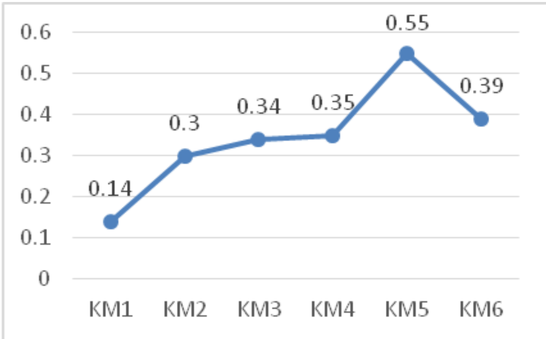


Figure 6 Content of Mg

The nutrient content obtained in the treatment of KM1 0.14, KM2 0.30, KM3 0.34, KM4 0.35, KM5 0.55, KM6 0.39. The content contained in each treatment is lower than TKKS. Magnesium availability can occur due to the weathering-weathering process of minerals containing magnesium-containing minerals. Furthermore, due to this process, magnesium will be free in the soil solution. This situation can cause magnesium loss with percolation water, and magnesium is absorbed by plants or other living organisms, adsorbed by clay particles, and precipitated into secondary minerals.

CONCLUSION

Based on the research that has been done in Composting TKKS with the Help of Cellulosic Microorganisms, the best treatment is KM5 with the content of N content of 0.73%, C-Organic 9, 28%, C / N ratio 12.29%, P 0.42%, K 3.99%, while the TKKS content only is N 6.28%, C-Organic 14.19%, C / N ratio 2.26 %, P 1.88%, K 2.51%, and Mg 1.61%.

BIBLIOGRAPHY

Aiman, U., dan N. Astuti. 2012. Mikroorganisme selulolitik dari berbagai substrat peranannya dalam meningkatkan kualitas hijauan makanan ternak. *Jurnal Agri Sains*. 3(4): 71–87.

Badan Pusat Statistik. 2019. *Statistik Kelapa Sawit Indonesia 2018*. Badan Pusat Statistik

Dewanti, D. P. 2018. Potensi selulosa dari limbah tandan kosong kelapa sawit untuk bahan baku bioplastik ramah lingkungan. *Jurnal Teknologi Lingkungan*. 19(1): 81.

Faisal, M., Mahidin, dan M. Nizar. 2010. Pemanfaatan tandan kosong kelapa sawit sebagai sumber energi di Provinsi Aceh dalam skema clean development mechanism. In *Seminar Nasional Masyarakat Perkelapa Sawitan Indonesia* (hal. 1–12).

Gusmawartati, Hapsoh, dan W. P. D. Rambe. 2013. Pemberian mikroorganisme selulolitik (MOS) dan pupuk anorganik pada pertumbuhan kelapa sawit (Elaeis guineensis Jacq.) di TBM II. *Jurnal Agroteknologi*. 3(2): 21–26.

Harapan, H. A. 2000. *Ekologi*. Balai Pustaka: Jakarta.

Hasibuan, Z. H., T. Sabrina, dan B. S. Mariani. 2012. Potensi bakteri. *Jurnal Agroekoteknologi*. 1(1): 237–253.

Hidayati, Y. A., E. T. Marlina, T. Benito, dan E. Harlia. 2010. Pengaruh campuran feses sapi potong dan feses kuda pada proses pengomposan terhadap kualitas kompos. *Jurnal Ilmiah Ilmu-Ilmu Peternakan*. 13(6): 299–303.

Lukas, A., S. Ngudiwaluyo, H. Mulyono, I. Rosyadi, I. M. Noor, dan P. N. La Teng. 2018. Aspek teknis dan finansial insinerasi limbah tandan kosong kelapa sawit menjadi biokar sebagai pupuk karbon. *Jurnal Industri Hasil Perkebunan*. 13(1): 37–42.

Pane, M. A., M. M. . Damanik, dan B. Sitorus. 2014. Pemberian bahan organik kompos jerami padi dan abu sekam padi dalam memperbaiki sifat kimia tanah ultisol serta pertumbuhan tanaman jagung. *Jurnal Agroekoteknologi*. 2(2): 1426–1432.

Perkebunan, D. J. 2020. *Statistik Kelapa Sawit 2018-2020*. Direktorat Jenderal Perkebunan.

Pramana, A., dan W. Heriko. 2020. Perbandingan kandungan hara limbah tahu dan limbah tahu plus buah maja sebagai pupuk organik cair (POC). *Jurnal Agronomi Tanaman Tropika*. 2(2): 119–127.

Purnomo, E. A., E. Sutrisno, dan S. Sumiyati. 2017. Pengaruh variasi C/N rasio terhadap produksi kompos dan kandungan kalium (K), pospat (P) dari batang pisang dengan kombinasi kotoran sapi dalam sistem vermicomposting. *Jurnal Teknik Lingkungan*. 6(2): 1–15.

Rahmadanti, M. S., A. Pramana, D. Okalia, dan W. Wahyudi. 2019. Uji karakteristik Kompos (pH, tekstur, bau) pada berbagai kombinasi tandan kosong kelapa sawit (TKKS) dan kotoran sapi menggunakan mikroorganisme selulolitik (MOS). *Jurnal Ilmiah Teknosains*. 5(2): 105.

Rahmawati, L. 2017. Kandungan unsur hara kompos berbahan dasar tandan kosong kelapa sawit (TKKS). *Jurnal Budidaya Tanaman Perkebunan Politeknik Hasnur*. 3(2): 38–41.

Ratna, D. A. P., G. Samudro, dan S. Sumiyati. 2017. Pengaruh kadar air terhadap proses pengomposan sampah organik dengan metode takakura. *Jurnal Teknik Mesin*. 06: 63–68.

Saskiawan, I. 2015. Penambahan inokulan mikroba selulolitik pada pengomposan jerami padi untuk media tanam jamur tiram putih (Pleurotus ostreatus). *Jurnal Biologi Indonesia*. 11(2): 187–193.

Statistik, B. P. 2019. *Statistik Kelapa Sawit Indonesia 2018*. Badan Pusat Statistik.

Wardati, M. Ali, dan R. N. Silitonga. 2017. Pemanfaatan solid dan mikroorganisme selulolitik dalam media tanam podzolik merah kuning untuk pertumbuhan bibit kakao (Theobroma cacao L). *Jurnal Agrotek Trop*. 6(1): 35–43.

Wardiani. 2013. Tandan kosong kelapa sawit (TKKS) sebagai alternatif pupuk organik.

AUTHOR GUIDELINES

Term and Condition

1. Types of paper are original research or review paper that relevant to our Focus and Scope and never or in the process of being published in any national or international journal
2. Paper is written in good Indonesian or English
3. Paper must be submitted to http://journal.trunojoyo.ac.id/agrointek/index and journal template could be download here.
4. Paper should not exceed 15 printed pages (1.5 spaces) including figure(s) and table(s)

Article Structure

1. Please ensure that the e-mail address is given, up to date and available for communication by the corresponding author
2. Article structure for original research contains

   Title, The purpose of a title is to grab the attention of your readers and help them decide if your work is relevant to them. Title should be concise no more than 15 words. Indicate clearly the difference of your work with previous studies.

   Abstract, The abstract is a condensed version of an article, and contains important points ofintroduction, methods, results, and conclusions. It should reflect clearly the content of the article. There is no reference permitted in the abstract, and abbreviation preferably be avoided. Should abbreviation is used, it has to be defined in its first appearance in the abstract.

   Keywords, Keywords should contain minimum of 3 and maximum of 6 words, separated by semicolon. Keywords should be able to aid searching for the article.

   Introduction, Introduction should include sufficient background, goals of the work, and statement on the unique contribution of the article in the field. Following questions should be addressed in the introduction: Why the topic is new and important? What has been done previously? How result of the research contribute to new understanding to the field? The introduction should be concise, no more than one or two pages, and written in present tense.

   Material and methods,"This section mentions in detail material and methods used to solve the problem, or prove or disprove the hypothesis. It may contain all the terminology and the notations used, and develop the equations used for reaching a solution. It should allow a reader to replicate the work"

   Result and discussion, "This section shows the facts collected from the work to show new solution to the problem. Tables and figures should be clear and concise to illustrate the findings. Discussion explains significance of the results."

   Conclusions, "Conclusion expresses summary of findings, and provides answer to the goals of the work. Conclusion should not repeat the discussion."

Acknowledgment, Acknowledgement consists funding body, and list of people who help with language, proof reading, statistical processing, etc.

References, We suggest authors to use citation manager such as Mendeley to comply with Ecology style. References are at least 10 sources. Ratio of primary and secondary sources (definition of primary and secondary sources) should be minimum 80:20.

Journals

Adam, M., Corbeels, M., Leffelaar, P.A., Van Keulen, H., Wery, J., Ewert, F., 2012. Building crop models within different crop modelling frameworks. Agric. Syst. 113, 57–63. doi:10.1016/j.agsy.2012.07.010

Arifin, M.Z., Probowati, B.D., Hastuti, S., 2015. Applications of Queuing Theory in the Tobacco Supply. Agric. Sci. Procedia 3, 255–261.doi:10.1016/j.aaspro.2015.01.049

Books

Agrios, G., 2005. Plant Pathology, 5th ed. Academic Press, London.