PISSN : 2615-2207 Agrosainstek, 10 (1) 2026: 1-9 EISSN : 2579-843X

AGROSAINSTEK

Jurnal Ilmu dan Teknologi Pertanian

Website jurnal : http://agrosainstek.ubb.ac.id

Research Article

Improving the Quality of Corn Cob Compost Fertilizer with Various Raw Material Compositions

Peningkatan Mutu Pupuk Kompos Tongkol Jagung dengan Berbagai Komposisi Bahan Baku

Selly Ika Damayanti[1], Ugik Romadi[1*], Rika Despita[1]

[1] Sustainable Agricultural Extension Study Program, Malang Agricultural Development Polytechnic, East Java. Jl. Dr. Cipto No. 144 A Bedali, L:awang, Malang 65200

Received: February 19, 2025 /Received in revised : June 10, 2025/ Accepted: May 20, 2026

ABSTRACT

Farmers have not yet utilized corn cobs, one of the agricultural wastes. Corn cobs themselves contain organic material, which can be optimized as an ingredient for making organic fertilizer. However, the habit of farmers when the harvest season arrives is that they burn or pile up corn cobs on their agricultural land. This results in the accumulation of corn cob waste increasing every time the harvest season takes place. Methods to determine the best composition of corn cob compost by testing its effectiveness using various formulations. The research was conducted using a Completely Randomized Design (CRD) with 4 treatments and 6 replications. P1 pure composition of corn cobs, P2 (2:1) corn cobs and cow cohe, P3 (1:2) corn cobs and cow cohe, P4 (1:1) corn cobs and cow cohe. Results In this research, the parameters observed include pH, temperature, macronutrients (N, P, K), C-organic, C/N ratio, color, odor/aroma, and texture. pH and temperature checks are carried out every 3 days in the morning. Laboratory tests are carried out to determine the content of macronutrients (N, P, K), C-organic, and the C/N ratio. Meanwhile, organoleptic tests were carried out on texture and aroma parameters by 3 expert panelists. Conclusion: Based on the results of observations and laboratory tests, the best composition of corn cob compost fertilizer is found in P2 with a composition of cow cobs and kohe (2:1).

Keywords: Improvement Fertilizer Quality, Compost, Corn Cobs

ABSTRAK

Petani belum memanfaatkan tongkol jagung yang merupakan limbah pertanian. Tongkol jagung memiliki kandungan bahan organik yang dapat dioptimalkan menjadi bahan pembuatan pupuk organik. Namun, kebiasaan petani ketika musim panen tiba, mereka membakar atau menumpuk tongkol jagung di lahan pertaniannya. Metode yang digunakan untuk mengetahui mutu pupuk kompos tongkol jagung terbaik, dilakukan kajian tentang peningkatan mutu pupuk kompos tongkol jagung dengan berbagai komposisi bahan baku. Penelitian dilakukan dengan Rancangan Acak Lengkap (RAL) 4 perlakuan dan 6 ulangan. P1 komposisi murni tongkol jagung, P2 (2:1) tongkol jagung dan kohe sapi, P3 (1:2) tongkol jagung dan kohe sapi, P4 (1:1) tongkol jagung dan kohe sapi. Hasil kegiatan kajian terdapat parameter yang diamati yaitu pH, suhu, unsur hara makro (N, P, K), C-Organik, C/N Rasio, Warna, Bau/Aroma, dan Tekstur. Pengechekan pH dilakukan dan suhu dilakukan setiap 3 hari sekali pada pagi hari. Uji laboratorium dilakukan untuk mengetahui kandungan unsur hara makro (N, P, K), C-Organik, dan C/N Rasio. Sedangkan uji organoleptik dilakukan pada parameter tekstur dan aroma, oleh 3 panelis ahli. Kesimpulan: Berdasarkan hasil uji organoleptik dan uji laboratorium, komposisi pupuk kompos tongkol jagung terbaik terdapat pada P2 dengan komposisi tongkol dan kohe sapi (2:1).

Kata kunci: Penimgkatan Mutu Pupuk, Pupuk Kompos, Tongkol Jagung

*Korespondensi Penulis
E-mail : ugikromadi13@gmail.com
DOI: https://doi.org/10.33019/agrosainstek.v10i1.911

1. Introduction

The agricultural sector in Indonesia is currently a very important sector in meeting the food needs of its people. However, the problems faced in the agricultural sector today are related to the restriction of subsidized fertilizers. Based on the Regulation of the Ministry of Agriculture No. 10 of 2022, it states that the availability of organic fertilizers, ZA, and SP-36 is currently no longer included in subsidized fertilizers. And it is only focused on 9 commodities, including rice, corn, soybeans, onions, garlic, chili, sugarcane, people's coffee, and cocoa. This results in farmers having to meet their fertilizer needs with non-subsidized fertilizers that are relatively expensive, thus burdening farmers. In addition, farmers' dependence on the use of chemical fertilizers results in land degradation or a decrease in soil fertility quality, as well as physical damage to the soil. Many farmers believe that chemical fertilizers have a more immediate impact on crop yields than organic alternatives. In fact, the use of organic fertilizers is a necessity to maintain the quality of soil fertility, as well as the application of the concept of sustainable agriculture.

Organic fertilizer is a fertilizer derived from the residue of living things, both animals and plants or commonly called organic waste. Organic fertilizer processing can be done by utilizing existing agricultural and livestock waste. This is in line with the UPPO Program (Organic Fertilizer Processing Unit) from the Ministry of Agriculture. Based on the Directorate General of Agricultural Infrastructure and Facilities Number 45.10/KPTS/85.510/11/2022, it is necessary to facilitate the development activities of Organic Fertilizer Processing Units to support the independent provision of organic fertilizers. This needs to be developed in all regions of Indonesia, especially areas that have the majority of potential for food and horticultural commodities.

Rice and corn are one of the leading food commodities in Indonesia. Based on BPS data in 2023, the area of corn land in Indonesia reached 2.48 million ha. From this land area, the production of dry corn cernels reached 14.77 million tons, so that the productivity reached 5.9 tons/ha. According to (Islamiyati *et al*. 2016), from the corn harvest, the percentage of waste produced consists of 50% stalks, 20% cobs, 20% leaves, and 10% corn husks. That corn cobs can be produced up to 1.1 tons/ha. Farmers usually leave the corn cobs as waste after harvesting. Corn cobs themselves contain 0.92% nitrogen, 0.29% phosphorus, and 1.39% potassium. The potential of existing corn cobs can be optimized as a material for making compost.

Compost material from organic waste that undergoes a decomposition process due to the activity between microorganisms that decompose organic matter in it. Mature compost can be applied to the soil, so that it can increase soil fertility, increase the content of C-organic in the soil, increase water absorption, become a place for microorganisms to develop, and help neutralize acidic soil pH (Bachtiar *et al*. 2019)

In the process of making compost, it is also considered safe because it utilizes environmentally friendly plant and animal waste, the materials used are often found, and do not cost a lot of money in the manufacturing process. (Pereira *et al*. 2014) stated that the remains of organic matter can function as a buffer in the soil which functions to improve the physical, chemical, and biological properties in the soil after the composting process occurs.

To increase the nutrient content in the compost, the addition of organic matter is required. Corn cob waste has a high C/N ratio, when mixed with livestock manure will produce good compost content. Cow manure contains nutrients that can be used as organic fertilizer. In cow kohe, there is a macronutrient content in the form of (N) 0.8%; (P) 0.2 %; (K) 0.4% that can be optimized in the manufacture of compost (Melsasail *et al.* 2018). Livestock manure is an organic matter with a low C/N value, while the C/N content of corn cob ratio reaches 50. Although the C/N level of corn cobs is quite high, corn cobs are still organic matter that can be decomposed (Baharudin and Rubiyo 2013). In addition, other organic ingredients are also added to increase the nutrient content in the compost. The materials used are also common among farmers, so they are easy to get. The addition of organic matter includes husk charcoal, dolomite, and molasses. The jam also requires the help of a decomposer in decomposing organic materials. Therefore, research was carried out on the best composition in the manufacture of corn cob compost, based on organoleptic and laboratory test results. So that the best composition can be optimized by farmers in making compost and able to make farmers independent in processing organic fertilizers.

2. Materials and Methods

Place and Time of Research

The implementation of a technical study on the Effectiveness of Corn Cob Compost Fertilizer with Various Compositions on Compost Quality was carried out at the Malang Agricultural Development Polytechnic, Lawang District, Malang Regency. This

research activity was conducted from January to May 2024.

Tools and materials

The tools and materials used in this study are buckets, hoes, chopping machines, plastic tarpaulins, soil meters, scales, and stationery. The materials used are corn cobs, cow stalks, husk charcoal, dolomite, petrofast, molasses, and water. Petrofast decomposer was chosen because it is often used by farmers and is rich in micoorganisms that can help the composting process.

Experimental design

The experimental design used was a Complete Random Design with 4 treatments and 6 replicates, so there were 24 experimental units. The comparison of the composition used in the manufacture of corn cob compost fertilizer was used as a treatment with P1 (Pure composition of corn cobs), P2 (Corn cobs and cow cots 2:1), P3 (Corn cobs and cow cots 1:2), and P4 (Corn cobs and cow cots 1:1).

Steps of Making Corn Cob Compost (Dahliana et al. 2022)

1. The use of Petrofast is 50 ml and molasses is 50 ml, dissolved in 5 L of water and let stand for 15 minutes.
2. Mix corn cobs, beef cobs, husk charcoal, and dolomite in a dry container.
3. Pour the bioactivator solution slowly and gradually until a dough is formed. The desired nature of the dough is that no water comes out of the dough when kneaded by hand. Likewise, if the fist is released, the dough will expand again (approximately 30% moisture content).
4. Next, stack the dough until it becomes a mound of 15-20 cm.
5. Cover the fertilizer mixture with a tarpaulin/thick plastic so that the fertilizer is overgrown with white mold and emits a pleasant aroma. During the process, the temperature of the material is kept within a vulnerable 40-60°C. If the temperature exceeds the limit, it is necessary to turn the dough over, then the dough is closed again.
6. See the condition of the fertilizer so that it is clearly visible by removing the tarpaulin/plastic cover. The manufacture of compost is said to be successful if it has blackish-brown characteristics, and the aroma does not smell bad (like the smell of soil).

Parameters and Data Analysis

The parameters observed in this study were temperature and pH. Observations were conducted every three days over a 21-day period. Observation of pH and temperature using a soil meter and is carried out every 07.00 AM. The results of the observation data obtained were recorded, then statistically tabulated with the ANOVA Test at the 5% level if there is a real difference, further tests are carried out using the Duncan's Multiple Range Test on SPSS. The observation of color, smell/aroma, and texture was carried out after 21 days of composting process by 3 expert panelists in composting. The results of the organoleptic test were then tabulated and statistically analyzed using the Wallis Kruskal Test and the Mann-Whitney Test to determine the difference in each treatment. Furthermore, the observation of Macro Nutrients (N, P, K), C-Organic, and C/N Ratio of BSIP East Java Soil Laboratory. The measurement of C-Organic levels uses the fogging method, for the determination of N is carried out by the Kjeldahl method, the P element uses the spectrophotometry method, the K element uses wet fogging using the AAS *(Atomic Absorption Spectrophotometry) method.*

3. Results

Composting Process

In making compost, it is adapted to suit the composition of the material., then the compost stored in a closed state with minimal oxygen. In addition, the compost in a shady place with a normal temperature of around 25-30^{0}C. The composting process carried out for 21 days, compost is covered with a tarpaulin. During the composting process, it is carried out aerobically (with O_2), because every 3 days the compost checked for pH and temperature. When the temperature of the compost reaches 60^{0}C, the reversal process is carried out. This is done so that microorganisms do not experience dormancy or do not function in the composting process.

Temperature During Composting Process

Temperature plays an important role in determining the activity of the organism working during the composting process. In addition, temperature changes also indicate the activity of microorganisms in the decomposition process of organic matter. The composting temperature can be seen in Table 1.

Table 1. Temperature During the Corn Cob Compost Making Process

Treatment	Temperature Observation on Day 1						
	3	6	9	12	15	18	21
P1 (pure)	36	32	39,7 b	31,2 b	29	29	27,5
P2 (2:1)	34,5	32,5	37,3 ab	30,0 ab	29,3	29	28
P3 (1:2)	34,5	31,6	36,7 ab	30,0 ab	28,6	29	28,3
P4 (1:1)	34,1	31,1	36,0 a	29,2 a	29	28,6	28,5
Sig	tn	tn	*	*	tn	tn	tn
KK(%)	6,7	3,6	6,2	3,6	2,5	3,7	2,9

Remarks: Numbers followed by the same letter in the same column show no real difference with *Duncan's multiple range test* of 5%. (*shows a real difference)

Temperature During Composting Process

The acidity level in the composting process is one of the important indicators in the composting process. In addition, changes in pH also indicate the activity of microorganisms in the decomposition process of organic matter.

Organic matter synthesized by protein synthesis by decomposing microorganisms (Krisnawan *et al*. 2018). The pH during the composting process can be seen in Table 2.

Physical Properties of Fertilizer (Aroma/Odor, Texture, and Color) (Sentence case format)

The physical properties of corn cob compost can be seen in the aroma/odor, color, and texture parameters by organoleptic test. The Wallis Krusskal Test Results in Table 3. The assessment of organoleptic tests is carried out using numerical scales and value scales, including:

a. Aroma: (1 = Smells like the original material; 2 = smells slightly earthy; 3 = smells of earth)
b. Design: (1 = Rough; 2 = Somewhat Rough; 3 = Smooth)
c. Color: (1 = brown; 2 = blackish brown; 3 = black).

Table 2. pH During the Corn Cob Compost Making Process

Treatment	Observation of pH on the day						
	3	6	9	12	15	18	21
P1 (pure)	5,3	5,7	6,5 c	6,6	6,5	6,5	6,8
P2 (2:1)	5,2	5,5	6,2 b	6,3	6,6	6,6	6,9
P3 (1:2)	4,9	5,4	6.1 ab	6,2	6,5	6,2	6,7
P4 (1:1)	4,9	5,3	5,8 a	6,2	6,5	6,5	6,9
Sig	tn	tn	**	tn	tn	tn	tn
KK(%)	12,4	10,4	3,9	14,4	5,2	4,8	5

Remarks: Numbers followed by the same letter in the same column show no real difference with *Duncan's multiple range test* of 5%.

Table 3. Wallis Krusskal Test Results

Parameter	Treatment			
	P1	P2	P3	P4
Aroma	1,4 a	1,4 a	1,5 b	1,5 b
Color	1,1 a	1,3 a	2,4 a	2 a
Texture	1,2 a	1,2 a	2,4 b	2,2

Remarks: Numbers followed by the same letter on the same line showed no real difference with *Duncan's multiple range test* of 5%.

Chemical Properties of Fertilizer (C-Organic, C/N Ratio, NPK Macro Nutrients)

C-Organic

Based on the results of laboratory tests that have been carried out, all samples of corn cob waste compost fertilizer meet the technical requirements. This is in accordance with the Ministry of Agriculture Regulation No. 261 of 2019 concerning the minimum technical requirements for solid organic fertilizers, biological fertilizers, and C-Organic soil amendments in compost, which is a minimum C-Organic content of 15%. The data table of C-Organic compost fertilizer for corn cob waste can be seen in Table 4.

C/N Ratio

C/N Ratio in organic matter is a comparison between the content of carbon and the nitrogen content in it. The availability of nutrients in the soil is inversely proportional to the C/N value of the soil. The higher the C/N value (table 5), it shows that the organic matter in the compost has not been optimally decomposed Rinaldi *et al*., 2023).

Table 4. C-Organic Content of Corn Cob Compost Fertilizer

Treatment	C-Organik (%)
P1	34,73
P2	21,69
P3	14,49
P4	16,97

Remarks: Numbers followed by the same letter on the same line showed no real difference with *Duncan's multiple range test* of 5%.

Table 5. C/N Content Ratio of Compost Fertilizer Corn Cob

Treatment	Value C/N Ratio (%)
P1	39,02
P2	16,95
P3	12,82
P4	13,47

Source: Primary Data processed in 2024.

4. Discussion

The initial process of decomposition occurs on days 3 and 6, namely in the *lag phase*, where there is a change in temperature that is quite volatile. The average temperature on the 3rd day reached 34^{0}C, then the temperature decreased on the 6th day with an average temperature of 31^{0}C. This shows that at this stage the microorganisms in the compost undergo an acclimation process, namely microorganisms begin to adapt and multiply in the composting process (Krisnawan *et al*. 2018). On the 9th day, there was an increase in the maximum temperature in each treatment, the highest temperature was in the P1 treatment. According to (Sains *et al*. 2021), the composting temperature that almost reaches 40^{0}C is indicated as a thermophilic phase. Supported by the opinion of (Sari *et al.* 2021) who stated that at a significant increase in temperature there is *an active phase* or thermophilic phase, in this phase there is an exponential or very rapid increase in the number of microorganisms. The increasing number of microorganisms is proportional to the increasing activity of microorganisms in decomposing the substrate in the compost. In the implementation of this study, it was carried out in Lawang District which has a temperature ranging from 22-30^{0}C, so that in the thermophilic phase the average temperature does not reach 40^{0}C. Temperatures that exceed 60^{0}C can kill some of the active microbes in the composting process, only some thermophilic microbes can survive (Makaruku and Wattimena 2022). The temperature decreased on the 12th - 21st day, the decrease in temperature that occurred due to microbial activity began to decrease in decomposing organic matter. In this phase, it shows that the composting process has entered *the maturation phase* or maturation phase. According to SNI 19-7030-2004 to meet the quality

of raw materials, the temperature of compost fertilizer is in accordance with the temperature of groundwater, which is ≤ 30^{0}C.

The results of pH observations for 21 days presented in Table 2, showed that there was a significant difference on day 9 in each treatment. In the P1 sample with pure corn cob composition materials, it contains the highest levels of lignin, hemicellulose, and cellulose so that microbes are active in helping the compost decomposition process. This is in accordance with the opinion of (Faesal and Syuryawati 2018). that *Trichoderma harzianum* can accelerate the decomposition of organic matter in soil because it contains three enzymes, namely the *enzyme cellobiohydrolases,* which actively decompose cellulose, the enzyme endoglucanase, which reacts with dissolved cellulose, and the *enzyme glucosidase,* which hydrolyzes cellulose into glucose. The activity of microorganisms in the decomposition process results in a faster change in pH in the P1 sample, compared to other samples.

The initial phase of composting usually occurs the process of hydrolysis of complex molecules into simple molecules. In this phase, there is an initial decrease in the pH of the compost at vulnerable 4-5 which tends to be acidic. The decrease in pH to acid is due to the formation of organic acids such as acetic acid, hydrogen, and carbon dioxide in the acidogenesis phase. Then the pH gradually increases until the final composting process, this is due to the activity of methanogenic bacteria that convert organic acids into other compounds such as methane, ammonia and carbon dioxide (Asri *et al*., 2017). The average pH of compost fertilizer is between 6-7 which is in the neutral category. The addition of dolomite to the manufacture of compost is also one of the factors in the condition of fertilizers that tend to be neutral. (Prihantoro *et al*., 2023). The ideal acidity degree according to SNI: 19-7030-2004 is pH in the range of 6.8 – 7.49 and all fertilizer samples have met the standard.

Based on Table 3. There was a real difference in the aroma parameters and texture of corn cob compost, then continued *by the Mann-Whitney Test*. The results of the Mann-Whitney test showed that there was a real difference ($p < 0.05$) between P1 and P3, P4 and P2 with P3, P4. However, there was no real difference between P1 and P2, and P3 and P4. Overall, the composting process of corn cob waste fertilizer does not produce a strong aroma or odor. This is because in this study the composting process is carried out aerobically (with O2). The aerobic composting process does not cause a foul odor because approximately two-thirds of the carbon element evaporates into CO2 and the remaining one-third of the material reacts with nitrogen in living cells (Wandansari *et al*., 2020). According to (Chan *et al*. 2023), the pungent aroma of organic fertilizer when composting occurs because during composting microbes remodel organic matter, thereby releasing ammonia gas (NH3), which causes an oxidation response that produces ammonia gas, water, and heat energy which results in a pungent odor of compost from the material. So to achieve a perfect composting process, it takes longer.

In the first week of the composting process, the entire treatment has the same color as the original material. In the color parameters of the P1 and P2 samples, the color is the same as the original material, this is because the material of origin is the dominant compost from corn cob waste. Meanwhile, the P3 and P4 samples showed a blackish-brown compost color, this is because the dominant compost material is made from cow kohe. In the second week of the composting process, the color of the compost began to change to blackish-brown. This is due to the decomposition process of organic matter by microbial activity that takes water, oxygen, and nutrients from compost organic matter which will then decompose and release CO2 and O2 (Siregar *et al*. 2020). According to (Atmaja *et al*. 2017), organic matter that contains a lot of lignin fiber will be difficult to decompose. Therefore, the corn cob waste compost fertilizer in the P1 and P2 samples takes longer in the composting process. It is hoped that the compost results will be in accordance with SNI: 2004 standards, which are blackish-brown in color.

In the results of the texture analysis, there were real differences in each treatment, so the Mann-Whitney Test was used to determine the differences in each treatment. From the data results in Table 13, it can be seen that P1 and P2 are not significantly different, and the texture of the compost is still relatively rough. The composting process is still not optimal because the compost material is dominated by corn cobs, which take a long time to decompose completely. This is following the opinion of (Saraswati *et al*. 2017) The content of lignin and cellulose is an obstacle in the composting process, because it hinders the activity of cellulolytic enzymes in degrading lignocellulosic fiber materials in the composting of organic matter. Various factors affect the quality of compost, one of which is particle size, the smaller the size of the composting material, the faster the composting process because the wider the surface area of the material that comes into contact with microbes (Makaruku *et al*. 2022). So that this affects the texture of a compost, the smaller the particle size of

the compost material, the smoother the texture of the compost will be and vice versa.

Based on the data in Table 4. It can be seen that the highest C-Organic value in the P1 sample is 34.73%. This is in line with the opinion of (Elvania *et al*. 2024) corn cobs are agricultural waste that is rich in organic matter and can be processed into organic fertilizer in the form of compost. In the composting process, microorganisms play an important role in decomposing organic matter, in this process complex compounds from organic matter are decomposed into simpler compounds. The lower the C-Organic content in the compost indicates that the better the decomposition process carried out by microorganisms during the composting process (Palupi 2015).

Based on the Ministry of Agriculture No. 261 of 2019 concerning the minimum requirements for organic fertilizers, biological fertilizers, and soil amendments, the maximum standard C/N Ratio for solid organic fertilizers is ≤ 25%. So it can be seen in Table 5. fertilizer samples that meet the requirements at P2, P3, P4. The C/N Ratio level at P1 is still high due to the content of compost using pure corn cobs. Agricultural waste itself is rich in organic matter, but in the decomposition process it needs the help of microorganisms. The addition of cow kohe has an important role in improving the physical, biological, and chemical properties of the soil because it is rich in microorganisms. The microflora of cow dung contains many *Lactobacillus* and cocci as well as some identified and unidentified fungi and yeasts (Rajeswari *et al*. 2016). In addition, the addition of cow cow cow pigs is able to work optimally in anaerobic composting because the C/N ratio of cow cows tends to be low, which is 23.5% (Ristiyana *et al*. 2022). So that the more cow kohe is added, the more optimal the process of decomposing the C/N Ratio. The application of compost fertilizer to plants that have a C/N ratio of > 25, can result in the decomposition process continuing and the nutrient content cannot be absorbed optimally by plants. This can create anaerobic conditions in the root environment due to the use of oxygen by microbes and the immobilization of N nutrients, and there is nutrient competition between microbes and plants (Saraswati and Praptana 2017).

5. Conclusion

The best quality corn cob compost fertilizer is in the P2 sample with the composition of corn cob and cow kohe (2:1). In the P2 sample, the NPK content was 3.75%; C-Organic 21.69%; C/N Ratio 16.95%. In P1, the C/N level has not met the quality standard that should be ≤ 25%, so it is necessary to carry out a longer composting process. At temperature and pH parameters the entire sample met the standard, with a prone pH of 6-7. The composition of the compost material affects the composting process, the addition of cow kohe is able to reduce the C/N ratio of corn cobs.

6. Acknowledgments

We would like to express our sincere gratitude and highest appreciation to all the leaders and academicians of the Malang Agricultural Development Polytechnic and BSIP East Java Soil Laboratory for all the support, facilities, and guidance that have been provided during the implementation of our research activities. This extraordinary assistance, starting from research permits, access to laboratories and practice areas, is very crucial in ensuring the smoothness and success of the entire series of research. Hopefully this good cooperation can continue Malang Agricultural Development Polytechnic and BSIP East Java Soil Laboratory will always be a superior institution that contributes to the progress of Indonesian agriculture.

7. Declaration of Conflicting Interests

The author declares that there is no potential conflict of interest in the research, writing and publication of this article.

8. References

Asri, Dian, Puspa Ratna, Ganjar Samudro, and Sri Sumiyati. 2017. "Pengaruh Kadar Air Terhadap Proses Pengomposan Sampah Organik Dengan Metode Takakura." *Jurnal Teknik Mesin (Journal Of Mechanical Engineering)* 6(2):124–28. doi:10.22441/JTM.V6I2.1192.

Atmaja, I. ,. Tika, I. and Wijaya, I., Teknik Pertanian, and Fakultas Teknologi Pertanian. 2017. "Pengaruh Perbandingan Komposisi Bahan Baku Terhadap Kualitas Dan Lama Waktu Pengomposan." *Jurnal BETA (Biosistem Dan Teknik Pertanian)* 5(1):111–19. https://ojs.unud.ac.id/index.php/beta/article/view/27159.

Bachtiar, Velicia, Matthew D. Kelly, Henry R. Wilman, Jaco Jacobs, Rexford Newbould, Catherine J. Kelly, Michael L. Gyngell, Katherine E. Groves, Andy McKay, Amy H. Herlihy, Carolina C. Fernandes, Mark Halberstadt, Marion Maguire, Naomi Jayaratne, Sophia Linden, Stefan Neubauer, and Rajarshi

Banerjee. 2019. "Repeatability and Reproducibility of Multiparametric Magnetic Resonance Imaging of the Liver." *PLOS ONE* 14(4):e0214921. doi:10.1371/JOURNAL.PONE.0214921.

Baharudin, and Rubiyo. 2013. "Pengaruh Perlakuan Benih Dan Media Tanam Terhadap Peningkatan Vigor Bibit Kakao Hibrida The Effects Of Seed Treatment And Grwoth Medium To Improve Vigor Of Hybrid Cocoa Seedlings."

Dahliana, A. Besse, Hujemiati Hujemiati, Yusnan Suyuti DM, and Jumardi Jumardi. 2022. "Proses Pengolahan Limbah Jagung Menjadi Pupuk Organik Di Desa Wellulang Kecamatan Amali Kabupaten Bone." *Empowerment: Jurnal Pengabdian Masyarakat* 1(4):455–61. doi:10.55983/EMPJCS.V1I4.178.

Elvania, Nindy Callista, Cendy Riskia Indah Agustin, and Agita Dwi Pratiwi. 2024. "Sosialisasi Pembuatan Pupuk Organik Sebagai Upaya Mengurangi Limbah Tongkol Jagung." *Surya Abdimas* 8(2):165–70. doi:10.37729/ABDIMAS.V8I2.3491.

Faesal and Syuryawati. 2018. "Efektivitas Kompos Limbah Jagung Menggunakan Dekomposer Bakteri Dan Cendawan Pada Tanaman Jagung." *Jurnal Pangan* 27(2):129–40. doi:10.33964/JP.V27I2.378.

Islamiyati, Rohmiyatul, Y. D. A. Surahman, and Dan Wardayanti. 2016. "Kandungan Protein dan Serat Kasar Tongkol Jagung Yang Diinokulasi *Trichoderma Sp*. Pada Lama Inkubasi Yang Berbeda Crude Protein and Crude Fiber Corncob Inoculated by Trichoderma Sp. at Different Time of Incubation."

Krisnawan, Kadek Ardhi, I. Wayan Tika, and I. A. Bintang Madrini. 2018. "Analisis Dinamika Suhu Pada Proses Pengomposan Jerami Dicampur Kotoran Ayam Dengan Perlakuan Kadar Air." *Jurnal BETA (Biosistem Dan Teknik Pertanian)* 6(1):25–32. https://ojs.unud.ac.id/index.php/beta/article/view/38059.

Makaruku, Marlita H., and Anna Y. Wattimena. 2022. "Studi Penggunaan Dua Jenis Pupuk Kandang Terhadap Kualitas Fisik Bokashi." *Agrinimal Jurnal Ilmu Ternak Dan Tanaman* 10(1):23–28. doi:10.30598/AJITT.2022.10.1.23-28.

Melsasail, Linus, Verry RChWarouw, and Yani EB Kamagi. 2018. "Analisis Kandungan Unsur Hara Pada Kotoran Sapi Di Daerah Dataran Tinggi Dan Dataran Rendah." *COCOS* 10(8). doi:10.35791/COCOS.V2I6.26095.

Mulia Sari, and Jamilah. 2023. "Uji C/N Dan Bahan Organik Pada Beberapa Jenis Limbah Dan Lama Fermentasi Kompos." *Jurnal Agroristek* 6(2):76–81. doi:10.47647/JAR.V6I2.1800.

Palupi, Nurul Puspita. 2015. "Karakter Kimia Kompos Dengan Dekomposer Mikroorganisme Lokal Asal Limbah Sayuran." *Ziraa'ah Majalah Ilmiah Pertanian* 40(1):54–60. doi:10.31602/ZMIP.V40I1.98.

Pereira, Clara, L. Miguel Martins, and Lucília Saraiva. 2014. "LRRK2, but Not Pathogenic Mutants, Protects against H2O 2 Stress Depending on Mitochondrial Function and Endocytosis in a Yeast Model." *Biochimica et Biophysica Acta - General Subjects* 1840(6):2025–31. doi:10.1016/j.bbagen.2014.02.015.

Rajeswari, K., M. Rohinidevi, V. Vimala, and D. Megala. 2016. "Morphometric Analysis Of Infra Orbital Foramen In Human Dry Skulls." *International Journal of Anatomy and Research* 4(3.2):2725–29. doi:10.16965/IJAR.2016.317.

Wandansari Niken, Suntari Soemarno. 2020. "Pembuatan Kompos Dari Sampah Pasar Dengan Teknologi Open-Windrow | Rani Wandansari | AGROINOTEK." https://agroinotek.ub.ac.id/index.php/agroinotek/article/view/3.

Ristiyana, Suci, Yagus Wijayanto, Tri Wahyu Saputra, and Ika Purnamasari. 2022. "Processing Pengolahan Limbah Kotoran Sapi Menjadi Pupuk Organik Untuk Perbaikan Kualitas Lingkungan Desa Seputih Kecamatan Mayang Kabupaten Jember." *Jurnal Pengabdian Magister Pendidikan IPA* 5(1):161–68. doi:10.29303/jpmpi.v5i1.1357.

Sains, Jurnal, Teknologi Lingkungan, Sri Wahyuni Siagian, Yebi Yuriandala, and Fina Binazir Maziya. 2021. "Analisis Suhu, Ph Dan Kuantitas Kompos Hasil Pengomposan Reaktor Aerob Termodifikasi Dari Sampah Sisa Makanan Dan Sampah Buah." *Jurnal Sains & Teknologi Lingkungan* 13(2):166–76. doi:10.20885/JSTL.VOL13.ISS2.ART7.

Saraswati, Rasti; Balittanah, and R. Heru Praptana. 2017. "Percepatan Proses Pengomposan Aerobik Menggunakan Biodekomposer / Acceleration of Aerobic Composting Process Using Biodecomposer." 16(1):44–56. doi:10.21082/PSP.V16N1.2017.44-57.

Sari, Nada Pirma, Rinaldi Rinaldi, and Zuli Rodhiyah. 2021. "Pengaruh Perbedaan Tinggi Tumpukan Kompos Terhadap Jumlah Bakteri Escherichia Coli Dan Salmonella Sp. Pada Kompos Sampah Organik Pasar Dan Limbah Padat Rumah Potong Hewan." *Jurnal Engineering* 3(1):44–55. https://online-

journal.unja.ac.id/JurnalEngineering/article/view/12206.

Sari Rukmana Okta Sagita Chan., Benny Satria Achmad.,. Ferdinant Ferdinant. 2023. "Pemanfaatan Berbagai Limbah Organik Sebagai Bahan Baku Pembuatan Kompos Menggunakan Decomposer M21 | Jurnal Agrium." https://ojs.unimal.ac.id/index.php/agrium/article/view/14009.

Siregar, Adella Hotnyda, Sargi Br Ginting, and Alina Cynthia Dewi. 2020. "Daur Ulang Sampah Kertas Menjadi Briket." *Ikra-Ith Abdimas* 3(2):26–30. https://journals.upi-yai.ac.id/index.php/IKRAITH-ABDIMAS/article/view/485.