UTILIZATION OF WET GRASS AS A RESULT OF CAMPUS LAND WASTE INTO COMPOST (MACRONUTRIENT AND MICRONUTRITIENT)

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Abstract

The results of trimming the grass are routinely disposed of in a temporary waste dump (TPS) which is actually one of the potentials as raw material for the practice of waste management course which is always available for implementation and developing studies in the field of sanitation for all civitas academics. This research was a quantitative descriptive study. The stages in this research: preparation stage, observation stage, and implementation stage. The results of the physical measurement study obtained pH = 7.00-7.50, temperature = 30-48 ^{o}C, and moisture = 44-78% (met the requirements for the decomposition process to occur in the waste to get a fast and good fertilizer). For macronutrient yields N + P_2O_5 + K_2O = 5.34%, C-Organic = 1.61 dan C/N = 17.78% (met the requirements). For micronutrients, Fe = 5762 ppm and Zn = 17.78 (met the requirements).

Keywords: grass; macronutrient; micronutrients; organic fertilizer

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1. Introduction

Campus is a higher education and as a gathering place for young people of productive age who have the potential as agents of change and contribute greatly to various innovations and promotions including health promotion including environmental health and prevention of various environmental-based infectious diseases including Covid-19 and non-communicable diseases. Implementation of "Clean and Healthy Living Behavior" of students during the Covid-19 pandemic by 49.2%-53.1% [1]. A healthy campus is an implementation of the Health Promoting University concept that has existed since two decades ago as an effort to create habits and cultivate a clean and healthy lifestyle for the entire academic community in higher education. Building superior human resources in the Golden Indonesia era can be started from students who healthy. Thus, it is time for universities to participate in promoting a healthy lifestyle for all civitas academics. Many studies have investigated which environmental factors in schools are associated with student health status, school attendance, and academic performance [2-4].

Compost is a value added by product generated during the waste recycling process called composting [5]. Compost reduces the use of non-renewable chemical fertilizers [6,7]. In composting, organic materials such as grass, dry leaves, decayed wood, and sawdust are combined with the primary solids of the waste to create a final organic amendment with relatively high nutritional value and low levels of pathogens [8,9]. Compost can also be used as a stand alone substrate for plant growth or as a component in top organic dressing [10,11]. There is possible that potentially toxic legacy contaminants are already present in their gardens due to buildings, industry, transport of soil from elsewhere and waste practices [12]. Compost enhance soil health by providing aeration, drainage, moisture, increased nutrient availability, soil microbial activities [13].

The following are the reasons why universities are chosen as healthy campus programs, namely[13]: 1) Universities have the potential to protect and improve the health of college students and staff as well as the surrounding community; 2) Universities can use their influence in the community in order to improve public health; 3) Universities is a big institution where many people spend a lot of their time to study, work, socialize and so on; 4) Universities have students who will become professionals and policy makers who can influence public health.

Poltekkes Kemenkes Surabaya (Health Polytechnic of the Ministry of Health at Surabaya) is one of the universities under the Ministry of Health of the Republic of Indonesia with campus allocations spread across various cities in East Java province which include: Surabaya, Sidoarjo, Bangkalan, Tuban, Bojonegoro and Magetan. The sanitation of Magetan Campus based on its vision of "community empowerment in the field of sanitation" is a campus that has a relatively wide expanse of green grass with routine maintenance by cleaning service officers in the form of pruning activities with grass trimmer machines. The results of this grass cutting actually become one of the potentials as practice raw materials that are always available for implementation and developing studies in the field of sanitation for all academics, but in fact the potential for this grass clipping is routinely disposed of in a temporary waste dump (TPS) in the corner campus.

2. Methods

This research was a quantitative study to identify the quality of compost fertilizer. The development of compost maturity level is evaluated through changes in physicochemical properties during the composting process [14,15]. Tools of this study was a set of decomposition tools in making compost in the form of: lawn mower, shovel, fork hoe, bucket, polyethylene plastic, thermometer and weighing equipment as well as used car tires, while research materials include: wet grass produced.

According to Peni & Purwanto [16], procedure to make compost was: 1) Collect all the wet grass that is the result of clearing campus land. Wet grass that is the result of clearing campus land and select or sort as much as 20 Kg for research; 2) Add fermenter bacteria (EM-4) at a rate of 1:20, meaning 1 liter fermenter (EM-4) for 20 kilograms of raw materials; 3) Add Molasses with a dose or ratio of: 1: 200, meaning 1 ml of molasses for 200 grams of raw materials. For 20 kg of raw materials, 100 ml of molasses is needed. The fermenter and molasses were then diluted with water to a volume of 5000 ml and then ready for use; 4) Mix the raw materials with a mixture of fermenter and molasses (which has been diluted); 5) Put the mixture of raw materials that have been mixed with a mixture of Fermenter and Molasses (Point d) into a container made of PE. By putting the material in the container, the decomposition process begins in the container; 6) After the decomposition lasts 3-6 weeks, then take sample and check the content of macro nutrients: N, P, K and C – organic and micro nutrients in the 3rd and 6th weeks. Examination of samples for macro and micro nutrients is carried out in the soil science laboratory of the Faculty of Agriculture, Sebelas Maret University, Surakarta or other laboratories that have the ability**.**

The observation stage, namely: observing that the raw material for wet grass from cleaning campus land, wet grass from cleaning campus land in PE

containers (for a period of 3-6 weeks) had been processed to get to the characteristics or signs of finished compost [17-19]. During the observation stage there were several parameters that must be measured and observed, namely temperature, moisture, pH and texture.

3. Results and Discussion

Table 1: pH, temperature and moisture

NO	Day	Date	pH	Temperature (ºC)	Moisture (%)	Description
1	1	30 May 2022	7.0	30	75	Treatment
			7.1	30	65	Control
2	3	2 June 2022	7.3	45	78	Treatment
			7.5	40	66	Control
3	7	6 June 2022	7.2	48	75	Treatment
			7.2	42	65	Control
4	10	9 June 2022	7.2	43	73	Treatment
			7.2	40	70	Control
5	14	13 June 2022	7.1	40	70	Treatment
			7.2	38	60	Control
6	16	15 June 2022	7.2	40	65	Treatment
			7.3	37	48	Control
7	19	18 June 2022	7.1	35	64	Treatment
			7.2	34	48	Control
8	21	20 June 2022	7.0	31	48	Treatment
			7.2	30	44	Control

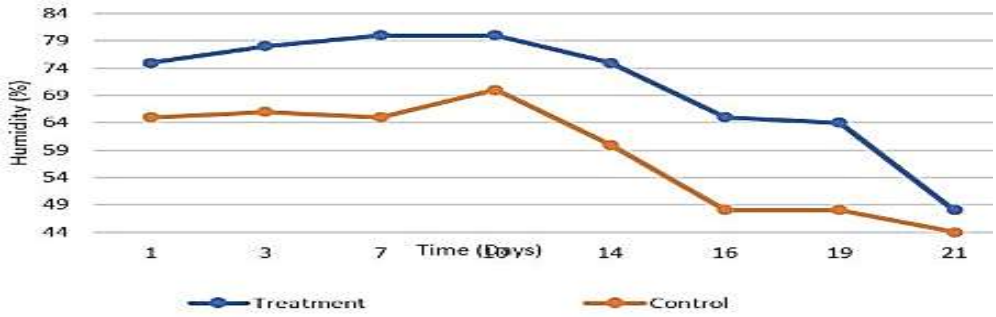

Figure 1: Time series of humidity

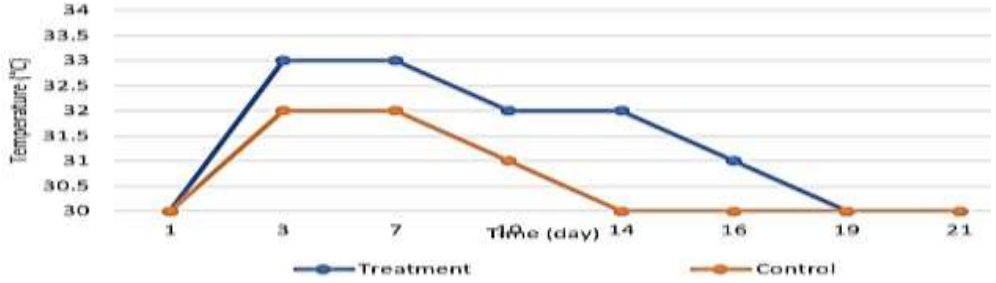

Figure 2: Time series of temperature

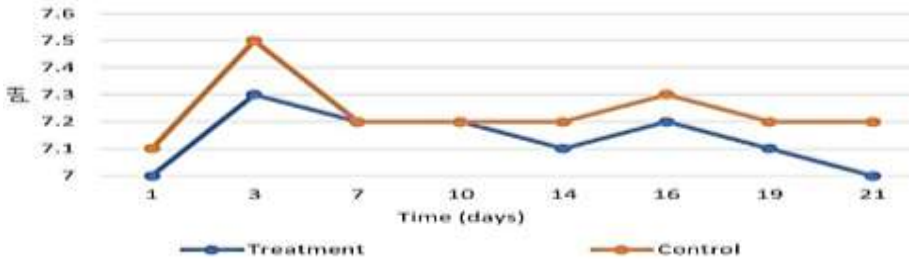

Figure 3: Time series of pH

In the composting process the moisture can range from 44-78%. This is because microbes can decompose organic matter if the environment is moist. In moist conditions, microbial processes can run smoothly in the decomposer, so that in these conditions the nutrient supply for microbes is fulfilled [10,15]. If the moisture in the decomposer is less than 40%, it will hamper the composting process because the compost is too dry (needs wetting). how to compost every 3-6 days inverted to get oxygen (aerobic process) so that the expected Moisture is 50-65%. during the composting process. In the composting process the temperature can range from 30-48ºC, high temperatures can increase the activity of the decomposer microbes in using oxygen, so that the compost decomposition process can run quickly, the temperature will be influenced by Moisture in the composting process; The expected Moisture in composting is more than 60%, so that the temperature increase can occur, and the thermophilic microbes are expected to live. In order to maintain the temperature and moisture conditions as expected, the height of the compost pile needs to be adjusted so that oxygen can enter (aerobic process occurs). At the beginning of the composting process, it is expected that the temperature will increase by adjusting the moisture in the composting process, this occurs on the third composting day until the tenth day, this makes the process of peak degradation. The compost maturation process occurs after the tenth day, marked by a decrease in temperature and Moisture, where the temperature approaches the normal air temperature of less than 35ºC [11,12]. On the twenty-first day and so on, the degradation conditions have stabilized and the composting has begun to be finished, physically marked by the color becoming blackish and the texture resembling soil and odorless.

In the composting process the pH can range from 7.00 to 7.50, the optimum composting process ranges from 6.50 to 7.50, so composting from wet grass raw materials has met the requirements in the degradation process. The composting process will cause changes in pH and organic matter itself, where if the acidification process occurs it causes a decrease in pH, and vice versa if there is ammonia production from the origin of compounds containing nitrogen, the pH will increase [6].

Examination of samples for macro and micronutrients was carried out at the soil science laboratory of the Faculty of Agriculture, Sebelas Maret University, Surakarta, the first sample, after 3 weeks of fermentation on 23 June 2022 and the second sample after 6 weeks of fermentation on 21 July 2022.

Table 2: Results measurement of macro nutrients (pH, C-Organic, N, P, K and C/N)

Treatment	pH	C-organic (%)	N-Total (%)	P (P_2O_5) (%)	K (K_2O_5) (%)	C/N
Week 3	7.3	28.62	1.61	0.92	2.81	17.78
Week 6	7.2	26.80	1.52	1.31	1.44	17.63
Requirement: Permentan RI No. 261/KPTS/SR.310/M/4/2019 [20]	4-9	>15	**N +P_2O_5 + K_2O >4** Week 3 = **5.34** (qualified) Week 6 = **4.27** (qualified)			15-25

Table 3: Results mesurement of micro nutrients

Treatment	Fe (ppm)	Zn (ppm)
Week III	5762	214
Week VI	19.792	108
Requirement: Permentan RI No. 261/KPTS/SR.310/M/4/2019 [20]	Max 15000	Max 5000

About macronutrients, The N P_2O_5 K_2O elements was 5.34% in the third week and 4.27% in the sixth week, by testing in the Chemistry and Soil Fertility Laboratory, Faculty of Agriculture, Sebelas Maret University, Surakarta, so the macro nutrients from the compost of wet grass raw materials have met the requirements of the Minister of Agriculture RI No. 261/KPTS/SR.310/M/4/2019, because the requirements of the Ministry of Agriculture was more than 4% [20]. Likewise, the C-Organic parameter was 28.62% in the third week and 26.80% in the sixth week, so met the requirement (>15%) [15]. C/N ratio parameter was 17.78 in the third week and 17.63 in the sixth week, so met the requirement (15-25) [9,11,15]. That the composting process can be natural but runs slowly because of organic materials that occur naturally, to speed up the composting process, some of these technologies use a composting activator, namely microbial decomposers which are widely sold in the market, for this study using EM4.

About micronutrients, Fe levels = 5762 ppm in the third week, and 19.792 ppm in the sixth week, so met the requirement (15000 ppm) in third week, and did not meet the requirements in the sixth week, this is why we analyze the cause it is possible for a stirrer/sampler to use an iron tool (punch or hoe) [20]. Zn = 214 ppm in the third week and 108 ppm

in the sixth week, so met the requirement (5000) [20], so Zn is also eligible [2,5,8,9].

That all plants in their growth always need nutrients to thrive and develop properly, these nutrients are in the form of macro and micro nutrients contained in fertilizers. With the results of this study, namely organic fertilizer from the cleaning of wet grass from campus that has met the requirements for macro and micro nutrients according to the Ministry of Agriculture, we recommend that the results of this fertilizer can be used to fertilize all plants on campus to make campus beautiful and green by utilizing the generation of waste [13,14,20]. Macro nutrients have several important functions for plants to produce healthy, strong, green plants and produce good fruit [12,15], namely: 1) With the presence of macro nutrients can occur the formation of carbohydrates, respiration, photosynthesis, chemical work, mechanical work and also osmotic work in plants can be smooth; 2) Increase plant growth, leaves can be healthy green, can accelerate plant growth such as increasing height and increasing the number of leaves; 3) Increased protein content in plants; 4) Increase in leaf and fruit size; 5) Accelerate the growth of food and roots, thereby strengthening the growth of maturity, and finally the plant makes fruit quickly ripe and harvest; 6) Reducing the risk of falling fruit and leaves, so that the quality of the plant becomes better; 7) Makes plant growth stronger; 8) Make plants healthier and greener with the presence of P in macronutrient fertilizers.

Some of the benefits of micronutrients for plant growth, are [12,15]: 1) Help the process of forming pollen, roots and flowers in plants; 2) Formation of carbohydrates, fats, proteins and enzymes in the process of photosynthesis; 3) Helps the formation of vitamin C, which functions to maintain the green color of the leaves.

It is hoped that the results of this study can enrich research on chemical substances related to environmental health, especially on the topic of waste management, in addition to other topics such as water management [21-24], and so on.

4. Conclusion

Based on the results of the study it was concluded that the macronutrient and micronutrient levels of grass compost met the requirements of government regulations.

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