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The Differences on Number of Mulberry Leaf and Fruit in Sewage Compost Dosage Distribution

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Abstract: Sewage is known as a waste which disrupts residential area because it creates a bad odor. Many people are still unaware that sewage can be used as compost. This research aims at identifying the differences on number of mulberry leaves and fruits in sewage compost dosage distribution. This research is a qualitative research with experimental study type. The data analysis uses ANOVA test. The treatment of dosage distribution of liquid compost from sewage is divided into 5 ml, 10 ml and 15 ml per poly bag. The results of this research shows that there is a significant difference on number of mulberry leaves in the dosage distribution of 5 ml, 10 ml, and 15 ml with the significance of 0.000 (< 0.05) and mulberry fruits in the dosage distribution of 5 ml, 10 ml, 15 ml with the significance of 0.008 (< 0.05).

Key words: leaves, fruits, mulberry, compost, sewage

1. Introduction

Issues on environmental pollution are never ending problems. These problems are actually the consequence of human bad behavior towards the environment. One source of the pollution happening in residential area is pollution from sewage. Sewage as the disposal of household waste causes the high level of BOD which means that it will cause the unpleasant odor and the sewage water to be black colored. If this problem is left alone then it can disrupt the residential area around. Therefore, we need to minimize the pollution that is still happening. In Islam, human is recommended to function their faith in saving and conserving the environment where they live, as the word of Allah in QS. Al-A'raf, 10th verse that: "Indeed We have placed you on the face of the earth, and We have made it for you in it (the source of) livelihood. Very few of you are grateful." Maulana (2014).

According to the verse above, we should keep the surrounding environment always as well as solving the problem on sewage pollution. Ma'sud (2008) [1] states that, human as beings who think is equipped with curiosity. This curiosity will encourage the will to know, understand and explain natural phenomenon as well as trying to solve the problems faced. While Walgito (2003) [2] also states that, humans are essentially individual and social creatures. As an individual, they have relations to themselves and devote themselves while as social creatures, they have relations to the surrounding including society and environment. Neolaka (2008) [3] states that environment also means the nature as well as the people living in the society influence human as the member of the society. Tutik (2008) [4] contributes three meanings of environment such as physical, biological, and social environment. Physical environment includes everything around us such as house, vehicles, mountain, air, river, sea and many more. Biological environment includes all the things around human such as living organism like animals, plants, microorganism and more. Lastly, social

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environment includes other human beings around like the neighborhood, friends, and more.

Farissa (2015) [5] states that along, with the rate of population growth and the increasing necessities of life, it is certain that the waste will also increase due to the sewage produced. It is because sewers become the reservoirs of disposal of all household liquid waste. O. J. Sumampow (2015) also states that liquid waste which is mostly distributed in sewers includes remaining bathing water, used washing water, and kitchen waste. Other than liquid waste, there is also household waste which causes the sewer to become clogged. Thus, in addition to unpleasant odor, when it rains flooding is unavoidable.

Based on the results of a study it shows that sewage has 70% sand, 20% mud and 10% stagnant waste. Sewage contains H_2S which causes unpleasant odor, methane that is not good for health and global warming, as well as *E. colli* and *Salmonella*. However, sewage turns out to have valuable potential and could be utilized as a business opportunity [6]. One of the potentials of sewage is that it can be processed into compost. Compost is an organic fertilizer which is used as plant fertilizer.

In this research, sewage will be used as liquid compost to be tested on mulberry plants. Mulberry plants are rare plants which are currently not getting the attention of the people in the society. In fact, in addition to its easy maintenance, it also has many benefits. Based on the Ministry of Forestry Team (2007), mulberry plants have the following taxonomy:

Division : Spermatophyta
Sub Division : *Angiospermae*
Class : *Urticalis*
Family : *Moraceae*
Genus : *Morus*
Species : *Morus sp.*

Mulberry also has several types, namely white mulberry (Morus alba L.), black mulberry (M. nigra L), red mulberry/American mulberry(M. rubra L), Korean mulberry (M. australis), Himalayan mulberry (M. laevigata), India mulberry (M. indica), M. muticaulis, M. cathayana, M. macroura, M. itouwase, M. shiwasuguea dan M. amakusaguwa). The regional name of mulberry are *walot* (Sunda), *besaran* (Jawa), *malur* (Batak), *nagas* (Ambon) and *tambawa mrica* (Makasar). Saddul and Halim (2005) [7] mention that mulberry is a long-aged plant and naturally easily adapts well to several types of soil. Mulberry leaves are highly favored by herbivores. It can also be animal feed, have good nutritional value and contain high crude protein which is 22.9%-25.6%.

Hastuti (2016) [8] in her research shows that in addition to being consumed directly, mulberry fruit can also be used as a cough medicine, indigestion and inflammation of skin ulcer. While Has et al. (2014) also mention that crude fiber found in mulberry leaves can stimulate the movement of the digestive tract and as a source of energy. The lack of fiber in the body causes digestive disorder.

On the other hand, in Pudjiono (2007) [9], it shows that mulberry fruit can be used as jelly drinks which is gel beverage made of pectin, jelly, carrageenan, gelatin or other hidrocolloid substance with the addition of sugar, acid and other materials. This drink can function as an antioxidant because it contains anthocyanin. While mulberry leaves can improve the productivity and quality of silkworm cocoons.

Meanwhile a research by Setiadi et al. (2011) [10] shows that the use of organic fertilizer can increase the production of mulberry leaves which function as silkworm feed. Based on the description mentioned before, it is necessary to conduct research to determine the differences in the number of mulberry leaves and fruits in the distribution of sewage compost dosage.

2. Materials and Methods

This research is an experimental research with quantitative approach. The required tools include: compost container, bucket, stirrer, watering can, gloves, mask and poly bag. The materials needed are deposited sewage, bio activator EM-4, sugar cane drops,

mulberry seeds, and soil. The data collection is done by calculating the number of mulberry leaves and fruits. Experimental design uses the *Rancangan Acak Lengkap* (RAL) or Complete Random Design. RAL is considered as the most suitable design for this experiment where there is no grouping (Hanafiah, 2005). The treatment is carried out for 3 months by giving compost once a week with a dose of 5 ml/poly bag, 10 ml/poly bag and 15 ml/poly bag. The data analysis technique used was ANOVA with the help of SPSS 16.0 [11].

3. Results and Discussion

The difference in the number of mulberry leaves and fruits between several treatments are discovered using the ANOVA (Analysis of Variance) test. After the data is obtained, the data is next processed and analyzed. Before being analyzed with ANOVA, the prerequisite tests are carried out first, for example the homogeneity test and the normality test. If the data is not homogeneous and/or abnormal then the hypothesis test cannot use the ANOVA. Instead the non parametric test (Kruskal Wallis).

This research uses a RAL/Complete Random Design experimental design in which there were 3 treatments and 5 replications. The research data obtained are as in Table 1.

Table 1 Data on number of mulberry leaves and fruits given with liquid compost with three treatments.

Replication	T1		T2		T3	
	NL	NF	NL	NF	NL	NF
1	134	156	140	143	178	136
2	123	143	125	150	167	132
3	134	140	143	165	189	127
4	120	165	143	154	197	129
5	121	145	150	139	170	134
Total	632	749	701	751	901	658
Average	126.4	149.8	140.2	150.2	180.2	131.6

Description:
NL: Number of Leaf
NF: Number of Fruit
T1: Treatment with liquid compost on 5 ml/poly bag concentration.
T2: Treatment with liquid compost on 10 ml/poly bag concentration.
T3: Treatment with liquid compost on 15 ml/poly bag concentration.
These treatments are done in 3 months with the distribution of compost once a week.

The average number of leaf and fruits from several treatments can be seen in the following Figs. 1 and 2. The graphs show that the more dosage of the compost distribution, the more leaves will be produced. On the contrary, the more dosage of sewage compost given, the less fruits are produced.

The above data is then tested for homogeneity. The following Table 2 and Table 3 are the homogeneity test results from the data on the number of mulberry leaves and fruits.

Based on the homogeneity test, the number of leaf above shows the significance value of (Sig.) = 0.336 which means it is greater than 0.05. Because sig. > 0.05 means that the data on the number of leaf is homogeneous.

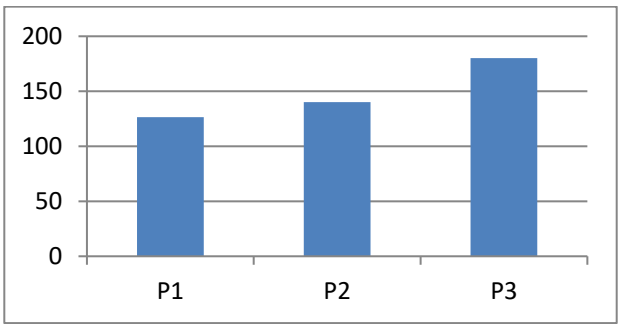

Fig. 1 Graph of the average number of leaf from the three treatments.

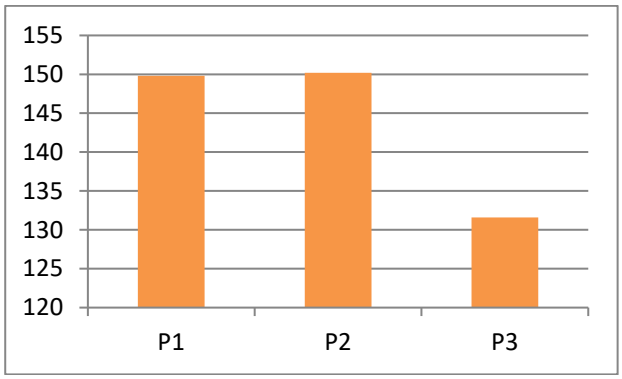

Fig. 2 Graph of the average number of fruit from the three treatments.

Table 2 Homogeneity test on number of leaf.

Levene statistic	df1	df2	Sig.
1.196	2	12	.336

Table 3 Homogeneity test on the number of fruit.

Levene statistic	df1	df2	Sig.
2.536	2	12	.121

Based on the homogeneity test, the number of fruit above shows the significance value of (Sig.) = 0.121 which means it is greater than 0.05. Because sig. > 0.05 means that the data on the number of fruit is homogeneous.

In addition to the homogeneity prerequisite test, a normality prerequisite test is also performed. The following Table 4 and Table 5 show the normality test results from data on the number of mulberry leaves and fruits.

According to the Table 4, the normality test on the number of leaf shows that the significance value is (Sig. = 0.634) which means it is greater than 0.05. Because sig. > 0.05 then it can be considered that the number of leaf is normal.

Based on Table 5, the normality test of the number of fruit shows that the significance value is Sig. = 0.964 which means it is greater than 0.05. Because sig. > 0.05 so that the number of the fruits is normal.

Based on the prerequisite tests of homogeneity and normality mentioned before, it can be understood that the data on number of leaf and fruits are homogeneous and normal. Thus, it can be concluded that the data on the number of leaf and fruits can be carried out for further analysis namely ANOVA parametric analysis.

Table 4 Normality test on the number of leaf.

		Number of leaf
N		15
Normal parameters[a]	Mean	148.93
	Std. deviation	25.342
Most extreme differences	Absolute	.193
	Positive	.193
	Negative	-.127
Kolmogorov-Smirnov Z		.746
Asymp. Sig. (2-tailed)		.634

a. Test distribution is Normal.

Table 5 Normality test on the number of fruit.

		Number of fruit
N		15
Normal parameters[a]	Mean	143.87
	Std. deviation	12.035
Most extreme differences	Absolute	.129
	Positive	.129
	Negative	-.094
Kolmogorov-Smirnov Z		.500
Asymp. Sig. (2-tailed)		.964

a. Test distribution is Normal.

Next, the hypothesis test is performed with the ANOVA test. The following is the Anova test results in order to find out the number of leaf and the number of fruit from several treatments.

According to Table 6, it shows that the value is sig. (0.000) < 0.05. Because of sig. < 0.05 it can be concluded that "There are differences in the number of leaf from the three different treatments".

Meanwhile, the differences on number of leaves in each of the treatments can be seen in Table 7.

Based on Table 7, it shows that: There are significant differences on the number of leaf (1) between T1 and T2 which is indicated by the value of sig. 0.048 < 0.05; (2) between T1 and T3 which is indicated by the value

of sig. 0.000 < 0.05; and (3) between T2 and T3 which is indicated by the value of sig. 0.000 < 0.05.

It is shown in Fig. 1 that the more dosage distribution of sewage compost, the more leaves are produced. While the ANOVA test shows that there are significant differences of the mulberry leaves from the different treatments of liquid sewage compost distribution. In the provision of liquid sewage compost with large doses will increase the number of leaf. This proves that the mulberry leaves will flourish or many leaves will be produced of the plant is in acidic condition.

Table 6 ANOVA analysis test on number of leaf from several treatments.

Number of Leaf					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7808.133	2	3904.067	39.608	.000
Within Groups	1182.800	12	98.567		
Total	8990.933	14			

Table 7 The results of post hoc (LSD) analysis test on the number of leaf in each treatment.

(I) Treatment	(J) Treatment	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
P1	P2	-13.800*	6.279	.048	-27.48	-.12
	P3	-53.800*	6.279	.000	-67.48	-40.12
P2	P1	13.800*	6.279	.048	.12	27.48
	P3	-40.000*	6.279	.000	-53.68	-26.32
P3	P1	53.800*	6.279	.000	40.12	67.48
	P2	40.000*	6.279	.000	26.32	53.68

*. The mean difference is significant at the 0.05 level.

According to the results of research analysis, it is shown that the optimization level of mulberry leaves is in the distribution of high concentrated liquid sewage compost fertilizer. This means that the more liquid sewage compost is distributed, the more leaves will be produced. This is due to the fact that leaves in mulberry plants prefer the acidic condition to grow. Thus, the more sewage contained, the more acidic the fertilizer compost will be. It will also increase the number of mulberry leaves produced. It was shown that the T3 treatment showed the most number of leaf produced compared to T1 and T2 treatments. In the treatment T2 has more leaves than T1.

It is known that the sewage water contains harmful microorganisms such as *Escerica coli*, *Salmonella typhy* (causing fever), *Staphylococcus aureus* or *Streptococcus pyogenes* (the cause of itching of the skin) and larva/*jentik jentik cacing*. It is extremely dangerous if our skin or the food we eat is contaminated with sewage water. Nutrients contained in sewage water are nitrogen in the form of urea slow resulted from urine, potassium from decomposition of disinfectants and surfacants, phosphate from protein residues, dead cells and sediments that precipitate, carbohydrates, lignin, non-essential amino acids, iron Fe ions from iron precipitate, magnesium, vitamins, cellulose and others. Based on the content in the sewage water, it shows that sewage has acidic contents and knowing the fact that mulberry leaves will flourish under the acidic condition.

The next chapter is the description of the number of mulberry fruit with several treatments.

Viewed from Table 8, it shows that the value is sig. (0.008) < 0.05. Because of sig. < 0.05, it can be concluded that "There are Some Differences from The Three Different Treatments".

Meanwhile, the differences in the number of leaf from each treatments can be seen in the following Table 9.

Based on Table 9, it shows that: (1) There is no significant difference in the number of fruit between T1 and T2 indicated by the value of sig. 0.943 > 0.05; (2) There is a significant difference in the number of fruit between T1 and T3 indicated by the value of sig. 0.006 < 0.05; and (3) There is another significant difference in the number of fruit between T2 and T3 indicated by the value of sig. 0.005 < 0.05.

Table 8 ANOVA analysis test on the number of fruit viewed from several treatments.

Number of fruit					
	Sum of Squares	df	Mean Square	F	Sig.
Between groups	1128.933	2	564.467	7.536	.008
Within groups	898.800	12	74.900		
Total	2027.733	14			

Table 9 Post hoc analysis test results (LSD) on the number of fruit in each treatment.

(I) Treatment	(J) Treatment	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
T1	T2	-.400	5.474	.943	-12.33	11.53
	T3	18.200*	5.474	.006	6.27	30.13
T2	T1	.400	5.474	.943	-11.53	12.33
	T3	18.600*	5.474	.005	6.67	30.53
T3	T1	-18.200*	5.474	.006	-30.13	-6.27
	T2	-18.600*	5.474	.005	-30.53	-6.67

*. The mean difference is significant at the 0.05 level.

From Fig. 2. it shows that the more doses of sewage compost, the smaller the number of fruit. While the ANOVA test results showed that there were significant differences in the number of mulberry fruit with some treatments in distributing the liquid sewage compost. The distribution of the compost with large doses will reduce the number of fruit. This proves that mulberry fruit will flourish or be greatly produced in a condition that is not so acidic.

Based on the results of the analysis, it is also shown that the degree of optimization in mulberry fruit is in the distribution of liquid sewage compost fertilizer in a low concentration. This means that the more fertilizer distributed, the less number of fruit will be produced. It is due to the fact that mulberry plants will not bear so many fruits growing in an acidic condition. Thus the more sewage content in the fertilizer, the more acidic the fertilizer will be. In other words, increasing the dosage of the compost fertilizer will also reduce the number of mulberry fruit. It was shown that the T3 treatment showed the smallest number of fruit produced compared to T1 and T2 treatment. Treatment T1 has almost the same number of fruit with T2. The post doc test showed that there was no difference in the number of fruit treated with T1 and T2 but it is very different from T3 treatment.

The results of the analysis above indicate that there are significant differences in the number of mulberry leaf and fruit depending on some treatments of liquid compost distribution. The large doses of liquid sewage compost distribution will increase the number of leaf. This proves that mulberry leaves will flourish under

acidic condition. On the other hand, the number of mulberry fruit will decrease by the large distribution of liquid sewage compost. As it is known that in a body of living things there should be a balance, so does the growth of this mulberry plant. If many quantities of leaf are produced then the fruit will be produced in a less quantity and vice versa.

Based on the results of the research, it indicates that if the leaves are to be utilized then the addition of sewage compost is needed. Mulberry is a plant with very good nutritional value and a high crude protein contained such as 22.9%-25.6%. Therefore it is widely used as animal feed. Mulberry has a high level of digestibility. Mulberry's biomass production depends on the season. The production will be very high in rainy season and will decrease in dry season. The quality of mulberry nutrition is greatly influenced by the age of the harvest. In general, mulberry leaves are widely used as silkworm feed. Conversely, if the mulberry fruit is to be utilized, the distribution of sewage compost should be reduced. Mulberry fruit is widely used among other things such as the ingredients of jam, syrup, and other food.

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It is obvious that nothing is perfect, as well as this research which might still have some shortcomings. Therefore, constructive inputs, suggestions and criticisms are expected in order to improve further research. Hopefully the results of this study will benefit the public, students, farmers and readers at large.

References

[1] Ma'sud Ibnu, *Ilmu Alamiah Dasar*, Bandung: Pustaka Setia, 2008.

[2] Walgito, Psikologi Sosial, Yogyakarta: Andi, 2003.

[3] Neolaka Amos, *Kesadaran Lingkungan*, Jakarta: Rineka Cipta, 2008.

[4] Tutik Triwulan, *Pengembangan Sains dan Teknologi Berwawasan Lingkungan Perspektif Islam*, Jakarta: Lintas Pustaka Publisher, 2008.

[5] Farissa Ikhwanul, Limbah Got Jadi Produk Yang Bernilai, 2015, available online at: https://www.kompasiana.com /ikhwanulparis/limbah-got-jadi-produk-yang-bernilai_56 7736655c7b6118048b4576.

[6] Mutawakil, Pengolahan Limbah Got Sebagai Peluang Usaha, Jakarta: Penebar Swadaya, 2006.

[7] D. Saddul, Z. A. Jeln, J. B. Liang and R. A. Halim, Evaluation of mulberry as potential feed supplement for ruminants: The effect of plant maturity on in situ disappearance and in vitro intestinal digestibility of plant fraction, *Asian-Aust. J. Anim. Sci*. 18 (2005) (11) 1569-1574.

[8] S. U. Hastuti, A. Oktantia and H. N. Khasanah, Daya Antibaketri Ekstrak Daun dan Buah Murbei Terhadap Staphylococcus aureus Dan Shigella dysenteriae, in: *Proceeding Seminar Nasional IX Pendidikan Biologi*, FKIP UNS, Hlm, 2016, pp. 529-534.

[9] S. Pudjiono and M. Na'iem, Pengaruh Pemberian Pakan Murbei Hibrid terhadap Produktivitas dan Kualitas Kokon, *Jurnal Pemuliaan Tanaman Hutan* 1 (2007) (2) 1-5.

[10] W. Setiadi, Kasno and N. F. Haneda, Penggunaan Pupuk Organik Untuk Peningkatan Produktivitas Daun Murbei sebagai Pakan Ulat Sutera, *Jurnal Silvikultur Tropika* 2 (2011) (3) 165-170.

[11] Sujianto Agus, Aplikasi Statistik dengan SPSS 16.0, Jakarta: Prestasi Pustaka, 2009.