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GROWTH DIAMETER AND LENGTH OF ROOTS IN JELUTUNG RAWA PLANTS (DYERA POLYPHYLLA (MIQ.) STEENIS): EMPIRICAL STUDY USING FERTILIZER LIQUID WALET ACCESSION

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ABSTRACT

The use of swallow excretion in agriculture is no stranger, many farmers have succeeded and get maximum results with the use of swallow fertilizer, but in the field of forestry plants very rarely use swallow excretion fertilizer as a trigger for plant growth. This research was carried out for the effect of giving the best liquid swallow excretion and dose to the diameter and final length of the roots of the Jelutung Rawa (*dyera polyphylla (miq.) Steenis*). This study uses a randomized block design (RBD) consisting of 2 groups of observations. the first group observed open areas, the second group observed areas of shrub cover, consisting of 5 levels of treatment with 16 replications. Measurement of light intensity at the study site was done using a light-meter. Data analysis for plant diameter variables used analysis of variance for RCBD with a linear model, while for root length was done by calculating the root length ratio of each treatment. Based on the results of the study it was found that the administration of liquid swallow excretion had a significant effect to the variable increase in diameter of the Swamp Jelutung plant Rawain the open area at a level of 5% while the closed area has no significant effect. In the open area with a dose of fertilizer control and 100 gr / L produces the longest root which is 12 cm long with a long branched taproot form, while for the longest closed root area is 12.2 cm with a taproot and branched roots that are the fertilizer dose 50 gr / L.

KEY WORDS

Liquid swallow excretion, liquid swallow dose, plant height, number of leaves.

Liquid organic fertilizer is a solution of decomposition of organic materials originating from plant residues, animal and human waste containing more than one elemental substance. The advantage of this organic fertilizer is that it can overcome nutrient deficiency quickly, has no problem in washing nutrients, and is also able to provide nutrients quickly. When compared with inorganic fertilizers, liquid organic fertilizer generally does not damage the soil and plants even though it has been used as often as possible. In addition, this fertilizer also has a binding material so that the fertilizer solution given to the soil surface can be directly utilized by plants (Hanisar, 2016). According to (Ayu & Pramushinta, 2018; Rahmawati, 2020) Liquid organic fertilizers are fertilizers that contain chemicals that can provide nutrients according to the needs of plants in the soil. The advantages of liquid organic fertilizer are that it can nourish the environment, revitalize soil productivity, reduce costs, and improve product quality.

Swallow (*Collocalia fuciphaga*) is the most widely cultivated bird species in Indonesia, this species is of medium size (12 cm), the upper body is blackish brown with pale gray tungging, the lower body is brown, the wings are crescent-shaped elongated and spiky, has a wagging tail and sharp nails. Swallow, a type of animal that is often found in Indonesia (Ministry of Forestry and Plantation, 1999). This bird is often known for its benefits (nests) which are made from its saliva, where the swallow's saliva is known for its many benefits, especially for treatment. Even so, swallow bird droppings have been proven in agriculture, as a very effective natural fertilizer for a variety of plants Nurhadiyah, 2017). Swallow excretions so far have not been used by swallow nest breeders and only as waste. Based on the results of research in the laboratory of swallow droppings themselves contain high nutrition compared to other animal droppings (Hariyadi, 2015).

According to Talino, et al (2013) bird droppings contain C-Organic 50.46%, N / total 11.24%, and C / N ratio 4.49 with pH 7.97, Phosphorus 1.59%, Potassium 2.17%, Calcium 0.30% Magnesium 0.01%. So far, swallow bird droppings have not been maximally utilized by swallow breeders, usually swallow bird houses are cleaned every month from manure so that bird health is maintained and prevents pests and diseases, which can reduce the quality of nests, swallow droppings can be used as organic fertilizer so plants can grow optimally to support increased crop yields. According to Lestari (2011), the composition of swallow organic fertilizer is Phosphorus 14%, Phosphate P_2O_5 dissolved in citric acid 10% Nitrogen 1-2%, Potassium 1%. Organic matter reaches 24% and maximum water content is 5%, the quality of organic guano swallow fertilizer has advantages because it meets national organic agricultural product standards, the application of guano organic fertilizer is expected to improve soil conditions both physically, chemically and biologically.

Managing organic material on agricultural land in a sustainable manner must pay attention to the source of organic material, methods and appropriate media in order to improve its function in helping to improve soil fertility. One of them is the utilization of liquid swallow excretion. The results of the research by Talino et al (2013) showed that the application of liquid swallow excretion fertilizers in agricultural crops, namely red spinach, can increase growth and production.

MATERIALS AND METHODS OF RESEARCH

The study was conducted for 5 (five) months, starting from August to December 2019. The research was conducted at the Seed Garden Semai UPR Green Campus Area whose land is located on Jl. Yos Sudarso, Kota Palangka Raya. The design used is with 2 groups. The open area observation group, group II observed the area covered with shrubs, consisting of 5 levels of treatment with 16 replications. So that the total number is 160 tillers.

Swamp Plant Jelutung Rawa (*dyera polyphylla (miq.) Steenis*), planted in 2018, with an average plant height of 10 cm - 30 cm seedlings originating from nurseries in BPDAS-HL Kahayan. Swallow Excretion Liquid: with different compositions, namely 0 gr / L per crop (Control), 50 gr / L per crop, 100 gr / L per crop, 150 gr / L per crop, and 200 gr / L per crop.

The first step taken is to clean each line of Plant Jelutung Rawa. Continue to prepare the fertilizer and weigh the swallow excretion fertilizer according to the required dose, then mark each path of the Swamp Jelutung plant Rawato be observed. After being marked, it is then observed and fertilized once every 2 weeks with a study period of 5 months. The next process is to perform maintenance on plants by watering twice a day ie morning and evening, then measuring height and counting the number of leaves 1 time per 2 weeks for 5 months. For the process of liquefaction of swallow excretion, the first time is done by preparing swallow excretion fertilizer that has been stored for $\pm 4 - 5$ months, then weighing swallow excretion fertilizer according to what is needed in fertilizing. After weighing, swallow excretion fertilizer is still solid with ground water, after the material has been mixed; the fertilizer is evenly mixed until the fertilizer is completely dissolved with water. The final step is to put fertilizer in a large bucket and incubated for 7 days and the bucket closed tightly.

Collection of data about stem diameter of plants was measured using calipers with measurement time per two weeks for 5 months. While the root length data is obtained by measuring the root length of plants in each sample that has been determined so that it can be known differences in each root length, root samples will be taken from each treatment that has been determined from open or closed areas.

The stem diameter data were analyzed using analysis of variance or analysis of variance (ANOVA) for RCBD. If the treatment shows different effects (at the level of 5% and 1%) then proceed with further testing. Before further testing is done, the coefficient of diversity (CV) value is determined first. The alternative follow-up test that will be used is If the $CV > 10\%$ then the follow-up test used is the Duncan test, if the CV is between 5% - 10%, the follow-up test used is the Least Significant Difference Test, whereas if the $CV < 5\%$ then the follow-up test used is Real Honest Difference. While the root length data were analyzed by calculating the root length ratio of each treatment in the open and closed areas.

RESULTS AND DISCUSSION

The average increase in diameter for each treatment for a given dose can be seen in Figure 1.

Figure 1 – Increase in diameter of Swamp Jelutung in the Open Area

Based on Figure 1 results of the average increase in diameter of Jelutung Swamp for 5 months by dosing predetermined for the open area obtained an increase in the average diameter of each treatment, namely P0 by 0.59 cm, P1 by 0.63 cm, P2 by 0.35 cm, P3 by 0.38 cm and P4 by 0.52 cm. Based on these results it can be seen that P1 by giving a liquid swallow excretion dose of 50 gr / L per plant has the highest average diameter of 0.63 cm while P0 has an average diameter of quite high at 0.59 cm while for the lowest diameter in P2 that is equal to 0.35 cm.

Anova test results influence the application of several types of fertilizers to the stem diameter of the Swamp Jelutung plant Rawafor open areas can be seen in Table 1.

Table 1 – Increase in diameter of Swamp Jelutung Swamp Open Area

Model	db	SS	MSS	F test		F table	
						0.05	0.01
Treatment	4	1.01	0.25	3.06	*	2.49	3.57
Group of Error	15	1.40	0.09	1:13	ns	1.79	2:27
Total	79	4.95	0.08				
	79	7.36					

Based on Table 1, significant treatment is therefore necessary to be carried out with further testing. To find out the further tests used, the coefficient of diversity (KK) was determined in advance for the average height of aelutung tillers in open areas.

$$CV = \sqrt{MSE / Y} \times 100\% = 58.18\%$$

Based on the results of the Diversity Coefficient that is 58.18% ie> 10% then it will be continued with Duncan's further test using the SPSS application with and the following Homogeneous Subsets results are obtained:

Table 2 – Duncan Test for the Average Diameter of Open Area

	Tiller in Dose Fertilizer	N	Subset	
			1	2
Duncan ^{a, b}	P2	16	,3513	
	P3	16	,3750	
	P4	16	,5231	,5231
	P0	16		,5919
	P1	16		,6281
	Sig.		,115	,336

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square (Error) =, 083.

a. Uses Harmonic Mean Sample Size = 16,000.

b. Alpha = 0.05.

Based on the results of Duncan further tests using SPSS it can be seen that the most significant treatment of repetition is in P1 by administering a dose of 50 gr / L per hectare with a value of 0.6281 as shown in Table 2.

The average stem diameter of Jelutung Swamp tillers at closed area for each dose of treatment can be seen in Figure 2.

Figure 2 – Increased stem diameter of Jelutung Swamp tillers in a Closed Area

Based on Figure 2 results from the average increase in diameter of Jelutung Swamp tillers in closed areas carried out for 5 months with a given dose It has been determined that the average diameter increase of each treatment is P0 0.52 cm, P1 0.59 cm, P2 0.57 cm, P3 0.50 cm and P4 0.56 cm. Based on these results it can be seen that P1 by giving a liquid swallow excretion dose of 50 gr / L has the highest average diameter of 0.59 cm while P2 has an average diameter of 0.57 cm while the average diameter the lowest in P3 is 0.50 cm.

Anova test results of the effect of giving several doses to the increase in diameter of Swamp Jelutung for a closed area can be seen in Table 2.

Table 3 – Height Increase of Swamp Jelutung Swamp Covered Area

Model	db	SS	MSS	F test		F table		
						0.05	0.01	0.01
Treatment	4	0.09	0.02	0.30	tn	2.53	3.65	
Group	15	1.71	0.11	1.52	tn	1.84	2.35	
Error	60	4.49	0.07					
Total	79	6.29						

Based on Table 1 the treatment turned out to have a significant effect on the diameter of the swamp jelutung tillers open area, while the grouping has no significant effect. To increase the diameter of plants is strongly influenced by the element K in plants, this is triggered by cell division activities and the development of plant meristematic tissue (Satria, et al, 2015). According to Herdiana (2008) that the rate of plant growth is strongly influenced by the index of soil quality and conditions surrounding the plant. But the thing that affects the increase in diameter in Jelutung Swamp tillers has no significant effect because photosynthesis results are more widely used for new shoots, this is in line with Rosman (2012) statement stating the growth of tillers in plants will give priority to the addition of new shoots compared to the increase in diameter.

The increasing diameter of the swamp jelutung saplings in a closed area (Table 3) shows that the F count < F table at 1% or 5% level, this shows that neither the treatment nor the group had a significant effect on the increase in diameter of the Jelutung Swamp tillers in the closed area. The increasing diameter of the stem is influenced by several things namely the canopy surface, climate and soil conditions, relative humidity and the root system. Changes in temperature will affect the rate of transpiration characterized by a decrease in relative humidity. At the time of the study the temperature at the study site was not good enough for growth, due to fires that caused unstable temperatures and unstable rainfall

conditions. Plant air temperature for normal growth requires air temperature of 20 - 30 °C, above normal temperature is a critical temperature for plant growth. The critical temperature varies according to variety, the length of time the critical temperature lasts, the daily temperature changes day and night, and the physiological conditions of the growth of the puppies themselves (Oryza, et al, 2017). Where the temperature taken at the study site is 33.60 °C which means it has exceeded normal air temperature. While rainfall is a climate component that is always changing and difficult to predict, each region has a different rainfall pattern from one area to another, where at the time of research the rainfall was uncertain and the dry season was prolonged and had an impact on the growth of Jelutung Rawa saplings which lack nutrients.

Table 3 – Results of Measurement Length Plant Roots

Group	Treatment	Long Roots (cm)	Image	Description
Areal Open	P0	12		Roots riding, and branched long
	P1	11.5		Short root and branching
	P2	12		Long Long
	P3	10		roots and branches roots and branches
	P4	11		Long roots and Long and lengths Long

Closed area	aP0	1.5		roots and branches Long roots and branches Long
	P1	12.2		roots and branches roots and branches Long
	P2	10		Rootsroots and short branching
	P3	10		Long stemming and branching
	P4	11.5		Short stemming and branching roots

If this happens for a long time, it can cause the water balance of plants to be disturbed and can reduce plant growth, including plant diameter. Further tests do not need to be used

in increasing this diameter because neither the group nor the treatment has a real effect. The results of the analysis of variance in the increase in diameter in the open and closed areas had no significant effect at the 5% level and at the 1% level this was influenced by the lack of growth rates in the swamp jelutung saplings.

The measurement results jelutung marsh plant root length for each treatment in the open and closed areas can be seen in Table 3.

The final result is a comparison of the shape and length of roots in plants that can be seen from each treatment, where the roots of the sample are obtained from representatives of each treatment by randomization, in the open area can be seen the roots of P0 and P2 with a dose of control fertilizer and 100 gr / L of plantations have a root length of 12 cm, the form of taproots and long branches is the longest root compared to other treatments accompanied by P1, P4, and P3, which at P3 with a root length of 10 cm with the form of taproots and small branches is the shortest root in the open area.

While in the closed area can be known the ratio of the shape and length of plant roots in each treatment where the root P1 with a dose of 50 gr / L fertilizer has a root length of 12.2 cm and the form of taproots and branching branches accompanied by P3, P0, P2 and P4, and P4 covered area with fertilizer dosage of 200 gr / L per hectare having a root length of 10.5 cm is the lowest root length compared to other treatments, in this case the root growth is influenced by environmental factors. According to Dhaniaputri (2015) the growth of the root system will deviate from the ideal condition if the condition of the soil as a place of growth is not at optimal conditions, but if the opposite occurs it is certain that the plant root system is fully influenced by genetic factors. Where the location at the time of the study was peat soil which is wet soil or a lot of wetlands and has high acidic properties, but at the time of the study due to the long dry season the soil became dry which resulted in the soil becoming nutrient deficient so that plant growth was not optimal.

In the formation of stems, leaves and roots, nutrients that play a role in the process of photosynthesis that produce photosynthates are used in the formation of canopy and roots. Likewise, according to Samsuddin (2017), if plant roots develop well, the growth of other plant parts will be good too because the roots are able to absorb water and nutrients needed by plants. Plant root systems are more influenced by the genetic characteristics of plants and the condition of the growing media. (Roidah, 2014) states that root development in addition to being influenced by genetic traits is also influenced by the availability of water and nutrients. The root is an important factor in plant growth which reflects the process of absorption of nutrients. Haryadi (2015) states that a plant will grow well if the nutrients needed are sufficiently available in a form that is easily absorbed by plant roots. The improved plant growth will be able to increase plant weight.

CONCLUSION

In this study it was concluded that the dose of liquid swallow excretion fertilizer had a significant effect on the addition of stem diameter of Jelutung Swamp plants in open areas, but did not have a significant effect on closed areas. On the addition of the root length of each plant each treatment has a different average and length values in both open and closed areas, which means that the dose of liquid swallow excretion fertilizer has a significant effect on increasing the root length of the Plant Jelutung Rawa .

SIGNIFICANCE STATEMENT

The results of this study found that the best dose of fertilizer for the stem diameter of swamp jelutung plants in open and closed areas is P1 (fertilizer dose of 50 gr / L). For variable lengths of plant roots in open areas, P0 and P2 with control fertilizer doses and 100 gr / L cropping have a root length of 12 cm, long and branched roots form the longest root compared to other treatments so that P0 and P2 are the best fertilizer dosages for length plant roots and in a closed area P1 (fertilizer dose 100 gr / L), is the best fertilizer dose for the growth of plant root length that produces the longest root which is 12.2 cm.

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