WATER HYACINTH EXTRACT AND LIQUID WASTE OF TOFU INDUSTRYAFFECTED ONGROWTH PERFORMACE OF DELI TOBACCO SEEDLINGS

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ABSTRACT

The use of plant extraction and waste product utilisation as a source of organic nutrients is a novelty in conjunction of using organic product by fulfill plant's nutrient requirement. An experiment was carried out to determine the most suitable dosage level of water hyacinth extract in combination with liquid waste of tofu industry on growth performance of Deli Tobacco seedlings. The xperiment was conducted at Deli Tobacco Research Agency, PTPN-2 Medan-Indonesia and its arranged in a factorial randomised complete block design followed by Duncan multiple range test to separate between treatment means.Based on analysis results, the effective dosage of water hyacinth ectract application on the growth performance of Deli Tobacco was found at 3 liter per seedlings during nursery process or 220 ml/application (E3 treatment). This treatment factor resulted in a significant highest on parameter measuement of plant height (20.76 cm), leaf area index (76.00 cm^2), root volume (2.70 ml), total fresh weight (31.57 g) and total dry weight (5.63 g). Meanwhile, the suitable dosage of liquid waste of tofu industry was found at 300 ml/seedlings during nursery process or 45 ml/application (T3 treatment). This treatment factor produced a significant highest on parameter measurement of of plant height (19.51 cm), leaf area index (69.24 cm^2), root volume (2.80 ml), total fresh weight (34.57 g) and total dry weight (5.50 g). Nevertheless, no interaction was occurred between water hyacinth extract and liquid waste of tofu industryapplication.

Keywords: Deli Tobacco, Water Hyacinth Extract, Liquid Waste of Tofu Industry Table 1. Height of 7 MSPT Age Seedlings in Treatment of Water Hyacinth Extract and Tofu Liquid Waste

Water Hyacinth Ekxtract	Tofu Liquid Waste				Average
	T_0	T_1	T_2	T_3	
.....(cm).....					
E_0	11.56	14.58	17.44	17.58	15.29 c
E_1	16.97	17.95	17.78	18.47	17.79 b
E_2	18.71	20.17	20.23	21.34	20.11 a
E_3	20.68	20.81	20.91	20.63	20.76 a
Rataan	16.98 c	18.38 b	19.09ab	19.51 a	

Note: The numbers followed by unequal letters in the same column are significantly different according to DMRT at the 5% level

Based on Table 1, it can be seen that the height of Deli Tobacco seedlings with the highest water hyacinth extract in E3: 20.76 cm treatment was not significantly different from E2: 20.11 cm but significantly different from E1: 17.79 cm also significantly different from E0: 15.29 cm. Based on Table 1, it can be seen that the height of Deli Tobacco seedlings with the highest tofu liquid waste in T3: 19.51 cm treatment was not significantly different from T2: 19.09 cm treatment, but significantly different from T1: 18.38 cm and significantly different from T0: 16.98 cm.

High Chart of Deli Age Tobacco Seedlings 7 MSPT with Treatment of Hyacinth Extract can be seen in Figure 1. Deli Age Tobacco Seedlings 7 MSPT with Treatment of Hyacinth Extract

A. PRELIMINARY

Tobacco (*Nicotianatabaccum* L.) has a large enough role in the National economy through excise and tax, providing employment and multiplier effects of tobacco procurement and trade. Historically, tobacco commodities have gained great attention as a commercial commodity (high value commodity) since the Dutch East Indies government. The tobacco planting policy continues to be continued by the Indonesian government through the State Plantation Company (PNP) (Purdyaningsih, 2012).

Deli tobacco is very specific in location, it can only be cultivated in North Sumatra precisely between the Wampu River and Ular River. Planted at the beginning of the dry season and to be able to grow well requires sufficient water. The phenomenon of global warming causes a long dry season so that the environment becomes less suitable for the growth of this plant and results in a shift in planting time. Deli Tobacco varieties that have been cultivated so far such as Deli-4 and F1-45 are very sensitive to drought stress. Water shortages causelow quality of tobacco leaves (Edison danGinting, 2015).

As one source of state revenue, tobacco has an important economic value because it contributes to state revenues through excise. In Indonesia, export-quality cigar tobacco comes from Sumatra, known as Deli Tobacco which is specifically used as a cigar dressing (Erwin, 2000).

Water hyacinth plants are perennial plants that grow floating in the waters. Water hyacinth is a plant whose growth rate is very fast, this aquatic plant is considered as a water weed because it causes a lot of harm, namely the reduction in productivity of water bodies such as taking space. Water hyacinth is a potential organic material, because based on previous studies that the production of water hyacinth in Bangladesh can reach more than 300 tons per hectare every year (Sitadewi, 2007).

Tofu liquid waste is a by-product of the tofu-making industry that has not been widely used so far. After further exploration, tofu liquid waste contains substances such as protein, calories, fat, and carbohydrates. These organic materials can be recycled by microbes, so they can become potential nutrients for the growth and yield of cultivated plants (Junita, 2012).

Research purposes

This study aims to determine the effect of water hyacinth extract and tofu wastewater on the growth of Deli Tobacco plants (*Nicotianatabaccum* L).

LITERATURE REVIEW

Growing Terms

Tobacco plants require an average rainfall of 2000 mm / year with temperatures between (21-32) ° C. The ideal temperature during the day is 270 C. Tobacco plants grow well at altitudes between 200-3,000 meters above sea level and rainfall is also very influential on determining the quality and quantity of tobacco products. A good soil acidity for this plant is a pH between 5-6. Tobacco plants will thrive on loose soil, crumbs, easily bind water, have good water and air. Tobacco plants are tropical plants that can live in a wide range of climate. Good topsoil texture for tobacco plants is sandy clay. This texture has an optimum portion of air and water for plant root growth(Murhawi, 2015).

Each type of tobacco plant requires different types of soil. Deli tobacco is suitable to be planted in alluvial soil, good acidity for tobacco plants is 5-5.6, if pH is less than 5 it is necessary to give liming to increase pH, if the pH is high then to reduce the pH can be given sulfur (Khusrizal, 2015).

Role of Hyacinth Extract

One of the agricultural production facilities made from organic ingredients of water hyacinth plants has a function as organic fertilizer. According to the Medan Research and Standardization Center the results of the chemical analysis of the water hyacinth in fresh condition consisted ofC organik0,37%, N total 0,08%, P total 0,33%dan K total 0,11%(Baristand, 2017).

The role of Tofuliquid waste

Tofu liquid waste is a by-product of the tofu-making industry that has not been widely used so far. After further tracing the liquid tofu waste contains substances such as protein, calories, fat and carbohydrates. These organic materials can be recycled by microbes, so they can become potential nutrients for the growth and yield of cultivated plants (Sediaoetomo, 1999).

Based on the preliminary test, obtained the value of nutrient content in tofu wastewater which has been fermented using EM4 with a total N content of 1.116%, P of 0.040%, K of 1.137%, C-Organic of 5.803%, organic matter of 9.981% and C / N of 5 (Sutrisno, 2015)

Mechanism of Entry of Nutrients

Based on the level of plant needs, essential nutrients needed by plants can be classified into 2 parts, namely macro and micro nutrients. Macro nutrients include N, P, K, Ca, S and Mg, while micro nutrients are Fe, Cu, Zn, Mn, Mo, B, Na and Cl. This nutrient requirement is absolute for each plant and cannot be replaced by other elements of course with different levels according to the type of plant because if the nutrient deficiency will inhibit the growth of the plant itself (Hanum, 2008).

Mechanism of Entry of Nutrients Through Roots

Plants can absorb nutrients through roots or leaves. Elements C and O2 are absorbed by plants through the air in the form of CO2 taken through stomata in photosynthesis. The nutrient element H is taken from the water by the roots of the plant. Meanwhile, other nutrients are absorbed by the leaves. Nutrients absorbed from the soil are available around the roots through three processes, namely mass flow, diffusion and root interception. Mass flow is the movement of nutrients in the soil to the surface of the root of the plant together with the movement of water mass that continues continuously because it is absorbed by the root and evaporation occurs through transpiration. Nutrients will be absorbed by plants by diffusion if the concentration outside the soil solution is higher than the concentration in the soil solution. The diffusion process can take place because the concentration of several ions in the soil solution can be maintained to remain low, so that the ions in the cytosol (soil solution) will soon be converted to another form. Root interception is the growth of plant roots towards the nutrient position in the form of a soil matrix. Plant root growth means shortening the distance between the root surface and nutrients in the soil solution (Putri, 2008).

B. MATERIALS AND METHODS

This research was carried out in the experimental field of the Deli Tobacco Research Ins
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carried out from December 2017 to February 2018.

Materials and tools

The materials used in this research were Deli-4 tobacco variety tobacco seeds, water hyacinth extract, tofu liquid waste, EM4, aquades, 3.7 x 7 cm lonplast, blue tarpaulin, 2 cc / l water of Propamokarb Hydrochloride fungicide (Previkur N 722 SL), Deltamethrin insecticide 2 cc / l water (Decis 25 EC), water, 5 g TSP fertilizer / seed and 20 g ZK fertilizer / seedlings.

The tools used are hoe, tripe machete, harrow, brochure, bamboo, meter, brown envelope, oven, excicator, analytic scale, 10 mesh sieve, grinding machine, wheelbarrow, measuring tube, bucket, calculator and stationeries.

Research methods

This research was conducted using factorial randomized block design with 2 factors that were examined, namely:

1. Hyacinth Extract Factor (E):

E_0: Without the provision of hyacinth extract (Control)

E_1 :1litre/seed : 72 ml/seed/aplication

E_2:2litre/seed: 144 ml/seed/application

E_3 :3litre/seed: 216 ml/bibit/application

2. Tofu Liquid Waste Factor (T) :

T_0 :Without the provision of Tofu Liquid Waste (Control)

T_1 :100ml/seed : 14 ml/seed/application

T_2 :200 ml/seed : 28 ml/seed/application

T_3:300 ml/seed : 42 ml/seed/application

C. RESULTS AND DISCUSSION

Plant height

High observation data of Deli Tobacco seeds on water hyacinth extract and tofu liquid waste showed a significant effect on seedling height aged 3, 5, 7 MSPT, but the interaction of water hyacinth and liquid waste knew no significant effect on the height of Deli Tobacco seeds and its variability.

Based on observational data and the results of tests of variance showed that the treatment of water hyacinth extract and liquid waste knew significantly. However, the interaction of the two treatments between water hyacinth extract and tofu liquid waste had no significant effect on the height of Deli Tobacco seeds.

The height of Deli Tobacco seeds with the treatment of water hyacinth extract and tofu liquid waste can be seen in Table 1.

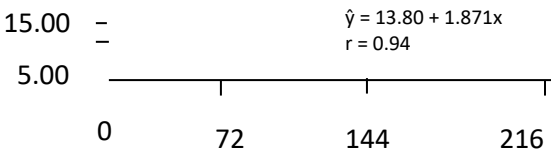

Figure 1. High Relationship of Tobacco Seeds Deli Age 7 MSPT withTreatment of Hyacinth Extract

Based on Figure 1, it can be seen that the height of plants aged 7 MSPT with the provision of water hyacinth extract. In all treatment of water hyacinth

extract showed a positive linear relationship with the equation ŷ = 13.80 + 1.871x with a value of r = 0.94.

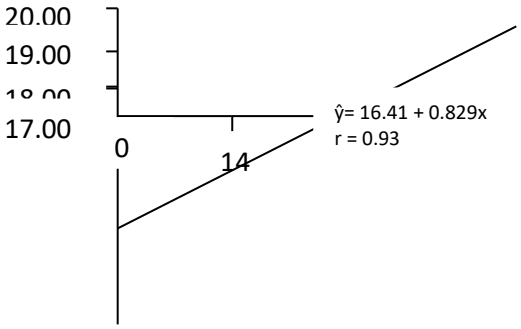

Figure 2. High Relationship of Deli Age 7 MSPT Tobacco Seeds with Tofu Liquid

Based on Figure 2, it can be seen that the height of seedlings aged 7 MSPT by giving tofu liquid waste. In all treatment of water hyacinth extract showed a positive linear relationship with the equation ŷ = 16.41 + 0.829x with a value of r = 0.93.

The difference in the height of Deli Tobacco plants is due to the availability of sufficient nutrients by giving water hyacinth and tofu liquid waste which can increase nutrient N which is needed for vegetative growth. As stated by Antonius (2016) that N nutrients are very necessary for the formation and growth of vegetative parts of plants such as leaves, stems and roots. Plants will thrive if the nutrients needed are sufficient and the nutrients are available in a form that can be absorbed by plants. In addition, opinions (Nurhakim, 2007), if the supply of nitrogen is sufficient, the leaves of the plant will grow well and expand the surface available for photosynthesis so that the increased rate of photosynthesis will produce photosynthate in large quantities. Photosynthate is then used to increase plant growth and development through the process of cell division, cell enlargement, and cell differentiation so as to increase plant height.

Organic fertilizers have a role in influencing soil physical, chemical and biological activities. Organic fertilizers can improve soil physical properties through the formation of solid soil structures and aggregates and are closely related to the soil's ability to bind water, infiltrate water, reduce erosion threats, increase ion exchange capacity (CEC) and regulate moisture which all affect plant growth. Organic fertilizers contain nutrients that are needed for plant growth. The use of organic extracts with a concentration of several treatments increases the yield of various plants. The provision of organic extracts with relatively short intervals (7 days), can directly maintain the supply of nutrients that play a role in the decomposition of soil organic matter and maintain soil health (Darmian, 2011).

Leaf Area

Leaf area of Deli Tobacco seedlings with treatment of Water Hyacinth Extract and Liquid Tofu Extract can be seen in the average difference test from treatment with Duncan's Multiple Range Test (DMRT), can be seen in Table 2.

Table 2. Age Leaves of 7 MSPT in Treatment of Hyacinth Extract and Tofu Liquid Waste

Hyacint Extract	Tofu Liquid Waste				Average
	T_0	T_1	T_2	T_3	
.....	.....(cm^2).....				
E_0	25.82	46.92	50.83	51.27	43.71 c
E_1	40.33	58.58	55.13	60.26	53.58 b
E_2	52.58	78.77	92.69	79.96	76.00 a
E_3	72.26	75.96	60.12	85.48	73.45b
Average	47.75	65.06 b	64.69 b	69.24a	

Note: The numbers that are not followed by letters in the same row and column are not significantly different according to DMRT at the level of 5%

Based on Table 2 it can be seen that the leaf area of Deli Tobacco seedlings with the widest Hyacinth Extract at E2 treatment was 76.00 cm2 not significantly different from E3: 73.45 cm2, but significantly different from E1: 53.58 cm^2 and significantly different from E0: 43.71 cm^2. Can be seen in Table 3 that the leaf area of Deli Tobacco seedlings with the widest tofu liquid waste in treatment T3: 69.24 cm^2 was significantly different from T2: 64.69 cm^2, significantly different from T1: 65.06 cm^2 also significantly different from T0: 47.75 cm^2.

Obtained broad relationship of Deli Tobacco leaves aged 7 MSPT with the treatment of water hyacinth extract can be seen in Figure 3.

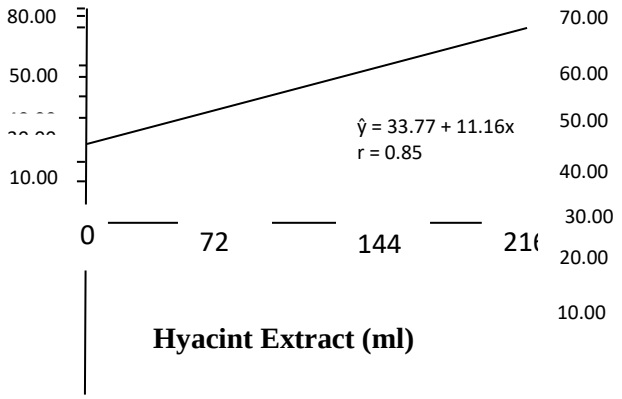

Figure 3. Relationship between Deli Age Tobacco

Based on Figure 3, it can be seen that the leaf area of Deli Tobacco seeds aged 7 MSPT with the provision of water hyacinth extract. The treatment of water hyacinth extract showed a negative linear relationship with the equation $\hat{y}$ = 33.77 + 11.16x with a value of r = 0.85.

Obtained wide relationship of Deli Tobacco leaves aged 7 MSPT with tofu wastewater treatment can be seen in Figure 4.

Based on Figure 4, it can be seen that the leaf area of Deli Tobacco seedlings aged 7 MSPT by giving tofu liquid waste showed a positive linear relationship with the equation $\hat{y}$ = 45.65 + 6.411x2 with a value of r = 0.75.

The application of water hyacinth extract and tofu liquid waste gave a good response to the leaf area of tobacco plants with E2 water hyacinth extract dose = 144 ml and T3 = 42 ml of liquid waste when compared with other doses. Leaves are the most important thing in the cultivation of tobacco plants. The need for balanced N nutrients in plants will affect vegetative growth of plants. This is in accordance with Sumarni's (2012) statement which states that N nutrients are directly involved in the formation of amino acids, proteins, nucleic acids, enzymes, nucleoproteins, and alkaloids which are needed for the process of plant growth, especially the development of leaves, increasing the green color of leaves, and establishment of branches or tillers. Nutrient deficiency of N can limit cell division and enlargement, and the formation of chlorophyll, so that plant growth becomes inhibited and the leaves are yellowish. Nuryani (2007) said that if the supply of nitrogen is sufficient, the leaves of plants will grow large and expand the surface available for photosynthesis so that the increased rate of photosynthesis will produce photosynthate in large quantities.

The photosynthesis process produces primary metabolites which are used for plant metabolism so that growth and development occur. In addition, primary metabolites are used to prepare secondary metabolites that support the process of adaptation and plant protection. A very important aspect in the process of plant growth is the provision of substrate. The substrate that is used to form new plant material which is mostly carbohydrates, is obtained from photosynthesis in the organ, which is the leaves. The ability of leaves to produce photosynthate products is determined by productivity per unit of leaf area and total leaf area. The energy produced depends on the external and internal ratio of the leaf.

Root Volume

Based on observational data and test results of variance showed that the administration of water hyacinth extract and tofu liquid waste, along with the interaction of the two treatments had no significant effect on the volume of Deli Tobacco seedling roots, the average difference between treatment with Duncan's Multiple Range Test can be seen in Table 4.

Table 3. Volume of 7 MSPT Age Roots in Giving Hyacinth Extract and Tofu Liquid Waste

Hyacint Extract	Tofu Liquid Waste				Average
	T_0	T_1	T_2	T_3	
	.....(ml^3).....				
E_0	1.70	2.72	2.55	2.79	2.44
E_1	1.91	3.36	2.49	2.82	2.65
E_2	2.70	1.95	3.48	2.69	2.64
E_3	2.39	2.39	2.82	2.89	2.70
Average	2.18	2.61	2.84	2.80	

Note: The numbers that are not followed by letters in the same row and column are not significantly different according to DMRT at the level of 5%

From Table 3 it can be seen that the administration of water hyacinth extract and tofu wastewater does not have an effect on the development of roots in Deli Tobacco seeds. Because nutrients in the growing media are sufficient for plant nutrients and the lack of water

intake to the soil that causes the roots does not have a significant effect, the weather factor is very variable. Roots are the most important thing in tobacco cultivation. Plant roots have a role that is as important as the canopy. This is because the root function for the absorption of water and nutrients that are dissolved in the soil is then transported to the shoot (Lystianto, 2010). Ningsih's statement (2007) plants must have roots and root systems that are wide enough to be able to obtain nutrients and water according to the needs of plants, so that plants will grow well. The longer and wider the root of the plant, the more absorption of nutrients will be. According to Hakim (1986) soil porosity is related to the number and size of soil pores because it is filled with water and air moving through the soil. Plant root development is closely related to soil porosity which affects the value of plant root volume.

Upper Dry Weight

Based on observation data and test results of variance showed that the treatment of water hyacinth extract and tofu liquid waste, along with the interaction of the two treatments had no significant effect on the dry weight of the Deli Tobacco seedlings. seen in Table 4.

Table 4. Dry Weight of the Upper Age of 7 MSPT in Treatment of Water Hyacinth Extract and Tofu Liquid Waste

Hyacint Extract	Tofu Liquid Waste				Average
	T_0	T_1	T_2	T_3	
	.....(g).....				
E_0	2.43	2.97	3.40	2.79	2.90
E_1	3.49	3.08	2.93	2.47	2.99
E_2	3.16	2.84	2.97	3.58	3.14
E_3	3.02	3.03	2.97	3.52	3.13
Average	3.02	2.98	3.07	3.09	

Note : Numbers that are not followed by letters in the rows and columnsthe same is not significantly different according to DMRT at the level of 5%.

From the table above it can be seen that the administration of water hyacinth extract and tofu liquid waste did not have a significant effect on the development of the upper dry weight of Deli Tobacco seeds. This is due to the lack of seeds for Deli Tobacco to dophotosynthesis which can increase the amount of chlorophyll which supports an increase in dry weight of plants. This statement is supported by the opinion of Fatimah and Budi (2008) saying that the total dry weight of plants is the result of a balance between carbon dioxide extraction and actual oxygen expenditure. The less nutrients that are absorbed by the roots of the plant will produce a smaller amount of photosynthesis, and conversely the more nutrients absorbed by the plant will produce a large amount of photosynthesis and high levels of dry matter depending on the amount or minimum of nutrient uptake takes place during the growth process, as well as photosynthesis rate which affects the dry weight of the plant where the higher photosynthesis rate increases the dry weight of the plant, and conversely the lower the photosynthesis rate the lower the dry weight of the plant.

Lower Dry Weight

Based on observation data and test results of variance showed that the treatment of water hyacinth extract and tofu liquid waste, along with the interaction of the two treatments had no significant effect on the lower dry weight of the Deli Tobacco seedlings. seen in Table 5.

Table 5. Underage Dry Weight of 7 MSPT in Treatment of Water Hyacinth Extract and Tofu Liquid Waste

Hyacint Extract	Tofu liquid waste				Average
	T_0	T_1	T_2	T_3	
	.....(g).....				
E_0	2.29	2.13	1.90	2.02	2.09
E_1	1.85	2.25	3.03	2.59	2.43
E_2	2.21	2.56	3.13	2.56	2.52
E_3	3.01	2.49	2.04	2.45	2.50
Average	2.34	2.36	2.53	2.41	

Note: The numbers that are not followed by letters in the same row and column are not significantly different according to DMRT at the level of 5%.

From Table 5 it can be seen that the administration of water hyacinth extract and tofu liquid waste did not have a significant effect on the development of lower dry weight on Deli Tobacco seeds. This is due to frequent weather change so that Deli Tobacco plants get less water and optimal sunlight so that the photosynthesis process of the plant is hampered. This is supported by the opinion of Nanda (2016) that the dry weight produced by a plant is very dependent on leaf development. Photosynthesis process is an important factor in plant growth which requires high sunlight intensity, causing photosynthesis to increase which then photosynthetic compounds circulated throughout the plant organs that need and cause plant dry matter to be high. The number of parameters that have no realeffect can be caused by climate and environmental factors. Lack of rainfall can be a barrier to plant growth and development, and can cause plants to become drought. Water is very necessary for the development and growth phase of plants. (Kurniawan, 2012) states that water is one of the most important and needed physical components in large quantities for plant growth and development. About 85-90% of the fresh weight of plant cells and tissues is water.

D. CONCLUSIONS AND RECOMMENDATIONS

Conclusion

1. The provision of water hyacinth extract with a dose of 216 ml has an effect on the highest seedling height of 20.76 cm and the widest leaf area of dose 144 is 76.00 cm^2.
2. Provision of liquid waste to know the dose of 42 ml gives the highest influence on seedling height 19.51 cm and the widest leaf area is 69.29 cm2.

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