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Responses of Tobacco Plant (*Nicotiana Tabacum L.*) Payakumbuh Rudau Gadang Variety to The Application of Tomato Liquid Organic Fertilizer

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ABSTRACT: The availability of nutrients in plants dramatically influences the production and quality of tobacco produced need during their growth. Therefore, excess or deficiency in nutrient availability will affect tobacco production and quality (Djajadi and Murdiyati, 2000). Many tomatoes that are too ripe and nearly rotten become waste. To overcome this organic waste so that it does not go to waste, it can be used as an ingredient to make "Pupuk Organik Cair" (liquid organic fertiliser). The research aims to obtain information on what dose level of tomato POC can increase the vegetative growth and production of Payakumbuh tobacco, as well as how it affects the vegetative growth and production of Payakumbuh tobacco of the Rudau Gadang variety. The research was carried out at the experimental garden of Politeknik Pertanian Negeri Payakumbuh, Tanjung Pati, Limapuluh Kota Regency, from March to June 2022. The experiment used a randomised block design with one treatment factor, namely the tomato POC dose consisting of 5 levels, namely: (1) D0 = No Tomato POC; (2) D1 = 10 ml Tomato POC / litre of water; (3) D2 = 20 ml Tomato POC / litre of water; (4) D3 = 30 ml Tomato POC / litre of water; (5) D4 = 40 ml POC Tomato /L water. The research was carried out with five replications. The variables observed consisted of plant height (cm), number of leaves (sheets), leaf length (cm), leaf width (cm), fresh leaf weight (grams) and dry leaf weight (grams). Production observations were carried out during harvest using a destructive method by taking three samples per experimental unit. The results of research on giving tomato POC to tobacco plants at a treatment dose of 40 ml tomato POC / litre of water was a treatment that had a very significant effect on the parameters of plant height (118.33 cm), number of leaves (27), leaf length (46.36 cm), leaf width (27.93 cm), stem diameter (27.85 mm), leaf area (893.76), wet weight (234.96 grams) and dry weight (33.10 grams). Moreover, further research is recommended to obtain optimal dosage levels for the best growth and production of tobacco plants.

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KEYWORDS: Payakumbuh Tobacco of the Rudau Gadang variety, Liquid Organic Fertilizer from tomato

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1.0 INTRODUCTION

Tobacco is one of the plantation crops, which is mostly used for cigarette raw materials, as a component of tranquilizers and insecticides both in Indonesia and abroad (Widiyanto, 2017). The results of the tobacco industry in Indonesia can also contribute to the Indonesian economy, especially excise and foreign exchange as a source of state revenue, employment, as well as a source of income and regional development (Rachmat dan Risma, 2010)

West Sumatra is one of the provinces in Indonesia that produces 0.50 (thousand tons) of smallholder tobacco in 2019 and experienced a decrease in production of 0.20 (thousand tons) in 2020 from several districts that cultivate tobacco. Regencies / cities that cultivate tobacco in West Sumatra from 2017 to 2018 are Solok Regency, Tanah Datar Regency, Agam Regency, Lima Puluh Kota Regency, Pasaman Regency, Sawahlunto City and Payakumbuh City. Of all the regencies in West Sumatra, the largest tobacco producer is Kabupaten 50 Kota. (Central Bureau of Statistics of West Sumatra Province, 2021) (Badan Pusat

Statistik Provinsi Sumatera Barat, 2021).

Lima Puluh Kota Regency is one of the regencies in West Sumatra where the community is engaged in the tobacco plantation business. The tobacco plantation area in Lima Puluh Kota Regency is a smallholder plantation area, so it has a major influence on the economy of the people, especially tobacco farmers. The production and quality of tobacco produced is strongly influenced by the availability of nutrients needed by plants during their growth. Therefore, excess or deficiency in the availability of nutrients will affect the production and quality of tobacco (Djajadi and Murdiyati, 2000).

The availability of nutrients needed by tobacco plants during their growth can be done by applying organic fertilizers that can improve the quality and quality of tobacco plants. According to the Forestry and Plantation Research and Development Agency (2006) organic fertilizer is a fertilizer that is mostly or entirely composed of organic matter derived from plants and or animals, which can be solid or liquid, so as to improve the physical, chemical, and biological properties of the soil.

Liquid organic fertilizers have several benefits for plants, because liquid fertilizers (extracts) when applied to plants will be more evenly distributed, there is no accumulation of fertilizer concentration in one place because the fertilizer is already in the form of a solution, can encourage and increase the formation of leaf chlorophyll so as to increase the photosynthetic ability of plants and the absorption of nitrogen from the air, can increase plant vigor so that plants become sturdy and strong, increase plant resistance to drought, stimulate the growth of production branches, increase flower and ovule formation, reduce flower and ovule fall (Huda, 2013).

Liquid organic fertilizer can be made from several types of organic waste, namely new vegetable waste, stale vegetable waste, rice waste, fish waste, chicken, eggshells, fruit waste such as grapes, orange peels, apples and others (Hadisuwito, 2007). Wet organic matter such as fruit and vegetable waste is a very good raw material for liquid fertilizer, because this material is rich in nutrients needed by plants and is very easy to decompose. If the cellulose content of organic materials is higher, the decomposition process will be longer (Purwendro and Nurhidayat, 2006).

Utilization of materials in the surrounding environment such as fruit, and vegetable waste can be used as an ingredient to make liquid organic fertilizer. Tomato (Solanum lycopersicum) is a plant that is widely cultivated and produced in district 50 cities. Tomatoes have a better selling value if the fruit is in good condition, while for tomatoes that are overripe and close to rotten the price becomes cheaper so that many become waste. To overcome this organic waste so that it is not wasted, it can be used as an ingredient to make Liquid Organic Fertilizer. Liquid organic fertilizers are mostly applied through the leaves containing essential macro and micro nutrients (N, P, K, S, Ca, Mg, B, Mo, Cu, Fe, Mn, and organic matter).

IPTEKDA LIPI laboratory test results on fermentation of tomato fruit and vegetable waste in South Solok showed the presence of LAB (lactic acid bacteria), as well as an increase in the value of N (Nitrogen), P (Pospor) and K (Potassium) content tested. The test results of N, P and K values in tomato POC after 14 days of fermentation are N 1.26%, P 0.33% and K 0.98%. The results of Tambunan's research (2018), stated that giving Tomato Waste POC at a dose of 15 ml / liter of water gave the best growth and yield in Chili plants.

Based on the explanation in this background, a study was conducted with the title "The response of Payakumbuh tobacco plants of Rudau Gadang variety to the application of tomato liquid organic fertilizer with the aim of obtaining information at what dose level the application of tomato POC can increase vegetative growth and production of Payakumbuh tobacco, and how it affects vegetative growth and production of Payakumbuh tobacco Rudau Gadang variety.

2.0 MATERIALS AND METHODS

The research was conducted in the experimental garden of Politeknik Pertanian Negeri Payakumbuh, Tanjung pati, Lima Puluh Kota Regency from March to June 2022. The tools used are Hoe, Rake, Koret, Machete, Knapsack Sprayer, Measuring cup, 1.5 m Meter, Scales, Gembor, Bucket, Plastic, 50 M Meter, while the materials used are Payakumbuh Tobacco Seedlings Rudau Gadang Variety, Tomato POC, ZA Fertilizer, SP36, KCl, Manure, Dithane M45, Thiodan Decis, Aristick, Zinc Plate and Rafia Rope.

Research Design

The study used a group randomized design with one treatment factor, namely the dose of tomato POC which consisted of 5 levels, namely; (1) D0 = No Tomato POC; (2) D1 = 10 ml Tomato POC / liter of water; (3) D2 = 20 ml Tomato POC / liter of water; (4) D3 = 30 ml POC Tomato /liter of water; (5) D4 = 40 ml POC Tomato /L water, with 5 replications so that there are 25 plots, each plot consists of 15 plants so that there are 375 plants, with the number of samples per experimental unit as many as 3 plants/plot. The application of tomato POC was done 5 times starting at the time of 14 HST with 5 replications. The observed variables consisted of plant height (cm), number of leaves (sheets), leaf length (cm), leaf width (cm), leaf fresh weight (grams) and leaf dry weight (grams).

Conducting the research

The research was conducted using seedlings purchased from seed breeders. The seedlings used were the Rudau Gadang variety with homogeneous growth aged 40 to 50 days, with a height of 10-12.5 cm, a total of 5 leaves, good rooting, and free from pests and diseases.

Tomato fruit POC is made by mashing 4 kg of tomato fruit and then filtered. The filter results were added with 1 kg of crushed brown sugar and 4 liters of coconut water and 16 l of water left over from rice washing. Then all the ingredients are put into a jerry can, close the lid tightly, give an air hole at the top and then insert a hose connected to a bottle that has been filled with water, the end of the plastic hose must be submerged in water. Fermentation for ± 14 days. The results of perfect POC fermentation will have a distinctive aroma or smell that is sour and has a light brown color.

The soil is processed twice, the first tillage mechanically with a tractor and the second using hoes and rakes to clean the land from plastic waste, wood roots, weeds and others. The next step was to make an experimental field with a length of 16.5 m and a width of 14 m while each plot measured 3 x 2.5 meters.

Planting holes are made 1 week before planting, using a 10-15 cm deep hoe. The planting distance used for the rudau gadang tobacco variety is 100 cm × 50 cm. The basic fertilizer given is manure at a dose of 500 gr / planting hole. Planting is done by immersing the seedling into the planting hole as deep as the root neck, carefully cutting the polybag so as not to destroy the soil, then inserted into the planting hole along with the soil and the polybag is collected to be disposed of in the trash. The planting hole is covered with soil and pressed slightly so that the plant can stand strong and upright.

Replanting is done 2 weeks after planting if there are seedlings that grow poorly or die. Maintenance such as watering is done if there is no rain, bulldozing together with fertilizer application. ZA fertilizer at a dose of 10 grams/plant, KCl and SP36 at a dose of 5 grams/plant were applied at 7 days after planting (HST) and 35 HST. All fertilizers were applied in a circular manner, with a distance of 10 cm from the base of the plant stem, the placement of N fertilizers with P and K was separated.

Tomato liquid organic fertilizer was given according to the treatment dose, namely D0 = No application, D1 = Tomato POC 10 ml/liter of water, D2 = Tomato POC 20 ml/liter of water, D3 = Tomato POC 30 ml/liter of water, D4 = Tomato POC 40 ml/liter of water. POC is applied to plants by pouring the solution around the plant roots with a flush volume of 200 ml per plant. Pest and disease control in the field is done manually and chemically. Chemically using Dithane M45 fungicide as much as 2 grams/liter of water, Decis Insecticide 2 cc/liter of water sprayed with a Knapsack Sprayer tool, and Aristick as an adhesive. Control was carried out on plants aged 2 MST, with chemical control rotation every 2 times a week. Furthermore, pruning of shoots and buds in the leaf axils was carried out every 2 weeks until 1 week before harvest.

Harvesting is done by picking leaves that have a yellowish green color with a wavy leaf surface, which is done three times, namely the first harvest of 4 treadle leaves, the second harvest of 8-10 filler leaves and the third harvest of 6-8 leather leaves.

3.0 RESULTS AND DISCUSSION

The results of observations of the growth variables of tobacco plants of the Rudal Gadang variety on average plant height, number of leaves, leaf length, leaf width, stem diameter and leaf area at the age of 75 HST in the experiment "Response of tobacco plants of the Rudau Gadang variety to the application of tomato liquid organic fertilizer" are in Table 1.

Table 1. Average height of tobacco plants (cm), number of leaves (strands), leaf length (cm), leaf width (cm) and stem diameter at the age of 75 HST in the experiment " Table 1. Average height of tobacco plants (cm), number of leaves (strands), leaf length (cm), leaf width (cm) and stem diameter at the age of 75 HST in the experiment "Responses of Tembakau Varieties Rudau Gadang to The Implementation of Tomato Flavor Organic Pupukaya".".

Perlakuan	Plant Height (centimeters)	Number of Leaves (strands)	Panjang Daun (centimeters)	Lebar Daun (centimeters)	Diameter Batang (millimeters)	Luas Daun
D0= Without POC	77,60 a	21 a	37,40 a	21,60 a	20,82 a	563,40 a
D2=10 ml POC tomat/liter air	89,73 bc	23 bc	40.27 bc	23,28 bc	23,28 bc	654,21 bc
D3=20 ml POC tomat/liter water	91,60 c	24 c	41,56 c	24,62 cd	23,87 c	703,96 cd
D4=30 ml POC tomat/liter water	107,47 d	26 de	43,64 d	25,64 d	25,90 d	770,56 d
D5=40 ml POC tomat/liter water	118,33 e	27 e	46,36 e	27,93 e	27,85 e	893,76 e

	KK= 7,69%	KK= 4,31%	KK= 3,61%	KK= 4,94%	KK = 5,46%	KK= 7,73

Note: Numbers followed by the same letter are not significantly different in the 5% F test.

3.1 Plant Height

In Table 1. There is an average result of plant height at the age of 75 HST. The results of variance analysis and LSD 5% further test showed that the application of tomato POC 0 ml / liter of water (D0) was significantly different from 10 ml / liter of water (D1), 20 ml / liter of water D2, 30 ml / liter of water (D3) and 40 ml / liter of water (D4), while D1 was not significantly different from D2, where D0 without treatment had the lowest average plant height of 77.60 cm, while D4 produced the highest average plant height of 118.33 cm. Giving tomato POC can increase mineral nutrients and microorganism activity that can fertilize the soil, so that plants grow better with increased plant height growth. According to Syafruddin et al (2012) that plant height can grow well, due to the availability of mineral and essential nutrients that play a role in plant growth. The results of Tambunan's research (2018) state that the provision of 15 ml / L water solution of tomato POC and coconut water can increase the height of chili plants. The increase in height in chili plants is due to the content of nutrients both macro and micro at this dose which is sufficiently available for the extension of plant cells. In addition, the presence of functional microbes in the combined tomato and vegetable POC solution also affects soil properties so that it can support plant vegetative growth.

3.2 Number of Leaves

The results of the variance analysis and LSD 5% further test on the average number of leaves based on Table 1. show that the provision of tomato POC 0 ml / liter of water (D0) is significantly different from 10 ml / liter of water (D1), 20 ml / liter of water (D2), 30 ml / liter of water (D3) and 40 ml / liter of water (D4), while D1 is not significantly different from D2, and D3 is not significantly different from D4, where D0 without treatment has a smaller number of leaves, namely 21 strands, while D4 with the provision of 40 ml / liter of water produces 27 leaves. Leaves are one of the organs in plants that have the ability to receive light for photosynthesis activities, the more leaves formed, the faster the photosynthesis process occurs. According to Yunita et al. (2016), the elements of N, P, and K in liquid organic fertilizer from vegetable waste and tomatoes are able to influence the acceleration of the process of leaf growth, flowering, seed and fruit development, helping the formation of carbohydrates, proteins, fats and various other compounds. The content of nutrients in the POC combination of tomatoes and vegetables and the optimum dose can accelerate the growth of leaves of curly red chili plants. From the results of laboratory analysis that tomato and vegetable waste POC contains nutrients N, P, K and functional microbes that play a role in supporting the flowering process in red chili plants (Environmental Biotechnology Laboratory, 2020).

3.3 Leaf Length

Based on Table 1. The results of the variance analysis and LSD 5% further test of the average leaf length show that the application of 0 ml tomato POC / liter of water (D0) is significantly different from the treatment of 10 ml tomato POC / liter of water (D1), 20 ml tomato POC / liter of water (D2), 30 ml tomato POC / liter of water (D3) and 40 ml tomato POC / liter of water (D4). while D1 is not significantly different from D2, where D0 without POC application produces the lowest leaf length of 37.40 cm, While D1 is not significantly different from D2, where D0 without the provision of POC produces the lowest leaf length of 37.40 cm, while D4 with the provision of 40 ml of tomato POC / liter of water with the longest leaf length is 46.36 cm. The relationship between the length of tobacco leaves with the provision of various doses of tomato POC continues to increase as the number of doses of tomato POC increases until treatment D4. This is thought to be the content of nutrients contained in tomato POC, containing the element N which is quite dominant and most needed by tobacco plants. This statement is in accordance with the opinion of Indranada (1996) which states that Nitrogen is a nutrient that often limits production, and generally Nitrogen is needed for the formation and growth of vegetative parts of plants such as leaves, stems, roots. This is in line with the statement of Sonbai, Prajitno, and Syukur (2013) which states that nitrogen is one of the main components of leaf chlorophyll.

3.4 Leaf Width

The average leaf width (cm) at the age of 75 HST is in Table 1. In Table 1, the results of variance analysis and LSD 5% further test show that the application of 0 ml tomato POC / liter of water (D0) is significantly different from 10 ml tomato POC / liter of water (D1), 20 ml tomato POC / liter of water (D2), 30 ml tomato POC / liter of water (D3) and 40 ml tomato POC / liter of water (D4), While D1 is not significantly different from D2, and D2 is not significantly different from D3, where D0 without treatment has the lowest leaf width of 21.60 cm, while D4 with the application of 40 ml of tomato POC / liter of water with the highest leaf width of 27.93 cm. The relationship between the width of the leaves of tobacco plants with the provision of various doses of tomato POC continues to increase along with the increasing provision of tomato POC. This is because the nutrients contained in tomato POC contain the element N which is quite dominant and most needed by tobacco plants, because

the nitrogen element functions to increase the growth of plant leaves so that the size of the leaves can grow optimally, in accordance with Agustina's statement (1990) that the function of nitrogen for plants is to increase plant growth, especially wide and thick plant leaves and greener leaf color, increase protein levels in plants, improve the quality of leaf-producing plants, the main component of various compounds in plants, namely amino acids, chlorophyll and alkaloids.

3.5 Stem Diameter

Average stem diameter at the age of 75 HST (Table 1). Based on Table 1. The results of variance analysis and LSD 5% further test showed that the application of tomato POC 0 ml / liter of water (D0) was significantly different from 10 ml / liter of water (D1), 20 ml / liter of water (D2), 30 ml / liter of water (D3) and 40 ml / liter of water (D4), while D1 was not significantly different from D2, where D0 without treatment had the lowest stem diameter of 20.82 mm, while D4 as the best treatment with a dose of 40 ml / liter of tomato POC water with the highest stem diameter of 27.85 mm. This is in accordance with the opinion of Jumin (2002), which states that the stem is an area of accumulated growth, especially in younger plants, so that the presence of nutrients that can encourage vegetative growth of plants will spur the rate of photosynthesis. The higher the rate of photosynthesis, the photosynthate (carbohydrate) produced will give a large stem circumference.

3.6 Leaf Area

The average leaf area of tobacco plants at the age of 75 HST can be seen in Table 1. Based on Table 1. The results of variance analysis and LSD 5% further test showed that the application of tomato POC 0 ml / liter of water (D0) was significantly different from 10 ml / liter of water (D1), 20 ml / liter of water (D2), 30 ml of tomato POC / liter of water (D3) and 40 ml / liter of water (D4, while D1 was not significantly different from D2, and D2 was not significantly different from D3, which D0 without treatment has the lowest leaf area of 563.40 cm2, while D4 as the best treatment with a dose of 40 ml / liter of water with the highest leaf area of 893.76 cm2, means that the relationship between the leaf area of tobacco plants with the provision of various tomato POC continues to increase along with the increasing amount of tomato POC to treatment D4. This is due to the content of nutrients contained in tomato POC containing the element N which is quite dominant and most needed by tobacco plants, in accordance with the opinion of Ade, and Triswanti (1993) which states that the need for the element N for tobacco plants is more than other elements. Nutrient N is an element that can help the process of cell division and enlargement, thus forming young leaves faster and become perfect leaves. This is because the nitrogen element functions to increase the growth of plant leaves, so that the size of the leaves increases optimally, by applying N fertilizer.

The results of observations of the average variable Wet Weight of Leaves and Dry Weight of Leaves of tobacco varieties Rudal Gadang at the age of 75 HST in the experiment "Response of tobacco plants of rudau gadang varieties to the application of liquid organic fertilizer tomatoes" are in Table 2.

Table 2. Average Leaf Wet Weight and Leaf Dry Weight at the Age of 75 HST in the experiment "the response of tobacco plants of rudau gadang varieties to the application of tomato liquid organic fertilizer"

Treatment	Leaf Wet Weight (gram)	Leaf Dry Weight (gram)
D0= Without POC	142,22 a	22,48 a
D2=10 ml POC tomat/liter air	161,60 ab	24,38 ab
D3=20 ml POC tomat/liter water	172,89 bc	27,14 bc
D4=30 ml POC tomat/liter water	191,51 c	29,26 c
D5=40 ml POC tomat/liter water	234,96 d	33,10 d
	KK= 10,36%	KK= 9,92

Note: Numbers followed by the same letter are not significantly different in the 5% F test.

3.7 Fresh Weight of Leaves

Average Fresh Weight of Leaves at 75 HST in Table 2. "Based on Table 2. The results of variance analysis and LSD 5% further test show that the application of tomato POC 0 ml / liter of water (D0) is significantly different from 10 ml / liter of water (D1), 20 ml / liter of water (D2), 30 ml / liter of water (D3) and 40 ml / liter of water (D4), while (D1) is not significantly different from (D2), and (D2) are not significantly different from (D3), where D0 without the application of tomato POC produces the lowest fresh weight of leaves at 142.22 grams, while D4 with the application of 40 ml of tomato POC / liter of water produces the highest fresh weight of leaves which is 234.96 grams. According to Lakitan (2013) plant wet weight is the weight of the plant when the plant is still alive and weighed directly after harvest, before the plant becomes wilted due to water loss. Wet weight weighing was carried out starting at week 12 after harvest, and weighed using analytical scales. According to Salamah (2016), the purpose of measuring plant wet weight is to obtain an overall picture of plant growth biomass. This is due to the difference in the number of leaves picked during the first harvest of 5 leaves, the second harvest of 8 leaves and the third harvest of 6 leaves.

Picking is done at the age of 90 - 100 days. The composition of tobacco leaves consists of: Tread leaves (3-4 sheets), Filler leaves (6-8 sheets), Skin leaves (3-6 sheets), top leaves (2-4 sheets) with a total of 12-18 sheets. In the treatment of tomato POC tobacco plants, there is a tendency to increase the wet weight of tobacco in line with the increase in the amount of tomato POC given in each treatment. Of all the previous observation parameters, treatment D4 (40 m l POC tomato/liter of water) is the best treatment and followed by treatment D3 (30 m l POC tomato/liter of water), D2 (20 m l POC tomato/liter of water), D1 (10 m l POC tomato/liter of water) to D0 (no treatment). This is in line with the statement of Fatimah (2008) which states that the growth of plant height, stem and number of good leaves will produce better wet weight and total dry weight of plants. This statement is strengthened by Purwasasmita in Ramli (2014) saying that tomato POC also contains substances that can stimulate plant growth and development (Phytohormones) such as Gibberlin, Cytokinin, Auxin and Inhibitors which can increase plant activation and additional nutrients for plants.

3.8 Leaf dry weight

The average dry weight of plants at the age of 75 HST in Table 2. The results of variance analysis and LSD 5% further test showed that the provision of 0 ml tomato POC / liter of water (D0) was significantly different from the provision of 10 ml tomato POC / liter of water (D1), 20 ml tomato POC / liter of water (D2), 30 ml tomato POC / liter of water (D3) and 40 ml tomato POC / liter of water (D4), while (D1) was not significantly different (D2), and (D2) were not significantly different from (D3), where D0 without the application of Tomato POC had the lowest leaf dry weight of 22.48 grams, while D4 with the application of 40 ml of Tomato POC produced the highest average dry weight of 33.10 grams which was significantly different from all treatments. According to Fatimah (2008) that the growth of plant height, stem and number of good leaves will produce better wet weight and total dry weight of plants. Meanwhile, according to Syamsunihar (2007), dry weight is a description of plant growth as a result of the accumulation of photosynthate from the vegetative organs of the crown of the plant. The higher the concentration of fertilizer given, the faster the development of organs such as roots will increase, as a result the plant can absorb nutrients and water in the soil which will further affect the growth of tobacco plants.

CONCLUSION

The conclusions that can be drawn from the results of the research conducted are as follows:

1. From the results of the study that the treatment of tomato POC on tobacco plants has a significant effect on the growth and production of tobacco plants, namely on the parameters of height, number of leaves, leaf length, leaf width, stem diameter, leaf area, wet weight and dry weight.
2. The results of the research on the provision of tomato POC on tobacco plants in the treatment dose of 40 ml of tomato POC / liter of water is a treatment that gives a very real influence on the parameters of plant height (118.33 cm), number of leaves (27 strands), leaf length (46.36 cm), leaf width (27.93 cm), stem diameter (27.85 mm), leaf area (893.76), wet weight (234.96 grams) and dry weight (33.10 grams).

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