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GROWTH AND YIELD OF GRANOLLA BULBS ON ORGANIC MULCH AND POC FORMULATION

Adnan
Agrotechnology Study Program, Pat Petulai University, Rejang Lebong, Bengkulu, Indonesia
adnanhanafiah12@gmail.com

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ABSTRACT

The research was conducted from June to December 2019, Rejang Lebong Regency. on a plateau 600 m above sea level. Factorial Randomized Block Design (RBD) study. The first treatment was organic mulch (M), M1 = without mulch, M2 = banana leaves, M3 = rice husks, M4 = coffee husks. The POC (O) treatment is O0 = Without POC, O1 = POC 50 ml/liter of water, O2 = POC 75 ml/liter of water and O3 = POC 100 ml/liter of water. The number of plants is 288 potato seed tubers. The results of the variance of the single treatment of liquid fertilizer and single treatment of mulch had a very significant effect on: the number of main stems and shoots, fresh weight, stem diameter, but had no significant effect; plant height, number of tubers and dry weight. The combination of treatments had a very significant effect: number of main stems, plant height, number of shoots, fresh weight and tuber diameter. Liquid fertilizer and mulch have interactions: plant height, number of main stems, number of shoots, wet weight and tuber diameter.

INTRODUCTION

Potato (*Solanum tuberosum*) is one of the many vegetable commodities cultivated by farmers in the highlands of Indonesia, including in Rejang Lebong Regency, Bengkulu Province. Rejang Lebong Regency is located on a plateau ranging from 750 to 1100 m above sea level. Potato plants require an average rainfall of 1500 mm/year, 9-10 hours/day of light exposure, optimal temperature of 18-21°C, 80-90% humidity and altitude between 1000-3000 m above sea level. The potato planting medium needed is crumb structure, loose, contains lots of organic matter, is well drained and has a deep treated layer and a pH between 5.8-7.0.

In Rejang Lebong Regency, through farmer groups in Selupu Rejang District, red potato production reaches 15 tons/ha. Then through Damiri (2014)'s research, that red potato production on land in Rejang Regency averaged 16 tons/Ha. However, the problem is that production in quantity is still far from what is expected from the average national production, which is 30 tonnes.

Potato plants are generally propagated through tubers, propagation with tubers has a ratio of 1:3 to 1:15, meaning that one potato tuber can produce 3 to 15 tubers. This comparison or ratio is influenced by several things, namely varieties, methods of planting and treatment of tubers (Öztürk & Yildirim, 2010; Singh et al., 2013). For the preparation of seed tubers, it is necessary to look for quality seeds, one of which is seed development through F1 seed development which will be developed through the use of various organic mulches and the application of liquid organic fertilizer (POC) in Rejang Lebong Regency. Potato is a staple crop and is the fourth largest carbohydrate warehouse in the world after rice, wheat and barley (Fernie & Willmitzer, 2001) to support food diversification programs. The relatively low productivity of potatoes in Indonesia is

caused by the use of low quality seeds, lack of knowledge about technical culture, continuous planting and limited farmer capital (Sunaryono, 2007). Furthermore, according to Purbayani et al. (2014) the results showed that the treatment of 2 shoot buds accompanied by the use of reed mulch 7 tons ha^{-1} was able to increase potato production compared to the control, tithonia mulch and coffee skin mulch each 1.16 %; 1.15 %; and 1.05%, and can reduce the growth rate of weeds.

The Iptekda LIPI potato seeding technology package managed by Biotechnology researchers from Hasanuddin University were able to increase the productivity of potato farmers in South Sulawesi 3-4 times from 8 tons per ha to 20-30 tons per ha and increase farmer income 3.5 times fold (Baharuddin et al., 2011).

The research aim to determine the type of organic mulch that is effective on the growth and yield of yellow potato tubers in the highlands of the Rejang Lebong Regency, the effective composition of liquid organic fertilizer (POC) on the growth and yield of yellow potato tubers in the highlands of Rejang Lebong Regency, and the combination of both organic mulch and liquid organism fertilizer (POC) treatments on the growth and yield of yellow potato tubers in the highlands of Rejang Lebong Regency.

Research Stages

Seed Preparation

Local granola potato tubers are ready for 4 month old seeds, sown on a nursery shelf for 45 days then allowed to grow stem shoots on media that has been prepared to grow shoots.

Land Preparation

Land length 20 m x width 10 m, plowing the land with a hoe to a depth of 20-30 cm, making plots of beds with a length and width of 1 meter-2, a total of 16 plots with three repetitions, namely 48 plots of beds, the distance between plots of beds is 50 cm. Each plant plot was sown with enough chicken manure before 2 weeks of planting. The plots of beds were sown with manure and then covered with mulch according to the treatment used. The spacing of the planting holes between plants is 25 cm and the spacing of the planting holes with rows is 50 cm.

Planting

Planting the seeds is done in the late afternoon or early morning, after making a planting hole with a depth of approximately 5 to 6 cm, then the potato seeds are covered with soil until evenly distributed.

Giving Treatment

The use of organic mulch is given to the plots of beds according to the treatment. Spraying with liquid organic fertilizer according to the treatment used, at the age of the plants 21 hst, 35 hst, 45 hst and 55 hst.

Plant Maintenance

Seed stitching is done if the seeds are rotten or the seeds don't grow 10 days after planting, weeding is done if we see grass growing around the plants. NPK follow-up fertilization is done 5 grams to 10 grams of plants aged 20 days and 50 days after planting. Pruning is done by plants aged 30 days after planting, 50 days after planting. Loosening of the soil and hoarding of potato tubers that arise and come out of the surface of the planting hole. Watering is done when the land looks a bit dry. Spraying of insecticides with fungicide is done when symptoms of pests and diseases appear with coracrown.

Harvesting

Harvesting is done when the plants are 80 to 100 days old or the stems are yellow. The sample population is:

a) The first treatment factor used various kinds of organic mulches;
b) The second treatment factor with doses of liquid organism fertilizer (POC);
c) The number of each treatment combination in the bed plots used 6 planting holes;
d) The total of 16 treatment combinations was repeated three times the number of bed plots of 48 plots; and
e) Total planting holes used in three replicates were 288 plant seeds.

Observed Variables

1) Plant Height (cm): Plant height was measured with a ruler, namely from the neck of the plant stem to the growing point, the measurement was made after the plant was 50 days after planting;
2) Number of main stems: The number of stems was counted by plants aged 50 days after planting;
3) Number of shoots: Shoots are counted after leaving the main stem;
4) Weight of wet bulbs (grams):The tuber weight of each treatment combination was weighed, after harvest and the tubers were cleaned;
5) Tuber Diameter: Tuber diameter was measured on average from each treatment combination, after harvest with a slide rule;
6) Number of Bulbs: The number of tubers was calculated from each treatment combination, after harvest; and
7) Dry weight of tubers: The dry weight of tubers was weighed after drying in the wind for 1 week after harvest.

Data Collection Technique

Experimental research to collect data, the researcher gives a treatment to the object of research, then observes and measures the effect of the treatment according to the variables observed.

Data Analysis Techniques

Data were analyzed statistically using ANOVA based on Factorial Complete Randomized Block Design (RAKL), the results of the analysis of variance, if the F_{count} is greater than the F_{table} at the 5% level, then tested further by the Dunnet method.

METHOD

The research was conducted in mid-June 2018 to December 2018, in the Air Rambai Village, Curup Tengah District, Rejang Lebong Regency. At an altitude of 600 m above sea level. The tools used include: Hoes, sickles, tape measure, sitting scales, buckets, paranet, sprayer, camera and stationery. The materials used include: potato granola variety, liquid fertilizer, organic mulch (rice husk, coffee husk, and banana leaves), NPK fertilizer, Coracrowon pesticide, Dithane M-45.

The research design used was a factorial randomized block design (RBD). The first type of organic mulch (M) was M1 = without mulch, M2 = banana leaf mulch, M3 = rice husk mulch, M4 = coffee husk mulch. The second treatment was the composition of liquid organism fertilizer (O), namely: O0 = without liquid organism fertilizer, O1 = liquid organism fertilizer 50 ml/liter of water, O2 = liquid organism fertilizer 75 ml/liter of water and O3 = liquid organism fertilizer 100 ml/liter of water . The total population of the planting holes from the combination of the two treatments, namely organic mulch and liquid organic fertilizer, was M x O x T x U = 4 x 4 x 6 x 3 = 288 potato seeds.

RESULT AND DISCUSSION

The results of the variance on the observed variables have a significant effect, if the calculated F is greater than the F table, then the Dunnet test is continued. The results of variance showed that the single treatment of liquid fertilizer (O) and the single treatment of mulch (M) had a very significant effect on the following variables: a. number of main stems, b. number of shoots, c. wet weight, and d. stem diameter. And has no significant effect on the variables: a. plant height, b. number of tubers and c. dry weight. The combined treatment of liquid fertilizer (O) and mulch (M) had a very significant effect on the following variables: a. number of main stems, b. plant height, c. number of buds, d. wet weight and e. tuber diameter. Liquid fertilizer treatment (O) and mulch treatment (M) have interactions with variables: a. plant height, b. number of main stems, c. number of buds, d. wet weight and e. tuber diameter.

Results

The Effect of a Combination of Organic Mulch and Liquid Organic Fertilizer on the Average Variable Height of Potato Plants

BNT 5% follow-up test, that the combination of the two mulch treatments and liquid organic fertilizer contained a combination of coffee husk mulch treatment with liquid fertilizer 100 ml/l water (M3O3) with an average plant height = 93.7 cm, which differed or not from the combination of treatments without mulch with doses coffee husk (M0O3) average plant height 89 cm, combined treatment of coffee husk mulch with no liquid fertilizer (M3O0) average plant height = 82.9 cm,

combination of treatments without mulch with fertilizer without liquid fertilizer (M0O0) = 85.6 cm, combined treatment without mulch with a dose of liquid fertilizer at a dose of 50 ml/l water (MOO1) = 84.5 cm, a combination of rice husk mulch treatment with treatment without liquid fertilizer (M2O0) = 80.8 cm and rice husk mulch with liquid fertilizer at a dose of 75 ml/l water (M2O2) = 87.2 cm, but significantly different from the other treatment combinations, on plant height. Further test BNT 5%, the effect of a single treatment of liquid organic fertilizer on the variable average number of main stems, number of shoots, tuber diameter and wet weight.

Based on BNT 5% follow-up test, a single treatment of 50 ml/l water liquid organism fertilizer was significantly different from the other liquid organism fertilizer treatments for the main stem observation variable. Follow-up test BNT 5%, single treatment of liquid organism fertilizer composition of 100 ml/l water was not significantly different from the liquid organism fertilizer composition of 75 ml/l water on the observation variable of the number of shoots (Table, 1). Furthermore, the 5% BNT test, single treatment of liquid organism fertilizer 100 ml/l of water was not significantly different from the composition of 75 ml/l of water and 50 ml/l of water, but significantly different without administration of liquid organisms, to the tuber diameter.

BNT test 5%, single treatment liquid organism fertilizer composition 75 ml/l water and 100 ml/l water was significantly different from liquid organism fertilizer composition 50 ml/l water and without liquid organism fertilizer (O0), to the wet weight observation variable. The numbers followed by the same letter in the column indicate whether they are different.

Table 1. Follow-up Test of BNT 5%, Single Treatment of Liquid Organism Fertilizer (O) on Main Stem, Number of Shoots, Tuber Diameter, and Tuber Wet Weight

POC (O)	Main Stem	Number of Shoots	Tubers Diameter	Fresh Weight
O0	9,0[a]	1,6[a]	2,9[a]	137,5[a]
O1	11,0[b]	3,9[a]	3,2[b]	132,3[a]
O2	8,2[a]	8,2[b]	3,2[b]	194,1[b]
O3	8,2[a]	8,2[b]	3,1[b]	220,8[b]

The Effect of a Single Treatment of Organic Mulch on the Average Variable Number of Main Stems, Number of Shoots, Tuber Diameter and Wet Weight

Based on the 5% BNT follow-up test, single treatment without mulch (M0), was not significantly different from other mulch treatments, on the observed variable number of main stems. BNT 5%, single treatment of rice husk mulch (M3) was not significantly different from banana leaf mulch (M1), but significantly different from coffee husk mulch (M2) and without mulch, on the variable number of shoots. The 5% BNT test, single treatment without mulching was not significantly different from other mulches on tuber diameter variable. Further test of BNT 5%, single treatment of rice husk mulch (M3) was not significantly different from coffee husk mulch (M2), but significantly different from banana leaf mulch and without mulch on the wet weight observation variable (Table 2). The numbers followed by the same letter in the column indicate whether they are different.

Table 2. Follow-Up Test BNT 5 %, Single Treatment of Mulch (M) on the Main Stem, number of shoots, tuber diameter and tuber wet weight

M	Main Stem	Number of Shoots	Tubers Diameter	Fresh Weight
M0	37,3[a]	6,6[a]	3,2[a]	670[a]
M1	34,4[a]	20[c]	3,0[a]	626[a]
M2	38,3[a]	14[b]	3,2[a]	993,4[b]
M3	36,4[a]	22[c]	3,1[a]	646[a]

Effect of Combination of Mulch with Liquid Fertilizer on Plant Height, Number of Main Stems, and Number of Shoots

Based on the 5% BNT follow-up test, the combination treatment of rice husk mulch with liquid fertilizer 100 ml/l water (M3O3) was not significantly different from the combination of rice husk mulch without liquid fertilizer (M3O0), (M2O0), (M0O1), (M2O2) , and (MOO3) on the average plant height (Table 1). Follow-up test BNT 5%, combination treatment of coffee husk mulch with organic fertilizer cir 50 mg/liter of water (M2O1), significantly different from other treatments on the average number of main stems.

Furthermore, the 5% BNT follow-up test, the combination of treatments on coffee husk mulch with liquid organism fertilizer 50 ml/liter of water (M3O1) was significantly different from the other treatment combinations on the number of shoots (Table 3). The numbers followed by the same letter in the column indicate whether they are different.

Table 3. Follow-up Test BNT 5 % of Combination of Mulch (M) with Liquid Fertilizer (O) on the parameters of Plant Height, Main Stems, and Number of Shoots

M/O	Plant height				Main stem				Number of shoots			
	O0	O1	O2	O3	O0	O1	O2	O3	O0	O1	O2	O3
M0	85,16[b]	84,5[b]	69,8[a]	89[b]	31[d]	30[d]	26[c]	25[b]	1[a]	4[a]	16[b]	3[a]
M1	72,2[a]	77,7[a]	73,7[a]	78,8[a]	26[b]	33[e]	23[b]	21[a]	6[b]	7[b]	3[a]	2[a]
M2	80,8[b]	68,7[a]	87,2[b]	73,3[a]	19[a]	37[f]	29[d]	30[d]	4[a]	9[b]	12[c]	17[d]
M3	82,9[b]	64,6[a]	65,9[a]	93,7[b]	26[a]	21[a]	31[a]	23[b]	9[b]	27[f]	15[c]	15[c]

Effect of Combination of Mulch with Liquid Fertilizer on Tuber Diameter and Fresh Weight

Based on the 5% BNT follow-up test, the combination treatment of coffee mulch with liquid organism fertilizer (M2O3) was not significantly different from the combination treatment of banana leaf husk mulch with liquid organism fertilizer 50 mg/liter of water, banana leaf mulch with liquid organism fertilizer 50 ml/liter of water, banana leaf mulch against tuber diameter.

Furthermore, the 5% BNT follow-up test, the combination treatment of rice husk mulch with liquid organism fertilizer 100 ml/l of water was significantly different from the other treatment combinations on the wet weight observation variable (Table 4). The numbers followed by the same letter in the column indicate whether they are different.

Table 4. 5% BNT Continuation Test, Combination of Mulch Treatment (M) with Liquid Fertilizer (O) Parameters of Meter Tuber Diameter and Wet Weight

M/O	Tuber Diameter				Wet weight			
	O0	***O1***	***O2***	***O3***	***O0***	***O1***	***O2***	***O3***
M0	$9,6^{d}$	$8,5^{b}$	$9,1^{c}$	$7,3^{a}$	480^{a}	320^{a}	340^{b}	870^{f}
M1	$9,2^{c}$	$10,5^{e}$	$10,4^{e}$	$9,2^{c}$	270^{a}	700^{e}	590^{d}	320^{a}
M2	$9,9^{d}$	$9,3^{c}$	$8,4^{b}$	$10,5^{e}$	600^{d}	500^{c}	920^{f}	960^{g}
M3	$9,9^{d}$	$7,8^{a}$	$9,9^{d}$	$9,8^{d}$	300^{a}	660^{e}	480^{c}	500^{c}

Advanced Test of BNT 5%, Interaction of Mulch with Liquid Fertilizer on Plant Height, Number of Main Stems, Number of Shoots

Follow-up test BNT 5%, there is an interaction of the mulch treatment with the dose of liquid organisms, but not different from all combinations of treatments on the variable observation of the average plant height, (Table, 5). The 5% BNT test, the interaction of the coffee husk mulch treatment with a dose of 50 ml/l water organism liquid fertilizer was not different from the banana leaf mulch treatment and 50 ml/l water liquid organism fertilizer, on the observation variable on the number of main stems of potato plants.

Furthermore, the 5% BNT test, the interaction of the coffee husk mulch treatment with a liquid organism fertilizer dose of 50 ml/l water was not significantly different from the banana leaf mulch treatment and a liquid organism fertilizer dose of 75 ml/l water. The numbers followed by the same letter in the column indicate whether they are different.

Table 5. BNT 5 % Test Results on the Interaction of Mulch with Liquid Fertilizer on the Number of Stems, Number of Shoots, Potato Plants d = 0.01 % = 2.36

MO	Plant Height				Main Stem				Number of Shoots			
	O0	***O1***	***O2***	***O3***	***O0***	***O1***	***O2***	***O3***	***00***	***O1***	***O2***	***O3***
M0	$28,53^{a}$	$28,17^{a}$	$23,70^{a}$	$29,66^{a}$	$10,3^{b}$	$10,0^{b}$	$8,7^{b}$	$8,3^{a}$	$0,3^{a}$	$1,3^{a}$	$4,0^{b}$	$1,0^{a}$
M1	$24,07^{a}$	$25,90^{a}$	$24,57^{a}$	$26,27^{a}$	8,7b	11^{c}	7,7a	$,0^{b}$	$2,0^{a}$	$2,3^{a}$	$8,7^{c}$	$7,0^{b}$
M2	$26,90^{a}$	$22,90^{a}$	$29,07^{a}$	$24,43^{a}$	$6,3^{a}$	$12,3^{c}$	$9,7^{b}$	10^{b}	$1,3^{a}$	$3,0^{a}$	$4,0^{b}$	$5,7^{b}$
M3	$27,63^{a}$	$21,53^{a}$	$21,97^{a}$	$31,23^{a}$	11^{b}	$10,7^{b}$	$7,0^{a}$	$7,7^{a}$	$3,0^{a}$	$9,0^{c}$	$5,0^{b}$	$5,0^{b}$

Advanced Test of BNT 5%, Interaction of Mulch with Liquid Fertilizer on Tuber Diameter, Wet Weight

Further test BNT 5%, the interaction of banana leaf mulch and coffee husk mulch (M1,M2) with liquid organism fertilizer 50 ml/l water was not significantly different from mulch with rice husk mulch and coffee husk mulch (M2,M3) with composition liquid organism fertilizer 75 ml/l water and coffee husk mulch treatment (M2) with a liquid organism fertilizer composition of 100 ml/l water, on the observation variable of tuber diameter.

Furthermore, the 5% BNT test, the interaction of the banana leaf husk mulch and coffee husk mulch (M1, M2) with a liquid organism fertilizer composition of 50 ml/l water, was not

significantly different from the rice husk mulch treatment (M3) with a liquid organism fertilizer composition of 75 ml/l of water and coffee husk mulch (M2) with liquid organism fertilizer composition of 100 ml/l of water, on the wet weight observation variable (Table 6). The numbers followed by the same letter in the column indicate whether they are different.

Table 6. 5% BNT Continuation Test, Interaction of Mulch Treatment (M) with Liquid Fertilizer (O) Parameters of Tuber Diameter, and Wet Weight

M/O	Tuber Diameter				Wet weight			
	O0	***O1***	***O2***	***O3***	***O0***	***O1***	***O2***	***O3***
M0	$3,2^{b}$	$3,0^{b}$	$3,3^{b}$	$3,3^{b}$	320^{b}	300^{b}	330^{b}	330^{b}
M1	$2,8^{a}$	$3,5^{c}$	$3,1^{c}$	$2,6^{a}$	280^{a}	350^{c}	310^{b}	260^{a}
M2	$3,0^{b}$	$3,4^{c}$	$2,8^{a}$	$3,3^{c}$	300^{b}	340^{c}	280^{a}	330^{c}
M3	$2,4^{a}$	$3,1^{b}$	$3,5^{c}$	$3,2^{b}$	240^{a}	310^{b}	350^{c}	320^{b}

Discussion

The single mulch treatment (M) had a very significant effect on the variables: number of main stems, number of shoots, fresh weight, and stem diameter.

The use of mulch was not significantly different from other mulch treatments, in terms of vegetative mass such as plant height, number of main stems and generative period of tuber diameter. The use of coffee husk mulch (M3) was not significantly different from the treatment of banana leaf mulch (M1) on the vegetative mass variable, namely the number of shoots. The rice husk mulch (M2) treatment was significantly different from other mulch treatments on fresh weight. Rice husk mulch treatment (M2) can increase the wet weight of tubers. It is suspected that rice husk mulch on a stretch of planting media can provide optimal density so that the humidity and temperature that occur around the plants are better than other mulch treatments. Besides that, rice husk mulch has a higher nutritional content of organic matter, especially elements that are needed by the generative period of potato plants. In accordance with the opinion of Nandur (2016) that rice husk mulch is for binding nutrients in the soil, improving soil acidity, its silicate content can strengthen leaves, its phosphate content can strengthen plants and encourage the development of plant cells, and a good living place for microorganisms, making soil cavities so that oxygen can easily enter the soil and at the same time when the rice husk is weathered it makes nutrients more available.

The single treatment of liquid fertilizer (O) had a very significant effect on the variables: number of main stems, number of shoots, wet weight, and stem diameter.

Based on the Dunnet 1% follow-up test, the single treatment of liquid fertilizer (O2) 75 ml/liter of water was significantly different from the other doses of liquid fertilizer (O) on the number of shoots and wet weight. Giving a dose of liquid fertilizer at a dose of 75 ml/liter of water is an ideal dose to stimulate the growth of the vegetative mass and provide yields of fresh weight of potato tubers. It is suspected that the treatment dose at 75 ml/liter of water can increase the fresh weight of tubers. It can also increase the growth of the vegetative period on the number of shoots.

The high wet weight indicated that the water content contained in the potato tubers was higher than the other liquid fertilizer (O) treatments. The higher the wet weight, the higher the water content contained. Djufry (2015) stated that the tuber weight produced was inseparable from the process of tuber formation that occurred in potato plants.

The combination treatment and interaction of mulch (M) and liquid fertilizer (O) were very significant for the variables: plant height, number of main stems, number of shoots, wet weight and tuber diameter.

The combination treatment of coffee husk mulch and liquid fertilizer 100 ml/liter of water (M3O3) has an interaction with plant height, the combination treatment of banana leaves with liquid fertilizer 50 ml/l water (M2O1) has an interaction of the number of main stems, the combination treatment of coffee husk mulch and fertilizer liquid 50 ml/l water (M3O1) there is an interaction with the number of shoots. While the combination treatment of rice husk mulch and liquid fertilizer 100 ml/l water (M2O3) had an interaction on wet weight and tuber diameter.

It is assumed that each treatment has the same nutritional opportunity and sunlight to stimulate plant height growth. The mulch treatment functions to cover the surface of the plants, which is not significantly different from the treatment without mulch, meaning that the condition of soil moisture in the mulch treatment does not affect the growth of plant height. Because the planting media is in the same humidity conditions due to the rainy season planting time, namely September to December. While liquid fertilizer at a dose level of 50 ml/l to 100 ml/l of water did not differ significantly with plant height.

This factor of sunlight affects plant height, during the study the intensity of sunlight directly hit plants so that sunlight can affect growth through the process of photosynthesis, stomata formation, and chlorophyll synthesis. While the effect on cell enlargement and differentiation is seen in the growth of plant height and size and cell structure such as growth in stem diameter. According to Parman (2010), there are many factors that influence the formation of potatoes, including the intensity of sunlight, the quality of sunlight and the length of time the plants receive.

CONCLUSION

The use of a single treatment of rice husk mulch is very good for increasing the wet weight and diameter of potato tubers. The use of liquid fertilizer dose of 75 ml/l water is very good in increasing the number of shoots and tuber wet weight. The combination of coffee husk mulch with a liquid fertilizer dose of 50 ml/l water up to 75 ml/l water can spur the growth of plant height, number of shoots and number of stems. The combination treatment of rice husk mulch and liquid fertilizer 100 ml/l of water has an interaction on wet weight and tuber diameter.

The author suggest that the use of organic mulch is not appropriate for use during the rainy season. Also, from the use of liquid fertilizer used for further research, it is necessary to increase the dosage and application period by taking into account climatic conditions.

(Adnan, 2017; Arifin et al., 2014; Hanafiah, 2010; Nisa, 2017; Wulandari et al., 2014; Zulkarnain & Adnan, 2019)

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