



The Effect of Dosage of KCl Fertilizer and Mulse Type on Growth and Road Sweet Results (*Ipomoea Batatas L.*)

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Abstract

This research has been carried out at the Experimental Farm Faculty University Muhammadiyah South tapanuli, indonesian country, from May until August of 2017. The purpose of this research is to know the influence of KCl fertilizer dose and type of mulch against the results of the sweet potato. The design used was 4 x 3 faktors in a randomized blok design with 3 replications. The main factor is the dose of KCl fertilizer consisting of four levels, and the second factor is the use of mulch that consists of three levels. The first dose of KCl fertilizer factor (K) with 4 levels, namely: K1 = 150 kg/ha, K2 = 300 kg/ha, K3 = 450 kg/ha, K4 = 600 kg/ha. The second factor is the treatment of mulch (M) with 3 levels namely: M1 = Without mulch, M2 = rice straw Mulching, M3 = silver black plastic Mulch. The data were analyzed statistically observations according to test F at 5% level. If count is greater than F table 5% means different influential real then continued with Duncan's New Multiple Range Test (DNMRT). The next dose of KCl fertilizer effect of the real against the diameter of the tuber, tuber weight per plant and the production of tubers per hectare. The best treatment is the use of KCl fertilizer dose 11.25 g/plant (450 kg/ha).

Keywords: dose of kcl fertilizer; mulch; a type of sweet potato.

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1. Introduction

Species of *Ipomoea batatas* L. in Indonesia known as sweet potatoes or cassava vines thought to originate from the Americas region of sweet potato plant origin sentrum is Central America. Sweet potato spread throughout the world, especially tropical countries, on the 16th century the spread of sweet potatoes to Asia, especially the Philippines, Japan, and Indonesia is carried out by the General Spain [1].

Sweet potato (*Ipomoea batatas* L.) can be a food staple and a distraction for the population to reduce rice consumption needs continue to increase. Chemical content of sweet potato are good enough to be used as food ingredients. The chemical composition of sweet potato largely consists of 72.8% water, and carbohydrate 24.3%, while other components such as proteins, fats, vitamins, and minerals, very dependent on genetic factors and conditions of cultivation occurring. Thus, the sweet potato is a source of food energy, namely in the form of sugar or carbohydrates. In addition, sweet potatoes also contain a variety of vitamins and minerals needed by the body, such as calcium and iron, as well as vitamin A and C [2].

Production of sweet potato plants in North Sumatra Province in the year 2015 of 122,362 tons, and in the year of 2020 targeted amounted to 210,776 tons [3]. To achieve the target of increasing production of sweet potatoes in 2020 then various efforts carried out one of them is with the granting of KCL fertilizer.

To increase the production of sweet potatoes is to do cultivation. Sweet potatoes require a lot of elements of K of the N and P elements for the production of bulbs. Nutrient substance potassium (K) increases the formation of flowers and chlorophyll, increases the formation of sugar, increasing the formation of carbohydrates, increases the absorption of water, increase the power of leaves tuber enlargement, enhancing, and meningkatkandaya resistant to disease [4]. The availability of sufficient K gives the condition a more efficient water use as turgor rights allowing the lancarnya metabolic processes, K mainly accumulated in the organs of the young plants like on shoots, roots and shoots, the accumulation of K will form a network of cortex in young cells extension [5] Potassium is also important in ensuring a fixed root absorbs water to the maximum because of the increasing osmotic value, this allows the secretion of ions into the cell root osmotic urgent to vesicular and other tissues [6]. Reference [7], revealed that potassium not only influential in the growth and reproduksi plants, but also plays a role in protein synthesis as well as useful in the process of nutrient transport from one to the other syntheses synthesis [8], adding the bakwa potassium plays a role in plant, maintain turgor, forming a stronger shaft, and the effect on the results. Besides potassium affect the process of photosynthesis and respiration. Further results from penelitian [9] suggested the granting of KCl fertilizer with dosage of 450 kg/ha against the number of tubers of influential real pertanaman, perumbi bulbs, weight Corm weight pertanaman and production of tuber perguludan, compared to granting of KCl fertilizer with dosage of 300, 150 and without granting fertilizer. When the results of the production converted to acres of 450 kg/ha dose of 44.2 tons, a dose of 350 kg/ha of 36.8 tons, a dose of 150 kg/ha of 19.2 tonnes. Plant sweet potatoes on land that the State fertile to do the reversal stems every 3 weeks for a lush growth of plants within one month propagates along the 1-1.5 m If continuing to stem left above ground immediately propagates will grow roots in each leaf armpit. The roots will form small tubers that reduce the food reserves for the bulbs in the main stem [10]. Then for the research I am doing planting sweet potatoes with the awarding of the mulch. Because mulch is one way for sweet potato stem does

not touch the ground, so that the stems of sweet potatoes do not remove the roots from the armpit-armpit leaves will form a starchy tuber reduce small food reserve for the main on the stem bulbs. In addition to the fertilizer K, one way to increase the growth and yield of organic mulch and deployment is done an organic on the growth and yield of crops sweet potato (*Ipomea batatas* L.). Mulching is the materials used on the surface of the ground and serves to avoid water loss through evaporation and repressing the growth of weeds [11]. Materials that can be used as mulch is straw and black plastic silver. The function of the mulch is to suppress weed growth, maintain soil aggregate of lacing rainwater, reducing erosion of topsoil, prevent the evaporation of water, and protect the land from exposure to sunlight, can also help fix stabilised soil aggregate thing [12]. In addition the mulch can also keep the soil structure, improve soil infiltration, reduce nutrient leaching, and suppress the growth of weeds [13], so that will increase the ability of soil to support plant on it.

2. Materials and methods

2.1. Research on place and time

These experiments have been conducted in the month of May until August 2017 at Muhammadiyah University of South Tapanuli, Padangsidempuan North, Indonesian country, with an altitude of 321 metres places above sea level (a.s.l.).

2.2. Materials and research tools

Antin1varieties of sweet potato seeds, fertilizer, fertilizer KCl fertilizer UREA, TSP, black plastic Mulch mulching rice straw, silver, insecticides, fungicides, dosage and time of control tailored to circumstances in the field.

2.3. Research methods

Research using 4 x 3 factorial design in the design of random groups with three replicates. The main factor is the dose of KCl fertilizer consisting of four levels, and the second factor is the use of mulch that consists of three levels. The first dose of KCl fertilizer factor (K) with 4 levels, namely: K1 = 150 kg/ha, K2 = 300 kg/ha, K3 = 450 kg/ha, K4 = 600 kg/ha. The second factor is the treatment of mulch (M) with 3 levels namely: M1 = Without mulch, rice straw Mulching = M2, M3 = silver black plastic Mulch.

2.4. Implementation Of The Research

2.4.1. Land Management

Land management is performed twice, the first treaimed aims to turn the ground and destroy chunks of land. While the second processing, aiming to let aerase or tata air in the soil is better done with making dike wall.

2.4.2. The granting of fertilizer

The granting of basic fertilizer was implemented at the time of a week or so before planting in a manner

sprinkled evenly above the dike wall then back hoe until evenly distributed, given basic fertilizer fertilizers is as much as 60 g/TSP dike wall (100 kg/ha), Urea (dike wall 120 g/200 kg/ha). Whereas, the granting of KCl fertilizer is given a week after children's doses in accordance with the treatment. Fertilizer is given in array's with a depth of 5 cm at a distance of 5 cm from the rows of plants. After the fertilizer given fertilizer closed again with soil.

2.4.3. Installation of mulch

Silver black plastic mulch installation carried out one week before the crop is planted, Making holes in plastic mulching done 2 days before planting, with a diameter of 10 cm. wide trench installation of rice straw mulch was done a week before the plant planted as much as 6 kg/bed or 10 tons/ha, rice straw mulch installation done by straw above the dike wall stocked.

2.4.4. Planting

Seedling cuttings taken from the tops of sweet potato Varieties Antin 1 aged two to three months, cuttings and shoots were taken with the same length and the number of books as much as 5 books. Cuttings and shoots grown sweet potato planting distance 100 cm x 25 cm and number of plants by as much as 24 plants/dike wall.

2.5. Harvesting

Sweet potato harvest is done when the plant was 4 months after planting.

3. Results and discussion

From the results of this research can be obtained on the parameters the number of tubers (bulbs), per plant, Long bulbs (cm) showed no noticeable difference.

Tuber diameter (cm)

Table 1: The diameter of the bulbs on the dosing KCl and types of mulch

Treatment	Types Of Mulch			Average
	Without Mulch	Straw Mulch	Plastic Mulch	
Doses of KCl (g/plant)				
3.75 gr	4.83	5.47	4.71	5.00 c
7.5 gr	4.58	5.11	6.08	5.26 b
11.25 gr	5.43	5.53	6.16	5.70 b
15 gr	6.30	6.96	5.97	6.41 a

The results in table 1. Be aware that the granting of potassium fertilizers showed the highest tuber diameter average on fertilizer dosing 15 g/plant (600 g/ha) with the diameter of the tuber rataan 6.41 cm different fertilizer dosing with 3.75 g/plant (150 kg/ha), fertilizer dose 7.5 g/plant (300 kg/ha) and a dose of fertilizer

11.25 g/plant (450 kg/ha), while granting the lowest dose of fertilizer treatment refractory 3.75 g/plant (150 kg/ha) with the diameter of the tuber rataan 5.00 cm.

The real influence of potassium fertilizer against the diameter of the tuber caused by fotosintat that is distributed to the tuber, K is acting as a catalyst or settings mechanism of photosynthesis and translocation of carbohydrates, so the role of K are more directional in the storage of carbohydrates when compared compilers constituent vegetative organs plant.

Reference [14] explains that the plants absorbed nutrient elements will affect her little big fotosintat results are transmitted to the tuber so that will affect small diameter and thick large bulbs, but if too much of the nutrient elements available then the plants were not able to absorb all of the nutrient elements at a time when the plant enters the generative phase.

Tuber weight per plant (g)

Table 2: Tuber weight per plant at KCl and dosing type of mulch

Treatment Doses of KCl (g/plant)	Types Of Mulch			Due to the KCl treatment
	Without Mulch	Straw Mulch	Plastic Mulch	
3.75 gr	1182,00	1132,83	1250,83	1188,56 d
7.5 gr	1064,67	1513,33	1312,67	1296,89 c
11.25 gr	1438,67	1649,83	1560,83	1549,78 a
15 gr	1512,67	1191,67	1302,17	1335,50 b

The results in table 2. indicates that the dosing of different potassium fertilizer. The highest tuber weight avarege is present on the fertilizer dosing 11.25 g/plant (450 kg/ha) with rataan of 1549.78 g/a different real plant with different dosing with 3.75 g/plant (150 kg/ha), a dose of 7.5 g/fertilizer plant (300 kg/ ha) and K4 (15 g), while the lowest is present on the treatment dose of 3.75 g/fertilizer plant (150 kg/plant) with the production of 1188.56 g/plant. Thus the more improved dosing up to 450 kg/ha showed the higher weight of bulbs and progressively enhanced tuber weight decline doses.

Based on the results of this research can be aware that different potassium fertilizer application manifest against the weight of tuber per plant. This is caused by the ability of potassium in improving results assimilat and translocation carbohydrates to the tuber. [15] explains that the potassium to function keeping the status of water plants and cell turgor pressure, adjust the stomata and set the accumulation and translocation of carbohydrates that are newly formed. [16], shows an increase in the potassium fertilization can increase yield and tuber in sweet potato Tuber size through the mechanism of increase of the number of results fotosintat translocations to the tuber which is characterized by increasing the ratio of root and the positive correlation between ratio of root harvest index values against.

The influence of mulching is not unlike real, caused by the existence of the reversal of the stem. The reversal of

root adventif. The roots of adventif are the organs that are not expected in the cultivation of bulbs. With a reversal at the plant then the influence of mulch against the increase of the tuber becomes reduced [17] explains that the ratio of sink and source is the thing to watch out for. Efficiency against the sink and source there is a goto assimilat distribution with kaitanya plants, if the results of assimilat used for unproductive part then it can lead to menurunya weight of the plant.

Production (ton/ha)

Table 3: Production (ton/ha) in the dosing KCl and types of mulch

Treatment Doses of KCl (g/plant)	Types Of Mulch			Due to the KCl treatment
	Without Mulch	Straw Mulch	Plastic Mulch	
3.75 gr	47.28	45.31	50.03	47.54 d
7.5 gr	42.59	60.53	52.51	51.88 c
11.25 gr	57.55	65.99	62.43	61.99 a
15 gr	60.51	47.67	52.09	53.42 b

The results in table 3. indicates that different doses of KCl fertilizer treatment. The highest production of refractory average dosing 11.25 g/plant (450 kg/ha) with average of 61.99 ton/ha, whereas the lowest refractory the fertilizer dosing 3.75 g/plant (150 kg/ha) with average 47.54 tons/ha. The higher the dose of KCl fertilizer provided produce sweet potato high production until a dose of 450 kg/ha if the dose is increased decline already in production.

Application of potassium fertilizer that can affect the parameters of crop production due to the role of the potassium fertilizer in plant physiological processes. One such role was the role of potassium in the mechanism of stomata open and close it. Potassium will act when high temperatures where the potassium fertilizer will reduce the rate of transpiration is high due to high temperature. Mechanism of potassium in lowering the rate of transpiration in plants is potassium plays a role in the process of stomata closing so that the loss of water in plants is not too high. [18] explains that potassium plays a role in the mechanism of stomata open and close it.

Besides nutrient Substance potassium (K) increases the formation of flowers and chlorophyll, increases the formation of sugar, increasing the formation of carbohydrates, increases the absorption of water, increase the power of leaves tuber enlargement, increase, and increase resistant to disease [19].

4. Conclusions and suggestions

4.1. Conclusions

Based on the results of the research can be drawn the following conclusions treatment of straw mulch plastic mulch and produce the best bulbs compared to treatment without mulch Dose of KCl fertilizer at 450 kg/ha yield the highest tuber of 61.99 tons/ha.

4.2. Suggestions

Based on the research results obtained advice on sweet potato cultivation disaran KCl fertilizer to put on a dose of 450 kg/ha.

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