

APPLICATION OF LEAF FERTILIZER AND PLANT HORMONES TO ACCELERATE SHOOT CUTTINGS GROWTH ON THE POTATO VARIETIES OF GRANOLA LEMBANG (*Solanum tuberosum* L.)

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ABSTRACT

An important factor in the productivity of potatoes is the procurement of quality potato seeds. Procurement of potato seeds can be done several ways, one of which is by cuttings. Giving plant hormones in cuttings can encourage and accelerate the formation of roots, stimulate the formation of new shoots, and increase the number and quality of shoots and roots. This study uses a split-plot design factorial with the first factor is the influence of various kinds of leaf fertilizer consisting of 3 levels, namely PAB (AB Mix), PGD (Gandasil D) and PG (Growmore), and the second factor is some natural plant hormones which consist of Z0 (Rootone F / control), Z1 (bamboo shoots), Z2 (coconut water), Z3 (aloe vera) and Z4 (shallots). All treatments were repeated 3 times. The data obtained were analyzed using orthogonal contrast for treatment vs. control testing. F test to determine diversity, if there is a diversity of treatment followed by BNJ test level of 5%. Observation variables included: when the roots appeared, plant height, number of leaves, and stem diameter. The results showed that there was no interaction between the administration of leaf fertilizer with extracts of some plant hormones, only that the treatment of the leaves of the gandasil D fertilizer had a very significant effect on plant height parameters, with an average of 6.57 cm. whereas in orthogonal analysis the contrast between control and treatment, control tends to be higher in value.

Keywords: *Potato cuttings, Leaf fertilizer, Plant hormones*

INTRODUCTION

Potato plant (*Solanum tuberosum* L.) is a commodity that gets top priority, this is because the potato plant has the potential to be developed as a source of carbohydrates. This crop is included as the fourth major food crop in the world, after rice, wheat and corn (Asgar, 2013).

Procurement of quality seeds is needed to overcome the problems that often occur. Procurement of potato seeds can be done several ways, one of which is by

cuttings. Cuttings are the procurement of seeds that can be said to be simple. The success of plant growth by means of cuttings is characterized by the formation of roots in plant parts that have been cut and planted into the planting medium. Hormones in the body of the plant are very few in number, so we need hormones from outside, namely growth regulators to accelerate and increase root formation (Parnata, 2010).

In addition to giving growth around, providing nutrients is also very important to

increase maximum productivity results. Giving nutrients in addition to being given by soil is generally given through leaves. Leaf fertilizer is the ingredients or elements that are given through the leaves by spraying or watering the leaves of the plant so that it can be directly absorbed to meet the needs for growth and development, it is in agreement with, Desiana, et al., (2013) to meet the nutrient requirements for plants is done by applying fertilizer to the media so that healthy plant seedling growth can be achieved. According to Priangga, et al., (2013) the use of liquid organic fertilizer provides benefits, this fertilizer can be used by splashing or spraying directly on plants and the results will be more evenly distributed, this is due to liquid organic fertilizer 100% soluble.

This study aims to determine the response of leaf fertilizer and plant hormones give effect to the growth of shoots of potato buds (*Solanum tuberosum* L.) Granola lembang cultivars.

METHOD

This study uses a factorial split-plot design which is repeated 3 times. The first factor is placed as the main plot, the influence of the type of leaf fertilizer consists of 3 levels, that is PAB = AB Mix, PGD = Gendasil D and PG = Growmore. The second factor is placed as sub-plots (combination of natural plant extracts)

consisting of Z0 = Rooten F (control), Z1 = Bamb So that a combination of 15 plants was obtained and each treatment combination was repeated 3 times to obtain 45 experimental units and each experimental unit consisted of 8 plant populations with 3 samples in it so that the total was 360 plants.oo shoots, Z2 = Coconut water, Z3 = Aloe vera and Z4 = shallot. And obtained such a combination is :

PAB Z0 = Fertilizer AB Mix + Rootone F

PAB Z1 = Fertilizer AB Mix + bamboo shoots

PAB Z2 = Fertilizer AB Mix + coconut water

PAB Z3 = Fertilizer AB Mix + aloe vera

PAB Z4 = Fertilizer AB Mix + onion

PGD Z0 = Fertilizer Gendasil D + Rootone F

PGD Z1 = Fertilizer Gendasil D + bamboo shoots

PGD Z2 = Fertilizer Gendasil D + coconut water

PGD Z3 = Fertilizer Gendasil D + aloe vera

PGD Z4 = Fertilizer Gendasil D + shallot

PG Z0 = Growmore Fertilizer + Rootone F

PG Z1 = Growmore fertilizer + bamboo shoots

PG Z2 = Growmore fertilizer + coconut water

PG Z3 = Growmore + aloe vera fertilizer

PG Z4 = Growmore Fertilizer + shallots

Variables observed in this study were published: when roots appeared, plant height, number of leaves and stem diameter appeared. The observational data were

analyzed using the F test at 5% level if there was a real influence between treatments further testing was done using a BNJ level of 5%. Also performed Contrast Orthogonal Test to determine the difference between treatment and control.

Root Appears

Based on the results of an analysis of the variety when the roots appear, showed no real difference between some plant extracts. The mean value when a plant extract appears some plant extracts.

RESULT AND DISCUSSION

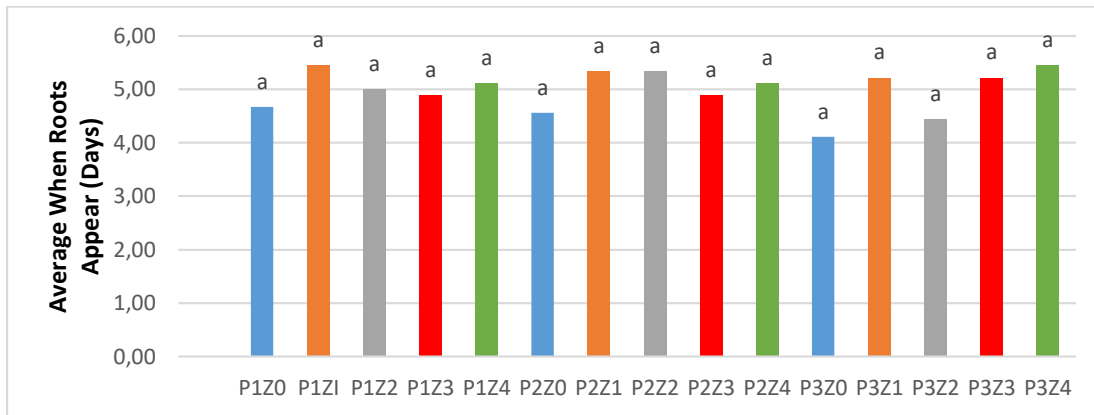


Figure 1. When the mean appears with a combination of several plant extracts on potato cuttings.

Information :

- The mean value accompanied by the same letters between treatment combinations shows no significant difference according to the BNJ test level of 5%.
- Z0 (Rootone f), Z1 (Bamboo shoots), Z2 (Coconut water), Z3 (Aloe vera) and Z4 (Shallots).

Figure 1. shows that the average root emergence did not show a non-significant effect between the treatment of leaf fertilizer and plant extract but the root appeared most quickly in the P3Z0 treatment (growmore + rootone f).

Plant Height

Based on the analysis of various types of height increase of potato plants

showed no significant interaction between the treatment of some plant extracts and the treatment of leaf fertilizers. Separately at 14 DAP the treatment of fertilizers had a very significant effect with the highest average height of plants on the Gandasil D treatment with an average value of 6.57 cm (Appendix 2). The mean value of plant growth in the treatment of some plant extracts and leaf fertilizer treatments in figures 2, 3 and 4.

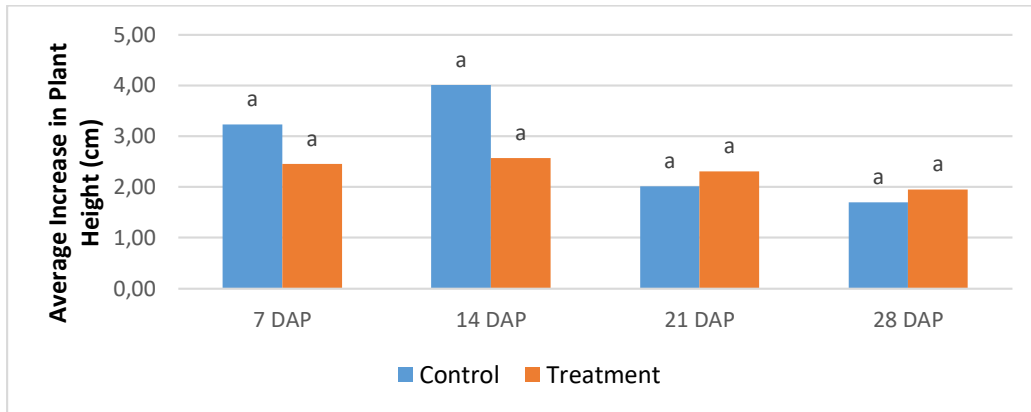


Figure 2. Average height increase of plants aged 7-28 DAP on potato bud cuttings.

Information :

- The mean value accompanied by the same letter at the same age shows no significant difference according to the BNJ test level of 5%.

Figure 3. shows that the mean increase in plant height was not significantly different from age 7, 14, 21, and 28 DAP, but

the higher mean height was found in the control compared to the treatment.

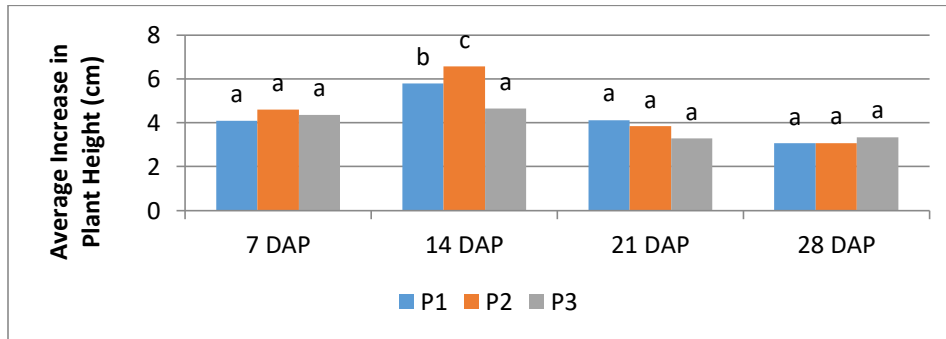


Figure 3. The increased average height of potato plants at the age of 7-28 DAP with the treatment of leaf fertilizer on potato cuttings.

Information :

- The average value accompanied by the same letter at the same age shows no significant difference based on the BNJ test at 5% level.
- P1 (AB Mix fertilizer), P2 (Gandasil D fertilizer), P3 (Growmore).

In Figure 3. shows the average height

increase of potato plants at the age of 14 DAP has a very significant effect with the

highest value of 6.57 in P2 (Gandasil D) treatment.

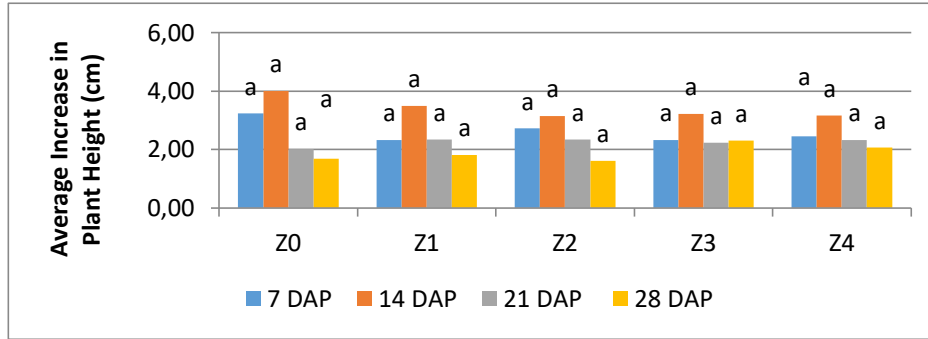


Figure 4. Increased height of potato plants at the age of 7-28 DAP with the treatment of some plant extracts on potato cuttings.

Information :

- The average value accompanied by the same letter at the same age shows no significant difference based on the BNJ test at 5% level.

Figure 4. shows that the mean increase in plant height showed no significant effect at age 7, 14, 21 and 28 DAP, but the treatment was higher in the Z0 (control) treatment than in Z1, Z2, Z3 and Z5 treatments.

Number Of Leaves

Based on the analysis of the variance in the number of leaves, the number of

interactions showed no significant difference between the treatment of some plant extract hormones and the treatment of leaf fertilizers. The mean value of increasing the number of leaves of several plant extracts and leaf fertilizer treatments is presented in figures 5, 6 and 7.

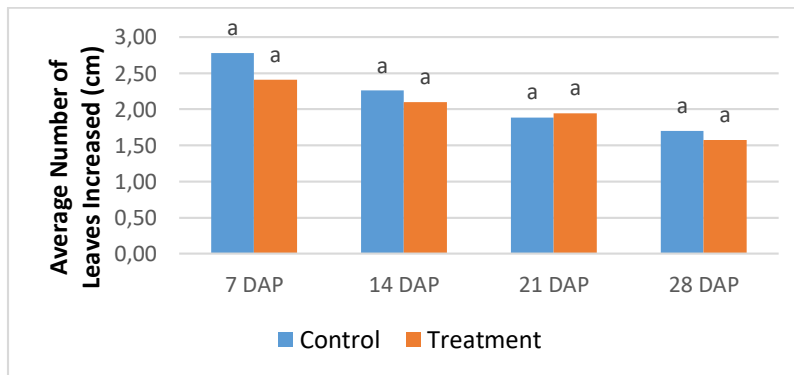


Figure 5. Average increase in the number of leaves aged 7-28 DAP on potato bud cuttings.

Information :

- The mean value accompanied by the same letter at the same age shows no significant difference according to the BNJ test level of 5%.

Figure 5. shows that the average increase in the number of leaves shows no significant effect from the age of 7, 14, 21,

and 28 DAP, but the higher is in the control compared to the treatment of potato cuttings.

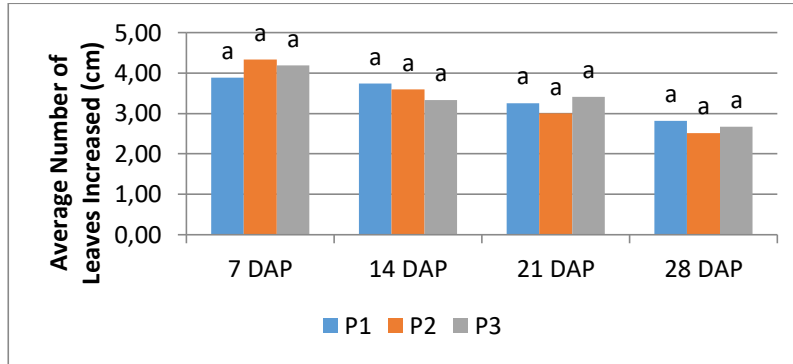


Figure 6. Increase in the average number of potato leaves at the age of 7-28 DAP in the treatment of leaf fertilizer on potato cuttings.

Information :

- The average value accompanied by the same letter at the same age shows no significant difference based on the BNJ test at 5% level.
- P1 (AB Mix fertilizer), P2 (Gandasil D fertilizer), P3 (Growmore).

In Figure 6 shows that the average increase in the number of leaves at the age

of 7 DAP to 28 DAP is higher at the age of 7 DAP treatment P2 (dandelion fertilizer D).

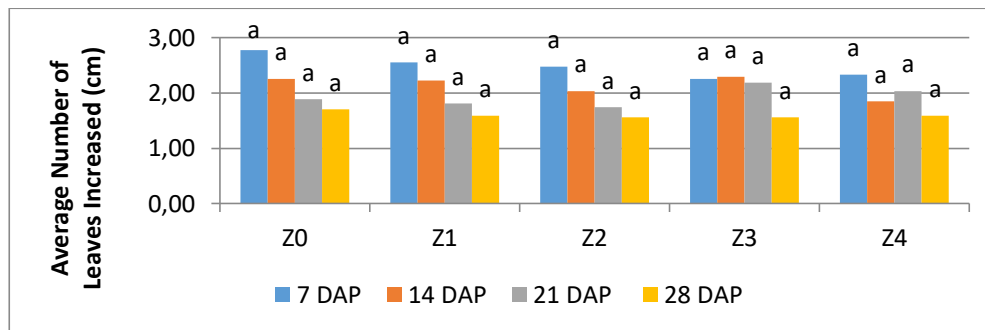


Figure 7. Increasing the number of leaves of potato plants at the age of 7-28 DAP treatment of plant extracts on potato cuttings.

Information :

- The average value accompanied by the same letter at the same age shows no significant difference based on the BNJ test at 5% level.
- Z0 (Rootone f), Z1 (Bamboo shoots), Z2 (Coconut water), Z3 (Aloe vera) and Z4 (Shallots).

Figure 7 shows that the average increase in the number of leaves at the age of 7 DAP is higher than 14, 21 and 28 DAP

but it has no significant effect on the treatment of some plant extracts.

Diameter Of Stem

Based on the analysis of the variance in the number of leaves, there was no significant interaction between the treatment of some plant extracts and the treatment of

leaf fertilizer (appendix 4). The mean value of increasing the number of leaves of several plant extracts and leaf fertilizer treatments is presented in figures 8, 9 and 10.

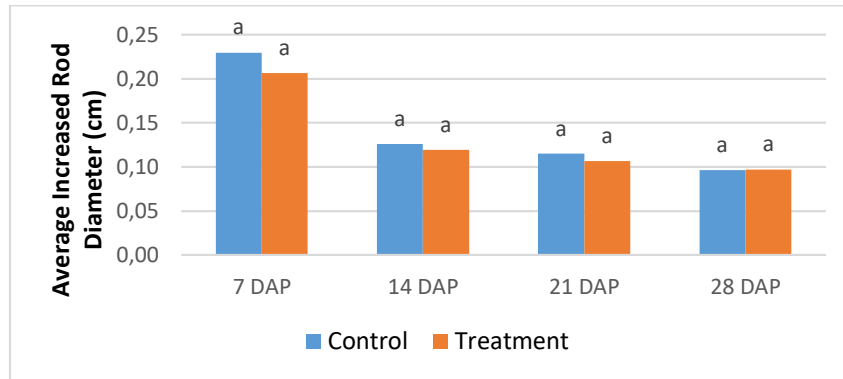


Figure 8. Average increase in stem diameter at the age of 7-28 DAP on potato cuttings.

Information :

- The mean value accompanied by the same letter at the same age shows no significant difference according to the BNJ test level of 5%.

Figure 8 shows that the mean increase in stem diameter had no significant effect from the age of 7, 14, 21 and 28 DAP,

but that there was a higher control than the treatment of potato cuttings.

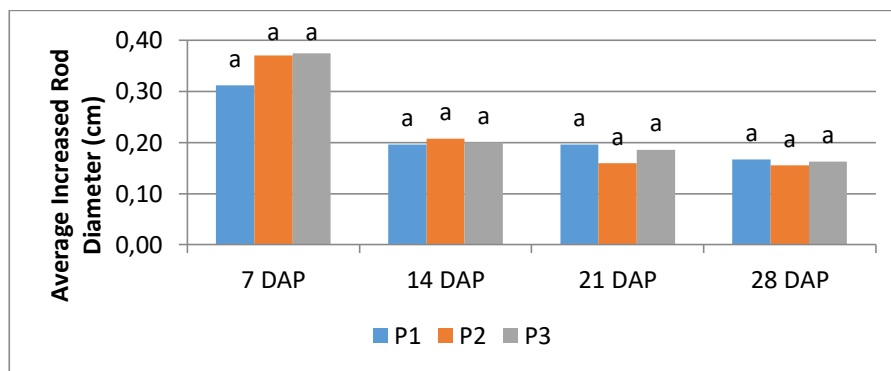


Figure 9. Increased mean diameter of potato stems at the age of 7-28 DAP treatment of leaf fertilizer on potato cuttings.

Information :

- The average value accompanied by the same letter at the same age shows no significant difference based on the BNJ test at 5% level.
- P1 (AB Mix fertilizer), P2 (Gandasil D fertilizer), P3 (Growmore).

In Figure 9 shows that the average increase in the diameter of the stem age 7

DAP to 28 DAP is higher at the age of 7 DAP P3 (Growmore) treatment.

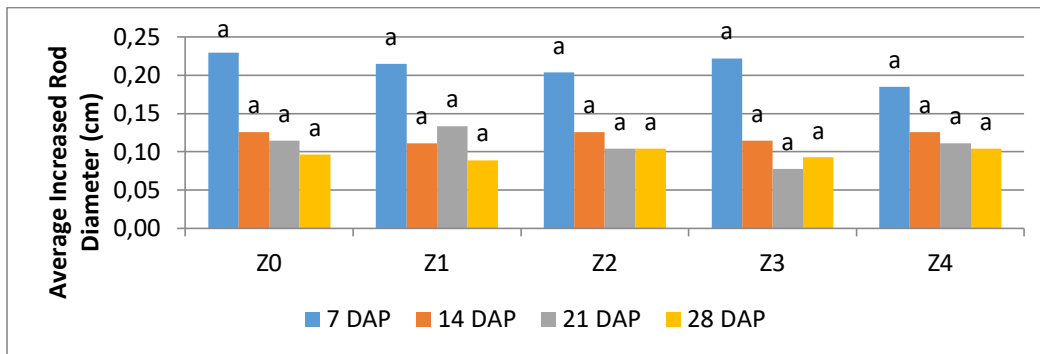


Figure 10. Average increase in diameter of potato stems at the age of 7-28 DAP treatment of plant extracts on potato cuttings.

Information :

- The average value accompanied by the same letter at the same age shows no significant difference based on the BNJ test at 5% level.
- Z0 (Rootone f), Z1 (Bamboo shoots), Z2 (Coconut water), Z3 (Aloe vera) and Z4 (Shallots).

Figure 10. shows that the average increase in stem diameter at 7 DAP was higher than those at 14, 21 and 28 DAP but did not significantly affect the treatment of some plant extracts.

Based on the results of the analysis of variance, it was obtained when the roots appeared most quickly at P3Z0 (control) which was an average of 4 days compared to extracts of several plants. Use of growth around to stimulate root formation on cuttings. Growth around Rootone F is included in the Auksin synthesis which is very active in the Experiment and reproduces out of the roots, uptake of air, will not be much and can compensate for the

evaporation of air in the soil. Auxin has a role in plant growth, which can stimulate the growth of roots in cuttings. In addition, the formation of roots is influenced by the composition of the appropriate hormones so that root growth is not inhibited (Marpaung, 2015). Factors that determine the success of cuttings to take root are the selection and management of planting media. Plants that are propagated by means of seeding must be grown on planting media that can support the formation of roots and shoots so that new plants are identified that are identical to the parent (Flaishman et al., 2008).

Based on the figure 4 the average increase in height of potato plants is higher

in the application of Gandasil D fertilizer with a value of 6.57 cm at the age of 14 DAP, in the application of AB Mix fertilizer with a value of 5.80, while in the application of Growmore fertilizer with a value of 4.65. This is because fertilizer contains PPN nutrients needed by plants, so that plants can be easily utilized in metabolism which has an impact on increasing growth in this case plant height (Hakim, 2006)

According to Palembang (2012), the application of Gandasil D leaf fertilizers gave significantly different results on the growth of red *A. cadamba* seeds. Whereas in the treatment of extracts some of the best plants are the use of a regulating agent Rooton F at 14 DAP. This is because Rootone F contains a more varied auxin content (NAA and IBA) compared to the auxin content in extracts of several plants, so getting a better plant height results. This is supported by a statement from Mulyono (2010), one of the functions of auxin can extend plant cells by affecting cell wall metabolism that results in rising plant height walls.

Based on the results of the analysis of the average increase in the number of leaves, showed that the administration of leaf fertilizer and the treatment of several plant extract hormones had no significant effect starting at 7 DAP up to 28 DAP. It is

suspected that the plants do not get fertilizer with the right concentration, according to Rizqiani *et al.*, (2006), plant growth and development will be good if the nutrients supplied with the right dose, because the application of fertilizers with inappropriate concentrations will affect the crop yield. On the average increase in the number of leaves given some natural plant extracts showed no significant effect. This is due to lack of sufficient concentration in the administration of extracts of growth regulators. In accordance with the opinion of Trisna *et al.*, (2013), that plants can grow well if the availability of plant growth regulators is sufficient to encourage plant growth, especially in the process of leaf formation. The increase in the number of leaves is caused by the administration of plant extracts that have contents according to Arif *et al.*, (2016), exogenous growth stimulants in cooperation with endogenous growth around in cuttings. The auxin hormone contained in all treatments is a growth regulator which can play a role in stimulating the growth of young tissues such as leaves. In the study of Vernoux *et al.* (2011) showed that the response of auxin administration is very complex, depending on the level of auxin administration.

Based on the results of the analysis of variance on the application of leaf fertilizer

did not significantly affect the average increase in diameter of the potato stems, but the highest observation at 7 DAP where the Growmore fertilizer is higher value of 0.37 cm compared to other fertilizer treatments. According to Nuryani (2007), if sufficient nitrogen supply, plant leaves will grow larger and expand the surface available for photosynthesis so that the rate of photosynthesis that increases will produce photosynthates in large quantities. The photosynthate is then used to increase the rate of growth and development of plants through the process of cell division, cell enlargement, and cell differentiation so as to increase the diameter of the stem. Whereas the treatment of some plant extracts also had no significant effect on the stem diameter of potato plants, according to Beemnet., Et al., (2011), environmental conditions and physiological status would influence the process of plant growth. However, the best extract in the treatment of shallot extract. According to Marfirani (2014), onion tubers contain the hormones auxin and giberellin, which can stimulate the growth of cuttings. The results of Siswanto et al., (2010) research, the provision of auxin as a growth regulator can increase the percentage of cuttings that form roots, accelerate root initiation, and homogenize root cuttings, so that it will affect the widening of the cell wall

which will then be continued to increase the diameter of the plant stem.

CONCLUSION

Based on the results of the study can be concluded as follows,

1. There is no real interaction between the types of leaf fertilizer and natural plant extracts on the growth of potato shoot cuttings (*Solanum tuberosum* L.) Granola Lembang cultivars.
2. The treatment of leaf fertilizer application shows very significant effect, with the treatment of fertilizer application Gandasil D has a high average value on the observation variable plant height increase.
3. The treatment of giving natural plant extracts does not significantly affect the variables when the roots appear, plant height, number of leaves and stem diameter.
4. The Rootone F control treatment showed that the roots appeared faster, the stem diameter was greater, and the number of leaves increased faster at all age observations compared to the hormone treatment of bamboo shoots, coconut water, aloe vera and onion.

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