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Response Of Natural Zpt Generation Of Green Bean Sprouting Extract And Plant Media On The Growth Of Lemon Orange (*Citrus Limon* L.) Plant Cuttings

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ABSTRACT

From March to May 2021, this study was carried out in the Asahan University research facility. This study's goal was to ascertain how administering natural ZPT green bean sprout extract and planting media affected the growth of lemon plant cuttings (Citrus limon L.). It was a randomized block design that was used (RBD). The first of the two components in the factorial treatment design is the administration of ZPT natural green bean sprout extract (Z) at four levels: Z 0 = no immersion, Z 1 = one hour of immersion, Z 2 = two hours of immersion, and Z 3 = three hours of immersion. The second factor is how growing media (M) are treated, with M 0 being moss and topsoil and M 1 being cocopeat and topsoil, and M 2 being chaff charcoal and topsoil, at three different levels. The proportion of live cuttings (%), the number of days before shoots appeared (days), the shoot height (cm), the number of leaves (strands), and the length of the roots were the parameters measured (cm). Almost all of the observed parameters, with the exception of the age at which shoots developed from cuttings, did not respond significantly to the administration of natural PGR extract of mung bean sprouts, according to the data. While this was going on, the treatment of the planting medium had a very big impact on the parameters of root length and leaf count that had been measured. In the meantime, the treatment of the planting medium had a very substantial impact on the parameters of root length, number of leaves, and shoot height that were measured. The percentage of live cuttings and the age at which shoots first developed, however, did not appear to have any discernible effects. Citrus limon L. cutting growth was not significantly affected by the interaction between the response of administering natural PGR extract of green bean sprouts and planting media, according to all measured parameters.

Keywords: Zpt , Green Beans , Lemon (Citrus Limon L.)

Abstract.

Keywords :

PRELIMINARY

Oranges are plants native to the continent of Asia which are widely found in India to China. One of the most widely known types of oranges (*citrus)* is *Citrus limon* or lemon. *Citrus limon* can grow well in the lowlands to an altitude of 800 meters above sea level. Cultivation of lemons or *Citrus limon* in Indonesia is on the island of Java (Mohanapriya, *ddk,* 2013). Lemon (*Citrus limon*) is native to Southeast Asia (Manner and Elevitch, 2006). The prospect of lemon agribusiness in Indonesia is quite good because of the potential for large production areas. However, there are very few people

in cultivating lemons. One of them is caused by the lack of availability of seeds which take a relatively long time to obtain seeds that are ready for planting from seeds. One alternative to overcome the shortage of seeds is to use seeds from vegetative propagation, namely by using cuttings (Anwar, *et al* , 2019).

Lemon is more popular in the culinary industry because it has a fresh citrus aroma and the part used is juice. Some of the benefits of lemons can be used as *garnishes* for food and drinks. Examples of drinks made from lemons are Lemon Orange Juice and Lemon *Infused Water* (Marwanto, 2014). Planting media plays a role in plant nurseries as a place to grow and take root. The selection of planting media must be adjusted to its purpose so that the media for seedlings and propagation even reaches the point where the plant is productive. According to Ashari (2006) rooting media in cuttings of plant organs serves to keep the cuttings from shaking easily and provide sufficient moisture. Therefore, the media used must be able to provide good aeration, have good water holding capacity and drainage and be free from fungi and bacteria/pathogens. The media used for growth are: husk charcoal, moss and compost. All of these media materials are organic media that can affect plant growth.

ZPT is a non-nutrient organic compound that supports plant physiological processes. One way of vegetative propagation is by cuttings, it is hoped that the same characteristics as the parents can be guaranteed. In order for the development in the plantation sector that has been planned by the government to materialize immediately, it is necessary to make efforts in the way of its implementation, so that at the time of planting there are always available seeds in sufficient quantities, on time and of high quality. The indication of successful cutting is the emergence of roots and shoots. Efforts to accelerate the emergence of roots and shoots on cuttings can be accomplished by administering growth stimulants (Kiptiyah, 2005).

With the description above, the authors are interested in conducting research by combining the use of natural PGR extract of mung bean sprouts and planting media , to obtain an optimal combination for the growth of lemon cuttings (*Citrus limon* L.).

METHOD

This research carried out on the land of the Faculty of Agriculture, Asahan University, with flat topography and elevation ± 24 m above sea level, with coordinates of 2.9667523 , 99.6208202 . Rainfall is between 1,917 mm–3,884 mm, with an average annual rainfall of 2,900 mm. Temperatures range from 20.4 to 32.7 ^{0} C and humidity between 82% -94%. Implementation of research in March to May 20 21 .

This study used a factorial randomized block design (RBD) with 2 factors, namely:

1. The first factor is giving ZPT natural green bean sprout extract (Z) with 4 levels, namely :
   - Z_0 =0 No immersion (Control)
   - Z_1 = 1 hour of immersion
   - Z_2 = 2 hours of immersion
   - Z_3 = 3 hours of immersion
2. Second factor is the planting medium (M) with 3 levels, namely:
   - M_0 = Moss + Topsoil 20:80
   - M_1 = Coco peat + Topsoil 50:50

M_2 = Charcoal Husk + Topsoil 50:50

With a combination of treatments is 4 x 3 = 12 treatments, :

Z_0M_0	Z_1M_0	Z_2M_0	Z_3M_0
Z_0M_1	Z_1M_1	Z_2M_1	Z_3M_1
Z_0M_2	Z_1M_2	Z_2M_2	Z_3M_2

With lots of repeats:

$(t-1)(r-1) \geq 15$

$(12-1)(r-1) \geq 15$

$11r - 11 \geq 15$

$11r \geq 26$

$r \geq 2.36$

r = 3 repetitions

With the following criteria:

Number of repetitions : 3 repetitions

Number of combinations : 12 combinations

Number of research plots : 36 plots

Number of plants per plot : 6 plants

Number of sample plants per plot : 2 plants

The total number of sample plants : 72 plants

Total number of plants : 216 plants

Plot length : 30 cm

Plot width : 30 cm

Distance between plots : 1 0 cm

Distance between repetitions : 4 0 cm

factorial randomized block design (RBD) linear model are as follows :

$Yijk = \mu + pi + \alpha j + \beta k + (\alpha\beta)jk + \Sigma ijk$

Yijk = Observations from natural ZPT treatment of mung bean sprout extract level j and planting media level k in block i.

μ = Mean effect.

pi = Effect of repetition in the i-th block.

αj = Effect of giving natural PGR extract of mung bean sprouts level j.

βk = Effect of planting medium level k.

$(\alpha\beta)jk$ = Interaction effect of giving natural ZPT green sprout extract level j and planting media level k.

Σijk = Error effect of giving natural ZPT green bean sprout extract level j and planting media level k in block i.

If the analysis of variance shows significant or very significant, then the test is continued using the BNJ test if the CC is <10%, the LSD test if the CC is 10% - 20%, and the DMRT test if the CC is >20%.

RESULTS AND DISCUSSION

Morphology of Lemon Citrus Plants

Lemon (*Citrus limon*) is a type of herbaceous plant that has many branches and twigs with a maximum height of 10-15 feet (3-6 m). Lemon It has thorny stems, green and oval leaves, oval and white flowers with purple stripes inside. The lemon fruit is 7-12 cm in size and has an oval shape with a pointed tip at one end. Lemon peel is bright yellow, sometimes there are green or white stripes and is about 6-10 mm thick. The flesh of the lemon fruit is hairy, pale yellow in color, has about 8-10 segments, is juicy and has a sour taste (Kristanto, 2013). The classification of the lemon plant is as follows:

- Kingdom : *Plantae*
- Sub-kingdom : *Spermatophyta*
- Division : *Magnoliopyta*
- Class : *Dicotyledonae*
- Sub class : *Rosidae*
- Order : *Sapindales*
- Family : *Rutaceae*
- Clan : *Citrus*
- Species : *Citrus limon* (L)

Terms of Growing Plants

1. Requirements for growing lemon plants (*Citrus limon* L.)

   Lemon plants do very well in areas with loose, organic soil. Make sure that the land to be planted has good organic content so that the nutrition of the lemon trees can be fulfilled. In addition, the soil to be planted has a low salt level and is free from weeds and other nuisance plants. The soil is not waterlogged, not muddy, and not too wet. It is important to note, the land used as a planting medium gets enough sunlight.

2. I the climate of lemon plants (*Citrus limon* L.)

   Lemons can grow in tropical and subtropical climates. Lemon plants can be planted in gardens on agricultural land to pots, the most important thing is enough sunlight. Basically lemons are plants that need sunlight around 8-12 hours a day.

Benefits and Economic Prospects of Plants

The lemon (*Citrus limon* L.) is a prolate yellow or pale yellow fruit with five to ten seeds, and is used in a variety of dishes. The juice is used as a food ingredient for both commercial and home consumption, and is valued for its sour, tangy and fresh taste. The fragrant lemon rind is used as a garnish and flavoring and is a major source of commercial essential oil and aroma compounds. Lemon flowers are sweetly scented, with a scent similar to other orange blossoms. The essential oils of flowers, twigs, and fruit can be distilled or extracted to obtain ingredients suitable for use in flavors and fragrances. The characteristics of the lemon tree are small thorns that can grow well in all tropical and subtropical regions of the world. Compared to oranges and grapes, lemon trees are quite sensitive to cold air. Lemon fruit has a low sugar content which can cause it to freeze at certain temperatures (Goodrich, 2003).

The Role of Natural ZPT Extract Mung Bean Sprouts

Mung bean sprout extract had concentrations of growth regulator compounds auxin 1.68 ppm, gibberellins 39.94 ppm, and cytokinins 96.26 ppm (Ulfa, 2014). Mung bean sprouts are a type of vegetable that is commonly consumed, easy to obtain and

cheap and does not produce toxic compounds. This can be an alternative to synthetic growth regulators which are relatively more expensive and difficult to obtain due to limited availability.

Bean sprouts also contain several antioxidants and substances related to antioxidants, namely phytosterols, vitamin E (α-tocopherol), phenols, and several minerals (selenium, manganese, copper, zinc, and iron) (Astawan, 2011).

Mung bean sprout extract had concentrations of growth regulator compounds auxin 1.68 mg/L, gibberellins 39.94 mg/L, and cytokinins 96.26 mg/L (Ulfa (2014) *in* Pamungkas and Rudin, 2020). Because of this, bean sprout extract has been widely tried as an alternative to natural ZPT. Pamungkas and Rudin (2020) soaked sugarcane seeds in bean sprout extract. The results show a concentration of 40% gives the best results.

The Role of Planting Media

Growing media is a living place for plants. In general, the planting medium must be able to support plant roots so they can stand upright and not easily collapse in the wind or other disturbances and can support plant growth (Wiryanta, 2007).

Z/M	M_0	M_1	M_2	Average
Z_0	100.00a	94.44 a	88.89a	94.44 a
Z_1	100.00a	88.89a	94.44 a	94.44 a
Z_2	94.44 a	94.44 a	77.78 a	88.89a
Z_3	100.00a	88.89a	100.00a	96.30a
Average	98.61a	91.67 a	90.28 a	KK = 11.57%

The planting medium functions as a place for growth and development of roots and holds nutrients and water temporarily. The type and nature of the planting medium will affect the availability of nutrients and water in the root zone. Several types of media have different effects on plant growth and yield. This difference is related to the binding capacity of water and nutrients for plants as well as porosity, humidity and aeration in the planting medium (Hardjowigeno, 2003).

Percentage of live cuttings (%)

Observation data and analysis of variance on the percentage of living cuttings of lemon citrus can be seen in appendices 4 and 6.

Based on the results of the analysis of variance, it can be seen that the administration of natural PGR extract of green bean sprouts showed no significant effect on the percentage of live cuttings of lemon citrus plants. The treatment of the growing media also showed no significant effect on the percentage of living cuttings of lemon citrus plants. The interaction of natural ZPT administration of mung bean sprout extract and planting media showed no significant effect on the percentage of live cuttings of lemongrass.

The results of the different test on the average response of natural ZPT extract of green bean sprouts and planting media to the percentage of live cuttings of lemon citrus plants can be seen in table 1 below:

Table 1. Average Difference Test Results for Giving Natural ZPT Extract Mung Bean Sprouts and Planting Media to the Percentage of Live Cuttings of Lemon Citrus Plants .

Z/M	M_0	M_1	M_2	Average
Z_0	10.67 a	11.00 a.m	10.00 a.m	10.56a
Z_1	9.33 a	7,67 a	7.00 a.m	8.00b
Z_2	6,67 a	7.33 a	7.00 a.m	7.00b
Z_3	6.33 a	7.33 a	7.00 a.m	6.89 bc
Average	8.25 a	8.33 a	7.75a	KK = 12.03%

From Table 1 it can be seen that the administration of natural ZPT extract of mung bean sprouts with soaking time 3 hours (Z_3) showed the highest percentage of live cuttings, namely 96.30% , not significantly different from the $Z_{2\ treatment}$ (2 hours), Z_1 (1 hour) and Z_0 (control) .

Age of emergence of shoots (days)

Observational data and analysis of variance on the age of emergence of lemon cuttings can be seen in appendices 7 and 9.

Based on the results of the analysis of variance, it can be seen that the administration of natural ZPT extract of mung bean sprouts showed very real effect on the age of emergence of lemon cuttings shoots. The treatment of the growing media showed no significant effect on the age of emergence of lemon cuttings. The interaction of response to giving natural PGR extract of green bean sprouts and planting media showed no significant effect on the observed parameters of the age of emergence of shoots of cuttings of lemon citrus plants.

The results of the different test on the average response to giving natural ZPT extract of green bean sprouts and planting media on the age of emergence of shoots of cuttings of lemon citrus plants can be seen in table 2 below this:

Table 2 . Test Results of Average Differences in Response to Natural ZPT Extract Mung Bean Sprouts and Planting Media Against the Age of Shoots Emerging of Lemon Citrus Plant Cuttings .

From Table 2 it can be seen that the administration of natural ZPT extract of green bean sprouts with immersion time of 3 hours (Z_3) shows age of emergence of shoots the fastest is 6.89 days , showed significantly different results as well as treatment Z_2 (2 hours), Z_1 (1 hour) and Z_0 (control), each treatment showed significantly different results.

The response of giving natural ZPT extract of green bean sprouts to the age of emergence of shoots of lemon cuttings can be seen in the curve below.

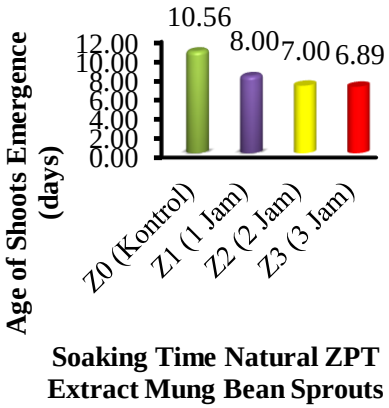

Figure 1. Graph of the Response of Natural ZPT Extract of Mung Bean Sprouts to the Age of Emerging Shoots of Lemon Citrus Plant Cuttings.

From the graphic above, it can be seen that the natural ZPT treatment of mung bean sprout extract with a soaking time of 3 hours (Z_3) resulted in the fastest emergence of shoots, which was 6.89 days, followed by a treatment with a soaking time of 2 hours (Z_2), which was 7 .00 days after that the long soaking treatment was 1 hour (Z_1) which was 8.00 days and without immersion or control (Z_0) which was 10.56 days being the treatment of the longest shoot emergence age. This shows that the natural ZPT treatment of mung bean sprout extract has a significant effect on the age of emergence of cuttings of lemon citrus plants.

Shoot height (cm)

Observational data and analysis of variance of shoot height of lemon cuttings aged 6, 7, 8 and 9 WAP can be seen in appendices 10, 13, 16, 19 and 12, 15, 18, 21.

Based on the results of the analysis of variance, it can be seen that the administration of natural PGR extract of green bean sprouts showed no significant effect on the height of the shoot height of the lemon plant cuttings at all observed ages. In the treatment of planting media, it showed no significant effect on the height of the shoots of cuttings of lemons at 6 WAP, but showed a very significant effect at 7 MST of age, while at the ages of 8 and 9 MST it showed a significant effect on the height of shoots of cuttings of lemons. . The interaction of natural ZPT extract of green bean sprouts and planting media showed no significant effect at all ages of observation.

The results of the different test on the average response to giving natural ZPT extract of green bean sprouts and various planting media on shoot height (cm) of lemon cuttings at 9 WAP can be seen in table 3 below:

Table 3 . Test Results of the Average Response of Natural ZPT Extract of Mung Bean Sprouts and Various Planting Media to Shoot Height (cm) of Lemon Citrus Plant Cuttings at 9 WAP .

Z/M	M_0	M_1	M_2	Average
Z_0	6,57 a	8,28 a	7.15 a	7.33 a
Z_1	9.45a	7,60 a	7.42 a	8,16 a
Z_2	6,20 a	8.43 a	6.80 a	7,14 a
Z_3	5.85 a	8.55a	6.52 a	6.97 a
Average	7.02a	8,22 a	6.97 ab	KK = 17.00%

From Table 3 it can be seen that the administration of natural ZPT extract of mung bean sprouts with a soaking time of 1 hour (Z_1) produced The highest shoot height was 8.16 cm , not significantly different from Z_3 (3 hours), Z_2 (2 hours) and Z_0 (control).

In the treatment of various planting media M_1 (cocopeat+topsoil 50:50) produced the highest shoot height, namely 8.22 cm, showed results that were not significantly different from the treatment of $M_{0\ \text{planting media}}$ (moss+topsoil 20:80), but significantly different treatments planting medium M_2 (charcoal husk + topsoil 50:50). The interaction of natural PGR extract of green bean sprouts and planting media showed no significant effect on all ages of observation .

The effect of the treatment of various growing media on shoot height (cm) of lemon cuttings at 9 WAP can be seen in the graph of Figure 2 below.

CONCLUSION

The response to giving natural ZPT extract of mung bean sprouts with soaking time of 3 hours (Z_3) resulted in a growing percentage of 96.30%, the age of shoots appearing was 6.89 days, the highest shoot height was obtained in the treatment with 1 hour long immersion (Z_1) which was 8.16 cm, then the best number of leaves and root length in the 2 hour long soaking treatment (Z_2) were 27.00 strands and root length 13.57cm.

The treatment of growing media M_0 (moss+topsoil 20:80) produced the highest percentage of live cuttings, namely 98.61%, then the treatment of planting media M_2 (charcoal husk+topsoil 50:50) showed age of emergence of shoots the fastest growth was 7.75 days, while the $M_{1\ \text{planting medium treatment}}$ (cocopeat+topsoil 50:50) produced the highest shoot height of 8.22 cm and the highest number of leaves, namely 29.17 strands, and the longest root length was obtained in the M planting medium treatment $_0$ (moss+topsoil 20:80) gives the longest root length that is 13.65 cm.

The interaction of response to natural ZPT administration of mung bean sprout extract and planting media on lemon cuttings showed no significant effect on all observed parameters.

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