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# Application Of Plus Liquid Organic Fertilizer And Leves Truncation Technique On Onion Growth And Yields

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## Abstract

This study aims to examine the growth and yields of onion resulted by combination of plus organic liquid fertilizer application andleaves truncation technique.Factorial randomized group designwith two factors was used.Factor I istwo levels truncation treatment (P) while factor II is concentration is four levels liquid organic fertilizer (O). Treatment was repeated three times with two (2) samples of plants. Observationincluded plant length, number of tillers, number and weight of tubers. The average top results in treatment group of liquid organic fertilizer was obtained by concentrations of 6 ml ($O_3$), the length of the plant at the age of 56 DAPwas 60.67 cm, number of leaves at the age of 56 DAPwere 82.50 strands, the number of tubers at the end of the observation was 14.42 and tubers weight at the end observation was 229.08 grams. The lowest result in $O_0$ and truncation treatment provides the highest result compared with plant of non-truncation technique withplant length was 59.83 cm (age of 56 DAP), number of leaves was 83.33 strands (age 56 DAP), the number of tubers was 13.67 (end of observations) and the highest tubers weight was of 229.08 grams (end of observation).

**Keywords:** Onion, Organic Fertilizer, truncation

## INTRDUCTION

Onion *(Allium ascalonicum)* is a multi-use herb plants commonly used as a seasoning ingredient in kitchen and a seasonal horticultural cropwith high economic value. At a certain timethe production is high the price decrease. The condition is worsened by import policy applied by the government exacerbating the fall in onion market prices (Anonymous, 2015).Onion consumption needs to be balanced with quantity of onion production. Onionagribusiness makes big profits if managed optimally. The age of the plant is relatively short by 65-70 days with production rate 15 tons/ha with price rate in farmer is Rp 5000, the result is 75 million / ha/ season. Unfortunately national average production ranges from 6-8 tons (Directorate of Horticulture, 2005, in SofyanSamad, 2014). In 2007-2008 onion production reached 427.4 tons in 2008-2009 and onion production increased to 2.9 million tones (Department of Agriculture, 2009, in SofyanSamad, 2014).

Onion can be planted by generative propagationwith seedorvegetativepropagation by using seeds, tiller or tubers. Bulbs are layered leaf midrib. Leaves grow at the top of tuber, while disc tuber and root fibers are found in lower part of the plant. Bulbs breeding begin with the growth of axillary buds cloves on the outermost. At the beginning of its growth, cloves take food from its main. When cloves have grown leaves and root, cloves can make food by photosynthesis (Anonymous, 2012 [c).]

Vegetative propagation is easier and faster than generativetechnique. Vegetative phase on plant growth and development is associated with three important processes of cell division, cell elongation and cell differentiation. Cell division occurs in the process of making new cells contained in meristematic tissue, precisely at the point of stem growth, root tip and cambium. (WibowoSinggih, 1991, *in* Anonymous. 2012 [d)]

Wibowo (2005 *in* Jumini, et al., **2010),** argues that cutting of seed tuber tip edge with clean knife by approximately 1/3 or ¼ part of the bulb length can cause even growth, stimulate bud, accelerateplants growth, stimulate side tuber growth and encourage tillers formation. EndroPurnomo (2015) supported the statement by stating that cutting tubers by ¼ parts has proven best effect on plant height, number of tillers, number of leaves, number of bulbs, tubers wet weight and tubers dry weight.

Onion productivity should be improved in order to meet domestic demand and export. Some steps are necessary to be performed in improving onion productivity from technical

improvements to the cultivation of onion postharvest treatment.

One of the most important things to note in onion cultivation technique improvement is the availability of sufficient price as ingredient to grow and develop that affects the quality and quantity of onion crop (Wahyunindyawatiet al., 2012).

In order to meet the increasing needs of onion, technological breakthroughs are necessaryto improve the cultivation of onion production through organic technology approach. Organic farming is able to increase productivity of onion. Therefore, one alternative to improve the productivity of onion is by using liquid organic fertilizer (Anonymous, 2012a).

In addition to the use of liquid organic fertilizer, other alternative other to improve onion productivity is by improving farming techniques, one of which is cutting the edge of onion tuber. With this technique, tuber can growevenly, stimulate shoots growth, accelerate plant growth, stimulate side tubers growth and encourage formation of tillers (Wibowo, 200 5). To increase onion productivity as we expect, plus liquid organic fertilizer application and truncation. DI Grow is a liquid organic fertilizer made from seaweed- the best formula from the USA. It contains a complete nutrient including macro nutrients (N, P, K, Ca, Mg, S) and micro nutrients (Fe, Zn, Cu , Mo, Mn, B, Cl), substances stimulating growth (auxin, cytokinin, and giberellin), humic acids and fulfic which can improve growth, development, and production of plants optimally.

D.I.Grow is good for plants; Flowers, ornamental plants, fruits, vegetables, grasses, rice, oil palm, cocoa, tobacco and others.

Benefits of Using DIGroware listed as follows:

1. Stimulate growth of stems, buds and tillers.
2. Increase nutrients absorption from soil by the roots.
3. Prevent premature loss of leaves, flowers and fruit.
4. Increase the number and size of leaves, flowers and fruit.
5. Improve the quality of flower color and fruit flavor.
6. Extend plant productive.
7. Speed up the harvest.
8. Improve yields.
9. Extend crops storage period (flowers or fruit is not quickly wither / rotten).
10. Increase resistance to pests/diseases.

Other functions of DI Grow are:

1. Complementary Fertilizer
   While DI Grow contains complete macro and micro nutrients, the composition is lowparticularly the nutrient. Therefore, it requires a basic fertilizer provided through soil withthe dose is reduced to 30 %.
1. Growth stimulants substances,
   Accelerate vegetative growth, stimulate flowering/fruiting and prevent flowers and fruits from prone to fall (ZPT content: auxin, cytokinin and Giberellin).
3. Soil Conditioner

   it improves physical properties of soil to become crumble gradually (organic acid content).

In principle, the entry of nutrients into the body ofplant can occur through roots, stems, and leaves. D.I GROW fertilizer technology is prioritized on application through spray to leaves as it is more effective and efficient. Except for plant with problem, spray applicationcannot be applied to leaves as the plant is too high. In this case, application can be carried out through injection system (injecting into trunk through drilling), through spray to the stem or flush to the ground (root zone).

The frequency of application D.I GROW is optimally carried out according plants critical condition, the average critical condition of plants are divided in three phases:

1. Young plants phase (vegetative phase)
2. Primordialphase (generative phase)
3. fruit/tubers enlargement phase

DI Grow application on generative phase will make plants grow well withbigger size of the crop compared to normal size. Plant growth is possible to be relatively fast and above normal fruit size after DI Grow application. DI Grow is balanced with by stimulants Substances (auxin, cytokinin, and Giberellin) that worksimultaneously. Auxinsupports plant meristems cells, make elastic wall, cytokinins stimulate new cell growth through accelerated cells division. Giberellin hormonestimulates the enlargement of plant differentiationthat plant growth bigger and rapidly. Visually, plant will show accelerated flowering period.

In general, the best application or 30 days plant (for crops) a dose of 4-5 cc / liter of water. Application for annual crops depends on the type of plant. Applications of DI Grow on Fruit / Bulbs enlargement phase where the plants start forming carbohydrate storage places can on fruit, root or stem tubers. Applications on primordial phase of flower have help shape storage area network. The size of fruit and tuber is prepared by differentiation multiplication activity and enlargement of plants cells that will serve as carbohydrates storage container.

Production phase will alsofollow the pattern of plant growth. Initial phase of production shows greater growth. In the one third age of the fruit/tubers, fruit / tubers growth is relatively quick, which means that the rate of carbohydrates gradually speeds up and carbohydrate storage speed averagely reaches maximum level ontwo thirds of their age. After this phase storaging ability is lowered and stops at ripening of fruit / tubers phase. In this phase, using Red DI Grow with a dose of 4-5 cc / liter of water is best applied. Applications on this phase will provide relatively good results and can accelerate fruit ripening.

To obtain optimal results, the following things are necessary to consider in the use of D.I GROW fertilizer:

1. Must be mixed with water
2. Sprayed onto the entire plant or sprayed on soil around the roots
3. Applied in the morning (06:00 -09:00) or afternoon (after 16:00)
4. Not to be used during the heat of the sun / daylight
5. Not to be used before the rain
6. Must be used at once, the remaining is better poured into the soil around the roots.
7. In case of pest / disease, it can be mixed with pesticides.
8. For tall plants (unreachable leaves) the application should be into the soil around the root radius or by injection techniques (injection into trunk), this must be consulted with expert (PPL) (Anonymous, 2012 [c).]

## RESEARCH METHODS

This research was conducted at experimental garden of the Faculty of Agriculture. Materials and tools used included onion, garden soil, fertilizers, polybag, DI Grow liquid organic fertilizer, hoe, pen, paper measuring tool, cutter, analytical scales, and bucket of water.

This study uses factorial randomized group design with 2 factors. The first factor is truncation (P) with two levels and the second factor is the concentration of liquid organic fertilizer (O) with four levels, "each treatment was repeated three times with two (2) samples of plants.

Factor I: Truncation (P), including:
$P_{0:}$ Without truncation
$P_{1:}$ 1/3 part of truncation
Factor II: The concentration of liquid organic fertilizer (O), including:
$O_{0:}$ 0 ml (Without liquid organic fertilizer) $O_{2:}$ 4 ml
$O_{1:}$ 2 ml
$O_{3:}$ 6 ml
8 (eight) combinations of treatments are gained as follows:
$P_0 O_{0;}$ $P_0 O_{1;}$ $P_0 O_{2;}$ $P_0 O_{3;}$ $P_1 O_{0;}$ $P_1 O_{1;}$ $P_1 O_{2;}$ $P_1 O_3$

Measurement of Observations Variables consists of:
1. The length of Plant (cm)
Measuring the length of the plant is carried out from ground level to the longest leaf in a way that leaves with upwards position and measured by using a ruler/meter performed at 14 days after planting with intervals of 2 weeks by14, 28, 42 and 56 DAP

2. The number of tillers
In counting the number of tillers, the whole tillers are counted and performed at the end of observation, ie75 days after planting by taking all the plants.
3. Tubers Weight
Weighing tubers is performed by weighing all tubers and tillersby the end of observation or 75 days after planting

4. The number of tubers per plant
Counting tubers is carried out by calculating all tubers on the main stem at the end of observation or 75 days after planting

Onion crop is harvested at age of 70 days after planting. Harvesting is performed carefully by pulling plants carefully in bright weather.

## RESULTS AND DISCUSSION

### Length of Plants

Variance analysis result on plant length measurement based on interaction between truncation and liquid organic fertilizer at all ages of observation indicates that there is no significant difference between the two treatments. Separately,truncation treatment and liquid organic fertilizer to the length of the plant at all ages of observations indicate real difference.

The average of plant length on truncation treatment and liquid organic fertilizer is exhibited in Table 1.

Table 1. Average of Plant Length by Truncation Treatment and Liquid Organic Fertilizer in Different Ages of Observations

| Treatment | Plant length (cm) | | | |
|---|---|---|---|---|
| | 14 DAP | 28 DAP | 42 DAP | 56 DAP |
| O0 | 10.83 a | 18:17 a | 31.83 a | 52.42 a |
| O1 | 11.67 b | 22:08 b | 34.83 b | 53.25 ab |
| O2 | 12:25 b | 23:50 b | 37.92 c | 57.58 b |
| O3 | 12:58 b | 24.00 b | 38.75 cd | 60.67 b |
| BNT 5% | 0.62 | 2:32 | 2:55 | 4:46 |
| P0 | 11:00 a | 18.71 a | 33.08 a | 52.13 a |
| P1 | 12.67 b | 25.17 b | 38.58 b | 59.83 b |
| BNT 5% | 0:44 | 1.64 | 1.80 | 1:39 |

Description: The figures accompanied by different letters in the same column indicate significant difference on BNT 5%
DAP: Days After Planting

### Number of leaves

Results of variance analysis evidence that interaction between truncation and liquid organic fertilizerson leaves number at all ages observationsindicate that there is no significant difference. Separately, truncation treatment and liquid organic fertilizer to total leaves at all ages of observations indicate real difference.

The average number of leaves on truncation treatment and liquid organic fertilizer is indicated in Table 2.

Table 2. Average Number of Leaves by Truncation treatment and Liquid Organic Fertilizer in Different Ages of Observations

| Treatment | Plant length (cm) | | | |
|---|---|---|---|---|
| | 14 DAP | 28 DAP | 42 DAP | 56 DAP |
| O0 | 7:50 a | 21:23 a | 51.50 a | 66.83 a |
| O1 | 7.67 a | 24.23 b | 56.50 a | 73.67 b |
| O2 | 8:17 b | 25.23 b | 59.33 a | 79.33 b |
| O3 | 8.83 b | 27.23 c | 72.17 b | 82.50 bc |
| BNT 5% | 0.84 | 1:23 | 8:14 | 6.71 |
| P0 | 7:04 a | 22:42 a | 49.17 a | 67.83 a |
| P1 | 9:04 b | 26.83 b | 70.58 b | 83.33 b |
| BNT 5% | 0.60 | 1:30 | 5.76 | 4.74 |

Description: The figures accompanied by different letters in the same column indicate significant difference on BTN of 5%
DAP: Days After Planting

Table 2 ontruncation treatment at various ages of observations indicate that the highest number of leaves is achieved by treatment of $P_{1,}$ ie 9:04 strands (age of 14 DAP), 26.83 strands (age of 28 DAP), 70.58 strands (age of 42 DAP) and 83.33 strands at the age 56 DAP. The lowest number of leaves is obtained at $P_{0.}$treatment. The highest number of leaves obtained in liquid organic fertilizer treatment was achieved by treatment of $O_3$ by 8.83 strands (age 14 of DAP), 27.23 strands (age of 28 DAP), 72.17 strands (age of 42 DAP) and 82.50 strands at the age of 56 DAP observations. The lowest result is obtained in $O_0$ treatment at all ages of observations.

### Number of Tubers and Tubers Weight

Results of variance analysis indicate that interaction between truncation and liquid organic fertilizers on tuber number and weight indicate that there is no significant difference by the two treatment. Separately, truncation treatment and liquid organic fertilizer on

the number and weight of tuber showed highly significant difference(Appendix 3).

The average number of tuber and tuber weight on truncation and liquid organic fertilizer is indicated on Table 3 that treatment cut 3. The highest weight was achieved by treatment of $P_{1,}$ by 13.67 (the number of tubers) and 229.08 grams (weights). The lowest weight is obtained at $P_{0.}$ The highest number of tubers and tubers weight by liquid organic fertilizer treatment was achieved by $O_{3,}$ treatment by 14:42 (the number of tubers) and 228.37 grams (weights). The lowest result is obtained at $O_0$ both on the number or weights of tubers.

Table 3. Average Number of Tubers and Tubers Weight with truncation and Organic Liquid Fertilizer at Final Observations

| Treatment | Observation | |
|---|---|---|
| | number of Bulbs | Tuber weight (grams) |
| O0 | 10:58 a | 170.35 a |
| O1 | 12:25 b | 187.02 b |
| O2 | 12.75 b | 214.37 c |
| O² | 14:42 c | 228.37 d |
| BNT 5% | 1:13 | 1:58 |
| P0 | 11:33 a | 170.98 a |
| P1 | 13.67 b | 229.08 b |
| BNT 5% | 0.79 | 1:11 |

Description: The figures accompanied by different letters in the same column indicate significant difference on BNT 5% DAP: Days After Planting

**Discussion**

Results of statistical analysis of a whole combination of truncation treatment and liquid organic fertilizer on onion growth and yield do not indicate real interaction. Separately, liquid organic fertilizer on onion growth and yield is significantly different from all parameters of all ages of observations.

Truncation provides better output on plant length, leaf number, tuber number and tuber weight compared to plants that did not receive the treatment. The results obtained was 59.83 cm (age of 56 DAP), number of leaves was 83.33 strands (age of 56 DAP), number of tubers was 13.67 fruit (end of treatment) and the highest weight of tuber is229.08 grams (end of treatment). Bulbs are layered leaf midrib and grow from axillary buds, truncation in onion bulbs can stimulate the growth of budscauseeven growth of buds.

Wibowo (2005 *in* Jumini, et al., **2010),** argues that cutting of seed tuber tip edge with clean knife by approximately 1/3 or ¼ part of the bulb length can cause even growth, stimulate bud, accelerate plants growth, stimulate side tuber growth and encourage tillers formation. EndroPurnomo (2015) supported the statement by stating that cutting tubers by ¼ parts has proven best effect on plant height, number of tillers, number of leaves, number of bulbs, tubers wet weight and tubers dry weight.

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Vegetative propagation is easier and faster than generative technique. Vegetative phase on plant growth and development is associated with three important processes of cell division, cell elongation and cell differentiation. Cell division occurs in the process of making new cells contained in meristematic tissue, precisely at the point of stem growth, root tip and cambium. (WibowoSinggih, 1991, *in* Anonymous. 2012 [d)]

Treatment of liquid organic fertilizer with a concentration of 6 ml ($O_{3)}$ gives the best results on the growth of plant length, leaf number, tuber number and weight in comparison with other treatments. Length of plant at the age of 56 DAPis 60.67 cm, number of leaves at the age of 56 DAPis 82.50 strands, the number of tubers at the end of the observation is 14:42 and at the end of observation was 229.08 grams. This is because liquid organic fertilizer contains elements needed by onion, thus both vegetative and generative can be performed well with good yields. In accordance with Anonymous (2012 [d),] stated thatDI Grow is a liquid organic fertilizer made from seaweed- the best formula from the USA. It contains a complete nutrient including macro nutrients (N, P, K, Ca, Mg, S) and micro nutrients (Fe, Zn, Cu , Mo, Mn, B, Cl), substances stimulating growth (auxin, cytokinin, and giberellin), humic acids and fulfic which can improve growth, development, and production of plants optimally.. Harjadi, S (1991), stated that

the plant extension and enlargement occurs due to the formation of new cells. This process requires sufficient nutrients and water. The presence of certain hormones during the growing period will increase cell wall that celss will open as the increasing plants cell metabolism process.

The use of liquid organic fertilizer will stimulate plant cells, auxinhormone and N nutrients contained in it is absorbed and react early. Auxin and N react to increased permeability of cell walls. These conditions allow the applied fertilizer solution to be absorbed as much as possible. Other nutrients such as g, Fe, Cu absorbed by the leaves will accelerate and increase the formation of chlorophyll. Increasing the amount of chlorophyll relatively fast as units of production plants can enhance the ability of the formation fotosintat quickly. Furthermore, carbohydrates along auxinhormone is rapidly translocated some parts of leaves. Cytokinins andgiberalin simultaneously work to spur the growth of shoots, both of which will form the leaf buds and flower buds.

According Harjadi, S. (1991), leaves are the main fotosintat manufacturer during the process of photosynthesis, fotosintat have an important role in the formation and growth of plant biomass.

## CONCLUSION

From the results of research on the application of liquid organic fertilizer plus with truncation, the following points summed up the research:

1. The combination of liquid organic fertilizer application and truncation does not indicate significant effect on all parameters of plant length, leaf number and tuber number and weight. Separately, liquid organic fertilizer application and truncationperformed very significant effect on the parameters of the plant length, leaf number and tuber number and weight.
2. On average highest results in liquid organic fertilizer treatment is on concentrations of 6 ml ($O_{3)}$,. The concentration produced 60.67 cm length after 56 DAP, 82.50 strands of leaves in 56 DAT, tuber numbers is 14:42 while fruit weight is 229.08 grams by the end of observation. The lowest result is in treatment $O_{0.}$
3. Truncated techniqueprovides the average highest yields compared to plant without such treatment with length of plants was 59.83 cm (age of 56 DAP), number of leaves was 83.33 strands (age of 56 DAP), number of tubers by13.67 fruit (end of treatment) and the highest weights of 229.08 grams (end of observation).

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