# Growth Response and Production of Onion by Applying Organic Fertilizer from Industrial Waste and Animal Waste

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## ABSTRACT

Organic fertilizer is one of the factors that can affect the growth and yield of onion. This research aimed to evaluate the response of growth and yield of onion lowland through organic fertilizers from industrial waste and livestock waste. The experiment was conducted in June to September 2014 at greenhouses Institute for Agricultural Technology Bengkulu. Experiments using a randomized block design with a single factor, it was use of organic fertilizers of various kinds of agricultural waste that is solid (P1), composted of cow manure (P2), quail manure (P3) and control (P0) which is repeated five times. Data were analyzed by analysis of variance and tested further by DMRT to determine differences between treatments. The results showed that the organic fertilizer significantly affected the growth and yield of onion. Of a given type of organic fertilizer, cow manure compost produced the highest yield (44.63 cm) in height parameter plant age 45 days after planting, weight of wet biomass (124.03 g), gross dry weight (79.54 g) and number cloves per clump (24.27 cloves) while the net dry weight was not significantly different, but the provision of manure cow compost generates the highest net dry weight (72.08 g).

**Keywords**: *Allium ascalonicum* L., industrial waste, livestock waste, growth and yield

## INTRODUCTION

Red onion (*Allium ascalonicum* L.) is one of the national commodities, and production continues to be developed each year. Red onions can be developed on dry land both lowland and upland. The development prospects of onion is good enough because needed a lot of people as a culinary spice and medicinal trasional. Increased demand for red onion along with population growth and purchasing power. So, these needs can always be met then it must be balanced with the amount of production (Putra, 2010).

Onion production in the Bengkulu Province in 2013 reached 699 tonnes with a productivity of 6.02 t / ha, lower than the average national productivity, which reached 10.22 t / ha (CBS, 2015). One of the factors that led to the low productivity of onion in Bengkulu province is farming systems is not maximized and excessive use of inorganic fertilizers so that over time will have an impact on soil fertility resulting in declining soil productivity. According Hervani *et al.* (2009) that the low onion production caused by using inferior seed, planting medium is less good, and pest / disease inadequate. Growing Media plays an important role in increasing the production of a plant. In addition to the land can be used alternative media such as rice husk, ash, compost or a mixture of several media. This alternative media very well in maintaining the friability, drainage and soil aeration and nutrient for plants also contributed to the growth of the onion bulbs can develop well.

Fertilization is an effort to increase the production of red onion. In general, farmers cultivate onion crops with chemical fertilizers (inorganic) continuously with increasing dose. Inorganic fertilizer application that continuously without accompanied by the provision of organic fertilizer is unwise, especially in the business of sustainable agriculture. According to Elisabeth *et al.* (2013) that the provision of continuous inorganic fertilizers can lead to decreased land productivity, one way to overcome the further impact that would arise from the use of inorganic fertilizers is through the provision of organic matter. Therefore the role of organic material that serves as a counterweight that can absorb some substance so that compounds that do not damage the plant excessively.

Organic materials often found in the environment, such as solid waste large livestock (cow dung compost) and poultry waste (manure dung of quail). Solid is one of the solid waste from the processing

of crude palm oil. In Sumatra, known as sludge waste oil, but usually separated with the liquid so that the solid waste (Ngaji and Widjaja, 2004). Research results Nasution *et al.* (2014) showed that the use of a solid as a mixture of growing media gives the best results on the amount of chlorophyll, root dry weight, shoot dry weight and root volume in oil palm seedlings. Thus the concept of utilization of waste as a planting medium can be applied.

Based on the problems mentioned above, there should be research on the growth and yield response of onion using organic fertilizers from industrial waste (solid) and large livestock waste (compost manure) and poultry waste (manure dung of quail).

## MATERIALS AND METHODS

The research was conducted from June to September 2014 in the greenhouse of Bengkulu Assessment Institute for Agricultural Technology. Experiments using a randomized block design (RBD) non factorial with organic fertilizer treatment of some kinds of agricultural waste consisting of 4 levels and is repeated five times. Treatment, control (P0), solid (P1), composted cow manure (P2), manure of quail (P3). From the combination of these treatments was obtained 20 experimental units, each unit consisting of 6 plants trial or 6 polybags. Bringing the total of 120 plants.

Planting medium used in this study is a mixture of soil, organic fertilizers and chaff with a volume ratio of 2: 2: 1. Land used for soil ultisol is taken around Assessment Institute for Agricultural Technology (AIAT) Bengkulu. Media preparation is done by mixing the three ingredients of the media separately on each of organic fertilizer, and stir evenly using a hoe and dried. Media mix dried then weighed weighing 5.5 kg, then put into a polybag size 40x30 cm a total of 120 pieces.

Before planting the first material in the form of dolomite ameliorant with doses as much as 5.6 g / polybag given 2 weeks before planting and basic fertilizers such as TSP fertilizer with a dose of 0.6 g / polybag given 3 days before planting by broadcasting and stirred uneven ground. After the media is prepared, then executed planting.

Seeds used are Katumi onion varieties with tuber size medium (5-10 g). Before planting the first seeds of cut (cutting at the end of the onion bulb) using a sharp knife to break dormancy and accelerate the growth of shoots. With a hole punch tool soil, the planting hole is made as deep as the average height of tubers. Onion bulbs put in the hole with movements such as turning the screw, so that the tip of the bulbs appear flush with the soil surface.

The first supplementary fertilization in the form of urea and KCl were given at 15 days after planting (DAP) with each dose of Urea 0.3 g / polybag and KCl 0.3 g / polybag. The second supplementary fertilizer at the age of 30 DAP at the same dose on the first supplementary fertilizer. The parameters observed were plant height, number of leaves, number of tillers per hill, wet weight, dry weight is dirty, clean dry weight and number of cloves per clump.

Data were analyzed by analysis of variance (ANOVA) using SPSS Statistics 20 and tested further with different test average Duncan Multiple Range Test (DMRT) at 5% level, when the F test showed significant effect (Steel and Torrie, 1995).

## RESULTS AND DISCUSSION

Results of analysis of variance carried out showed that the organic fertilizer treatment significantly affected the growth variables plant height and number of leaves (Table 1 and Table 2). While the results of variance were conducted on the number of tillers per hill there is no real difference between the fertilizer tested (Table 3).

Organic fertilizer significantly affected the variables plant height at age 15 DAP and 45 DAP. While organic fertilizer compost manure gives a significant influence on the growth variables plant height at 45 (DAP) is as high as 44.63 cm. Followed by treatment of organic fertilizer as high as 42.12 cm of quail dung and solid high as 40.94 cm (Table 1). This is consistent with result of the research Mayun (2007) which concluded that cow manure fertilizer significant effect on plant growth onion.

Table 1. Average plant height (cm) to the treatment of organic fertilizer at the age of 15 and 45 days after planting (DAP).

| Treatment of Organic Fertilizer | Plant Height (cm) | |
|---|---|---|
| | 15 DAP | 45 DAP |
| **Control (P0)** | 21.58 [a] | 33.83 [a] |
| **Solid (P1)** | 24.96 [b] | 40.94 [b] |
| **Cow Manure Compost (P2)** | 26.85 [b] | 44.63 [c] |
| **Manure Manure Quail (P3)** | 25.80 [b] | 42.12 [bc] |

Description: The numbers in the same column followed by the same letter show no significant difference at 5% level DMRT.

Organic fertilizer is also significant when compared with no organic fertilizer to the number of leaves on the plant age 15 DAP and 45 DAP. However, when compared with an organic fertilizer treatment was not significant (Table 2).

Table 2. Average number of leaves (pieces) with organic fertilizer treatment at 15 and 45 days after planting

| Treatment of Organic Fertilizer | Number of leaves (pieces) | |
|---|---|---|
| | 15 DAP | 45 DAP |
| **Control (P0)** | 17.63 [a] | 28.10 [a] |
| **Solid (P1)** | 21.80 [ab] | 37.93 [b] |
| **Cow Manure Compost (P2)** | 23.13 [b] | 39.27 [b] |
| **Manure Manure Quail (P3)** | 23.73 [b] | 38.88 [b] |

Description: The numbers in the same column followed by the same letter show no significant difference at 5% level DMRT.

Table 3. Mean maximum number of tillers (stems) with the treatment of organic fertilizer.

| Treatment of Organic Fertilizer | maximum number of tillers (stems) |
|---|---|
| **Control (P0)** | 6.53 |
| **Solid (P1)** | 7.78 |
| **Cow Manure Compost (P2)** | 8.33 |
| **Manure Manure Quail (P3)** | 8.26 |

Description: The numbers in the same column followed by the same letter show no significant difference at 5% level DMRT.

Table 4. Average keragaan the onion with the treatment of organic fertilizer.

| Treatment of Organic Fertilizer | Wet weight (g) | Gross Dry Weight (g) | Net Dry Weight (g) | Amount per Clump Cloves |
|---|---|---|---|---|
| **Control (P0)** | 56.59 [a] | 37.93 [a] | 34.23 [a] | 9.99 [a] |
| **Solid (P1)** | 88.30 [b] | 64.32 [b] | 58.80 [b] | 16.63 [b] |
| **Cow Manure Compost (P2)** | 124.03 [c] | 79.54 [c] | 72.08 [b] | 24.27 [c] |
| **Manure Manure Quail (P3)** | 102.88 [b] | 69.39 [bc] | 61.55 [b] | 18.89 [b] |

Description: The numbers in the same column followed by the same letter show no significant difference at 5% level DMRT.

Organic fertilizer significantly affected the variables wet weight, gross dry weight, net dry weight and number of cloves per clump when compared to without the use of organic fertilizers. Meanwhile, when compared between treatments fertilizer, cow manure compost significantly affect variables wet weight, dry weight gross and number of cloves per clump when compared with the treatment composting of quail and solid dung with a value of 124.03 g, 79.54 g and 24 , 27 cloves. While not significantly different with clean dry weight (Table 4).

Organic fertilizer is able to degrade soil bulk density that causes the lighter soil thus providing good conditions for the development of the roots and influence the growth and yield. Agus et. al. (2006) stated that the weight of the volume of soil is one of the physical properties of soil that is most often defined as a close relation with the ease of root penetration in the soil, drainage and soil aeration. Further stated that the soil with a high organic matter content has a relatively low volume weight. This is consistent with the results of research Lihiang (2009) which states that organic fertilizers can improve soil fertility so it is very beneficial for the growth of onion shallow root system.

Composting is the addition of a number of nutrients into the soil as plant nutrition. According to Gardner et. al. (1991), the addition of nutrients and minerals that are causing a lot of mobilization and tranport from the vegetative to the development of the fruit, seeds and bulbs. The use of organic fertilizers are quite the elements of macro and micro met so that the plant cells for the formation of fruit and onion bulbs more perfect. In addition the use of organic materials that make the soil more friable, soil structure is more compact, saving a lot of water and not easily eroded by surface runoff during rain (Isnaini, 2006).

Fertilizer demand is influenced by factors other than land is also influenced by climatic factors. Factors temperature and solar radiation, for example, will affect the rate of photosynthesis. If the photosynthetic activity is enhanced by sun radiation and temperature, then the activity will increase the translocation of nutrients so that the plant will absorb more nutrients. The air temperature can also affect the size and quality of the fruits and tubers (Jumin, 2008). The third treatment of organic fertilizer can accelerate the process of enlargement of onion bulbs and the resulting higher weight.

## CONCLUSION

The results showed that the organic fertilizer significantly affected the growth and yield of onion. Of a given type of organic fertilizer, cow manure compost produced the highest yield (44.63 cm) in height parameter plant age 45 days after planting, weight of wet biomass (124.03 g), gross dry weight (79.54 g) and number cloves per clump (24.27 cloves) while the net dry weight was not significantly different, but the provision of manure cow compost generates the highest net dry weight (72.08 g).

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