The Effect of the Medium and the Variety on the Yield of Shallots (*Allium ascalonicum* L.) Grown in a Polybag

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ABSTRACT

Shallot is an important spice and seasoning in Indonesia. It is consumed almost daily in many dishes. The objective of this experiment was to study the effect of the medium and the variety on the yield of shallots grown in a polybag. The experiments were arranged in a two-factorial randomized complete block design with three replications. The factors were medium (1 soil: 1 paddy husk ash and 1 soil: 1 compost) and variety (Agrihorti 1 and Menten). Data were statistically analyzed by Analysis of Variance (ANOVA), and the means were compared using Honestly Significant Difference (HSD) at $P < 0.05$. There was no interaction between medium and variety. Overall, all treatments did not significantly affect yield. Varieties were significant differences on bulb diameter; however, they were not significant differences on bulb height, fresh bulb weight per polybag, and bulb number per polybag. Those media are considered as precise media due to they contain organic materials.

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1. INTRODUCTION

Shallot (*Allium ascalonicum* L.) is an important spice and seasoning in Indonesia. Alliums are essential vegetables and consumed almost daily in many dishes (Sulistyaningsih, et al., 2002; Yitagesu-Kuma, et al., 2015). This commodity is commonly used as a condiment in Southeast Asian countries, including Indonesia (Ariyanti, et al., 2018). In Africa, especially Ethiopia, this crop is used for traditional dishes (Getahun, 2016). Shallot is a proper food for a healthy diet because it has high concentrations of quercetin, isorhamnetin, and glycosides (Fattorusso, et al., 2002). It has an important ingredient for human health because it exhibits antioxidant (Liang, et al., 2012), anticarcinogenic and anti-inflammatory (Mohammadi-Motlagh, et al., 2011; Moradi, et al., 2013).

Soil mixtures or medium is an important factor for the performance of the plant in a polybag (C. A, et al., 2014). Using polybags to grow plants has some advantages, i.e., farmers can select healthy seedlings and vigorous plants (Adu-Yeboah, et al., 2015). Shallot has sharp price fluctuation (Susanawati, et al., 2015), thus planting this crop in a polybag is a solution for small society. Vegetable cultivation technique in polybags or pots as diversification and efficient land use in nature (Suthamathy & Seran, 2011).

Shallot has sparse root hairs, shallow roots and these roots are not efficient to uptake the nutrients (Priyadharsini, et al., 2012). Therefore, it is necessary to find the appropriate medium to increase shallot yield. Shallot requires a constant of soil moisture (Woldetsadik, 2003). Some experiments to increase the production of shallot use media, which consisted of vermicompost, organic fertilizer, and microorganism, were examined by some researchers (Tambunan, et al., 2014; Anisyah, et al., 2014; Mahdalena, et al., 2016).

Using the appropriate variety is an effort to support the production of crops. This research used two varieties (Agrihorti I and Menten), which collected from Vegetable Crop Institute, Lembang, Indonesia. Agrihorti I able to adapt at the dry season, and Menten is suitable to grow in the lowland. Menten and Agrihort I was released by Vegetable Crop Institute, Indonesian Agency for Agricultural Development (IAARD), in 2011 and 2015.

The objective of this experiment was to study the effect of the medium and the variety on the yield of shallots grown in a polybag.

2. MATERIALS AND METHODS

The research was conducted at the Indonesian Tropical Fruit Research Institute (ITFRI), Solok, West Sumatra,

from March to June 2017. Shallot bulbs were planted in a polybag (30 x 40 cm²), each polybag was planted with one bulb. The experiment was arranged in a two-factorial Randomized Complete Block design with two factors and three replications. The first factor was medium with two levels, soil:paddy husk ash (1:1), and soil:compost (1:1), the second factor was variety, Agrihorti 1 and Mentas. The treatment was a combination of both factors, and every treatment consisted of 15 polybags.

The compost was obtained by mixing cattle manure, sawdust, dolomite (CaMg(CO₃)₂), Mexican sunflower (*Tithonia diversifolia*), paddy husk ash, and Trichoderma. Parameters were bulb diameter, bulb height, fresh bulb weight per polybag, and bulb number per polybag. Data of fresh bulbs were recorded at the end of the study. Plants were irrigated as when necessary during the duration of the experiment.

Data were statistically analyzed using Analysis of Variance (ANOVA), and means were compared using Honestly Significant Difference (HSD) at $P < 0.05$.

3. RESULTS AND DISCUSSIONS

Bulb yield was not statistically different ($P < 0.05$) by the treatments, and there were no interaction between medium and variety (Table 1). These media (M1 and M2) had a similar effect on the yield parameter of shallot. Compost contains 90-95% of organic content as a soil conditioner (Khater, 2015).

The results showed that both media gave a positive effect on yield because the production of shallot in media was 74.94 to 79.20 gram/cluster. These media content organic matter, and in fact, this result was not different to experiment by Purba (2014) that used synthetic fertilizer, it produced 73.28 gram/cluster. The result of this study is similar to Santosa (2015) found that bulbs yield were 70.4-114.3 gram/hill in the soil, which applied to inorganic and organic fertilizer. It can be concluded that organic material can replace synthetic fertilizer.

In this study, the bulb's diameter in different media was 2.40 cm and 2.47 cm. Kemal (2013) stated that bulb diameter was influenced by media, which high N contains and irrigation.

Table 1. Yield Parameters of Shallots in a Polybag

Treatments	Bulb diameter (cm)	Bulb height (cm)	Fresh bulb weight/polybag (g)	Bulb number/polybag
The factor I (Medium)				
M1 = soil : paddy husk ash (1:1)	2.47 a	3.01 a	79.20 a	8.08 a
M2 = soil : compost (1:1)	2.40 a	2.85 a	74.94 a	7.05 a
The Factor II (Variety)				
V1 (Agrihorti 1)	2.61 a	2.53 a	68.56 a	7.9 a
V2 (Mentas)	2.26 b	3.34 a	84.30 a	7.37 a

Means followed by the same letters in the same columns do not differ significantly as determined by HSD test at 0.05 probability level

Generally, this result indicated that the media showed good performance of the shallots yield (Figure 1). A good medium for vegetable crops is soil with a mixture of organic manures. The normally organic materials for media preparation were sawdust, sand or gravel, peat, perlite, vermiculite, cattle manure, and paddy husk ash (Suthamathy & Seran, 2011). In addition to Yoldas, et al., (2011) found that organic manure enhanced shallot yield. Rice husk organic compounds were C (39.8-41.1%), H

(5.7-6.1%), O (0.5-0.6%), and N (37.4%-36.6%) (Korotkova, et al., 2016). Due to rice husk has high Nitrogen content, it could increased shallot yield (Hilman, et al., 2014). Kabir, et al., (2016) added that rice straw was an appropriate organic matter to the crop due to more efficient water conservation. Organic matter affected bulb diameter in shallots (Gadelrab & Elamin, 2013).

Figure 1. The appearance of two varieties in different medium (A. M1V1, B. M2V1, C. M1V2, D. M2V2)

The result revealed that bulb weight on two varieties were 68.56 and 84.30 grams. The other experiment by Shimeles (2014) produced 58 to 60 grams of bulb weight on different varieties of shallot. The average bulb number per polybag on different variety was 7.37 to 7.9. It was an ideal number of the bulb because Woldetsadik (2003) stated that shallot plants produce bulb from 2 to 20 or more pieces. This result was similar to study by Aklilu & Dessalenge (2015), in Ethiopia could produce a minimum 2.1 number of split bulb of shallot and a maximum 5.5 number of them. However, the bulb diameter on every variety, 2.26-2.61 cm, was not the ideal size for the market because the consumer requires bulb, which sizes 3-4 cm in diameter. There were significant differences in bulb diameter; however, there were no significant differences in bulb height, fresh bulb weight per polybag, and bulb number per polybag. Two cultivars, due to the varieties, had the same ability to utilize the nutrients. Tesfa, et al., (2015) informed that the differences of bulb yield between cultivars due to genetic variation and the ability to utilize nutrients.

4. CONCLUSION

Both media showed good performance on shallots yield because they produced high yield (fresh bulb weight per polybag), and these varieties were significant differences on bulb diameter; however they were not significant differences on bulb height, fresh bulb weight per polybag, and bulb number per polybag. Those media are precise media due to they contain organic materials.

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