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The Effectiveness of Plant Growth Regulators on Shallot Cultivation in Polybag

Sugeng Priyanto[1)] and Sumarwoto Ps[1)]

[1)]Agricultural Faculty of Universitas Pembangunan Nasional "Veteran" Yogyakarta, Yogyakarta, Indonesia

e-Mail: sugeng.priyanto@upnyk.ac.id

Abstract.

Shallot plants are currently being cultivated in polybags and placed in residential yards. The purpose of this kind of cultivation is not to get crops to be traded, but merely as a cultivation activity for the use of limited time and space. Shallots itself is including herbs and or medicinal plants which are needed every day even though in small amounts. This is a factorial experiment of shallots that uses a growth regulator called Oligo Chitosan, which is sprayed like leaf fertilizer, carried out on plants periodically in various concentrations of solution. Factor 1 is the frequency of the provision of Oligo Chitosan at the age of plants reaching the age of 15 dap and 45 dap (F1); age 15 dap, 30 dap, 45 dap (F2); age 15 dap, 25 dap, 35 dap, 45 dap (F3). Factor 2 is the various concentrations of Oligo Chitosan solution, which is 1 ‰ (K1); 2 ‰ (K2) and 3 ‰ (K3). Nine treatment combinations are formed, and for control as a comparison are zero treatment combinations. The experiment was carried out using the Complete Randomized Block Design Method with an accuracy level of 95%. To determine the effect of treatment on the growth and yield of shallot bulbs, analysis of variance was performed. From observations of plant height, number of leaves and number of tillers until the plant age of 50 days after planting, it has not shown any significant effect from the treatment applied, but it can be expected that the F2K2 treatment will provide the most tuber yields.

Keywords: Oligo Chitosan Level, Frequency Of Oligo Chitosan Spraying, Cultivation In Polybags

1. Introduction

Shallots are included in the family Liliaceae, genus Allium which has more than 500 species, which are more widely known and needed by the community are types of shallots (*Allium cepa* L. or *Allium ascalonicum* L). Shallot is one type of annual plant in the form of grass, grows upright with a height of about 15-20 cm and shaped like a clump. This horticultural crop is a concern of the community as a superior crop to be fulfilled in the needs of its cultivation technology. According to the Directorate of Horticultural Production Development (2006), shallots are one of the top priorities in the development of national rank horticultural production, especially for export. The development of the export value of shallots has increased periodically from 2003 to 2006, which was exported at 5,514 tons, 6,745 tons, 6,874 tons and 7,254 tons. Horticulture Research and Development Center (2005), establishes technologies that can increase the yield of shallots, one of which is planting superior varieties that are resistant to pests and / or diseases and have broad adaptability; application of

technology for controlling plant-disturbing organisms with biological agents; and productivity enhancing technology with the use of new types of supplements. BATAN (National Atomic Energy Agency) is a government agency that has succeeded in innovating new products, in conducting research, development and utilization for the welfare of the community in the form of Oligo Chitosan or Chitosan Irradiation or Oligo Chitosan which functions as a supplement to plants. Oligo Chitosan is the result of Chitosan products, and Chitosan is an organic material produced from shrimp shells / shrimp waste. Oligo Chitosan is a derivative of chitin with the molecular formula D-glucosamine. Oligo Chitosan is mostly obtained from crustacean shells, molds, squid, etc., through the deproteination process using NaOH; demineralization using HCl; and deacetylation with 50% NaOH. Oligo Chitosan is in the form of white amorphous solids. Properties of Oligo Chitosan is soluble in organic acid solutions. At a pH of around 4.0, Oligo Chitosan is soluble, but insoluble at a pH greater than 6.5, insoluble in water, alcohol, and acetone solvents. According to Knorr (1984), a good and commonly used Oligo Chitosan solvent is acetic acid with a concentration of 1-2%.

2. Research methods

The research method was field trials using planting media in polybags in the form of a mixture of regosol soil and manure in a balanced ratio. The factorial experiment pattern is the Randomized Complete Block Design (RCBD) (Gomes and Gomez, 1983). In this experiment, the first factor for the experiment was the frequency of administering Oligo Chitosan, by spray in three levels, namely in aged plants: 15 dap (days after plant) and 45 dap (F1); 15 dap, 30 dap, 45 dap (F2); 15 dap, 25 dap, 35 dap, 45 dap (F3), while the second factor was Oligo Chitosan concentration in four levels namely 0 ‰ (K0) as a control, 1 ‰ (K1), 2 ‰ (K2) and 3 ‰ (K3). For planting material is the tuber seedlings of shallots Variety Tajuk originating from Nganjuk, East Java. While the supplement used as leaf fertilizer (Darmawan, 2016 and Rinsema, 1993) is Oligo Chitosan which has been packaged as a trade item with an official brand. In its implementation, as many as 20 polybags were prepared for each combination of treatment and control in one group, which was then repeated three times to form three groups, to meet the factorial experimental design. To determine the effect of treatment on the quality of growth of onion plants, analysis of variance was carried out at 95% accuracy level for the three parameters observed were plant height, number of leaves, number of tillers in the observation period of 10 days, since the plants were 20 days after planting to age 50 days after planting. If it shows a real effect, then further tests are carried out by DMRT (Duncan's Multiple Range Test) at 5% significance level and orthogonal contrast test to test the real difference between the control and factorial treatments that were tried.

3. Results and Discussion

Observations that have been made during the vegetative growth of plants are plant height, number of leaves and number of tillers at the age of the plant 20 days after planting (dap) until the age of the plant is 50 days after planting. From these observations, it can be seen the development of growth in each observation period of 10 days. In analysis of the three growth parameters, it shows the real effect of the treatment combination applied compared to the control treatment. Before getting the results of observations of the growth of onion plants, it can be informed that the

growth of tubers from the seed tested showed satisfactory results, because 100% can grow well, and tubers that are soaked by oligo chitosan before planting show better vigority, in terms of morphological appearance and plant growth performance.

Based on the variance in all observed parameters, all treatment combinations tried and between treatment factors, the interaction was not real. The effect of each treatment factor can be known in Table 1., up to Table 3.

Table 1. The average height of shallot plants at the age of 20 dap to age 50 dap (cm)

Treatment	Age 20 dap	Age 30 dap	Age 40 dap	Age 50 dap
Spraying Frequency 2x (F1)	30,07 p	35,83 p	40,70 p	41,02 q
Spraying Frequency 3x (F2)	31,15 p	37,78 p	42,26 p	43,75 p
Spraying Frequency 4x (F3)	29,44 p	36,49 p	40,56 p	41,62 pq
Average	30,22 x	36,70 x	41,17 x	42,13 x
Oligocitosan 1 ‰ concentration (K1)	30,21 a	37,41 a	42,20 a	42,95 a
Oligocitosan 2 ‰ concentration (K2)	29,35 a	35,47 a	39,80 a	41,08 a
Oligocitosan 3 ‰concentration (K3)	31,09 a	37,11 a	41,52 a	42,36 a
Average	30,22 x	36,70 x	41,17 x	42,13 x
Control (Without Oligocytosan) (F0K0)	27,96 x	31.55 y	36,51 y	39,63 y

Note: The average number in the column followed by the same letter, shows no significant difference between treatments based on the 5% level DMRT

In Table 1 shows, there is no interaction between the treatment, the frequency of spraying with the concentration of Oligo Chitosan, and its effect on plant height. Observation at the age of 20 dap until age 50 dap, the frequency of spraying did not show any real effect, but observations at age 50 dap, the F2 treatment showed better results than the F1 treatment, although the two treatments were not significantly different from the F3 treatment. By the treatment of Oligo Chitosan concentration, observations at the age of 20 dap, up to the age of 50 dap, did not show any real effect, so that the treatment between Oligo Chitosan concentrations was relatively the same. Furthermore, it can be explained, that the tubers treated with oligo chitosan, observations at the age of 30 dap, 40 dap and 50 dap showed better results than those not treated. That means the role of oligo chitosan is quite good in improving the quality of plant growth. According to Darmawan (2016), oligo chitosan has an important role in plant elicitor (plant vaccine) and as a plant growth regulator. Therefore, this plant can show an active role in promoting better growth, rather than not using oligo chitosan.

Table 2. The average number of leaves of shallot plants at the age of 20 dap to age 50 dap (strands)

Treatment	Age 20 dap	Age 30 dap	Age 40 dap	Age 50 dap
Spraying Frequency 2x (F1)	22,44 p	29,47 p	40,39 p	43,50 q
Spraying Frequency 3x (F2)	22,69 p	33,47 p	43,47 p	47,14 p
Spraying Frequency 4x (F3)	22,97 p	32,67 p	39,05 p	43,06 q
Average	19,33 x	31,87 x	40,97 x	44,57 x
Oligocitosan 1 ‰ concentration (K1)	23,00 a	32,00 a	42,33 a	44,78 a
Oligocitosan 2 ‰ concentration (K2)	22,72 a	31,08 a	40,00 a	44,94 a
Oligocitosan 3 ‰concentration (K3)	22,39 a	32,53 a	40,58 a	43,97 a
Average	19,33 x	31,87 x	40,93 x	44,16 x
Control (Without Oligocytosan) (F0K0)	22,70 x	24,50 y	37,75 y	38,67 y

Note: The average number in the column followed by the same letter, shows no significant difference between treatments based on the 5% level DMRT

Table 2., shows no interaction between the frequency of spraying with the concentration of oligo chitosan, and its effect on the number of leaves. Observations

on plants aged 20 dap until age 40 dap, the frequency of spraying did not show any real effect, but observations at 50 dap F2 treatments showed better results than F1 and F3 treatments. By the treatment factor of the concentration of oligo chitosan, observations on plants aged 20 dap to age 50 dap, whereas the vegetative growth period, did not show any real effect on the number of leaves, meaning that the treatment of oligo-chitosan concentration was the same or not significantly different. It can be further explained, that the plants treated with chitosan oligo spray, in the observation period from the age of 30 dap to the age of 50 dap, showed better results than those not treated (control). Means the role of oligocytosan is quite good in improving the quality of plant growth. In accordance with Darmawan's statement (2016), oligo chitosan has an important role in plant elicitor (plant vaccine) and as a plant growth regulator. Therefore in this plant, it can be said that oligo chitosan has a role in promoting better growth.

Table 3. The average number of tillers of shallot plants at the age of 20 dap to age 50 dap

Treatment	Age 20 dap	Age 30 dap	Age 40 dap	Age 50 dap
Spraying Frequency 2x (F1)	5,19 p	5,94 p	5,94 p	9,30 p
Spraying Frequency 3x (F2)	5,06 p	5,90 p	5,94 p	9,75 p
Spraying Frequency 4x (F3)	4,94 p	5,89 p	5,89 p	9,47 p
Average	5,06 x	5,93 x	5,92 x	9,51 x
Oligocitosan 1 ‰ concentration (K1)	5,03 a	5,83 a	6,04 a	9,51 a
Oligocitosan 2 ‰ concentration (K2)	4,94 a	5,83 a	5,83 a	9,47 a
Oligocitosan 3 ‰concentration (K3)	5,22 a	5,92 a	6,11 a	9,54 a
Average	5,06 x	5,93 x	6,00 x	9,50 x
Control (Without Oligocytosan) (F0K0)	22,70 x	5,50 x	5,93 y	8,57 y

Note: The average number in the column followed by the same letter, shows no significant difference between treatments based on the 5% level DMRT

In Table 3., there is no interaction between the treatment factors, the frequency of spraying with the concentration of oligo chitosan, also no effect on the number of tillers. In observations of plants aged 20 dap until age 50 dap, the frequency of spraying did not show any real effect, thus between treatments the frequency of spraying was not significantly different at age 20 dap until the age of 50 dap. In the treatment of chitosan oligo concentrations, observations from the beginning to the end of vegetative growth did not show any real effect on the number of tillers, so the treatment between chitosan oligo concentrations did not differ significantly. It can be further explained that plants treated with oligo chitosan spray, observations on plants aged 40 dap and aged 50 dap, showed better results than those not treated (control). This means that the role of oligo chitosan is quite good in improving the quality of plant growth. According to Darmawan (2016), oligo chitosan has an important role in plant elicitor (plant vaccine) and as a plant growth regulator. Therefore, this plant shows a role in promoting growth better than those not given oligo chitosan.

4. Conclusion

From the observations and analysis of variance, plant height parameters and number of leaf parameters, onion plants showed a tendency to increase rapidly from the age of 20 dap to 40 dap, subsequently the increase was low. In the parameter number of tillers there is a low increase from the age of 20 dap to age 30 dap, and from age 30 dap to age 40 dap increase in the number of tillers is very low, but then there is an increase in the number of tillers very high up to age 50 hst, most in the combination of F2K1 treatment . The number of tillers of the onion plant illustrates

the number of tubers formed, because the onion tubers are the base of the pseudo stem of the shallot plant. Thus oligo chitosan can improve the quality of growth of onion plants before the tubers can be harvested. Limited to this experiment, which was carried out within the time and parameters of observations that had only reached the stage of vegetative growth and had not yet reached tuber yields, it can be concluded as follows: the quality of the growth of shallots. The treatment of chitosan oligo frequency spraying three times at the age of 15, 30 and 45 dap, has the potential to improve the quality of plant growth, and even means to improve the quality of the onion bulbs in the end. The lowest concentration of chitosan oligo chitosan treatment factor, which is one permil (1 ‰), is good enough to influence the improvement of the quality of plant growth, which turns out to be the same as the higher concentration treatment, which is 2 ‰ and 3 ‰.

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