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**RESEARCH**

# POLLINATORS AND FERTILIZATION EFFECTS ON SEED YIELD AND BULB OF UNION (*Alium cepa* L)

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## Abstract

The use of tubers as seed onion crops require a long storage time prior to planting, require the amount of weight and volume are great for planting in the area of cultivation, as well as hard to be distributed among regions. Another alternative in onion cultivation practice is to use the seeds (True Shallot Seed). Constraints in the production of TSS is very prominent is that no simultaneous flowering and needed the help of pollinators or insect pollinators to increase its seedset. Green flies and honey bees are pollinate many flowers play a role in the onion. This study aims to gain the kind of effective pollinators helps in enhancing pollination and seed yield evaluate nutrient intake to increased seed yield and bulb onions. Intake nutrients with inorganic and organic, as well as pollinators with honey bees and green flies. To stimulate flowering vernalisation done. Conclusion: Mutiara Inorganic fertilizers and fertilizer Organic Compound Super-MS with each dose of 150 kg / ha and 1t/ha, increasing the number of tillers, number of flowers per umbel, seed weight per umbel, and the dry weight of tubers per hectar. Vernalisation accelerate flowering and number of flowers and number of flowers per umbel. Bee pollinators and green flies effectively increase the number of seeds per umbel and seed weight per umbel.

**Key words**: *Pollinator, Fertilization, Alium cepa L*

## INTRODUCTION

Onion as one of the national important commodity, so that the various programs and activities carried out in order to develop production. Yield and benefits seen by an increase in production and area harvested each year. Production and harvested area in 2005; 732. 610 tonnes and 83. 614 ha, while production and harvested area in 2006, is 794 929 tonnes and 89. 188 ha. To supply consumer union Indonesia with a population estimated 221.7 million people in 2005, it takes as many as 731 thousand tons, while in 2009 the estimated population of 235.4 million people, union needs to be 812 thousand tons (Anonymous, 2006).

Based on data availability and needs prognosis onion nationally (Ministry of Agriculture of Indonesia, 2010), the availability of these commodities is equal to

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701,667 tonnes, with consumption of 557 411 tonnes and 114 256 tonnes of production needs. Thus still available surplus of 113,079 tonnes of onion. Statistics in 2010 showed that the harvested crop onion nationally is 109 468 ha with a production of 1,048,228 tons. Productivity of onion in 2010, amounted to 9.58 tonnes / ha (Central Statistics Indonesia, 2011).

Onion cultivation practices in Indonesia are generally used as seed tuber crops. The use of bulbs as onion seeds are known to require a long storage time (up to 6-8 months) before planting, requires a number of weight and volume are great for crops be planted in the area, as well as difficult distributed among regions. This is impacting on the needs supplay onion seed crops nationwide. Another alternative in onion cultivation practice is to use seed grain, which is often referred to as True Shallot Seed (TSS). The advantages of onion plant propagation using seeds from the seed is in addition to reduce the cost of procurement of seeds, is also easily distributed between regions and even between countries at no additional cost warehouse storage. Seed requirements are also more efficient, which is about 2 kg / ha (compared to the needs of seed tubers, about 1 ton / ha) and free of viruses and other dangerous diseases (Permadi, 1993; Ridwan et al 1989 in Rosliani et al, 2005).

To obtain a good seed, it should also attention to aspects of culture that can support the achievement of optimal production. One important factor in obtaining optimum production of onion crop is nutrient intake. Nutrient needs for growth and production of onion, of which can be obtained through the appropriate fertilization. By using fertilizers that contain elements - nutrients essential for plant growth, can increase yield or optimal crop production. In addition to nutrient needs, to stimulate flowering and flowering uniformity, through treatment vernalisasi (cold treatment). The results of Sumarni and Soetiarso (1998) found that treatment vernalisasi 100C temperature on onion

percentage of plants flowering, number of flowers per umbel, number of seeds per bulbs a month old for 4 weeks, resulting in as many as 52.4% flowering and grain yield 27.7 kg / ha.

Flowers on onion plants including protandri type, in which the stamens mature earlier than the pistil, so the process is not simultaneous flowering. Thus, the need for relief of insect pollinators. Based on the results of research in the field, insect pollinators that can be used to help pollinate the flowers of red onion is the honey bee (Liferdi, 2008) and green flies (Rosliani et al, 2005).

## MATERIALS AND METHODS

The experiment was conducted in onion fields in the district of Bantul. Onion seed tuber cultivars Crok Yellow (> 5-8 g) aged 1 month after harvest, vernalisation treatment for 2 weeks at a temperature of 10° C. Bulbs planted in the field at a spacing of 15 x 15 cm.

Treatment consist of research :

Type pollinators: honey bees, green flies, Control

Nutrient intake: Mutiara Inorganic Fertilizer NPK 16-16-16 150 kg / ha

Super-MS Organic Fertilizer compond: 1 t / ha

The addition of KCl fertilizer 25 kg / ha

Control:Without pollinators and without nutrient intake

Inorganic fertilizers are given two times in the early planting as basal fertilizer and 30 days after transplanting (DAT). Organic fertilizer is given entirely at planting. RAKL factorial experimental design nested, nested kind and dosage of fertilizer on the type of pollinator. Efforts to increase seed-set through pollinator insects (flies green / bee) implemented by importing bees with honey and bee boxes to house flies sprinkled green with

Rotting fish on the block treatment. Observations were made on plant growth (plant height and number of tillers), the

umbel, seed weight per umbel. Data were analyzed using ANOVA testto see the effect of treatment, followed by DMRT at 5% level.

## RESULTS AND DISCUSSION

**Table 1.** The results of soil analysis on locations pollinators

| Parameter | Location I (honey bee) | Lokasi II (green flies) | Lokasi III (control) |
|---|---|---|---|
| C org (%) | 3.14 | 2.56 | 1.87 |
| BO (%) | 4.69 | 4.22 | 2.69 |
| N total (%) | 0.44 | 0.32 | 0.23 |
| P available (ppm) | 10.47 | 13.35 | 11.38 |
| K exchanged (Me%) | 0.25 | 0.28 | 0.17 |

**Tabel 2.** Kinds of fertilizers, Vernalisation and types of pollinators towards Plant height and the number of tillers

| Para meter | Pollinators (Pl) | Fertilizer / Vernalisation | F0 | | F1 | | F2 | | Mean Pl |
|---|---|---|---|---|---|---|---|---|---|
| | | | V0 | V1 | V0 | V1 | V0 | V1 | |
| Plant High | L1/ Honey bee | | 33.4 | 34.1 | 36.4 | 36.8 | 36.3 | 36.3 | 35.57A |
| | | Mean F | 33.75 b | | 36.63 a | | 36.33 a | | |
| | | Mean V | (V0) 35.39 p | | (V1) 35.75 p | | | | |
| | L2/ Green Flies | | 29.7 | 28.6 | 34.3 | 34.7 | 30.2 | 29.9 | 31.24B |
| | | Mean F | 29.17c | | 34.50 a | | 30.04 b | | |
| | | Mean V | (V0) 31.39 p | | (V1) 31.08p | | | | |
| | L3/ Control | | 21.7 | 25.5 | 33.0 | 32.9 | 27.0 | 29.2 | 28.21C |
| | | Mean F | 23.58c | | 32.96a | | 28.08b | | |
| | | Mean V | (V0)27.22 p | | (V1) 29.19p | | | | |
| Number of tillers | L1/ Honey bee | | 2.67 | 3.00 | 5.33 | 5.67 | 6.33 | 6.67 | 4.944 A |
| | | Mean F | 2.833 b | | 5.500 a | | 6.500 a | | |
| | | Mean V | (V0) 4.778 p | | (V1) 5.111 p | | | | |
| | L2/ Green Flies | | 3.67 | 3.67 | 5.00 | 4.67 | 6.33 | 5.67 | 4.833 A |
| | | Mean F | 3.667b | | 4.833 b | | 6.000 a | | |
| | | Mean V | (V0) 5.000 | | (V1) 4.667 | | | | |
| | L3/ Control | | 4.00 | 4.33 | 4.67 | 5.67 | 5.00 | 5.67 | 4.889 A |
| | | Rerata F | 4.167b | | 5.167 a | | 5.333 a | | |
| | | Rerata V | (V0) 5.000 | | (V1) 4.333 | | | | |

Note: L= location of pollinators treament. Same letter in the row or column of each column shows different types of pollinators evident in Duncan 5% and 1%

Table 2. shows that the inorganic fertilizer and organic fertilizer significantly higher compared to the treatment plant without fertilizer but Mutiara inorganic fertilizers have a greater ability than the organic fertilizer to increase plant height, because plants absorb nutrients faster than inorganic fertilizer and manure Pearls have Nitrogen nutrient fertilizer than organic compound that is 16% and 5%. However organic fertilizer also increased the plant height compared with no treatment fertilization; vernalisation did not significantly affect on high of plant. Plant height is more affected by nutrient intake that enhances the formation of protein to increase the volume of plant cells. From the analysis of soil Table 1. showed that soil fertility in all three locations there was no difference seen from the parameter BO, N total, P availabe and K exchange. Furthermore table 2. shows that treatment of kinds of fertilizer each location on the plant height significantly different, while the number of tillers not significantly different. This is possible because the Mutiara

inorganic fertilizers containing NPK elements higher than organic compound fertilizers.

Vachhani and Patel (1966) reported that K fertilizer can increase crop onion vegetative growth. Furthermore Vidigal et al. (2002) says that the growth of onions increased gradually with increasing amounts of fertilizer K. Increased provision of growth due to the provision relating to the role of the Nitrogen (N) , so the nitrogen fertilizers can increase the rate of plant growth. Engelstad (1977) said that the provision of optimal N can improve plant growth, enhance protein synthesis, leading to the formation of chlorophyll and increase the ratio of the root. Therefore the provision of optimal N can increase the rate of plant growth.

According to Gardner et al. (1985) nitrogen is a structural component of a number of important organic compounds such as amino acids, proteins, nucleoprotein, various enzymes, purine and primidin much needed for enlargement and cell division, thus giving optimum nitrogen, enhance the growth of plants. Hilman (1994) which states that K fertilization can increase the vegetative growth of onion. Rachman and Susanti (2004) said that the K fertilizer in the soil sufficient cause more optimal growth of onion. The addition of potassium showed good results as potassium role to help the process of photosynthesis thereby increasing plant growth and development.

At locations 2 and 3 show that plant respone to the fertilizer is to increase plant height more slowly than inorganic fertilizer but were significantly different ie faster than the control or without fertilizer. This is due to the organic fertilizer is able to activate many species of living organisms that produce phytohormones and can stimulate plant growth and nutrient absorption (Arisha et al, 2003.), But also microorganisms require nitrogen for propagation (Ouda and Mahadeen, 2008).

**Tabel 3.** Kinds of fertilizers, Vernalisation and types of pollinators towards number of flowers per plot and number of flowers per umbel

| Para meter | Pollinators (Pl) | Fertilzer / Vernalisation | F1 V0 | F1 V1 | F2 V0 | F2 V1 | F3 V0 | F3 V1 | Mean Pl |
|---|---|---|---|---|---|---|---|---|---|
| Number of flowers | L1/ Honey bee | | 25 | 46 | 40 | 62 | 36 | 69 | |
| | | Mean F | 35.83 b | | 51.33 a | | 52.50 a | | 46.56 A |
| | | Mean V | (V0) 33.78 q | | (V1) 59.33 p | | | | |
| | L2/ Green Flies | | 39 | 40 | 40 | 71 | 40 | 60 | |
| | | Mean F | 39.33b | | 55.50a | | 50.67 a | | 48.50 A |
| | | Mean V | (V0) 40q | | (V1) 57p | | | | |
| | L3/ Control | | 29 | 31 | 46 | 56 | 40 | 65 | |
| | | Mean F | 39.33b | | 55.50a | | 50.67 a | | 44.78 A |
| | | Mean V | (V0) 40 q | | (V1) 57.22 p | | | | |
| Number of flowers per umbel | L1/ Honey bee | | 21.3 | 30.7 | 49.7 | 41.3 | 34.0 | 41.0 | |
| | | Mean F | 26.0 c | | 45.5 a | | 37.5 b | | 36.3 A |
| | | Mean V | (V0) 35.00 q | | (V1) 37.67 p | | | | |
| | L2/ Green Flies | | 19.77 | 22.3 | 23.77 | 33.0 | 22.0 | 29.7 | |
| | | Mean F | 21.00 b | | 28.33 a | | 25.83 a | | 25.1 B |
| | | Mean V | (V0) 21.78 q | | (V1) 28.33 p | | | | |
| | L3/ Control | | 12.0 | 21.0 | 20.7 | 26.3 | 16.3 | 24.3 | |
| | | Mean F | 16.50 c | | 3.50 a | | 20.33 b | | 20.1 C |
| | | Mean V | (V0) 16.33 q | | (V1) 23.89 p | | | | |

Note: L= location of pollinators treament. Same letter in the row or column of each column shows different types of pollinators evident in Duncan 5% and 1%

Table 3 shows that the kinds of fertilizers and vernalisation significantly affect the number of flowers per plot and number of flowers per umbel per plot. Effect of inorganic fertilizer and organic fertilizer is higher than organic fertilizers to the amount of flowers per umbel. While the location affect the number of flowers perumbel, because the indirect effect of environmental factors. Besides soil fertility in all three locations there was no difference seen from the parameter BO, N total, P available and K exchange. Mutiara inorganic fertilizer containing NPK elements higher than organic fertilizers.

The number of flowers per umbel is very important in the production of onion seeds. Onion flower initiation is influenced other than by factors temperature and length of light intensity but also fertilization. Streck and A. Nereu (2003) states that the induction of flowering plants are influenced by cold temperatures. Therefore, vernalisation can accelerate flowering while fertilizing more effect on the amount of flowers even though the study was not interaction between fertilization and vernalisation.

Table 4 shows that seed weight per umbel influenced by the kinds of fertilizer significantly. While vernalisationi no significant effect. Then the dry weight of bulb per hill was also significantly influenced by the kinds of fertilizers. It is possible that the organic and inorganic fertilizers with nutrient content of P and K will stimulate formation and seed filling. In general, from Table 6 indicated that Mutiara inorganic fertilizers more influence on seed weight per umbel and bulb dry weight as percentage of P and K was higher than organic fertilizers and faster availability. There is a significant difference in the location of the seed weight per umbel and bulb dry weight due to the difference in fertility of each location as shown in table 1.

**Table 4.** Kinds of fertilizers, Vernalisation and types of pollinators towards seed weight per umbel and dry weight of tuber per hill.

| Para meter | Pollinators (Pl) | Fertilizer / Vernalisation | P0 | | P1 | | P2 | | Mean Pl |
|---|---|---|---|---|---|---|---|---|---|
| | | | V0 | V1 | V0 | V1 | V0 | V1 | |
| Seed weigt Per umbel | L1/ Lebah | | 2.52 | 2.63 | 2.90 | 2.49 | 2.79 | 2.73 | 2.68 A |
| | | Mean F | 2.578b | | 2.697a | | 2.765a | | |
| | | Mean V | (V0) 2.740p | | (V1) 2.620p | | | | |
| | L2/ lalat | | 29.7 | 28.6 | 34.3 | 34.7 | 30.2 | 29.9 | 2.71 A |
| | | Mean F | 29.17c | | 34.50 a | | 30.04 b | | |
| | | Mean V | (V0) 31.39 p | | (V1) 31.08p | | | | |
| | L3/ kontrol | | 21.7 | 25.5 | 33.0 | 32.9 | 27.0 | 29.2 | 1.88 B |
| | | Mean F | 23.58c | | 32.96a | | 28.08b | | |
| | | Mean V | (V0)27.22 p | | (V1) 29.19p | | | | |
| dry weight per umbel | L1/ Lebah | | 1069.5 | 961.2 | 1756.4 | 1661.5 | 1232.0 | 1311.6 | 1332.0 C |
| | | Mean F | 1015.3 c | | 1709.0 a | | 1271.8 b | | |
| | | Mean V | (V0) 1352.7p | | (V1) 1311.4p | | | | |
| | L2/ lalat | | 1359.1 | 1358.5 | 1752. 6 | 1575.9 | 1598.8 | 1366.8 | 1501.9 A |
| | | Mean F | 1358.8 b | | 1664.3 a | | 1482.8 ab | | |
| | | Mean V | (V0) 1570.2 p | | (V1) 1433.7 p | | | | |
| | L3/ kontrol | | 1273.7 | 1395.9 | 1364.4 | 1404.6 | 1407.4 | 1326.5 | 1362.1 B |
| | | Mean F | 1334.8 b | | 1384.5 a | | 1367.0 a | | |
| | | Mean V | (V0) 1348.5p | | (V1) 1375.7p | | | | |

## CONCLUSION

Limited on this research can be concluded:

1. Pearls of inorganic fertilizers and organic fertilizers Compound Super-MS with each dose of 150 kg / ha and 1t/ha, increasing the number of tillers perrumpun, number of flowers per Umbel, seed weight per umbel, and the dry weight of tuber per hill.
2. Vernalisation signicantly accelerate flowering and number of flowers per plot and number of flowers per umbel.
3. Honey bee pollinators and Green flies effectively increase the number of seeds per umbel and seed weight per umbel.

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