Aplication of giberelins on flowering and yield of two varieties of shallot in lowland

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Abstract. Shallot is one of horticultural commodities which has difficulties in flowering and producing seeds. Flowering of shallot generally occurs in highlands at 9-12°C. Flowering in lowland can be supported with vernalization or replace cold temperature with gibberelin (GA3). This research is aimed to determine the effect of varieties, the concentration of GA3 applied and their interaction on flowering and yield of shallots grown in the lowlands, 98 m altitude with Vertisol-type soil. The research was conducted in a randomized complete block design (RCBD) with two factors, which were varieties (V): Bima and Mentes and concentration of GA3 (C) 0 ppm, 50 ppm, 100 ppm, 150 ppm and 200 ppm and repeated three times. Varieties have significant effect (P<0.05) on plant height, leaf number, the number of bulbs per clumps, weight of fresh bulbs per clumps, and percentage of small and large bulbs produced. Bima varieties were able to flower and produced seeds, while Mentes varieties could not produce flowers and seeds. GA3 concentration have no significant effect in all of the observed component. GA3 can’t replace cold temperature for supported flowering in varieties Mentes which were planted in lowlands. There was interaction between varieties and GA3 concentration occurs in variable percentage of small and large bulbs.

1. Introduction
Shallot is one of the horticultural commodities whose needs are always increasing every year, but not always followed by increased productivity. According to data from BPS [1], there is a decrease in shallot productivity in Indonesia by 0.39% in 2015 compared to 2014. One of the causes of decreasing shallot production is the low quality of seed used [2] decline in the long term as seeds so as to increase the likelihood of decreasing virus like Shallot latens virus from the previous generation to the next generation [3].

Seeds can be used as alternatives in these problems. The use of seeds as planting materials will minimize transmission of the virus from the previous generation [4] and more efficient use because it only takes approximately 1.5 kg per Ha of shallot seeds. However, the production of seeds in Indonesia is still low due to the difficult flowering occurs especially in the lowlands. Not all varieties can flower in lowlands. The varieties used in this research are varieties of Bima and Mentes because both of these varieties are superior varieties of shallot which are of great interest to the public. Bima varieties of shallot have been able to adapt to flowering in lowland but with low yield, while Mentes variety to enter the generative phase requires cold temperatures (high land).

Environmental factors such as temperature, photoperiode and rainfall will affect the process of forming shallot flowers [5]. Shallot plant is a biannual and plant long days in which to flowering takes cold temperatures (<18°C) and photoperiode >12 hours [6], while in the lowlands of relatively high
temperatures (>29°C) with a photoperiod 12 hours or less. The cold-temperature function can be replaced by a vernalization treatment (cold temperature) or the administration of a growth regulator in the form of gibberellin which can specifically replace the cold temperature function to induce flowering induction.

Shallot basically have gibberellin hormones that are inactive and in limited quantities depending on the variety used so that the concentration of gibberellin given will have different effects depending on the needs of each variety. Gibberelin used in this research is the gibberellic acid (GA₃) which applied by soaking the seed bulbs before planting (30 minutes) and spraying the seedlings age 2-5 WAP at a concentration of 0 ppm, 50 ppm, 100 ppm, 150 ppm and 200 ppm.

According to Barani et al [7], concentrations below 100 ppm have not had any effect on plant growth because they have not been effectively used, while concentrations between 100 ppm and 200 ppm have a significant effect on the number of flowering plants per plot and seed weight per plant umbel [8]. This research was conducted with the aim to find out the response of varieties of Bima and Mentes planted in the lowlands in terms of flowering and yield of seeds and bulbs produced, knowing what the appropriate concentration to encourage flowering and improvement of crop production and to know the interaction between the varieties tested and the concentration of GA₃ was applied.

2. Methods
This research was conducted from May to August 2016 in Gunung Mijil village, Jaten sub-district, Karanganyar district. Materials used include shallot crop land, the seed bulbs and Mentes varieties, GA₃, SP36, ZA, KCl and Urea. The tools used to support this research include hoes, analytical scales, meters, measuring cylinders, sprayers, slide length, cameras, logbooks and stationery.

This research was conducted with randomized complete block design (RCBD) with two factors, such as the variety and concentration of GA₃. Varieties consists of two levels such as Bima variety and Mentes variety whereas the concentration of GA₃ consists of 5 levels such as 0 ppm, 50 ppm, 100 ppm, 150 ppm and 200 ppm. The two factors are then combined and repeated three times.

The observed variables were divided into 3 main components ie growth components consisting of plant height and number of leaves, flowering and seed forming components consisting of the time of flower emergence, percentage of flowering plants per plot, number of flower stalks per Ha, number of flowers per flower stalk, number of seeds per flower stalk and the weight of the seeds per flower stalk as well as the yield component consisting of the number of bulbs per plant clump, the weight of fresh bulbs per plant clump, the weight of fresh bulbs per Ha, the weight of dry bulbs after drying per Ha, the percentage of small, medium and large per plot.

3. Result and Discussion

3.1 General condition of research location
This research was conducted in Gunung Mijil village, Jaten sub-district, Karanganyar district at altitude of 89 mdpl (lowland). The study took place from May to August 2016 with relatively high rainfall of 168 mm in May, 242.5 mm in June, 255.5 mm in July and low in August of 36.5 mm and relative humidity 78 , 6% in May, 78.75% in June, 79% in July and 78.1% in August. The air temperature is relatively high at 26.9 to 38.4 °C in May, from 26.9 to 38.6 °C in June, from 26.8 to 38.6 °C in July and 26.7 to 38.7 °C in August. The temperature is too high for the induction and initiation of flowering (> 26 °C), but optimal for bulb formation and ripening seeds of shallot (9).

3.2 Growth components
The growth component consists of plant height and number of leaves obtained by measuring at ages 2 WAP to 7 WAP. Plant height is obtained by measuring from the base of the plant (ground level) to the longest leaf end of the sample plant while the number of plant leaves is obtained by counting the number of leaves that can form on each sample plant clump. Plant height and number of leaves of the plant are presented in Table 1.
Table 1. Average plant height (cm) and number of leaves (leaf) shallot plants aged 7 WAP in a wide variety, the concentration of GA$_3$ and the interaction between varieties and concentrations of GA$_3$. 

| Concentration of GA$_3$ (ppm) | Plant height (cm) | Number of leaves (strands) |
|------------------------------|------------------|---------------------------|
|                              | Bima | Mentes | Average | Bima | Mentes | Average |
| 0                            | 41.73| 34.86  | 38.56    | 36   | 42     | 38.97   |
| 50                           | 38.37| 35.50  | 36.93    | 36   | 36     | 35.80   |
| 100                          | 39.17| 33.20  | 36.46    | 34   | 36     | 34.57   |
| 150                          | 37.43| 32.47  | 34.95    | 25   | 36     | 30.37   |
| 200                          | 39.60| 33.57  | 36.58    | 31   | 43     | 36.90   |
| Average                      | 39.43| 37.96  | (-)      | 32.09| 33.44  | b(-)    |

Description: The numbers followed by the same letter are not significantly different based on the DMRT test of 5%.

The result of variance analysis showed that varieties had significant effect on plant height and number of plant leaves (p<0.05). Bima variety has higher plant height (39.43 cm) than Mentes variety (37.96 cm) but has fewer number of leaves (32.09 sheets) than Mentes varieties (33.44 leaf). This difference is because the two varieties have different genetics that will produce different phenotypes [10]. Abdissa et al. [11] revealed that vegetative growth of plants is influenced by the ability of plants to synthesize some of the protein components available and needed.

The concentration of GA$_3$ did not show any real effect on plant height and number of leaves of shallot plants (p>0.05). This is thought to be due to improper application (immersion in seed bulbs before planting and spraying on plants). Excessive application will cause gibberellin to be given gibberellin glucoside which is inactive so that can not be used by plants. Table 1 shows that the plant without the application of GA$_3$ generating plant height and number of leaves were higher than in plants by application of GA$_3$. Application of GA$_3$ tends to decrease the plant height and number of leaves produced. This result is contrary to the opinion and Benkeblia Williamson [12], which revealed that GA$_3$ applied capable of increasing the length of the leaf by influencing the degradation of chlorophyll. There is no interaction between the varieties used and the concentration of GA$_3$ was applied (p>0.05).

3.3 Purification and forming seeds components

The flowering component consists of the time of the flower emergence, the percentage of flowering plants per plot, the number of flower stalks per Ha and the number of flowers per stalk while the seedling component consists of the number of seeds per stalk and the weight of the seeds per stalk. The flowering component is presented in Table 2 and the seedling component is presented in Table 3.

Table 2. Average of the emergence of interest (DAP), percentage of flowering plants (%), the number of flower stalks per hectare and the number of flowers per stalk on a wide variety, the concentration of GA$_3$ and the interaction between varieties and concentrations of GA$_3$. 

| Concentration of GA$_3$ (ppm) | Time of the flower emergence (DAP) | Percentage of flowering plants per plot (%) | Number of flower stalks/ha | Number of flowers per stalk |
|------------------------------|----------------------------------|---------------------------------|---------------------------|---------------------------|
|                              | Bima | Mentes | Bima | Mentes | Bima | Mentes | Bima | Mentes |
| 0                            | 32   | -      | 31.67| 0      | 40,740| 0      | 48.27| 0      |
| 50                           | 32   | -      | 7.04 | 0      | 25,925| 0      | 43.90| 0      |
| 100                          | 30   | -      | 15.56| 0      | 66,666| 0      | 48.17| 0      |
| 150                          | 30   | -      | 14.07| 0      | 59,259| 0      | 32.85| 0      |
| 200                          | 29   | -      | 29.63| 0      | 134,567| 0    | 32.65| 0      |
| Average                      | 30.47| -      | 19.57| 0      | 65,432| 0      | 41.17| 0      |

Description: Mentes varieties of shallot can not flower and produce seeds, so can not be analyzed...
Flowering occurs only on the Bima varieties of shallot, while the varieties of Mentes cannot be flowered so it can not produce seeds. No occurrence of shallot varieties of flowering in suspected Test the temperature is too high because that is an average of 26.7 to 38.7°C at the time of the study. Triharyanto et al. [5] revealed that the temperature is above 29°C will impede the flowering process. Mentes varieties are allegedly unable to adapt well to enter the generative phase when planted in the lowlands, while the varieties of Bima have been able to adapt so that it can flower if planted in lowland even with low yield.

Shallot is a biennial plant in which the plant can flower after two seasons (spring and summer). Jasmi et al. [13] revealed that flowering induction is influenced by the presence of stimuli in the leaves that are affected by cold temperature induction (vernalization). Flowering induction is the initial stage of flower formation because at this stage there is a change in the biochemical response of the apex layer which is a signal of change from the vegetative to the generative phase [14]. Plant which induced will continue initiation and form the flower buds, while the induced failed plants will return to the vegetative phase [15].

Bima varieties grown in the lowlands can be flowering and produce seeds but with low yields. Shallot of Bima varieties are flowering at the age of 30 DAP. The timing of this flower is faster than the description of the varieties (50 DAP). Giving GA3 speed up the emergence of interest shallot varieties of Bima but was unable to push flowering Mentes varieties. This is contrary to the opinion of Sorensen et al. [15], which revealed that GA3 can be used to replace the function of cold temperatures to stimulate cell elongation umbel shallots from the growing point.

Shallot varieties Bima applied GA3 with a concentration of 200 ppm can be flowering at the age of 29 DAP, while at a concentration of 100 ppm and 150 ppm flowering at the age of 30 DAP as well as the concentration of 0 ppm and 50 ppm flowering at the age of 32 DAP. This result is basically the Bima varieties grown in lowland flowering and administration of GA3 could accelerate the emergence of interest in one plot although the percentage of flowering plants per plot are low (average 19.57%).

Application of GA3 can not increase the percentage of flowering plants per plot generated. Bima shallot varieties without the application of GA3 as a greater percentage of flowering plants per plot were higher than the Bima shallot varieties with the application of GA3. The concentration of GA3 50 ppm, 100 ppm and 150 ppm resulted in a low percentage of flowering plants, respectively 7.04%, 15.56% and 14.07%. GA3 was applied at a concentration of 200 ppm resulted in 29.63% of flowering plants per plot. This result is lower than in Bima shallot crop varieties without the application of GA3 (31.67%).

Flower stalks produced per Ha Bima varieties averaged 65,432 stalks. Each plant produces 2-5 flower stalks per hill plant. According to Patra et al. [16] GA3 applied will increase the synthesis and translocation of flowering hormones that will increase the size of the flowers and the maximum number of flowers per plant. The flower stalk comes from the core buds that are in the center of the stem and grow as well as the leaves in general. Varieties Bima applied GA3 with a concentration of 200 ppm produced 36 stalks of flowers/2.7 m² equivalent to 134,567 flower stalks/ha while that of the untreated GA3 resulted in the number of flower stalks are lower at 11 peduncle/2.7 m² or equivalent to 40,740 stalks/ha.

The number of flowers per flower stalk produced varies each individual. The interest rate per flower stalk is calculated after the interest is harvested. According Rahayu and Berlian [17] each flower stalk can produce 50 - 200 flower buds depending on varieties used. Plants that have undergone induction and flowering initiation will then proceed to the stage of forming the flower parts [14]. Flower buds that are formed then will do pollination. Successful flowers in their pollination will then develop and produce seeds, while pollination that fails will cause the flowers to dry and fall. Bima shallot crop varieties without the application of GA3 generates average number of flowers per stalk a higher interest rate than plants that applied GA3. This suggests that GA3 is not able to increase the number of flowers per stalk is produced and tends to decrease the number of flowers per stalk produced. Bima shallot crop varieties without the application of GA3 resulted in the number of flowers per stalk around 48.27 flowers while at a concentration of 50 ppm produced an average 43.90 flower/stem, the
concentration of 100 ppm produced an average 48.17 flower / stem, the concentration 150 ppm yields an average of 32.86 flowers / stalks and a concentration of 200 ppm yields an average of 32.65 flowers / stalks.

Table 3. Average number of seeds per stalk and seed weight per stalk (gram) in a wide variety, the concentration of GA$_3$ and the interaction between varieties and concentrations of GA$_3$

| Concentration of GA$_3$ (ppm) | Number of seeds per stalk | Weight of seeds per stalk (gram) |
|------------------------------|---------------------------|---------------------------------|
|                              | Bima          | Mentes | Bima        | Mentes |
| 0                           | 65.93         | 0         | 0.29        | 0       |
| 50                          | 60.33         | 0         | 0.30        | 0       |
| 100                         | 65.50         | 0         | 0.50        | 0       |
| 150                         | 71.00         | 0         | 0.41        | 0       |
| 200                         | 62.18         | 0         | 0.32        | 0       |
| Average                     | 64.99         | 0         | 0.36        | 0       |

Description: Mentes varieties of shallot can not flower and produce seeds, so can not be analyzed

The number of seeds per stalk produced is influenced by the success of pollination on each flower. Reproductive organs that have been ripe will continue the process of pollination and fertilization. Pollination shallot can occur alone or cross with the help of polinator. Palupi et al. [18], revealed that the seeds produced in the lowlands are still relatively low at below 30%. The number of seeds per stalk and seed weight per stalk are presented in Table 3. According Sumarni et al. [6] seed formation occurs at high temperature is 35°C and the temperature in this study about 26.7 to 38.7°C which is the temperature optimum for seed formation. Table 3 shows that the number of seeds produced in the shallot crop without GA$_3$ is on average 65.93 seeds, the concentration of 50 ppm produced an average 60.33 seeds, a concentration of 100 ppm produced an average 65.50 seeds, the concentration of 150 ppm yields an average of 71 seeds and a concentration of 200 ppm yields an average of 62.18 seeds. According Helaly et al. [19] revealed that the administration of GA$_3$ is able to increase the fertility rate of shallot, so that the beans are produced more and more. The formation of seeds only occurs in the varieties of Bima while the varieties of Mentes can not be flowered so it can not produce seeds anyway.

The weight of the seeds per flower stalk is obtained by weighing the weight of the seeds after drying in the sun for 2 days. The high number of seeds is not always followed by the high seed weight. The resulting beans have different sizes, so that every seed produced will also vary. The results showed that administration of GA$_3$ can increase the weight of seeds produced. Treatment without GA$_3$ yields 0.29 g/stalk whereas the application of GA$_3$ with a concentration of 50 ppm, 100 ppm, 150 ppm and 200 ppm respectively produce seed weight per stalk on average 0.30 grams, 0.50 Grams, 0.41 grams and 0.32 grams.

3.4 Yield components

The yield components include the number of bulbs per plant family, the weight of fresh bulbs per plant clump (table 4), the weight of dry bulb per Ha, the weight of dry bulb per Ha (table 5) and the percentage of small, medium and large bulbs produced per plant clump (table 6). The yield component is calculated after the bulbs are harvested. Shallot is a bulb with a layer that is quite a lot and quite thick.
Table 4. Average number of bulbs per plant and fresh weight of bulbs per plant (g) on a wide variety, the concentration of GA₃ and the interaction between varieties and concentrations of GA₃

| Concentration of GA₃ (ppm) | Number of bulbs per plants | Weight of bulbs per plants (gram) |
|---------------------------|----------------------------|-----------------------------------|
|                           | Number | Average | Bima | Ment | Number | Average | Bima | Ment |
| 0                         | 11.27  | 11.20   | 60.01| 64.73| 62.37  |
| 50                        | 8.87   | 10.73   | 49.15| 54.15| 51.65  |
| 100                       | 9.13   | 10.97   | 42.94| 53.82| 48.38  |
| 150                       | 9.00   | 11.33   | 44.05| 59.52| 51.78  |
| 200                       | 8.47   | 11.73   | 36.22| 62.82| 49.52  |
| Average                   | 9.35 a | 13.04 b | 46.47| 59.01|        |

Description: The numbers followed by the same letter are not significantly different based on the DMRT test of 5%

The number of bulbs produced is obtained by counting the number of bulbs in the sample plants after harvesting. The result of variance analysis showed that varieties had significant effect (p <0.05) on the number of bulbs per plant family. According to Hailu et al. [20] varieties have different attributes and levels of adaptation to the environment, this is what causes their productivity to vary. Bima varieties produce bulbs with a lower number than the varieties of Mentes. Bulbs produced on the average Bima variety 9.35 bulbs per hill while Mentes varieties produce 13.04 bulbs per plant clump.

Based on the results of analysis of variance concentration of GA₃ did not significantly affect the number of bulbs per plant (p>0.05). There is no significant difference in the number of bulbs produced in plants that applied GA₃ and plants that are not applied GA₃. This suggests that without the application of GA₃ will produce a pretty good number of bulbs due to the variety used is able to adapt well in low and productivity is high enough. According to Gautam et al. [21] bulb yields are more influenced by climatic conditions such as temperature, nutrition and spacing and the condition of seeds used as planting material. The temperature in this study is quite high (26-36°C) which is the optimum temperature for bulb formation. This is as revealed by Dinarti et al. [22] which revealed that high temperatures during the bulb-forming phase will lead to an increase in carbohydrate accumulation to bulb parts as well as enzymatic activity that increases the process of sucrose translocation to the bulb. No interaction between varieties with the concentration of GA₃ was applied (p>0.05).

The number of bulbs per hill produced will affect the weight of fresh bulbs per plant clump. Based on the result of correlation test, the number of bulbs per plant was positively correlated (62.4%) with the weight of fresh bulbs per plant clump, which means that the greater the number of bulbs per hill the weight of fresh bulbs per hill is also heavier. Based on the analysis of varieties, varieties affect the weight of fresh bulbs per plant grown (p<0.05). Bima varieties produce fresh bulb weight per plant clump 46.47 gram and lower than with varieties of Mentes yielding fresh bulb weight per plant of 59.01 gram. This is directly proportional to the number of bulb produced.

Based on the results of analysis of variance, the concentration of GA₃ did not significantly affect the weight of fresh bulbs per family of plants. Shallot without the application of GA₃ is able to generate fresh bulb weight higher than the shallot is applied GA₃. Asra [23] revealed that the administration of GA₃ could lead to an increase in the enzyme proteinase that converts the protein into amino acids and the enzyme lipase which converts fat into fatty acids and glycerol so the food reserves stored in the bulbs will become more mobile and can be transported evenly to all parts of the plant, this led to heavy fresh bulbs per family of plants that applied GA₃ tends to be lower than that of the untreated GA₃. No interaction between varieties used at a concentration of GA₃ was applied.
Table 5. Average weight of fresh bulb per ha (tons) and weight of dry bulb per ha (ton) on a wide variety, the concentration of GA$_3$ and the interaction between varieties and concentrations of GA$_3$

| Concentration of GA$_3$ (ppm) | Weight of fresh bulb per Ha (tons) | Weight of dry bulb per Ha (tons) |
|-------------------------------|-----------------------------------|-------------------------------|
|                               | Variety | Average | Variety | Average |
| 0 ppm                         | Bima    | 18.0    | Bima    | 15.6    |
|                               | Mentes  | 16.6    | Mentes  | 14.0    |
| 50 ppm                        | Bima    | 18.0    | Bima    | 15.1    |
|                               | Mentes  | 13.9    | Mentes  | 10.5    |
| 100 ppm                       | Bima    | 18.4    | Bima    | 14.8    |
|                               | Mentes  | 18.1    | Mentes  | 12.5    |
| 150 ppm                       | Bima    | 13.6    | Bima    | 10.2    |
|                               | Mentes  | 16.4    | Mentes  | 12.5    |
| 200 ppm                       | Bima    | 10.2    | Bima    | 8.9     |
|                               | Mentes  | 17.0    | Mentes  | 13.7    |

Average 15.7 16.4 12.9 12.7

Description: The numbers followed by the same letter are not significantly different based on the DMRT test of 5%

Based on the results of analysis of variance, variety and concentration of GA$_3$ did not significantly affect the fresh and dry weights per ha (p>0.05). The weight of fresh bulbs per high plant family is not always followed by the weight of fresh bulbs per Ha, as each individual plant produces different fresh bulbs. The weight of the dry bulb is used as the shallot productivity parameter. Bima varieties produce dried bulbs higher than the description. According Balitsa (2015) shallot varieties Bima produce 9.9 tons / ha dry bulbs, while this study varieties Bima able to produce an average of 12.9 tons / ha. Production of dried varieties of Mentes varieties according to descriptions of varieties of 12.7 tons / ha (range 7.10 - 27.58 tons / ha). According to Getahun [24] bulb yield is also affected by the type of soil and the availability of water both irrigation water and rain water. The availability of water at the time of the research is quite good, so the bulb productivity is also good. The concentration of GA$_3$ did not increase the weight of fresh and dried bulbs per hectare produced. This is presumably because the GA$_3$ applied too much (applied by immersion and spraying) so that the impact is likely to decrease the production of shallot. No interaction between varieties GA$_3$ were used at a concentration of GA$_3$ was applied.

The result of variance analysis showed that the varieties had significant effect on the percentage of small and large bulbs produced. Bima varieties produce more bulb (70.02%) than Mentes variety (56.61%), but lower yield small bulb (10.55%) than Mentes variety (20.79%). Bulb size is determined by the number of layers of bulbs that wrap the bulbs and the amount of moisture and nutrients that can be stored in the bulbs. The more layers of bulbs the larger the size. Each variety has its own differences in absorbing nutrients and producing photosynthesis. This difference is because each variety has a different metabolic processes so that the size of the bulbs will be different generated. Differences in response to this environment causes the difference in response to GA$_3$ was applied. Table 6 shows that the Mentes varieties applied GA$_3$ with a concentration of 50 ppm produced the highest percentage of large bulbs but lowest percentage of small bulbs and not significantly different from the Mentes varieties without the application of GA$_3$. Application of GA$_3$ concentration of 100 ppm, 150 ppm and 200 ppm tends to lower the percentage of large bulbs in the Mentes varieties and increase the percentage of small bulbs. This shows that the administration of GA$_3$ on the variety seems inappropriate Mentes so will reduce plant growth and development.
Table 6. Average percentage bulb size produced at multiple concentrations, a wide variety and interaction between varieties and concentrations of GA$_3$

| Concentration of GA$_3$ (ppm) | Percentage bulb size (%) | Bulb size | Varieties | Varieties | Average | Varieties | Varieties | Average |
|-------------------------------|--------------------------|-----------|-----------|-----------|---------|-----------|-----------|---------|
|                               | Small | Medium | Large | Small | Medium | Large | Small | Medium | Large |
|                               | Bima | Mentes | Bima | Mentes | Bima | Mentes | Bima | Mentes | Bima |
| 0 ppm                         | 3.4 a* | 12.2 ab* | 7.8 | 9.1 | 18.0 | 18.5 | 77.5 cd | 69.8 bcd | 73.7 |
| 50 ppm                        | 3.4 a* | 34.3 c* | 18.9 | 14.5 | 29.4 | 21.9 | 82.1 cd | 36.2 a | 59.2 |
| 100 ppm                       | 9.0 ab* | 21.4 bc* | 15.2 | 24.1 | 26.3 | 25.2 | 66.9 bcd | 52.3 ab | 59.6 |
| 150 ppm                       | 16.5 ab* | 21.5 bc* | 19.0 | 18.0 | 23.7 | 20.8 | 65.6 bcd | 54.8 abc | 60.2 |
| 200 ppm                       | 20.5 bc* | 14.6 ab* | 17.5 | 21.5 | 15.5 | 18.5 | 58.0 abcd | 69.9 bcd | 63.9 |
| Average                       | 10.55 a | 20.79 b | 19.42 | 22.60 | 70.02 b | 56.61 a |

Description: The number followed by the same letter has no real effect based on the 5% DMRT test and the 10% level (*).

GA$_3$ were applied to Mentes variety is different result with GA$_3$ were applied to Bima variety. Table 6 shows that the administration of GA$_3$ at concentrations of 50 ppm produces large bulbs lowest and highest small bulbs on Mentes varieties. They show a real difference to Mentes varieties without application of GA$_3$. Application of GA$_3$ with a concentration of 100 ppm, 150 ppm and 200 ppm (Table 6) showed a tendency to increase the percentage of large bulbs and lower percentage of small bulbs although not significantly different to Test the varieties without the application of GA$_3$. This shows that the administration of GA$_3$ on Test the variety does not really give a higher impact compared to Test the varieties without the application of GA$_3$. Large bulb are better when used as seeds, but it is recommended to use medium bulbs because it is more economical [20], whereas for consumption is preferred for large bulbs because it stores more photosynthate and more layers that surround it so it is not easy to shrink.

4. Conclusion

Bima variety of shallot which planted in lowland can be flowering on average at 30 DAP with low percentage of flowering plants per plot (average 19.57%) and low seed yield (0.36 gram / stalk).Mentes varieties can not bloom or produce seed if planted in lowland. GA3 applied to the varieties of Bima concentration of 200 ppm able to produce high flower stalk per ha (134,567 stalks / Ha) and accelerate flowering (29 DAP). On Mentes varieties, GA3 application has no effect on flowering and seed formation. Interaction between varieties with a concentration of GA$_3$ shown on bulbs quality. Application of GA$_3$ in Bima varieties tend to lower the percentage of large bulbs and increase the percentage of small bulbs, while the application of GA$_3$ on Mentes varieties tends to increase the percentage of large bulbs and reduced the percentage of small bulbs produced per clump.

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