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EFFECT OF SHADING LEVEL THE GROWTH AND YIELD OF SHALLOT PLANTS SEED (*Allium ascolonicum,* L)

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ABSTRACT

Shallots (*Allium ascolonicum,* L) are one of the horticultural crops that are widely consumed as a mixture of cooking spices. Shallots are one of the priority commodities in the development of lowland vegetables in Indonesia, which are quite strategic and economical in terms of farming profits. The development of shallot farming in Indonesia is directed at increasing yields, production quality and income as well as improving farmers' living standards. In Indonesia shallot cultivation generally uses tubers as planting material. This is because planting with bulbs is considered more practical and easy and has a high success rate. However, the use of tubers actually has many weaknesses, especially with regard to quality as seed, supply and management, including storage and distribution. The purpose of this study was to determine the effect of shade level on the growth and yield of shallot plants from seed. This research was conducted in Lolu Village, Sigi Biromaru District, Sigi Regency, Central Sulawesi Province. The research is from January to March 2021. This research was conducted using a Randomized Block Design (RBD) which consists of 5 levels of shade, namely N0 = No Shade, N1 = 9% Shade, N2 = 18% Shade, N3 = 38% Shade and N4=Shade 50%. Each treatment was repeated 3 times so that there were 15 experimental units. Parameters observed were plant height, number of leaves, number of tillers per clump, number of tubers per cluster, tuber circumference, fresh weight of tubers per cluster, weight of tuber per tile, tuber weight per ha and weather variables. The data analyzed using analysis of varian (ANOVA). If the results of the analysis show influence, then it is continued with the Honest Significant Difference (HSD) test at 5% level. The results of this study showed that the level of shade had a significant effect on the observed variables of tuber fresh weight, tuber weight and tuber weight per hectare, but on the variables of plant height, number of leaves, number of tillers, number of tuber clumps and tuber circumference had no significant effect. The 18% shade gives the best yields.

Keywords*:* Shallots, Shade, Growth and Yield of Onion Bulbs.

INTRODUCTION

Shallots (*Allium ascolonicum,* L) are one of the horticultural crops that are widely consumed as a mixture of cooking spices. Shallots are one of the priority commodities in the development of lowland vegetables in Indonesia, which are quite strategic and economical in terms of farming profits. The development of shallot farming in Indonesia is directed at increasing yields, production quality and income as well as improving farmers' living standards (Directorate General of Marketing and Processing of Agricultural Products, 2006).

According to AAK (2004), the physical morphology of shallots can be divided into several parts, namely roots, stems, leaves, flowers, fruits and seeds. Shallots have fibrous roots with a shallow root system and branched scattered, at a depth of 15-20 cm in the soil with a root diameter of 2-5 mm.

Shallots are best planted in the lowlands or at an altitude of about 30 m above sea level. Annual rainfall required is around 1000-2000 mm/year. The temperature for this plant is 25-32ºC, moderate humidity, and enough direct sunlight. The important soil type is sandy loam or silty loam with a rich (pH) of 6-6.8. The depth of groundwater should be about 50 cm from the ground surface (Wibowo, 2005).

Based on data from the Department of Agriculture in 2019 shows that in 2015 the yield of shallots was 8,869 tons/ha with a harvested area of 1,670 ha. Furthermore, in 2016 the yield of shallots was 9,088 tons/ha with the harvested area of onions reaching 1,804 ha. Meanwhile, onion production in 2017 has a harvested area of 1,732 ha with a yield of 8,651 tons/ha and in 2018 shallot production decreased with shallot harvested area reaching 1,599 ha with a yield of 8,362 tons, and the yield per hectare reached 14.88 ha. The unstable shallot production from year to year is caused by several factors, one of which is unfavorable climatic conditions such as high rainfall. (Department of Agriculture Sulawesi Tengah, 2019).

One of the external factors that can affect the growth and production of shallots is light intensity. Sunlight is one of the important factors that can affect the rate of photosynthesis. Shade treatment can affect chlorophyll content because the amount of light absorbed by plants is lower (Yuliarti, 2010). This is in line with Pantilu et al (2012) which states that high light intensity will affect the destruction of chlorophyll, faster transpiration, and the occurrence of chlorosis. Meanwhile, low light intensity will affect the limitation of photosynthesis and cause food reserves to tend to be used more than stored and close stomata due to slow CO2 diffusion.

Shade can be used to distinguish the intensity of light received by plants underneath. Providing shade can reduce air temperature and increase humidity. Shading can be done using of the paranets. (Nagasubramaniam et al., 2007). According to Hartanto (2009), 75% shade gave the highest yield among other treatments on onion plants on the parameters of plant length and number of leaves. According to Moekasan (2012), shade in the tropics has a function as a protector against pests, direct rain and wind exposure. Meanwhile, according to Gunadi and Sulatrini (2013), that the advantages of using shade to reduce the intensity of sunlight by 30% to 40%, the humidity of the air around the canopy is more stable, which is around 60% to 70%.

The purpose of this study was to determine the effect of shade level on the growth and yield of shallot plants from seed.

RESEARCH METHODS

This research was conducted in Lolu Village, Sigi Biromaru District, Sigi Regency, Central Sulawesi Province. The research starts from January to March 2021. The tools used in this research are, meters, hoes, shovels, waterwheels, thermohygrometers, lux meters, cameras, and analytical scales. The materials used are shallot seeds of Lokananta variety. ,

Organic fertilizer, NPK Mutiara fertilizer, 9% paranet, 18% paranet, 38% paranet and 50% paranet.

The experimental design used in this study used a Randomized Block Design with a one-factor experiment consisting of 5 Shade Levels, namely: N0 = No Shade (Control), N1 = 9% Shade, N2 = 18% Shade, N3 = 38 Shade % and N4 = Shade 50%. Each treatment was repeated 3 times so that there were 15 experimental units.

Seeding. True Shallot Seed (TSS) shallot seeds were sown until 36 days old, beds for nursery were made with a length of 2 meters, a width of 1 meter and a bed height of 30 cm, then an array (line) was made on the surface of the beds with a distance between the arrays of 5 cm and an array depth of 1 cm. Then the seeds are sown in rows, the distance between the seeds is 2-3 cm.

Soil Processing. Soil tillage is done by plowing with a hand tractor, to loosen and clear the plants of weeds. Then the beds are made with a width of 1 meter and a length of 1.50 meters and the distance between beds is 30-40 cm, then the plots are made of tiles with a size of 40cm x 45cm. Adjusting the height of the bed is done by taking the soil from the edge of the bed, the height of the bed is about 30 cm.

Paranet Shade Installation. The shade used in this study was black network shade (fisnet), the installation of the shade begins with the preparation of black nets, the manufacture of a shade frame from bamboo, the shade height is 2 m from the surface of the bed. Then install a black net or paranet by attaching a black net to the shade frame.

Planting. Before planting, the shallot seeds are selected by sorting the categories of good and bad seeds. Good seeds are fresh green seeds, 6 weeks old seeds, have 5-6 leaves and seeds that are already standing strong or strong. Planting is done when the seedlings are 30 day after planting. In each bed, a hole was made with a spacing of 15 cm x 20 cm, then 1 onion seed was planted in each hole.

Maintenance. TSS shallots were watered every day in the morning and evening. Embroidery works to replace plants that have died, wilted, damaged or have abnormal growth. Embroidery is done after the onion plants are 1 week old. Weeding aims to remove weeds in the planting area. The growth of a lot of weeds will reduce nutrients and have an impact on the growth of shallot plants.

Fertilizer. fertilizer used is NPK fertilizer as a basic fertilizer at a dose of 100 kg/ha or 40gr/plot by spreading evenly a day before planting. Biotren liquid fertilizer is given 1 week after planting. Liquid fertilizer spraying was carried out 2 times.

Pest and disease control is carried out when plants are attacked, control them using pesticides such as prefaton and antracol fungicide.

Harvest. Harvesting on shallots is done at the age of 70 day after planting or already has characteristics such as the bulbs have started to turn red then the leaves have started to fall down and turn yellow.

Observation variables included plant height, number of leaves, number of tillers, number of tubers per clump, bulb circumference, tuber fresh weight, tuber weight per tile, tuber weight per ha and weather variables.

Plant height. Plant height was measured from the base of the stem to the top of the plant using a measuring tape or ruler. Plant height measurements were carried out 2 weeks after planting with an interval of 1 week. Measurement of onion plant height is carried out until harvest

Number of Leaves. The number of leaves was calculated after the shallot plants were 2 week after planting with an interval of 1 week by counting the number of leaves that grew perfectly.

Number of tillers per clump. The number of tillers per clump was counted when the plants were 60 days old or at harvest.

Number of Bulbs Per-clump. The number of bulbs is done by counting the total number of onion bulbs at harvest.

Bulb Circle. The circumference of the bulbs is done by measuring the external physical of the shallot plant and using a tool in the form of a meter. Measurement of tuber circumference was carried out after the plants were 60 days old or at harvest.

Fresh Weight of Bulbs Per-clump. Fruit weight per clump was carried out by weighing all tubers in each plant sample. Weighing is done using a digital scale.

Weight of tubers per tile. The weight of the tubers per tile was carried out by weighing all the shallot bulbs in 6 clumps. Observation of tuber weight was carried out using a digital scale.

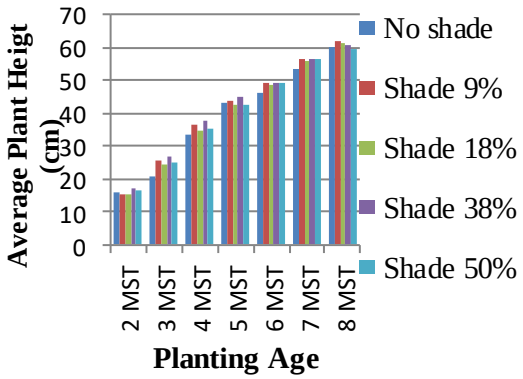
Bulbs Weight Per Ha. Bulb weight per Ha is done using the formula.

Weather Variables. The weather variable is a variable to determine the microclimate on the growth of shallot plants by measuring radiation intensity (Lux), daily temperature and humidity (%).

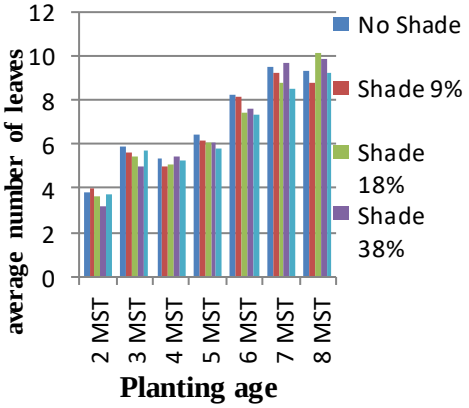
RESULTS AND DISCUSSION

Based on the observations obtained, it is shown that the level of shade has no significant effect on the observation of plant height. At the age of 2,3,4 and 5 week after planting, the plant height tended to be higher in the shade treatment 38%, while at the age of 6,7 and 8 week after palnting, the plant height was higher in the 9% shade treatment.

Based on the results of observations of the number of leaves obtained, it shows that the level of shade does not significantly affect the number of leaves observed. At the age of 2 week after planting the number of leaves was more in the 9% shade treatment with a value of 3.98 sheet. At the age of 3 week after planting the number of leaves was higher in the treatment without shade with a value of 5.88 sheet. At the age of 4 week after planting the number of leaves was higher in the shade treatment 38% with a value of 5.48 sheet. at the age of 5 and 6 week after planting the number of leaves tended to be higher in the treatment without shade. At the age of 7 week after planting the number of leaves was higher in the shade treatment 38% with a value of 9.72 sheet and at the age of 8 week after planting the number of leaves was higher in the shade treatment 18% with a value of 8.8 sheet



Picture1. Histogram of Planting Height Weeks after Planting .



Picture 2. Hitrogram number of leaves weeks after planting.

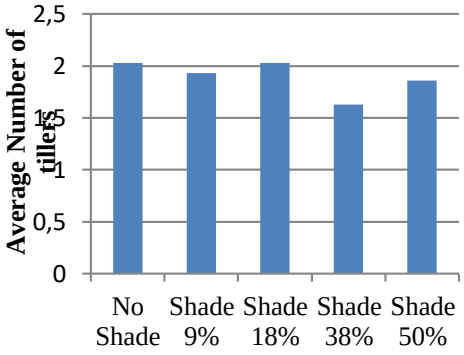
Based on observations, it was shown that the number of tillers and the number of tubers per clump tended to be higher in the treatment without shade, 9% shade and 18% shade. This is caused by the intensity of light and nutrients received by plants.

Based on the results of observations showed that the circumference of the bulbs tended to be higher in the 50% shade treatment with a value of 11.63 cm. This is

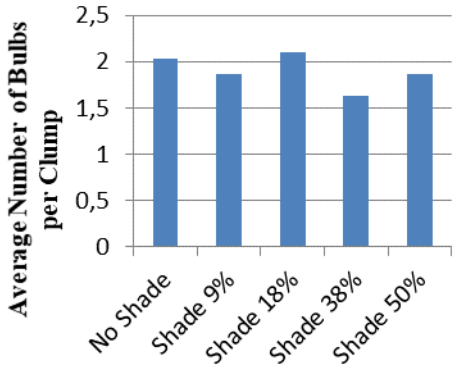
due to the intensity of light and nutrients received by plants, because large tubers really need sufficient light intensity and nutrients.

BNJ test results level 5% (Table 1). that the 18% shade showed the fresh weight of tubers with the highest value of 74.77g not different from treatment without shade, 9% shade, and 38% treatment, but different from giving 50% treatment with an average value of fresh weight of tubers that was 46.44g .

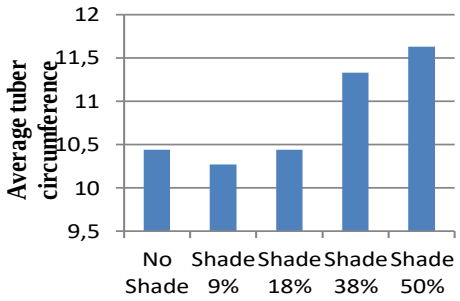
BNJ test results level 5% (Table 2). that the administration of 18% showed the weight of tubers with the highest value of 448.6g not different from treatment without shade, 9% shade and 38% treatment, but with treatment giving 50% with an average value of tile that was 277.66g.



Picture 3. Histogram Number of tillers



Picture 4. Histogram Number of Bulbs per Clump.



Picture 5. Histogram tuber circumference

BNJ test results at 5% level (Table 3). Showed that the tuber weight Per-Ha was highest in the shade treatment of 18% with an average value of 19.93 tons, not different from the treatment without shade, 9% shade, and 38% shade, but different from the 50% shade treatment with an average value. the lowest average is 12.33 tons.

Table 1. Average Fresh Weight of Bulbs per Clump (g) Shallots at Various Percentages of Shade.

Treatment	Average
No Shade	68,44[ab]
Shade 9%	70,77[b]
Shade 18%	74,77[b]
Shade 38%	65,11[ab]
Shade 50%	46,44[a]
BNJ 5%	22.65

Note: Numbers followed by the same letter, not different at the BNJ test level 5%.

Table 2. Average Value of Bulb Weight per Tile (g) Shallots in Various Shade Percentages.

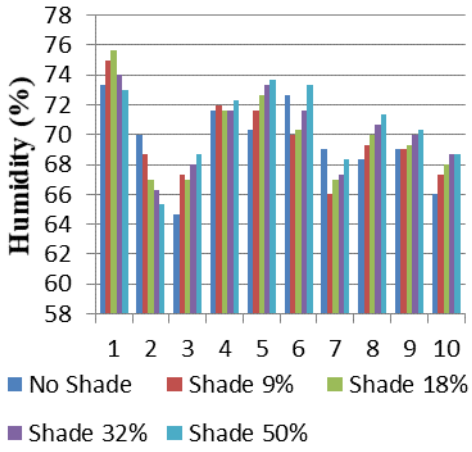
Treatment	Average
No Shade	410,66[b]
Shade 9%	424,6[b]
Shade 18%	448,6[b]
Shade 38%	390,66[ab]
Shade 50%	277,66[a]
BNJ 5%	131,37

Note: Numbers followed by the same letter, not different at the test level BNJ 5%

Table 3. Average Value of Bulbs Weight per Ha (Tons) of Shallots in Various Shade Percentages.

Treatment	Average
No Shade	17,53[ab]
Shade 9%	18,87[ab]
Shade 18%	19,93[b]
Shade 38%	17,36[ab]
Shade 50%	12,33[a]
BNJ 5%	9,06

Note: Numbers followed by the same letter, not different at the test level BNJ 5%



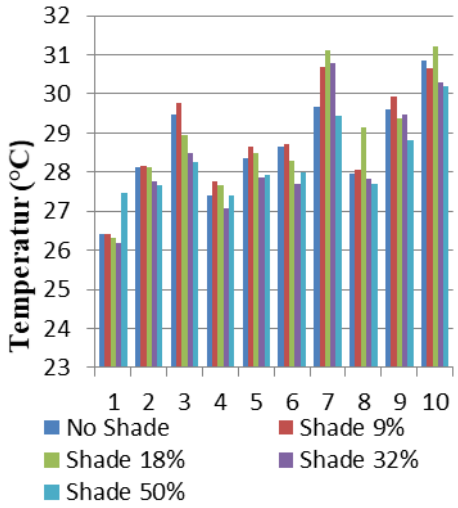
Picture 6. Daily Humidity (%) of Level Treatment Shade For 10 days.

Weather Variables.

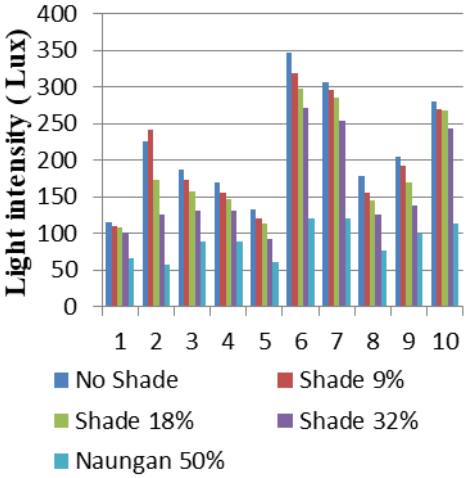
The results of daily air temperature measurements show that the average air temperature received by shallot plants changes every day. In measurements, the temperature range is between 26-31°C.

The results of daily humidity measurements show that the humidity in shallot plants increases every day. The daily humidity measurement tends to be higher at the 50% shade level. This is because the light intensity received is small. In the measurements, the humidity range was between 64-73%.

The results of daily air temperature measurements show that the average air temperature received by shallot plants changes every day, but there are treatments that tend to have a higher average air temperature value, namely at the shade level of 18%. Where in the measurement of air temperature, the temperature range is between 26-31°C.



Picture 7. Daily Temperature of Level Treatment Shade For 10 days



Picture 8. Daily Light Intensity (Lux) of Level Treatment Shade For 10 days

The results of the light intensity measurement show that the light intensity received by the shallot plant is very high. In the measurements obtained, the light intensity range is between 60-345 lux.

Discussion

Based on the research data, it showed that the shade treatment had a significant

effect on the components of fresh weight of tubers per clump, tuber weight per ha and tuber weight per tile. Meanwhile, the variables of plant height, number of leaves, number of tillers, number of tubers in the clump and bulb circumference of the shade level did not have a significant effect. Shallot plants with a 50% shade level have low plant height, this is because the intensity of light received by plants is only slightly. In contrast to plants that are in 9% shade, 18% shade and 38% shade.

One of the external factors that can affect the growth and production of a plant is light intensity. Sunlight is an important factor that can affect the rate of photosynthesis in plants that have chlorophyll. Shading treatment can affect the chlorophyll content because the amount of light absorbed by plants is lower. This is in line with Handriawan (2016) who stated that the higher the level of shade, the lower the level of sunlight received by plants. The low light intensity during plant development will cause etiolation symptoms caused by the activity of the auxin hormone.

There was a significant effect of shading on fresh tuber weight, tuber weight per tile and tuber weight per hectare, indicating that the 18% shade level gave better results. In the 18% shade the yield of fresh weight of tubers was 74.77g, for the shade 18% the yield of tuber weight per tile was 448.6g and the 18% shade yielded 19.93 tons/Ha, this is because at the level of 18% shade has the optimum temperature, humidity and light intensity where the plants are growing well.

The results of measurements of temperature, humidity and light intensity are obtained in the temperature range between 26-31°C, the air humidity range between 64-73% and the light intensity range between 60-345 Lux. This is in accordance with the results of research (Arlingga, 2014) which proves that daily air temperature, radiation intensity and humidity received by plants affect the growth of shallot plants.

The no shade treatment had air humidity ranging from 70-80%, the air humidity range in the 55% shade treatment was 69-79%, while the air humidity range in the 75% shade was 70-83%. Other research on onions shows that these plants can grow in a temperature and humidity range of 25-30 °C and 35-70%, respectively, and get enough direct sunlight (Purwanti and Taryono, 2018).

The rate of photosynthesis is affected by the intensity of light. An increase in the rate of photosynthesis occurs when the light intensity increases. When the light intensity is low, the rate of photosynthesis decreases. Each plant species has an optimal range of light intensity for the photosynthesis process to increase growth and production (Alfii et al, 2013).

Transpiration in plants is affected by light intensity. High light intensity will cause the water content in the tissue and soil water content to decrease due to high transpiration. Low light intensity conditions cause adequate soil and tissue water content, so that the transpiration process in plants does not increase (Pallas et.al, 1967).

CONCLUSIONS

The provision of shade with various percentages had a significant effect on the observed variables of tuber circumference, tuber weight and tuber weight per hectare, but on the variables of plant height, number of leaves, number of tillers, number of tubers and fresh weight of tubers had no significant effect. The higher the level of shade used inhibit the growth of shallots from seed. The use of shade for shallot plants tolerates 0% to 18% shade.

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