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Production Parameters of Three Varieties of Red Onion Origin of Botanical Seed Applied With Auxin

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ABSTRACT

Shallots are one of the horticultural commodities that are highly expected to be cultivated intensively. The need for shallots nationally increases from year to year. These needs cannot be increased by increasing national production. One thing that can be done to make shallots available is to use good varieties and provide growth regulators with auxin using botanical seeds (True Shallot Seed) as a seed source. This study aims to determine the effect of the interaction between varieties with auxin concentration on the growth and production of shallots. This research was carried out in the Exfam Land, Faculty of Agriculture, Hasanuddin University, Makassar, South Sulawesi Province and took place from August to November 2021. This study used a Split plot design which consisted of two factors, the first factor as the main factor being different plant varieties, namely Lokananta, Maserati, and Sanren. While the sub-plot is the concentration of Auxin consisted of 4 levels, namely 0 mg L^{-1}, 100 mg L^{-1}, 200 mg L^{-1}, and 300 mg L^{-1}. The experimental results showed that the red onion variety using the variety with a concentration of 200 mg L^{-1} gave the best results on the fresh weight of shallots (123.80 g), the dry weight of shallots (93.77 g), the tuber weight of (86.63 g/plot), tuber production (4.51 kg/plot), and productivity (19.50 ton ha^{-1}). The treatment of shallot varieties using the Sanren variety gave the best results on the parameters of the number of bulbs (1.89 bulbs). The application of auxin at a concentration of 300 mg L^{-1} gave the best results on the tuber diameter parameter of 28.42 mm.

Keywords:
Auxins; Concentration; Shallots; Variety

1. Introduction

Shallots are horticultural crops that have economic value. This commodity has good potential and opportunities if it is developed intensively. The need for shallots nationally increases from year to year. This increase in demand cannot be matched by an increase in national production. It can be seen from the level of shallot consumption in 2020 reaching 2,699 kg/capita/year (Sekretariat Jenderal Kementrian Pertanian, 2021). National shallot production has increased in the last three years. In 2018, shallot production was 1,503,436 tons, in 2019 it increased to 1,580,247 tons, and in 2020 it was 1,815,445 tons. Even though there is an increase in production, the need for shallots is not sufficient because they are needed every day, especially as a cooking spice and can

be used as industrial raw materials, so efforts need to be made to increase production so that shallots are available (Statistic Indonesia, 2019).

The availability of quality seeds is one of the causes of the low production of shallots. Technically, the propagation of shallots can be done vegetatively or generatively by using bulbs and seeds (Samadi, 2009). Generally, farmers use tubers as planting material without quality standards for seeds that are suitable for planting, causing low quality and productivity. The use of tubers as seeds has a drawback, namely the accumulation of diseases carried on tubers that are propagated through continuous vegetative propagation. The solution that can be applied to overcome the insufficient production of shallots is the use of botanical seeds (True Shallot Seed or TSS) as a seed source. Selection of seeds in the form of TSS seeds has many advantages including high productivity (can reach 2 times compared to tuber seeds), healthier plants, more efficient use of seeds (about 5-7 kg ha^{-1}), and lower production costs, relatively long shelf life (1-2 years), warehouse handling, distribution, and transportation are also easier (Aryana et al., 2019). In addition, the advantages of TSS seeds are that they can produce healthier plants and of higher quality because they are free from disease pathogens (Sumarni et al., 2012).

The selection process of varieties is an important aspect of improving cultivation techniques. In addition, the selection of varieties is also a determining factor for the result of plant production. The genetic traits carried by plants and the adaptation of plants to the environment are the determinants of production, both quality and quantity. The excellent varieties generally have high production, stand with plant-disturbing organisms, and tolerate certain ecological conditions, so that they can increase plant productivity (National Law Development Agency, 2018). In addition, giving of growth regulator in the form of auxin also plays an important role in increasing plant productivity. Growth regulator can qualitatively encourage and change plant growth and development. Naturally, plants produce growth hormones that affect plant growth, differentiation and development. To improve its performance, it is necessary to add exogenous hormones so that the content increases and has a balanced condition. The effectiveness of growth regulators in plants is influenced by the concentration given, because the differences in concentration will cause different activity. Auxin plays a role in growth to stimulate the process of cell elongation, the formation of lateral roots and fibrous roots that cause the process of water and mineral absorption to run optimally (Pramita et al., 2018). In addition, Auxin also plays a role in spurring the process of root formation and better root growth, spurring stem growth as a plant organ, stimulating apical shoot growth, and playing a role in the tuber formation process (Wiraatmajaya, 2017). Therefore, to increase the production of shallots, a research on plant production parameters can be carried out which aims to determine the interaction between three shallot varieties and several concentrations of auxin and to examine the growth response of shallots from botanical seeds on the growth and production of shallots.

2. Materials and Methods

2.1 Place and Time

This research was conducted in the Experimental Farm of the Faculty of Agriculture, Univesitas Hasanuddin, Makassar. This research was conducted in the dry season Schmidt-Ferguson climate classification type C from August to November 2021.

2.2 Research Design

This research was implemented in the form of an experiment arranged by the Split Plot Design (SPD). This study consisted of two factors, the first factor as the main factor was different plant varieties, namely Lokananta (v1), Maserati (v2), and Sanren (v3). While the second factor as a sub-plot is the concentration of Auxin which consists of 4 levels, i.e., 0 mg L^{-1} (k0), 100 mg L^{-1} (k1), 200 mg L^{-1} (k2) and 300 mg L^{-1} (k3). Observational data obtained were then analyzed by analysis of variance (ANOVA) at a 95% confidence level. If it has a significant effect, it will be tested further using the 0.05 Least Significant Difference (LSD) test.

2.3 Procedure Methodology

Land preparation was carried out by clearing and tiling until the land was formed in the form of plots until the number of treatment plots. Tillage aims to create a loose tillage layer, and remove weeds or crop residue. The land was processed by using a tractor then was made into 36 beds with a distance between plots was 50 cm and length of 1.2 m x 2 m and height of 20 cm.

Fertilization is done twice, namely basic fertilization and supplementary fertilization. Basic fertilization was carried out before transplanting by using manure as much as 2.4 kg at a dose of 10 tons ha^{-1}, trichoderma at a dose of 10 kg ha^{-1} and organic fertilizer in the form of NPK Ponska fertilizer as much as 16.9 g/plot with a dose of 400 kg ha^{-1}, urea as much as 12 g/plot with a dose of 150 kg ha^{-1}, and SP36 as much as 7 g/plot with a dose of 100 kg ha^{-1}. The fertilizer dose given is based on the results of the analysis and the use of the fertilization formula, namely the area of the plot divided by 10,000 and then multiplied by the dose of fertilizer given. After that, supplementary fertilization was carried out 2 times, the first at the age of 21-28 days after planting (DAT) using NPK fertilizer (16.9 g/plot) and Za fertilizer (48 g/plot) and sown evenly on the beds. The second follow-up fertilization at the age of 42-49 DAP using NPK fertilizer (16.9 g/plot).

The plant distance used is 15 cm x 10 cm by the spacing of shallots from seed (TSS) with 1 seed per hole. Seedlings are transferred to the field for planting. Planting is done on the same day according to the age of the seeds that have been sown. Before planting the seeds are soaked with a fungicide solution to prevent pests.

The application of Auxin growth regulators was carried out after the plants were 2 weeks old from planting by spraying. This spraying is carried out in the afternoon and given 2 times at the age of 14 days after planting and 28 days after planting

Shallot maintenance activities include embroidery, irrigation/watering, weed control, soil loosening, and pest and disease control according to experimental applications. Shallot plants originate from seeds, about 80% of the leaves have started to fall or yellow and dry and the tuber stems are drooping. Harvesting is done by removing the tubers and their roots and weighing them with an analytical scale. The post-harvesting technique is carried out by drying the tubers along with their leaves and roots or drying them for a week and then weighing them as dry weight.

2.4 Statistical Analysis

Parameters of research were leaf wet weight of plants, dry weight of plant, bulb dry weight, diameter of tuber, number of bulbs, production of tubers per plot and productivity. The data were analyzed by analysis of variance (ANOVA) at the 95% confidence level. If it has a significant effect, it will be tested further using the 0.05 LSD test.

3. Results and Discussion

3.1 Result

3.1.1. Components of the production

The interaction of shallot varietal treatment with auxiliaries with various concentrations was significant on the production parameters of shallots, such as fresh weight of stover, dry weight of stover, dry weight of tubers, tuber diameter, number of tubers, tuber moisture content, tuber production per plot and productivity. However, the concentration treatment had a significant effect on the tuber number parameter, while the auxin concentration treatment had a significant effect on the tuber diameter parameter, the result was A/D ratio >1.0. All plant production parameters can show real values so that further testing can be carried out.

Table 1. Results of ANOVA and components of the production.

Component	Variety	Concentration of Auxin	Interaction
Wet weight of plants	4876.78*	1425.01**	6786.14**
Dry weight of plant	2642.97**	750.69**	574.56**
Bulb Dry Weight	2138.68**	682.07**	506.66**
Tuber diameter	45.55 ns	8.77**	1.48 ns
Number of onion bulbs	2.56**	0.04 ns	0.01 ns
Production	6.67**	1.79**	1.58**
Productivity	105.34*	35.63**	25.11**

Remarks:**Hightly significant at 1% level (P<0.01), *Significantly influential at 5% level (0.01<P<0.05), ns: Not significant (P>0.05).*

3.1.2. Wet weight of plants

The results of observational data on plant fresh weight parameters showed that the interactions that occurred between shallot varieties and auxin concentrations had a very significant effect. The results of the LSD test (α = 0.05) Table 2 shows that the average fresh weight of safe plant (plant parts) of the best shallots in the treatment of varieties, namely the Sanren variety (v3) and significantly different from the Maserati variety (v2) and Lokananta variety (v1). While the treatment of auxin concentration in Lokananta which gave the highest average fresh weight of stover was v1k3 (103.10 g/plot) and significantly different from v1k2 (91.37 g/plot), v1k3 (84.73 g/plot) and v1k0 (57.23 g/plot). The Maserati variety and the concentration that gave the highest

fresh weight of shallot plant stem at v2k1 (123.80g/plot) and significantly different from v2k2 (96.79 g/plot), v2k3 (73.00 g/plot) , and v2k0 (72.52 g/plot) . The treatment of Sanren variety (v3) and the concentration that gave the highest fresh weight of shallot plant stem at v3k2 (127.93 g/plot) and not significantly different from v3k3 (125.17 g/plot), v3k0 (119.37 g/plot).), v3k1 (119.23 g/plot).

Table 2. Average fresh weight of shallots against various varietal treatments and auxin concentrations.

Varieties	Auxin Concentrations				CV. LSD 0.05
	0 mg L^{-1} (k0)	100 mg L^{-1} (k1)	200 mg L^{-1} (k2)	300 mg L^{-1} (k3)	
Lokananta (v1)	57.23^{c}_{q}	84.73^{b}_{p}	91.37^{c}_{p}	$\mathbf{103.10}^{a}_{p}$	
Maserati (v2)	72.53^{bc}_{r}	$\mathbf{123.80}^{a}_{p}$	96.97^{bc}_{qr}	73.00^{b}_{r}	26.12
Sanren (v3)	119.37^{a}_{p}	119.23^{a}_{p}	$\mathbf{127.93}^{a}_{p}$	125.17^{a}_{p}	
CV. LSD 0.05	22,41				

Remarks: *CV= comparison value , numbers that followed by the same letter in row (a,b,c) and column (p,q,r) were not different in the LSD test a=0.05*

3.1.3. Dry weight of plant

The results of observational data on dry weight parameters of safe plants (plant parts) showed that there was an interaction between shallot varieties and auxin concentration which had a very significant effect.

Table 3. Average dry weight of the red onion stove against various treatments of varieties and concentrations of auxin

Varieties	Auxin Concentrations				CV. LSD 0.05
	0 mg L^{-1} (k0)	100 mg L^{-1} (k1)	200 mg L^{-1} (k2)	300 mg L^{-1} (k3)	
Lokananta (v1)	36.13^{c}_{q}	59.33^{c}_{p}	66.43^{c}_{p}	$\mathbf{71.73}^{bc}_{p}$	
Maserati (v2)	59.57^{b}_{s}	$\mathbf{93.77}^{a}_{p}$	79.83^{ab}_{q}	60.17^{c}_{rs}	16.88
Sanren (v3)	85.97^{a}_{q}	79.50^{b}_{q}	$\mathbf{95.90}^{a}_{p}$	90.87^{a}_{pq}	
CV. LSD 0.05	16.36				

Remarks: *CV= comparison value , numbers that followed by the same letter in row (a,b,c) and column (p,q,r) were not different in the LSD test a=0.05*

The results of the LSD test (α=0.05) Table 11 shows that the average dry weight of the best shallot plant stover in the treatment of the Sanre variety (v3) is v3k2 (95.90 g/plot) and significantly different from v1k3 (90.87 g/plot), v1k0 (85.97 g/plot) and v1k1 (79.50 g/plot). The treatment of Maserati varieties and concentrations that gave the highest fresh weight of shallots at v2k1 (93.77 g/plot) and significantly different from v2k2 (79.83 g/plot), v2k3 (60.17 g/plot) , and v2k0 (59.57 g/plot). The treatment of Lokananta variety (v1) and the concentration that gave the highest fresh weight of

shallot plant stem at v1k3 (71.73 g/plot) and not significantly different from v1k2 (66.43 g/plot), v1k1 (58.33g/plot). and significantly different from v1k0 (36.13g/plot).

3.1.4. Tuber dry weight

The results of the research on the parameters of the dry weight of tubers showed that there was an interaction between shallot varieties and the concentration of auxin which had a very significant effect. The results of the LSD test (α=0.05) Table 15 shows that the average dry weight of the best shallot bulbs in the treatment of varieties, namely the Sanren variety (v3) and significantly different from the Maserati variety (v2) and the Lokananta variety (v1). The treatment of Sanren variety that gave the highest average clump dry weight was v3k2 (88.10 g/plot) and was not significantly different from v3k3 (83.43 g/plot), and v3k0 (79.43 g/plot). Maserati varieties with the highest average dry weight clump were v2k1 (86.63 g/plot) and significantly different from v2k2 (73.87 g/plot), v2k3 (55.30 g/plot), and v2k0 (53.17 g/plot). The treatment of Lokananta variety (v1) and the concentration that gave the highest dry weight of shallot bulbs at v1k3 (66.53 g/plot) and significantly different from v1k2 (62.13 g/plot), v1k0 (53.80 g/plot). , v1k1 (32.80 g/plot).

Table 4. Average dry weight of the red onion clump against various varietal treatments and auxin concentrations

Varieties	**Auxin Concentrations**				**CV. LSD 0.05**
	0 mg L^{-1} (k0)	**100 mg L^{-1} (k1)**	**200 mg L^{-1} (k2)**	**300 mg L^{-1} (k3)**	
Lokananta (v1)	32.80^{c}_{r}	54.80^{c}_{q}	62.13^{c}_{pq}	66.53^{bc}_{p}	11.27
Maserati (v2)	53.17^{b}_{s}	86.63^{a}_{p}	73.87^{b}_{q}	55.30^{c}_{rs}	
Sanren (v3)	79.43^{a}_{pq}	72.07^{b}_{q}	88.10^{a}_{p}	83.43^{a}_{p}	
CV. LSD 0.05	10.32				

Remarks: *CV= comparison value , numbers that followed by the same letter in row (a,b,c) and column (p,q,r) were not different in the LSD test a=0.05*

Table 5. Average diameter of shallot bulbs against various varietal treatments and auxin concentrations

Varieties	**Auxin Concentrations**				**Average**	**CV. LSD 0.05**
	0 mg L^{-1} (k0)	**100 mg L^{-1} (k1)**	**200 mg L^{-1} (k2)**	**300 mg L^{-1} (k3)**		
Lokananta (v1)	23.53	20.04	26.22	26.67	24.11	4.21
Maserati (v2)	23.32	25.46	26.52	27.39	25.67	
Sanren (v3)	24.34	27.36	29.06	31.19	27.99	
Average	23.73^{r}	24.29^{qr}	27.26^{p}	28.42^{p}		
CV. LSD 0.05	2.28					

Remarks: *CV= comparison value , numbers that followed by the same letter in row (a,b,c) and column (p,q,r) were not different in the LSD test a=0.05*

3.1.5. Tuber diameter

The results of the observation of tuber diameter parameters showed that the auxin concentration treatment had a very significant effect, while the interaction had no

significant effect on tuber diameter. The results of the LSD test (α = 0.05) Table 5 showed that the average diameter of the best shallot bulbs in the auxin treatment with a concentration of 300 mg L^{-1} (k3) is 28.42 mm and is not significantly different from the auxin concentration of 200 mg L^{-1} (k2), namely 27.26 mm.

3.1.6. Number of onion bulbs

The results of observations on production parameters showed that the treatment of shallot varieties, auxin concentration, and interactions had a very significant effect on tuber production per plot. The results of the LSD test (α = 0.05) Table 6 shows that the average number of the best shallot bulbs in the variety treatment was the Sanren variety (v3) with an average number of bulbs of 1.89 and significantly different from the Maserati variety (v2) and Lokananta (v1) with a value of 1.11 bulbs and 1.07 bulbs, respectively.

Table 6. Average number of shallot bulbs against various varietal treatments and auxin concentrations

Varieties	Auxin Concentrations				Average	CV. LSD 0.05
	0 mg L^{-1} (k0)	100 mg L^{-1} (k1)	200 mg L^{-1} (k2)	300 mg L^{-1} (k3)		
Lokananta (v1)	1.11	1.00	1.06	1.11	1.07^{c}	
Maserati (v2)	1.17	1.11	1.00	1.17	1.11^{bc}	0.30
Sanren (v3)	2.00	1.78	1.83	1.94	1.89^{a}	
Average	1.43	1.30	1.30	1.41		
CV. LSD 0.05	0.14					

Remarks: *CV= comparison value , numbers that followed by the same letter in row (a,b,c) and column (p,q,r) were not different in the LSD test a=0.05*

3.1.7. Production

The results from observations on production parameters showed that the treatment of shallot varieties, auxin concentration, and interactions had a very significant effect on tuber production per plot.

Table 7. Average production of bulbs per plot of shallots against various varietal treatments and auxin concentrations

Varieties	Auxin Concentrations				CV. LSD 0.05
	0 mg L^{-1} (k0)	100 mg L^{-1} (k1)	200 mg L^{-1} (k2)	300 mg L^{-1} (k3)	
Lokananta (v1)	$1.77^{\frac{c}{q}}$	$2.96^{\frac{b}{p}}$	$3.36^{\frac{b}{p}}$	$\mathbf{3.59}^{\frac{bc}{p}}$	
Maserati (v2)	$2.87^{\frac{b}{r}}$	$\mathbf{4.51}^{\frac{a}{p}}$	$3.99^{\frac{\boldsymbol{a}}{\boldsymbol{p}}}$	$2.99^{\frac{c}{qr}}$	1.00
Sanren (v3)	$4.42^{\frac{a}{p}}$	$3.89^{\frac{ab}{p}}$	$\mathbf{4.71}^{\frac{\boldsymbol{a}}{\boldsymbol{p}}}$	$4.62^{\frac{a}{p}}$	
CV. LSD 0.05	1.00				

Remarks: *CV= comparison value , numbers that followed by the same letter in row (a,b,c) and column (p,q,r) were not different in the LSD test a=0.05*

The results of the LSD test (α = 0.05) Table 7 shows that the production of tubers per plot of shallots is the best in the variety treatment, namely the Sanren variety (v3). The concentration treatment that gave the best average tuber per plot for the Lokananta variety was v1k3 (3.59 kg/plot) and was not significantly different from v1k2 (2.36 kg/plot), and v1k1 (2.96 kg/plot). The Maserati variety that gave the best average tuber per plot was v2k1 (4.51 kg/plot) and was not significantly different from v2k1 (3.99 kg/plot). Meanwhile, the Sanren variety that gave the best tuber average was v3k2 (4.71 kg/plot) and was not significantly different from v3k3 (4.62 kg/plot), v3k1 (3.89 kg/plot), and v3k0 (4.42 kg/plot).

3.1.8. Productivity

The results of observing the production parameters of shallots showed that the variety of treatment, auxin concentration and interactions had a very significant effect on the productivity of shallots. The results of the LSD test (α=0.05) Table 8 shows that the average productivity of the best shallots was in the Sanren variety (v3) and the concentration that gave the highest productivity was at v3k2 (19.84 ton ha^{-1}) and was not significantly different from v3k3 (18.62 ton ha^{-1}), and v3k0 (17.68 ton ha^{-1}). The treatment of Maserati varieties and concentrations that gave the highest productivity were at v2k1 (19.50 ton ha^{-1}) and were not significantly different from v2k2 (16.62 ton ha^{-1}), v2k3 (12.44 ton ha^{-1}), and v2k0 (11.96 ton ha^{-1}). While the treatment of Lokananta variety (v1), namely v1k3 (ton ha^{-1}) was not significantly different from v1k2 (13.98 ton ha^{-1}).

Table 8. Average productivity in various varietal treatments and auxin concentrations

Varieties	Auxin Concentrations				CV. LSD 0.05
	0 mg L^{-1} (k0)	100 mg L^{-1} (k1)	200 mg L^{-1} (k2)	300 mg L^{-1} (k3)	
Lokananta (v1)	7.38 $^{c}_{q}$	12.33 $^{c}_{p}$	13.98 $^{b}_{p}$	**14.97** $^{ab}_{p}$	3.74
Maserati (v2)	11.96 $^{b}_{p}$	**19.50** $^{a}_{p}$	16.62 $^{ab}_{p}$	12.44 $^{b}_{p}$	
Sanren (v3)	17.68 $^{a}_{p}$	16.22 $^{b}_{p}$	**19.84** $^{a}_{p}$	18.62 $^{a}_{p}$	
CV. LSD 0.05	3.33				

Remarks: *CV= comparison value , numbers that followed by the same letter in row (a,b,c) and column (p,q,r) were not different in the LSD test a=0.05.*

3.2 Discussion

3.2.1. Interaction of shallot varieties treatment with auxin concentration

The results showed that the production of fresh weight of stover, dry weight of stover, dry weight of tubers, tuber production and productivity showed that the Sanren variety treatment with a concentration of 200 mg L^{-1} gave the best average of 123.80 gr, 93.77 gr, 86.63 gr, 4.51 kg/plot, and 19.50 ton ha^{-1}. While the application of auxin with various concentrations had a variety of production values, namely the Lokananta variety was able to give the highest value at 300 mg L^{-1} auxin concentration, the Maserati variety was able to give the highest value at 100 mg L^{-1} auxin concentration, and for the Sanren variety it was able to give the highest value at 200 mg L^{-1} auxin concentration. According to Fathonah (2018), IAA at certain concentrations can affect

plant growth. The best concentration is 200 mg L^{-1} but the optimum concentration is in the range of 100-300 mg L^{-1}. Auxin concentrations below 100 mg L^{-1} do not give good results for plant growth. According to Lilik (2011), auxin can increase the osmotic pressure of plants so that it will increase the process of water absorption by plants. Auxin will soften the cell wall so that there is an increase in the absorption of water by the cell. An increase in the formation of carbohydrates, proteins, and fats will ultimately increase the potential for yields. The process of tuber growth is closely related to the supply of carbohydrates, so during tuber growth there will be cell enlargement and division. The supply of carbohydrates is very useful as food energy.

Syam'un et al. (2019), stated that the difference in the productivity of each variety/cultivar does not only depend on its nature, but is also influenced by regional situations and conditions. Auxin in the process of plant development is able to encourage the formation of lateral roots. Lateral roots are usually found above the zone of hair root elongation and arise from small clusters of pericycle cells. Auxin can stimulate perished cells to divide. Divide cells gradually to form root shoots (Nasruddin et al., 2019). Roots are the main vegetative organs that play a role in the process of absorption of water and nutrients which are needed by plants in the metabolic process. The wider the reach of the roots, the wider the absorption of water and nutrients so that nutrient uptake can be optimal and nutrients can be fulfilled. This is in accordance with the opinion of Wiraatmajaya (2017), which states that auxin also plays a role in the process of root formation and better root growth and plays a role in the process of tuber formation.

3.2.2. The effect of shallot varieties

The results showed that the Sanren variety gave the highest average number of tubers (1.89 bulbs) compared to the Maserati (1.11 bulbs) and Lokananta (1.07 bulbs) varieties. It is assumed that the number of tubers of each variety is influenced by genetic factors of each variety. According to research Basuki (2009), the number of different tubers in each variety is influenced by genetic factors of each variety. In addition, according to research by Azmi et al., (2011), the character of the number of tubers is largely influenced by genetic factors and slightly influenced by the environment. In addition, according to Sumarni and Hidayat (2005) the difference in the number of shallot bulbs is more influenced by factors of variety, spacing, and size of seed tubers.

3.2.3. Effect of auxin concentration

The parameter of tuber diameter has a significant effect on the concentration of auxin. Shallots given auxin with a concentration of 300 mg L^{-1} gave the highest average tuber diameter of 28.42 mm. It is suspected that the administration of auxin is able to stimulate the formation of onion bulbs. According to Wiraatmajya (2017), auxin also plays a role in the process of root formation and better root growth and plays a role in the process of tuber formation.

4. Conclusion

The conclusion of the study stated that the treatment of shallot varieties using the Sanren variety with a concentration of 200 mg L^{-1} gave the best results on the fresh weight of shallots (123.80 g), the dry weight of shallots (93.77 g), the tuber weight of (86.63 g/plot), tuber production (4.51 kg/plot), and productivity (19.50 ton ha^{-1}). The treatment of shallot varieties using the Sanren variety gave the best results on the

parameters of the number of bulbs (1.89 bulbs). The application of auxin at a concentration of 300 mg L^{-1} gave the best results on the tuber diameter parameter of 28.42 mm.

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