



Effect of Nitrogen Levels on the Growth and Yield of Two Varieties of Shallots (*Allium Ascalonicum*)

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The aim of this research is to study the effect of giving a dose of Nitrogen fertilizer on the growth and yield of the onion plants of the Batu Ijo variety and the Cipanas Maja variety. The experiment was conducted in the experimental garden of the Faculty of Agriculture, University of Winaya Mukti, Tanjungsari District, Sumedang Regency with a height of 850 m above sea level from July 2018 - September 2018. The research design used was a factorial Randomized Block Design (RBD) consisting of two factors: the first factor onion (v) divided by 2 levels, namely v1 = onion variety of Batu Ijo, v2 = onion variety of Maja Cipanas, and the second factor was ZA fertilizer (n) divided by 4 levels namely n0 = 0 kg ha-1, n1 = 200 kg ha-1, n2 = 250 kg ha-1, n3 = 300 kg ha-1 is repeated 4 times. The results of the experiment showed that Nitrogen had no significant effect on growth and yield of onion of the Batu Ijo Variety and the Cipanas Maja Variety, the onion of the Cipanas Maja Variety produced higher dry tuber weights (1.62 kg / plot or 16.17 tons /ha) than onion Batu Ijo Variety (1.41 kg/plot or 14.07 tons/ha), optimum dose of Nitrogen not identified.

Keywords: Onion Varieties Batu Ijo, Onion Variety Maja Cipanas, Nitrogen

Abstract

This research aims to study the effect of giving nitrogen fertilizer doses on the growth and yield of shallot plants of the Batu Ijo variety and the Maja Cipanas variety. The experiment was carried out in the experimental garden of the Faculty of Agriculture, Winaya Mukti University, Tanjungsari District, Sumedang Regency at an altitude of 850 m above sea level from July 2018 – September 2018. The research design used was a Randomized Block Design (RAK) with a factorial pattern consisting of two factors, namely the first factor is shallot (v) divided into 2 levels, namely v1 = shallots of the Batu Ijo variety, v2 = shallots of the Maja Cipanas variety, and the second factor is ZA fertilizer (n) divided into 4 levels, namely n0= 0 kg ha-1, n1= 200 kg ha-1, n2= 250 kg ha-1, n3= 300 kg ha-1 repeated 4 times. The experimental results showed that Nitrogen had no significant effect on the growth and yield of the Batu Ijo Variety and Maja Cipanas Shallots. The Maja Cipanas Shallots produced a higher dry tuber weight (1.62 kg/plot or 16.17 tonnes/ha) than onions. red Batu Ijo variety (1.41 kg/plot or 14.07 tonnes/ha), optimum nitrogen rate not identified.

Key words: Batu Ijo variety shallots, Maja Cipanas variety shallots, Nitrogen.

1. Introduction

Nuts in the National Medium Term Development Plan (RPJMN) (2015-2019 in the field of horticulture, one of which has a strategic commodity policy direction, namely the

development of shallots and red chilies (Pangan, 2019), (Brata, Bariun, Nashar, & Puguh, 2023). However, these two commodities on the market are still experiencing fluctuations in production and prices. Therefore, in the 2015 – 2019 RPJMN, the Food and Agriculture Directorate of Bappenas has targeted regions as potential for developing these 2 commodities. However, red onions on the market are still experiencing fluctuations in production and prices, even by Bank Indonesia they are included as one of the causes of inflation, as are red chilies. (Teak & in Numbers, nd), (Nurainun, 2021).

The centers of shallot production in West Java are the districts: Bogor, Sukabumi, Cianjur, Bandung, Garut, Tasikmalaya, Ciamis, Kuningan, Cirebon, Majalengka, Sumedang, Indramayu, Subang, Bekasi, West Bandung (Nurhasan, 2018), (AFANDI, nd). The range of shallot productivity of various varieties in West Java is between 7.9 tonnes – 24.1 tonnes per ha (West Java Provincial Food Crops Department, 2010). The superior shallot varieties in West Java with relatively high production are Bima, Batu Ijo, Maja Cipanas, Keling, Sembrani, Katumi, and Kuning (Ashari, 2017), (Djausal, Budi, & Astuti, 2021). Furthermore, of the 7 varieties of shallots, there are two varieties of shallots with relatively different characteristics, namely the Batu Ijo variety and the Maja Cipanas variety. The Batu Ijo variety produces ± 18.5 tons/ha of dry tubers and is good for planting in the lowlands and highlands, but is relatively resistant to tuber rot disease (*Botrytis allii*) (Simatupang, 2019), (Prambudi, 2018). Meanwhile, the Maja Cipanas variety produces ± 10.9 tons/ha of dry tubers, is quite resistant to tuber rot (*Botrytis allii*) whether planted in the lowlands and highlands. (LINDAWATI, 2018), (Pracaya, Kartika, & SP, 2016).

The vegetative growth of shallots is divided into two stages, namely: the vegetative phase, namely the development of roots and leaves, and the generative phase, namely flowering and bulb growth. During the development of roots and leaves, carbohydrate accumulation occurs which is greater than its use (Manalu, 2019), (SALIN & SUKMARANI, nd).

Tuber formation activity increases during vegetative growth and tuber formation is influenced by nitrogen availability, day length and temperature. Leaf formation stops when tuber formation begins (Trust, 2020), (Maharani, 2019). Subsequent tuber growth will be determined by the number of leaves that already exist. Shallot leaves are simple in shape with a narrow surface so their ability to photosynthesize is low (Splittosser 1978 and Edmond et al. 1983 in Abdullatif, 1999 in repository.ipb, 2016).

Nitrogen plays a role in stimulating plant growth in general, especially in the vegetative phase and plays a role in the formation of chlorophyll which is very useful in the photosynthesis process which produces carbohydrates which are ultimately stored in the form of tubers (Marsono and Sigit) (Irawan, Tampubolon, Elazhari, & Julian, 2021).

2. Materials and Methods

The method used in this research is verification so that experiments are carried out in the field. The experiment was carried out in the experimental garden of the Faculty of Agriculture, Winaya Mukti University, Tanjungsari District, Sumedang Regency at an altitude of 850 m above sea level from July 2018 – September 2018.

The materials used in this experiment were shallot bulbs of the Batu Ijo variety and the Maja Cipanas variety, ZA fertilizer, insecticide, Furadan 3G, fungicide Dithane M-45

80 WP, insecticide Curacorn 40 WSC. Meanwhile, the equipment used is a hoe, fork, raffia thread, bamboo stake, knife, measuring tape, bucket, emrat, stationery, plastic and scales.

The research was carried out using an experimental approach, namely for plant growth characteristics and results using a Randomized Block Design (RAK) factorial pattern consisting of two factors, namely the first factor, shallots (V) divided into 2 levels and the second factor was ZA fertilizer (N) divided into 4 levels, repeated 4 times so that in each repetition there were 8 treatment combinations placed randomly.

Table 1. Combination of Nitrogen and Shallot Treatment Treatments.

Red onion (B)	ZA Fertilizer (U)			
	n0	n1	n2	n3
v1	v1 n0	v1 n1	v1 n2	v1 n3
v2	v2 n0	v2 n1	v2 n2	v2 n3

Note: v1 = Batu Ijo variety shallots, v2 = Maja Cipanas shallot variety n0= 0 kg ha-1, n1= 200 kg ha-1, n2= 250 kg ha-1, n3= 300 kg ha-1

Table 2. Operational Independent Variables and Dependent Variables

No.	Variable Type	Sub Variable	Variable Indicator
1.	Independent Variable (Treatment)	1. ZA (N) fertilizer dosage	n0= 0 kg ha-1, n1= 200 kg ha-1, n2= 250 kg ha-1, n3= 300 kg ha-1
		2. Red onion variety (V)	v1 = red onion Batu Ijo variety v2 = red onion Maja Cipanas variety
2.	Variable Bound (Response)	1. Growth Characteristics Red Onion Varieties Green Stone and Varieties Maja Cipanas	1. Plant height 2. Number of leaves
		2. Results of Shallots of Batu Ijo Variety and Maja Cipanas Variety	1. Number of tubers per hill 2. Wet tuber weight per hill 3. Dry weight of tubers per hill 4. Wet tuber weight per plot
		Components of crop yields	5. Dry weight of tubers per plot

Table 3. Crop yield

Table 3. Dosage of Nitrogen Fertilizer											
Dose											
kg/ha			Kg/lot			Kg/plant					
n0	n1	n2	n3	n0	n1	n2	n3	n0	n1	n2	n3
0	200	250	300	0	0.02	0.025	0.03	0	0.0008	0.001	0.0012

Table 4. List of analyzes of various randomized block designs with factorial patterns

Diversity Source	Degrees of Freedom	Sum of Squares	Middle Square	F count	F table
Deuteronomy (r)	r-1=3	JKr	KTr	KTr/KTg	3,072
Treatment (t)	vn-1 = 7	JKt	Summit	KTP/KTG	2,487

Shallots(V)	v-1 = 1	JK(b)	KT(b)	KT(b)/KTg	4,324
Nitrogen Fertilizer (N)	n-1= 3	JK(u)	KT(u)	KT(u)/KTg	3,072
Interaction (VN)	(v-1)(n-1)=3	JK (ma'am)	KT(ma'am)	KT(ma'am)/ KTg	3,072
Error (g)	(vn-1)(r-1)=21	JK is wrong	KTg		
Total	vnr-1= 31	JKT			

Source: Herdiyantoro, (2013)

3. Results and Discussion

Plant Height

Based on the results of variance analysis, there was no interaction between shallot varieties and nitrogen fertilizer, but independently shallot varieties had a significant effect on plant height while nitrogen fertilizer had no significant effect on plant height.

Table 5. Effect of Nitrogen Fertilizer Doses and Varieties on Shallot Plant Height at 2, 3, 4, 5, 6 and 7 WAP

Treatment	Plant Height (cm)											
	2 WAP		3 WAP		4 WAP		5 WAP		6 WAP		7 WST	
Onion Varieties												
red												
v1 (Green Stone)	19.24	b	24.75	a	28,29	a	32.23	a	36.23	a	37.36	a
v2 (Maja Cipanas)	17.30	a	26.01	b	29.76	b	30.10	a	34.30	a	35.61	a
Nitrogen												
n0 (0 kg/ha)	18.49	a	25.60	a	29.40	a	31.79	a	34.48	a	35.78	a
n1 (200 kg/ha)	17.38	a	25.24	a	28.93	a	32.21	a	35.88	a	36.73	a
n2 (250 kg/ha)	18.67	a	25.59	a	28.87	a	28.85	a	35.50	a	36.83	a
n3 (300 kg/ha)	18.54	a	25.09	a	28.90	a	31.79	a	35.18	a	36.61	a

Note: The average number of treatments followed by the same letter in the direction of the column is not significantly different according to Duncan's Multiple Range Test at the five percent significance level.

From Table 5, it can be seen that treatment v1 (Batu Ijo) is significantly different from v2 (Maja Cipanas) at 2 MST, 3 MST and 4 MST, however treatment v1 (Batu Ijo) is not significantly different from v2 (Maja Cipanas) at 5 WAP, 6 WAP and 7 WAP. Meanwhile, the n0 treatment (0 kg/ha) was not significantly different from one treatment or another at 2 WAP, 3 WAP, 4 WAP, 5 WAP, 6 WAP and 7 WAP.

Number of Leaves

Based on the results of variance analysis, there was no interaction between shallot varieties and nitrogen fertilizer, but independently shallot varieties had a significant effect on the number of leaves while nitrogen fertilizer had no significant effect on the number of leaves.

Table 6. Effect of Nitrogen Fertilizer Rates and Varieties on the Number of Leeks
Red At 2,3,4,5,6 And 7 MST

Treatment	Number of Leaves (pieces)											
	2 WAP		3 WAP		4 WAP		5 WAP		6 WAP		7 WST	
Red Onion Varieties												
v1 (Green Stone)	14.04	a	18.03	a	21.07	a	24.41	a	28.55	a	28.96	a
v2 (Maja Cipanas)	14.93	a	21.36	b	26.49	b	30.26	b	34.63	b	35.67	b
Nitrogen												

n0 (0 kg/ha)	14.68	a	20.13	a	24.19	a	27.81	a	32.40	a	32.06	a
n1 (200 kg/ha)	13.70	a	18.73	a	23.13	a	26.98	a	31.39	a	32.68	a
n2 (250 kg/ha)	14.19	a	19.54	a	23.48	a	27.09	a	31.06	a	31.56	a
n3 (300 kg/ha)	15.38	a	20.38	a	24.34	a	27.46	a	31.51	a	32.96	a

Note: The average number of treatments followed by the same letter in the direction of the column is not significantly different according to Duncan's Multiple Range Test at the five percent significance level.

From Table 6, it can be seen that treatmentv1 (Batu Ijo) is not significantly different from v2 (Maja Cipanas) at 2 WAP, however treatmentv1 (Batu Ijo) is significantly different from v2 (Maja Cipanas) at 3 WAP, 4 WAP, 5 WAP, 6 WAP and 7 WAP. Meanwhile, the n0 treatment (0 kg/ha) was not significantly different from one treatment or another at 2 WAP, 3 WAP, 4 WAP, 5 WAP, 6 WAP and 7 WAP.

Number of Tubers per Clump

Based on the results of the variance analysis, there was no interaction between shallot varieties and nitrogen fertilizer, but independently shallot varieties had a significant effect on the number of bulbs per cluster while nitrogen fertilizer had no significant effect on the number of bulbs per cluster.

Table 7 Effect of Nitrogen Fertilizer Doses and Varieties on the Number of Tubers Shallots per bunch

Treatment	Number of Tubers/clump (tubers)	
Red Onion Varieties		
v1 (Green Stone)	2.08	a
v2 (Maja Cipanas)	2.55	b
Nitrogen		
n0 (0 kg/ha)	2.37	a
n1 (200 kg/ha)	2.28	a
n2 (250 kg/ha)	2.25	a
n3 (300 kg/ha)	2.34	a

Note: The average number of treatments followed by the same letter in the direction of the column is not significantly different according to Duncan's Multiple Range Test at the five percent significance level.

From Table 7, it can be seen that treatmentv1 (Batu Ijo) was significantly different from v2 (Maja Cipanas), while treatment n0 (0 kg/ha) was not significantly different from one treatment or another. The no effect of Nitrogen fertilizer on the number of tubers per hill and the higher number of tubers per hill of the Maja Cipanas variety compared to the Batu Ijo variety shows that the adaptation factors of the Maja Cipanas variety are better than the Batu Ijo variety. The suitability of the Maja Cipanas variety to the environmental conditions in Tanjungsari allows the Maja Cipanas variety to grow and develop well, even though nitrogen fertilizer has no real effect on its growth.

Wet Tuber Weight per Clump

Based on the results of the variance analysis (Appendix 18), there was no interaction between shallot varieties and nitrogen fertilizer, but independently shallot varieties had a significant effect on wet bulb weight per hill, while Nitrogen fertilizer had no significant effect on wet bulb weight per hill.

Table 8. Effect of Nitrogen Fertilizer Doses and Varieties on Wet Bulb Weight of Shallots per Clump

Treatment	Wet Tuber Weight Per Clump (grams)	
Red Onion Varieties		
v1 (Green Stone)	76.13	a
v2 (Maja Cipanas)	92.38	b
Nitrogen		
n0 (0 kg/ha)	79.88	a
n1 (200 kg/ha)	86.19	a
n2 (250 kg/ha)	82.38	a
n3 (300 kg/ha)	88.56	a

Note: The average number of treatments followed by the same letter in the direction of the column is not significantly different according to Duncan's Multiple Range Test at the five percent significance level.

From Table 8, it can be seen that treatment v1 (Batu Ijo) was significantly different from v2 (Maja Cipanas), while treatment n0 (0 kg/ha) was not significantly different from one treatment or another. The difference (greater) in wet tuber weight per hill of the Maja Cipanas variety compared to the Batu Ijo variety shows that the adaptation factor of the Maja Cipanas variety is better than the Batu Ijo variety.

Dry Tuber Weight per Clump

Based on the variance results, there was no interaction between shallot varieties and nitrogen fertilizer, but independently shallot varieties had a significant effect on dry bulb weight per hill, while nitrogen fertilizer had no significant effect on dry bulb weight per hill.

Table 9. Effect of Nitrogen Fertilizer Doses and Varieties on Dry Tuber Weight Shallots per Clump

Treatment	Dry Tuber Weight Per Clump (grams)	
Red Onion Varieties		
v1 (Green Stone)	62.36	a
v2 (Maja Cipanas)	74.78	b
Nitrogen		
n0 (0 kg/ha)	67.16	a
n1 (200 kg/ha)	68.19	a
n2 (250 kg/ha)	67.63	a
n3 (300 kg/ha)	71.31	a

Note: The average number of treatments followed by the same letter in the direction of the column is not significantly different according to Duncan's Multiple Range Test at the five percent significance level.

From Table 9, it can be seen that treatment v1 (Batu Ijo) was significantly different from v2 (Maja Cipanas), while treatment n0 (0 kg/ha) was not significantly different from one treatment or another. The difference (greater) in dry tuber weight per cluster of the Maja Cipanas variety compared to the Batu Ijo variety shows that the adaptation factor of the Maja Cipanas variety is better than the Batu Ijo variety. The suitability of the Maja Cipanas variety to the environmental conditions in Tanjungsari allows the Maja Cipanas variety to grow and develop well, even though nitrogen fertilizer has no real effect on its growth.

Wet Tuber Weight per Plot

Based on the results of variance analysis, there was no interaction between shallot varieties and nitrogen fertilizer, but independently shallot varieties had a significant effect on the wet bulb weight per plot, while nitrogen fertilizer had no significant effect on the wet bulb weight per plot.

Table 10. Effect of Nitrogen Fertilizer Dosage and Variety on Wet Bulb Weight of Onions Red per Plot

Treatment	Wet Tuber Weight Per Plot (kg)	
Red Onion Varieties		
v1 (Green Stone)	1.72	a
v2 (Maja Cipanas)	2.02	b
Nitrogen		
n0 (0 kg/ha)	1.70	a
n1 (200 kg/ha)	1.93	a
n2 (250 kg/ha)	1.85	a
n3 (300 kg/ha)	2.00	a

Note: The average number of treatments followed by the same letter in the direction of the column is not significantly different according to Duncan's Multiple Range Test at the five percent significance level.

From Table 10, it can be seen that the treatment v1 (Batu Ijo) was significantly different from v2 (Maja Cipanas), while treatment n0 (0 kg/ha) was not significantly different from one treatment or another. The difference (greater) in wet tuber weight per plot of the Maja Cipanas variety compared to the Batu Ijo variety shows that the adaptation factor of the Maja Cipanas variety is better than the Batu Ijo variety.

Dry Tuber Weight per Plot

Based on the variance results, there was no interaction between shallot varieties and nitrogen fertilizer, but independently shallot varieties had a significant effect on dry bulb weight per plot, while nitrogen fertilizer had no significant effect on dry bulb weight per plot.

Table 11. Effect of Nitrogen Fertilizer Doses and Varieties on Tuber Weight Dried Shallots per Plot

Treatment	Dry Tuber Weight	
	per plot (kg)	per Hectare (ton)
Red Onion Varieties		
v1 (Green Stone)	1.41	a
v2 (Maja Cipanas)	1.62	b
Nitrogen		
n0 (0 kg/ha)	1.42	a
n1 (200 kg/ha)	1.53	a
n2 (250 kg/ha)	1.51	a
n3 (300 kg/ha)	1.58	a

Note: The average number of treatments followed by the same letter in the direction of the column is not significantly different according to Duncan's Multiple Range Test at the five percent significance level.

From Table 11, it can be seen that the treatment v1 (Batu Ijo) was significantly different from v2 (Maja Cipanas), while treatment n0 (0 kg/ha) was not significantly different from one treatment or another. The difference (greater) in dry tuber weight per plot of the Maja Cipanas variety compared to the Batu Ijo variety shows that the adaptation factor of the Maja Cipanas variety is better than the Batu Ijo variety.

4. Conclusion

Based on the results of the experiment and discussion, several conclusions can be drawn as follows: Nitrogen has no significant effect on the growth and yield of the Batu Ijo variety of shallots and the Maja Cipanas variety. The Maja Cipanas variety of shallots produced a higher dry bulb weight (1.62 kg/plot or 16.17 tonnes/ha) than the Batu Ijo variety of shallots (1.41 kg/plot or 14.07 tonnes/ha). The optimum nitrogen rate has not been identified.

Based on the conclusions above, further research is needed to reveal more comprehensive information regarding the effect of Nitrogen dosage on the growth and yield of shallot plants of the Batu Ijo and Maja Cipanas varieties on different soil and agro-climatic conditions with different Nitrogen dosages.

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