Akta Agrosia

Production of Some Shallots Varieties at Different Plant Spacing

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Doi: 10.31186/aa.26.2.98-102

ARTICLE INFO

Keywords:
plant spacing
shallot,
variety testing,
yield,

Article history:
Received: Oct 18, 2023
Accepted: Dec 29, 2023
Published: Dec 31, 2023

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ABSTRACT

The demand for shallots continues to rise annually, yet production fails to meet the growing need. Enhancing production through strategic plant spacing and the utilization of diverse shallot varieties is imperative. This research aims to determine the optimal plant spacing for shallots and evaluate the performance of different shallot varieties under varying planting distances. A factorial Randomized Complete Block Design (RCBD) with two factors was employed, investigating three shallot types (Bima Brebes, Maja Cipanas, and Tajuk) and testing three planting distances (15 cm x 15 cm, 20 cm x 20 cm, and 25 cm x 25 cm). Each treatment was replicated four times, and data were collected on various parameters including leaf length, leaf diameter, number of leaves, bulb length, bulb diameter, number of tillers, bulb fresh weight, bulb dry weight, bulb weight per cluster, and bulb dry weight per cluster. Results indicate that Bima Brebes and Maja Cipanas types demonstrated the highest bulb dry weight per cluster, with 32.69 grams and 31.71 grams, respectively. The optimal plant spacing identified is 20 cm x 20 cm, promoting increased leaf and bulb diameter, as well as enhanced bulb dry weight per cluster..

INTRODUCTION

Shallots, a prominent horticultural crop, hold significant economic value, particularly in Indonesia, where they are extensively cultivated. With promising prospects in national consumption, farmers' income, and foreign exchange earnings (BPS, 2015), shallots play a vital role as a culinary spice. Shallots are consumed as a complementary spice in various dishes, so they are needed by the community (Purba, 2014). The escalating demand for shallots, driven by population growth, necessitates a commensurate increase in production. Selecting the right varieties is a key strategy, as plant genetics influence productivity potential under specific growing conditions (Karo and Manik, 2020; Hasanah *et al.,* 2022). The adoption of adaptive, high-yielding, and pest-resistant varieties is crucial for maximizing shallot productivity (Nikirahayu *et al*., 2021). Hence, it is essential to explore stable, high-yielding, and resilient shallot varieties (Wulandari *et al*., 2016; Upe and Sau, 2018).

Beyond selecting appropriate varieties, intensification efforts can further boost shallot

ISSN: 1410-3354 / e-ISSN:2615-7136

Cited this as: Zulfahmi, R., M.A. Lestari, H.P. Sari, D.A. Putrantri. 2023. Production of some shallots varieties at different plant spacing. Akta Agrosia 26(2):98–102. doi: 10.31186/aa.26.2.98–102.

production. Intensification involves optimizing cultivation techniques, including tillage, fertilization, and plant spacing (Anggarayasa *et al.,* 2018). Optimal plant spacing ensures adequate growth space without intraplant competition (Rezaei *et al*., 2013), positively correlating with plant population per unit area (Marliah *et al*., 2012). Tight spacing may result in high population density and competition, while loose spacing may lead to lower yields (Sumarni *et al*., 2012; Suavianti and Ardiyanta, 2014; Sakti and Sugito, 2018).

The synergistic use of appropriate varieties and optimal planting spacing is anticipated to positively impact shallot productivity. Therefore, this study investigates the production performance of select shallot varieties across different plant spacings to ascertain the ideal combination for optimal yields.

MATERIALS AND METHOD

The research spanned from June to August 2023 at the Research Field of the Horticulture Study Program, Department of Food Crop Cultivation, Lampung State Polytechnic, situated at an altitude of 118 meters above sea level. Employing a factorial randomized complete block design (RCBD) with two factors, the study assessed shallot varieties (Bima Brebes, Maja Cipanas, and Tajuk) and plant spacings (15 cm x 15 cm, 20 cm x 20 cm, and 25 cm x 25 cm). The nine treatments were replicated four times, and research activities encompassed land preparation, planting, fertilization, maintenance, harvest, and post-harvest procedures. Parameters observed included leaf length (cm), leaf diameter (cm), number of leaves (strands), bulb length (cm), bulb diameter (cm), number of tillers (fruit), bulb fresh weight (grams), bulb dry weight (grams), bulb fresh weight per cluster (grams), and bulb dry weight per cluster (grams). Data were analyzed using the analysis of variance (ANOVA) method, followed by the Duncan Multi Range Test (DMRT) at α 5% for significant treatments.

RESULTS AND DISCUSSION

The results of variance analysis showed that varieties had a significant effect on all the characters. Planting distance had a significant effect on leaf length, leaf diameter, bulb length, bulb diameter and bulb dry weight per cluster. The interaction between varieties and spacing did not have a significant effect on any of the characters. The coefficient of variation of the observed characters ranged from 2.38 to 22.36% (Table 1). The significantly different effect of varieties on all characters indicates that there are differences in performance between varieties. Shallots are one of the plants that are vegetatively propagated, but shallots have differences in characters between one type and another, so it is believed that shallots have a high genetic diversity (Nikirahayu *et al*., 2021). Variance analysis results revealed the significant impact of varieties on all measured parameters.

Table 1. Recapitulation of calculated F value and coefficient variation of shallots

Variables	Variety (V)	Plant spacing (S)	Interaction (V x S)	Coefficient of Variation (%)
Leaf length	387.36*	172.61*	0.07	2.55
Leaf diameter	3129.98*	166.76*	1.83	2.38
Number of leaves	1241.27*	0.00	0.00	10.96
Bulb length	74.54*	41.95*	0.36	5.65
Bulb diameter	476.44*	49.51*	0.17	5.06
Number of tillers	184.78*	0.00	0.00	20.15
Bulb fresh weight	455.33*	0.00	0.00	7.15
Bulb dry weight	455.12*	0.00	0.00	7.15
Bulb fresh weight per cluster	53.57*	0.00	0.01	21.63
Bulb dry weight per cluster	53.49*	8.47*	0.01	22.36

Note: * significant different at $p \leq 0.05$

Planting distance significantly affected leaf length, leaf diameter, bulb length, bulb diameter, and bulb dry weight per cluster. The interaction between varieties and spacing did not exhibit a significant effect on any parameter. The observed characters demonstrated a coefficient of variation ranging from 2.38 to 22.36% (Table 1), indicating variability across varieties. Shallots are one of the plants that are vegetatively propagated, but shallots have differences in characters between one type and another, so it is believed that shallots have a high genetic diversity (Nikirahayu *et al*., 2021).

Bima Brebes displayed the highest mean for all characters compared to Maja Cipanas and Tajuk. Tajuk exhibited a higher number of tillers compared to Bima Brebes and Maja Cipanas, but has a lower bulb dry weight per cluster (Table 2), possibly due to suboptimal bulb production. Bima Brebes, with a higher mean bulb fresh weight, bulb dry weight, bulb fresh weight per cluster, and bulb dry weight per cluster, proved adaptable and high-yielding. Bima Brebes has a higher mean bulb fresh weight, bulb dry weight, bulb fresh weight per cluster and bulb dry weight per cluster, although it was not statistically significantly different from Maja Cipanas. The bulb dry weight per cluster of Bima Brebes, Maja Cipanas and Tajuk were 32.69 g, 31.71 g and 24.58 g, respectively. The difference in bulb dry weight per cluster of each shallot varieties in a particular environment is the adaptability of a variety. Bima Brebes is one of the shallot varieties that is very adaptable and high yielding (Rahayu, 2017; Saidah *et al.* 2019).

Plant spacing of 15 cm x 15 cm enhanced leaf length, leaf diameter and bulb length characters compared to 20 cm x 20 cm and 25 cm x 25 cm spacings. The 20 cm x 20 cm spacing yielded higher bulb dry weight per cluster at 30.76 grams, though not statistically significantly different from the 25 cm x 25 cm spacing at 30.66 g. However, the spacing of 20 cm x 20 cm is better than the spacing of 25 cm x 25 cm because it provides a higher population size, which can increase the productivity of shallots (Nugrahini, 2013; Setiawan and Suparno, 2018). This is believed to be because in 15 cm x 15 cm plant spacing of shallot, there is competition among plants in absorbing water and nutrients, which affects their growth and production, while in 20 cm x 20 cm plant spacing of shallot, there is no competition among plants, which makes their growth and production more optimal. This is in line with the research of Midayani and Amien (2017), which states that the planting distance of 20 cm x 20 cm is the best planting distance for increasing the wet weight of the bulbs in shallots.

CONCLUSION

The varieties Bima Brebes and Maja Cipanas have the highest bulb dry weight per cluster. A planting distance of 20 cm x 20 cm for shallots results in an increase in leaf diameter, bulb length, bulb diameter and bulb dry weight per cluster. The 20 cm x 20 cm plant spacing is the ideal plant spacing compared to the 15 cm x 15 cm and 25 cm x 25 cm.

ACKNOWLEDGMENT

Thanks to the Center for Research and Community Service, Lampung State

Table 2. Mean values of observed characters to shallot varieties

Variety	The observed variables									
	LL	LD	NL	BL	BD	NT	BFW	BDW	BFWC	BDWC
Bima Brebes	35.35a	0.71a	8.0b	3.07a	2.67a	4.0b	11.55a	8.08a	48.14a	32.69a
Maja Cipanas	32.84b	0.69b	12.0a	2.90b	2.59b	3.0c	11.52a	8.06a	46.73a	31.71a
Tajuk	32.55c	0.56c	6.0c	2.81c	2.20c	5.0a	8.96b	6.27b	36.54b	24.58b

Note: LL: Leaf length; LD: Leaf diameter; NL: Number of leaves; BL: Bulb length; BD: Bulb diameter; NT: Number of tillers; BFW: Bulb fresh weight; BDW: Bulb dry weight BFWC: Bulb fresh weight per cluster, BDWC: Bulb dry weight per cluster. Numbers in the same column followed by the same letter are not significantly different in the DMRT test at α 5%.

Table 3. Mean values of observed variables to plant spacing

Plant Spacing	Observed variables				
	LL	LD	BL	BD	BDWC
15 cm x 15 cm	34.77a	0.63b	3.04a	2.39b	27.63b
20 cm x 20 cm	32.97b	0.66a	2.87b	2.53a	30.76a
25 cm x 25 cm	33.00b	0.66a	2.87b	2.54a	30.66a

Note: LL: Leaf length; LD: Leaf diameter; BL: Bulb length; BD: Bulb diameter; BDWC: Bulb dry weight per cluster. Numbers in the same column followed by the same letter are not significantly different in the DMRT test at α 5%.

Polytechnic, which has funded this research through DIPA Lampung State Polytechnic with the Beginner Lecturer Research Scheme in 2023.

REFERENCES

Anggarayasa, C., M.S. Yuliartini, and A.A.S.P.R. Andriani. 2018. Pengaruh jarak tanam dan pupuk kompos pada pertumbuhan dan hasil tanaman bawang merah. Gema Agro 23(2): 162–166.

Badan Pusat Statistik (BPS). 2015. Distribusi perdagangan komoditas bawang merah Indonesia 2015. Badan Pusat Statistik. Jakarta.

Hasanah, Y., L. Mawarni, and H. Hanum. 2022. Physiological characteristics of shallot (*Allium ascalonicum*) varieties in highlands and lowlands. Asian Jurnal Plant Science. 21(2): 236–242. doi: 10.3923/ ajps.2022.236.242.

Karo, B.B., and F. Manik. 2020. observasi dan adaptasi 10 varietas bawang merah (*Allium cepa*) di berastagi dataran tinggi basah. Jurnal Agroteknosains 4(2): 1–9.

Marliah A, T. Hidayat, and N. Husna. 2012. Pengaruh varietas dan jarak tanam terhadap pertumbuhan kedelai (*Glycine max* L. Merrill). Jurnal Agrista. 16(1): 22-28.

Midayani, and A.R. Amien. 2017. Pertumbuhan dan produksi bawang merah dengan perlakuan berbagai jarak tanam dan pemberian konsentrasi ekstrak jagung. Jurnal Agrotan 3(9): 68–79.

Nikirahayu, M., M. Syafi'i, R. Y. Agustini, and R. Soedomo. 2021. Keragaman karakter morfologi bawang merah (*Allium ascalonicum* L.) Varietas Katumi dan Violetta 3 Agrihorti di Lembang. Jurnal Agrotek Indonesia 2(6): 55-61.

Nugrahini T. 2013. Respon tanaman bawang merah (*Allium ascolanicum* L.) Varietas Tuk-tuk terhadap pengaturan jarak tanam dan konsentrasi pupuk organik cair Nasa. Ziraah Majalah Ilmiah Pertanian 36(1): 60-65.

Purba, R. 2014. Applications of NPK Phonska and KCl fertilizer for the growth and yield of shallots (*Allium ascalonicum*) in Serang, Banten. International Journal of Applied Science and Technology 4(3): 197–203.

Rahayu Y.S. 2017. Pengaruh waktu penanaman terhadap pertumbuhan dan hasil beberapa varietas tanaman bawang merah (*Allium ascalonicum* L.). Jurnal Agromix. 4 (1): 38-46. doi: 10.35891/agx.v4i1.777.

Rezaei, E.E, M. Kafi, and M. Bannayan. 2013. Nitrogen and cultivated bulb weight effect on radiation and nitrogen use efficiency, carbon partitioning and production of persian shallot (*Allium altissimum* Regel.). Journal of Crop Science and Biotechnology. 16(3): 237-244.

Saidah, S., M. Muchtar, S. Syafruddin. 2019. Pengaruh jarak tanam terhadap pertumbuhan dan hasil bawang merah asal biji di Kabupaten Sigi, Sulawesi Tengah. Prosiding Seminar Nasional Masyarakat Biodiversitas Indonensia 5(2): 209–212. doi:10.13057/psnmbi/m050211.

Sakti, I.T., and Y. Sugito. 2018. Pengaruh dosis pupuk kandang sapi dan jarak tanam terhadap pertumbuhan dan hasil tanaman bawang merah. Plantropica 3(2): 124–132.

Setiawan, I., and Suparno. 2018. Pengaruh jarak tanam dan pupuk pelengkap cair terhadap pertumbuhan dan produksi bawang merah (*Allium cepa* L.) Varietas Thailand. Jurnal Ilmiah Hijau Cendekia 3 (1): 30–34. https://ejournal.uniskakediri.ac.id/ Index.php/HijauCendekia/article/view/102/82.

Suavianti and Ardiyanta. 2014. Pengaruh macam pupuk kandang dan kerapatan tanam terhadap pertumbuhan dan kualitas

hasil tanaman bawang merah (*Allium ascalonicum* L.) biru Bantul pada lahan pasir pantai. Jurnal Agro UPY. 5:78-92.

Sumarni, N., R. Rosliani and Suwandi. 2012. Optimasi jarak tanam dan dosis pupuk npk untuk produksi bawang merah dari benih umbi mini di dataran tinggi. Jurnal Hortikultura. 22(2): 148. doi: 10.21082/ jhort.v22n2.2012.p148-155.

Upe, A., and T. Sau. 2018. Adaptasi keberagaman varietas terhadap pertumbuhan dan produksi pada wilayah marginal pertanaman bawang merah (*Allium ascalonicum* L.). Journal TABARO Agriculture Science. 2 (1): 172. doi: 10.35914/tabaro.v2i1.111.

Wulandari, R., N.E. Suminarti, and H.T. Sebayang. 2016. Pengaruh jarak tanam dan frekuensi penyiangan gulma pada pertumbuhan dan hasil tanaman bawang merah (*Allium ascalonicum*). Jurnal Produksi Tanaman. 4(7): 547–553.