

Off-Season cultivation of several shallot varieties in dry land Lampung

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Off-Season cultivation of several shallot varieties in dry land, Lampung

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Abstract. Lampung is one of the centers for shallot development in Indonesia. The application of location-specific off-season shallot cultivation technology and the use of superior varieties is expected to be able to guarantee its availability throughout the year and overcome price fluctuations. For this reason, it is necessary to study the cultivation of off-season shallots with varieties in accordance with market demand. This activity was carried out in Tanggamus Regency, from January to December 2018. The experimental design was the Split Plot, where the main plot was the use of mulch and without mulch and as sub-plots were three shallot varieties, namely: 1. Bima Brebes; 2. Trisula; and 3. Bali Karet varieties. Each treatment was repeated four times. The data obtained were analyzed using variance with DMRT at the 5% level. The results of the study show that off-season shallot cultivation is promising to be cultivated by farmers with an average of 14.59 tonnes/ha using Bima Brebes, Trisula, and Bali Karet varieties. Bali Karet variety has good prospects to be developed and planted off-season because they are more resistant to pests and diseases and have the highest production (20.87 tonnes/ha) compared to Bima Brebes and Trisula varieties.

1. Introduction

Imported shallots are one of the horticultural commodities that often exist on the Indonesian market. This is especially troubling for farmers, because the price and quality are very competitive with domestic onion products. With the increase in population and the culinary business that develops from year to year, the need for shallots continues to increase, but domestic production has not been able to meet the demand, so the government imports [1]. According to Bina Karya Tani [2], in its development efforts there are several obstacles in shallot cultivation in Indonesia, among others, due to its low productivity. There are several problems in shallot cultivation, including: small farming patterns, low quality seeds, and low application of cultivation technology. ⁵

To meet the needs of shallots in Lampung, the Food Crops and Horticulture Service of Lampung Province began in 2014 to develop shallot cultivation ²¹ in four districts whose land conditions are similar to producing areas such as Brebes, namely South Lampung Regency, Tanggamus Regency, Central Lampung Regency and Pesawaran Regency [3]. However, shallot production in Lampung is still low and even lower than the national average, recorded in 2014 only 6,324 quintals with a harvest area of 102 ha and productivity of 6.2 tonnes / ha, so it needs supplies from outside the region [4].

With the development of the culinary industry in Lampung, quality shallots must be produced throughout the year so that supplies are available so that prices do not fluctuate. On ³ the other hand, when climatic conditions are not normal, every December to April which coincides with the rainy season, the



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harvest area of shallots drops by more than 30% due to crop failure so that production is also reduced. The prolonged rainy season and the increasing attack of these pests have shifted the cultivation of shallots to dry land, because shallot farming in paddy fields is considered inefficient and not profitable [5, 6].

Lampung is also one of the centers for shallot development in Indonesia and it is estimated that there is 10 - 100 thousand ha of dry land in the lowlands and uplands whose utilization can be optimized for the development of shallot farming. The application of location-specific off-season shallot cultivation technology and the use of suitable superior varieties in the development of onion centers on dry land are expected to be able to cope with the supply of this commodity throughout the year in Lampung and be able to anticipate very sharp price fluctuations. Thus, it is necessary to study off-season shallot cultivation with varieties that are in following market demand to support the development of horticultural areas in Lampung.

2. Methodology

This activity was carried out at Pekon Kuto Dalom, Gisting District, Tanggamus Regency, from January to December 2018.

The design used is the Split Plot Design. The main plot was the use of mulch and without mulch and as subplots were 3 shallot varieties, namely: 1. Bima Brebes; 2. Trisula; and 3. Bali Karet varieties. Each treatment was repeated 4 times. The area of land for the study is approximately 3.750 m². Observation of the vegetative phase of the 15-day-old shallot plants was carried out in all treatment blocks, namely 24 observations blocks and 10 sample plants for each block. The parameters observed were the growth components (plant height, number of leaves and number of tillers). Yield components (number of tubers / plant, wet tuber weight, dry tuber weight, tuber weight loss and total production), and pest and disease attacks.

Growth parameters were observed at the time of maximum growth. Data for yield components were taken at harvest time and weight loss was taken after drying. for pests and diseases observed every 2 weeks. The data obtained were analyzed using variance with Duncan's continued test at the 5% level.

3. Results and discussion

The results of the observations are presented in the table 1 below:

Table 1. Observations on the vegetative growth of off-season shallot cultivation in Tanggamus Regency.

	Plant height (cm)	Number of tillers clumps ⁻¹	Number of leaves clump ⁻¹
Mulch and Variety Interaction			
Mulch			
Bima Brebes	29.75 b	8.5 bc	39.25 b
Trisula	29.25 b	11.8 a	53.25 a
Bali Karet	41.75 a	7.0 c	45.25 ab
Without mulch			
Bima Brebes	29.00 b	8.0 bc	44.75 a b
Trisula	29.50 b	10.0 ab	49.50 a
Bali Karet	43.50 a	6.5 c	53.25 a
Mulch treatment			
Mulch	32.83 a	9.08 a	46.00 a
Without Mulch	34.00 a	8.17 a	49.08 a
Treatment of Varieties			
Bima Brebes	29.38 b	8.25 b	42.00 b
Trisula	41.50 a	10.88 a	51.38 a
Bali Karet	29.38 b	6.75 b	49.25 a
Average	33.79	8.63	47.54
CV (%)	17.48	15.64	11.61

The number in each column followed by the same lowercase letter is not significantly different according to the DMRT at the 5% level.

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The results of the statistical analysis of the growth components (table 1) showed that there was no significant difference in the height, number of tillers and number of leaves of shallot plants between the mulch treatment and without mulch. However, it appears that without mulch gave a better response to vegetative growth, especially plant height and number of leaves. Mulch will directly affect micro-climatic environmental conditions in the soil such as soil temperature and soil moisture content [9].

This variation in soil temperature has also been proven by the results of the research by [7] that the use of straw mulch reduces the soil temperature by 0.2°C and plastic mulch increases the soil temperature by 1.8°C compared to without mulch. This shows that silver plastic mulch can provide optimal environmental conditions, especially air temperature and soil temperature which play an important role in various physiological processes and plant growth. As stated by [8], an increase in temperature to a certain extent can increase the net yield of photosynthesis, but at supraoptimal temperatures this result decreases sharply due to an increase in respiration. There is a possibility that the soil temperature in the silver plastic mulch treatment (24.73°C) provides the optimum temperature for microbial activity to break down organic matter into elements that can be absorbed by plant roots. It is suspected that at these temperature conditions the microbial activity increases, thereby increasing the nutrient content in the soil and the amount of nutrients absorbed by plant roots and in the end growth will increase [9]. During off-season, the use of mulch seems did not have much effect.

However, there is a very significant difference between varieties, where Bali Karet has the highest plant diversity, namely 41.50 cm on average. Observation of the number of tillers, Trisula variety had the highest number of tillers and the highest average number of leaves compared to the other 2 varieties, namely 10,875 tillers and 51.38 strands, respectively. The interaction between mulch treatment and varieties showed that the highest plant height was Bali Karet without mulch (43.50 cm) which was not significantly different from those without mulch, as well as the number of leaves, Bali Karet varieties had quite a lot of leaves but a small number of tillers per clump. During the off-season period, the Bali Karet variety (after being released named Batu Ijo) had better adaptability. Description of its adaptability is suitable for planting both in the dry season and the rainy season in the highlands [10].

Harvesting of shallots is carried out at 56 days after planting in all cultivated varieties. The method of harvesting was carried out as follows: each block of replications in both the use of mulch and without mulch, the number of plants was counted and the total weight of wet tubers (along with the leaves) was weighed. Data harvested tuber weight/10 clumps, tuber number/10 clumps and tuber net dry weight (eskip) after drying for 5 days were also collected. Observation data on shallot harvest in this activity are presented in the table 2 below.

Table 2. Data on off-season shallot production components in the District Tanggamus.

	Total harvest weight ha ⁻¹ ton	Harvest weight per clump g	Eskip weights per clump g	Weight loss per clump %	Number of tubers per clump tubers
Mulch and Variety Interaction					
Mulch					
Bima Brebes	12.12 c	75.00 c	56.38 b	24.28 bc	6.9 ab
Trisula	11.41 c	56.25 c	44.25 b	22.05 bc	6.6 ab
Bali Karet	18.87 b	122.50 a	98.63 a	19.81 c	5.5 bc
Without mulch					
Bima Brebes	11.47 c	97.25 abc	62.67 ab	28.86 ab	6.1 abc
Trisula	10.82 c	78.25 bc	48.50 b	32.24 a	7.5 a
Bali Karet	23.45 a	120.50 ab	91.50 a	23.74 bc	4.6 c
Mulch treatment					
Mulch	13.94 a	84.58 a	66.33 a	22.12 b	6.32 a

Without Mulch	15.22 a	98.67 a	70.10 a	28.02 a	6.06 a
Treatment of varieties					
Bima Brebes	11.79 b	86.13 ab	63.21 b	26.17 a	6.48 a
Trisula	11.08 b	67.25 b	46.38 b	25.17 a	7.05 a
Bali Karet	20.87 a	121.50 a	95.06 a	21.86 b	5.04 b
Average	14.59	91.63	66.98	25.03	6.19
CV (%)	16.57	29.25	30.35	15.3	16.57

The number in each column followed by the same lowercase letter is not significantly different according to the DMRT at the 5% level.

Statistical analysis, on the production component data (table 2), shows that there was no significant difference between the mulch treatments except for the weight loss per clump where the weight loss without mulch was higher, namely 28.02% compared to those using mulch (22.12%). Whereas in the treatment of the Bali Karet variety, the highest production was an average of 20.87 tons per hectare and was significantly different from other varieties, but had the lowest number of tubers per clump (an average of 5.04 tubers / clump). This is due to the size of the tubers of the Bali Karet variety is quite large, the average length is 3.5 - 5 cm, the diameter is 3 - 4.5 cm, the weight per tuber is 15-25 grams (description of Bali Karet varieties), so even though the number of a little clump, the total tuber weight per clump is higher.

The interaction between mulch and varieties showed that the Bali Karet variety without mulch had the highest production, namely 23.45 tons ha⁻¹. Planting the Bali Karet variety during off-season has a better performance than the other two varieties in terms of vegetative growth and production. It is known that the performance of a variety is largely determined by its genetics and the environment in which it grows, including climate and season. According to [11] stated that plant growth and growth are strongly influenced by external and internal factors. One of the factors is the genetic trait of the variety. While external factors are climate, temperature, humidity, rainfall, nutrient availability, and sunshine intensity.

Pests that attack shallot plants in Tanggamus Regency are presented in the table 3 below.

Table 3. Data on pest attack on off-season shallot activities in Tanggamus Regency

	Purple spot (Trotol) %	Fusarium %	Armyworms %
In Mulch and Variety Interaction			
Mulch			
Bima Brebes	95.00 a	4.41 a	5.23 a
Trisula	92.50 a	3.52 a	4.73 a
Bali Karet	79.25 b c	1.38 b	1.24 b
Without Mulch			
Bima Brebes	88.75 ab	2.08 b	4.82 a
Trisula	87.50 ab	3.47 a	4.43 a
Bali Karet	70.00 c	1.81 b	1.42 b
Mulch Treatment			
Mulsa	88.92 a	3.10 a	3.73 a
Without Mulch	82.08 a	2.45 b	3.56 a
Treatment of Varieties			
Bima Brebes	91.88 a	3.24 a	5.03 a
Trisula	90.00 a	3.50 a	4.58 a
Bali Karet	74.63 b	1.59 a	1.33 b
Average	85.5	2.78	3.65
CV (%)	7.68	25.3	18.43

The number in each column followed by the same lowercase letter is not significantly different according to the DMRT at the 5% level.

The dominant pest attacking shallot plants is armyworms (*Spodoptera exigua*) with an attack rate of 1.24 - 5.23% which occurs at all plant ages. The attacks were significantly different in the interaction between treatments, the highest percentage was found in the Bima Brebes variety (5.23%) in the block mulch and the lowest was in the mulch treatment of Bali Karet variety (1.24%). The disease that attacks is moler caused by Fusarium and purple spot / trotol (*Alternaria porri*). The lowest percentage of attacks on these two diseases was experienced by the Bali Karet variety in both the mulch block and the block without mulch, namely 1.60% and 74.63%, respectively. The percentage of attacks on site crops for armyworms and fusarium is not very high, however, trotol disease attacks are very high due to the high rainfall prior to harvest in May.

From the observations of pests and diseases, it can be seen that mulch treatment also does not have a significant effect on the presence of pests or diseases. The differences occur due to the influence of varieties. It is known that each variety has different resistance to pests and diseases. For off season planting, with high rainfall conditions (table 4) the Bali Karet variety is more able to withstand pests, especially purple spot disease (trotol). Diseases caused by the fungus *Alternaria porri* or purple spot disease can be transmitted through the air and thrive when humidity is high [12]. Symptoms of the disease attack at first, there are small, curved spots that are white to gray, if they are enlarged, they are purple in color. In humid weather, the surface of the spots is covered by fungal conidiums which are brown to black and the tips of the affected leaves become dry [13]. This disease is an important disease for shallots because it can destroy production [14]. Disease attack by the fungus *Alternaria porri*, can cause yield losses of between 35-40% [15, 16].

The rainfall table in Gisting Atas District, Tanggamus Regency is presented in the table below.

Table 4. Rainfall Data for January-November 2018 Gisting Atas District, Tanggamus (mm).

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
131.7	369	309	254	279	151	25	77	98	154	201

Biological disease control includes the control of armyworms using yellow traps and for Moler disease using the biological agents corine bacterium. In addition, the use of biological agents containing *Trichoderma* spp. It can also anticipate fusarium fungus attack that attacks plants.

4. Conclusion

- Off-season shallot cultivation is promising to be cultivated by farmers because the results average production is 14.59 tonnes / ha using the Bima Brebes, Trisula and Bali Karet varieties.
- Bali Karet varieties have good prospects to be developed and planted outside the season because they are more resistant to pests and diseases and have the highest production (20.87 tonnes / ha) than Bima Brebes and Trisula varieties.
- There is no significant difference between the use of mulch and without mulch on the off-season shallot production.

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