The performance of true seed of shallot (TSS) growth and production in East Java

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Abstract. True Seed Shallot (TSS) of shallot is shallot seed origin as solution of seed availability problem. Generally, farmers still use bulb seed for shallot production. This is because the aspect of shallot cultivation using TSS seed is still to be reviewed. The research objective was to known performance of growth and production of TSS in East Java. The Research was carried out in 2017 until 2018 at Probolinggo District and Batu city, using 2 (two) varieties, namely Trisula and Biru Lancor. The results showed that the growth phase of the Biru Lancor variety showed a better value than Trisula in each location with plant height (64.4 cm), number of leaves (78.2), number of tillers (14.5) and number of flowers (4.8). The generative phase showed that Trisula variety produced higher TSS yields but lower yields for bulb seed, whereas for Biru Lancor varieties the TSS yield was lower than bulb seed yields. Biru Lancor variety is also more resistant to environmental conditions but more susceptible to pest attack and the Trisula variety shows the opposite.

1. Introduction

As one of the strategic commodities, shallots have a fairly high chance, because the consumption of shallots by households nationally reached 751.24 thousand tons [1] or increased by 21 thousand tons from the previous year. Meanwhile, the participation rate of shallot consumption by households in Indonesia reached 93.42 % and increased by 1.5% from 2018. The increase in National production in 2018 showed that the increase in production was also offset by an increase in productivity (ton/ha) as well as an increase in the area of harvest. Productivity improvement technology continues to be increased by the government working with all parties to meet national needs, increase exports, and maintain national stability (preventing inflation).

One of the alternatives to growing shallot seed technology is the use of botanical seeds (TSS = True Seed of Shallot). The use of TSS is expected to overcome the seeding of shallots in Indonesia because it can meet the supply of shallot seeds in quantity (to cover the lack of availability of quality shallot seeds that reach 82.2%) and quality, such as high productivity, healthier crops, more efficient use of seeds around 5 – 7 kg/ha, relatively long shelf life, handling in warehouses and easier transportation [2, 3]. With the longer shelf life of TSS seeds(1-2 years), the problem of seed scarcity in each growing season can be resolved. varieties that are growing in East Java include: Biru Lancor Varieties, Bauji, Batu Ijo, Super Philip, Monjung and Rubaru [4]. TSS production studies in East Java include The Biru Lancor Variety grown in Probolinggo and the Trisula Variety planted in Batu while other varieties are still not produced [5].
2. Material and Methods

2.1 Material

The research was conducted in 2 (two) locations, namely Probolinggo regency and Batu City in 2017 and 2018 using Trisula and Biru Lancor varieties.

2.2. Methods

The research was carried out by farmers using participatory methods with farmers as replays. The data collected includes primary and secondary data. The data obtained was analyzed descriptively and quantitatively using RAK and in the event of a noticeable difference in further tests with Duncan the 5% trust rate. Plant growth includes the height of the plant, i.e. the growth of shallot plants measured ranging from the neck of tubers that appear at ground level to the highest leaves and the number of leaves per clump of plants. Flowering includes the number of flower produced percentage of flower plants, namely the number of plants that produce umbel flowers in each test tile and the number of umbel (wreaths/groups) of flowers per plant, namely the number of umbel flowers that appear from each plant and the results of seeds and tubers. Secondary Data consist of weather and pest and plant disease that Organism attack plants, namely the type of pest and plant disease that exists in shallot plants, both on the leaves and stalks of flowers as well as the intensity of the attack, and the data supporting environmental conditions (temperature, rainfall, and humidity).

3. Results and Discussion

3.1 Location Conditions

Weather condition in the vegetative and flowering phases indicate that rainfall at the site is very influential due to the growth and development of plants as in table 1.

| Months | temperature | Moisture | RF | number of rainy days | plant phase |
|--------|-------------|----------|----|----------------------|-------------|
| April  | 20,5 - 28,3 | 61,0 - 84,0 | 219 | 13 | Vegetative Growth |
| May    | 14,3 - 23,5 | 68 - 96 | 88 | 9 | Early flowering |
| June   | 18,3 - 24,3 | 70 - 99 | 12 | 3 | Flower formation |
| July   | 19,3 - 23,9 | 75 - 88 | 24 | 3 | Botanical flowers + stalks of flowers yellow and dry brownish seed formation is inhibited |
| August | 18,5 - 24,2 | 76 - 98 | 0,8 | 1 | Imperfect seed formation |

| Months | temperature | Moisture | Rainfall (mm) | Rainy days |
|--------|-------------|----------|---------------|------------|
| May    | 24,51       | 90       | 28            | 4          |
| June   | 24,06       | 86       | 23            | 4          |
| July   | 23,73       | 84       | 0             | 0          |
| August | 24,01       | 81,5     | 0             | 0          |
| September | 24,6   | 78,53    | 21            | 2          |

Table 2. Weather conditions on the Biru Lancor and Trisula varieties in Probolinggo District

Planting time in Batu city in April, time of vegetative phase experienced in wet season, but generative phase experienced in dry season, while in Probolinggo district planting time in
May, the vegetative phase experiences a wet season (albeit lower) intensity than the first in Batu City, and in the generative period experienced a dry season but at the time of harvest back experienced wet season. The amount of rain on a monthly day affects the growth and development of plants. All environmental variables that determine the changing seasons are potential factors that control the plant's transition to flowering. Major factor is photoperiod, temperature and water availability [5]. Warm temperatures can speed up paddy flowering time, as [6] reported in rice which is the influence of very dominant temperatures on the appearance of flowers. At higher average temperatures the interest rate is faster than at lower temperatures. Although the planting time is in Batu City and Probolinggo district only a difference of 1 (one) month, but makes a significant difference in seed yields in both of locations.

3.2 Pest and disease attacks

During the study activity, several types of diseases were found: Stemphylium patches, sidewalks or purple patches and anthrax with varying attack intensity. Observation of disease pests at the age of 8 weeks after planting (mst) that in both varieties there is an increase in the intensity of Stemphylium disease, pavement or purple patches or and anthrax. The highest increase occurred in Biru Lancor varieties, pavement disease increased to 27.5 % and in Trisula varieties 25%. In the last observation of 14 mst in addition to trorol disease also appeared attacks of Stemphylium and Anthrax diseases. Although it has actually been carried out intensive control with fungicides. The intensity of pavement disease increased to 35.25% in Biru Lancor varieties and 31.10% in Trisula varieties. The intensity of Trotol disease in each variety is about 15%. In addition, anthrax diseases with intensity of 3 % and 5 %. As the plant ages, until the end of observation at the age of 14 mst, the intensity of the attack of all three diseases increases. The intensity of Stemphylum, trotol, and anthrax attacks on Biru Lancor varieties was 43.15 %, 30.15 % and 12%. While the Trisula varieties became 32.1 %, 25.7 and 15% respectively.

Figure 1. Average intensity of disease attacks on Biru Lancor and Trisula varieties

When further study it appears that the attack of the three types of disease, from the age of 8 WAP until entering the generative phase, the intensity continues to increase as the plant ages even though it has entered the dry season. This incident is thought to be closely related to the lack of discipline of the suitcaseator farmers in the maintenance of mainly watering and disease control. This results in plants not growing optimally and less healthy, making them more vulnerable to attack by all three types of disease. Diseases caused by Stemphylium fungus develop very quickly and can lead to sudden death of shallot plants. This occurs in conditions of high humidity and strong wind gusts [7]. Attacks of the disease are reported to be more severe in cultivation aimed at seed production than consumption even causing loss of up to 100% [8]. Although control with fungicides has been carried out, its success
depends only on the intensity of its control [9]. The increase in attacks of Stemphylium spotting disease and spotting will develop rapidly along with the level of leaf wetness [10].

According to [11] that anthrax C. gloeosporioides commonly attack old leaves aged 54–69 DAP. According to [12] that in addition to weather factors especially humidity and rain at night, cultivation action factors are also very important in the development of diseases such as purple patches or sidewalks in shallot plants. Spores fall to the surface of host plants that do not grow healthy, will quickly germinate and infect plant tissue through stomata or wounds on the epidermis. Poor irrigation and balanced fertilization due to excessively high N doses also trigger disease progression [13].

3.3 Vegetative performance of Trisula and Biru Lancor

| Location  | Varieties       | Plant Height (cm) | Number of Leaf |
|-----------|-----------------|-------------------|---------------|
| Batu      | Biru Lancor     | 40.7              | 61.5          |
|           | Trisula         | 36.85             | 39.3          |
| Probolinggo| Biru Lancor   | 45.3              | 83.4          |
|           | Trisula         | 37                | 42.5          |

The variety difference gives a noticeable difference to the height of plant, the number of leaves, and the number of samples per clump (Table 3). Height of plants and number of leaves in varieties Trisula and Biru lancor varieties there had differences, it depends on clones as well as the type of growth, the length of the leaves is depend on by the location of plants, it is influenced by the environment and seasons [14]. The height of the plant and the number of puppies in addition to being influenced by abiotic factors such as nutrient nutrients are also influenced by genetic factors [14] states that Trisula varieties have a plant height of 39.92 cm and have 5–8 flower per clump.

3.4 Generative Performance of Biru Lancor and Trisula varieties

The generative discrepancy between the Trisula and Biru Lancor varieties also straddled intra-location and between locations according to table 4.

| Location | Variety      | Length of Flower Blossom Stalk (cm) | Blooming Flower Diameter | Number of Umbels per Plant |
|----------|--------------|-------------------------------------|--------------------------|---------------------------|
| Probolinggo| Trisula   | 24,4                                | 1.87                     | 6,8                       |
|           | Biru Lancor | 54,9                                | 3.38                     | 7,18                      |
| Batu      | Trisula     | 74,6                                | 3.5                      | 8                         |
|           | Biru Lancor | 57,8                                | 3                        | 4,5                       |

The length of the flower stalks of Biru Lancor varieties is higher than that of Trisula at location. Probolinggo district, but the opposite happened in Batu City location. Due to the adaptability of the Biru Lancor variety which is the original variety of Probolinggo which caused this to happen. It’s also occurred in the diameter of blooms and the amount of umbel per plant, it indicates that the location affects the generative of the plant.
### Table 5. Harvest of Biru Lancor and Trisula varieties in Batu city and Probolinggo District

| Results | Probolinggo | Batu |
|---------|-------------|------|
|         | Trisula     | Biru Lancor | Trisula | Biru Lancor |
| TSS     | 4159        | 3007     | 4093,622 | 0      |
| Umbi    | 320         | 625      | 1025     | 50     |
| Total   | 4479        | 3632     | 5118,622 | 50     |

The production of botanical seeds of shallots, in addition to producing botanical seeds also produces tubers that are ready to be planted. From the table it is known that the yield of Biru Lancor botanical seeds in Probolinggo district is lower than the Trisula variety but the yield of tubers is higher than the Trisula variety. While in Batu City the varieties of Trisula are higher for the yield of botanical seeds and tubers, whereas Biru Lancor does not produce botanical seeds only bulb. This shows that each variety can produce botanical seeds, but must be cultivated in areas that suitable for the variety, the results can be optimal. Percentage of flowering and breeding influenced by factors such as temperature and pollinators. According to [15] vernalization treatment, proper planting time in the dry season, and the use of large seed is able to increase the percentage of flowering and seeding. Lower temperature affected flowering, fertilization, and shallot breeding. Flowering initiation requires a temperature of 9–12 °C, umbel lengthening requires temperature of 17–19°C, while fertilization and breeding requires a temperature of 35°C [16]. Another thing that formation of seeds are the presence of polynators. Insects that visiting flowers of shallot during the activity are bees (Apis cerana). [17] reported that percentages of capsules per umbel of the plant with introduction A. cerana ranges from 70.67–74.08%, the highest among the introduction of other types of insects such as Trigona sp, and Lucilla sp. This reflects ini the A. cerana as an effective shallot pollinator insect compared to other types of insects.

![Figure 2. Appearance of True seed of shallot](image)

Figure 2. Appearance of True seed of shallot
4. Conclusion
Vegetative Performance Trisula (Number of flower/umbel) better than Biru Lancor in both of places and Vegetative Performance Biru Lancor (plant height, number of leaf, and number of tillery) better than Trisula in both of places but Yield of TSS in Probolinggo for Trisula higher than Biru Lancor, but for second product (bulb) Biru Lancor higher than Trisula Yield of TSS in Batu for Trisula higher than Biru Lancor (TSS and bulb)

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