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The Success Rate of Red Onion (*Allium ascalonicum* L.) Crosses in the Lowlands Area of Jember

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Abstract. Shallots (*Allium ascalonicum* L.) are vegetable plants that use as spices and cannot be substituted. The existing shallot varieties are generally not yet able to adapt to climate change or the altitude of the planted area and are still susceptible to important diseases. Therefore it is necessary to make efforts to obtain superior red onions that are adaptive to climate change and tolerant of important diseases. Red onion crossing is one way to expand genetic diversity, and combine the desired characters so that new populations are obtained as selection material in the assembly program for new superior varieties of shallots. Crosses in this study use local varieties of East Java. Bauji variety is one of the local shallot varieties in East Java which is adaptive in lowland areas, can be planted in the rainy season, and tolerant of diseases. Tajuk variety is also a local East Java variety with the advantage of being able to adapt to the dry season and to withstand the rainy season. The aim of this study was to determine the success rate of crossing two shallot varieties in order to produce an adaptive lowland variety of shallot and tolerant of important shallot diseases. The research was conducted in the Antirogo experimental garden at an altitude of 89 asl from August to November 2020. The study used a non-factorial randomized block design with three replications.

1. Introduction

Shallot is quite important vegetable and much needed in Indonesia. This fact causing the demand for shallots be higher from year to year [3]. [2] reports that shallot production has been under control for the last five years, however, farmers still use tubers as planting material. Even though there is an alternative planting material in the form of true shallot seed (TSS) which has more advantages. [4] reports that availability of shallot bulb as seeds could not provides farmer needs every year. In 2009, total of requirement is 120. 020 tons of shallot tubers for seeds and only 19,770 tons were available, consisting of 13,400 tons of domestic production and 6.370 tons of imports. Rates availability of new shallot seed tubers reaches 15 - 16% of the annual requirement. Therefore continuity is needed in the provides of shallot seeds. This is the most important factor in maintaining shallot production for sustainable development of shallot cultivation in Indonesia.

The use of seed tubers as planting material still has many weaknesses, such as seeds risk in carry tuber (seed)-borne diseases which can lead to decreased productivity [12]. Large volume of seed tubers do not last long enough to be stored for a long time, requiring a place for storage and special transportation [5]. The need for seed tubers can reach 1-1.2 tones / ha-1 [6] so that it requires a fairly high cost for the provision of tubers, reaching 40% of production costs [9]. The use of TSS can maintain



and increase the production of shallot seeds. As reported by [7], the source of shallot seeds using TSS is very prospective to increase the production and quality of shallot bulbs.

Crosses are an attempt to improve plant genetic diversity. Hybridization manipulation attempts with a combination of two or more plant traits to produce new individuals [10]. In order to obtain superior traits, one of the ways that can be done is by improving new traits or varieties such as combining the good qualities of several superior local shallot varieties through crossing, so that new superior and high productivity clones or new varieties can be obtained even better than his parents. In doing crosses, there are several factors that can affect the success of crossing. One of the factors that influence success is the selection of elders. According to [11] success in breeding is determined by the selection of elders to be crossed. In the selection of parents it is very important and it is hoped that the parents who will be crossed are suitable or compatible so that high crosses can be produced [10]. Meanwhile information about Information about pollen and ovule fertility in shallots is still mixed. [14] stated that the fertility of diploid onion pollen reaches 81-95% while the ovule fertility is lower, which is around 42-46%. This is the basic information on the existence of a maternal effect on shallot flowers so that a reciprocal crossing method is needed.

Tajuk and Bauji are shallots varieties from East Java that have been released by the Ministry of Agriculture and widely used in East Java also adaptive in the lowlands [1]. The superiority of the Tajuk variety is its ability to adapt well to the dry season and withstand the rainy season. It has a very sharp aroma which is suitable for fried onions as well as high production. Bauji variety can produce up to 18 tons / ha but is less resistant to important diseases. The cross between the two is expected to be able to produce new high yielding varieties, tolerant of important diseases and adaptive in all seasons.

2. Methods

This research was conducted in Antirogo Village, Jember Regency, at an altitude of 89 m above sea level from August to November 2020. This research was conducted using a non-factorial randomized block design that are crossing factor. These crossing containing as selfing and reciprocal. Each treatment variable had 3 replications, each replication had 30 populations, a total population of 540 populations. The samples of reciprocal crosses were 124 plants, for selfing were 124 plants. The parameters observed included number of umbels per plant, number of flowers per umbel, percentages of crossing test, number of capsule per umbel, number of seeds per umbel, weight of TSS per umbel, the weight of seeds per 100 TSS. The data obtained were analyzed using DMRT test analysis at the 5% significance level.

3. Results and Discussion

The research is currently on going and the plant was in its flowering phase. Crossing activities test have not occurred because the flowers that appear not yet entered the anthesis period, either as male flowers or female flowers. The following is temporary data from experiments that have been carried out (Tabel 1).

Table 1. Number of Flower Stalk of Bauji and Tajuk Varieties in the Lowland area of Jember

Treatments	Number of Flower Stalk of Shallot
Bauji Variety	0.75 a
Tajuk Variety	0.25 b
Mean	0.5
Coef of Varian	33%

The numbers followed by the same letters within the same column were not significantly using DMRT at a 0.05. Ns= not significantly

The result showed that Bauji Variety have more flower stalk than Tajuk Variety. This condition showed that Bauji have chance being female parental and Tajuk as male parental. But, these two variety could be reciprocal treatment depend on its number of flower. [13] said that reciprocal cross is a kind of crossing strategy, using female and male parents to make crosses between a pair of parents. Usually a cross is expressed in the way that the first parent is female and the second parent is male. Number of



flower however can influenced by temperature, altitude and its variety. How ever, there is still low information about fertility of pollen and ovule of shallot, [14] said that ovule fertility lowest than pollen fertility, so it could caused maternal effect. So, reciprocal crossing method is needed in this case.

4. Conclusion

Both varieties had the opportunity to become male as well as female elders, but the Bauji variety had a greater chance of becoming female parents because of the higher number of flowers.

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