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Short Communication

Combining Ability in *Jatropha curcas* L. Genotypes

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1. INTRODUCTION

Jatropha curcas L. is a vegetable oil plant growing under diverse climates throughout the year. This plant can adapt to very low rainfall areas and marginal lands possessing low soil fertility, and could produce high biomass as a potential cover crop to reduce evaporation [1]. The *J. curcas* biodiesel has numerous advantages, such as: more environmental friendly due to its better emission, higher combustion efficiency, biodegradable, and renewable. Oil content in *J. curcas* is rather high which can be used to replace diesel fuel to some extent [2]. thus, the Jatropha biodiesel has the potential to increase an independent fuel supply [3].

In an attempt to provide biodiesel fuel in Indonesia, by the year 2025 the cultivation area under *J. curcas* is intended to be increased to about 2.4×10^6 ha; the available land area for the purpose in the country is a mostly dry and unproductive otherwise [4]. The Directorate General of Plantation has planned for *J. curcas* cultivation especially in West Nusa Tenggara, East Nusa Tenggara, Southeast Sulawesi, Gorontalo, Maluku, and Papua areas [5]. However, a desirable variety of *J. curcas* with high production potential and adaptability in such areas is not available as yet. The success of the breeding program to produce such a leading variety relies predominantly on the available germplasm. The potential of a good genotype source can be exploited through introduction, exploration and hybridization. In an effort for exploration of *J. curcas* during 2005, the Centre for Research and Plantation Development had collected 421 germplasm accessions from East Java, West Nusa Tenggara, East Nusa Tenggara, and South Sulawesi areas [6]. The variety improvement can be attempted by utilizing a proper germplasm source [8]. This research was conducted in the plantation of *J. curcas's* germplasm located in Asembagus – Situbondo, East Java, Indonesia using seven local accessions of *J. curcas*, i.e., HS49, SP16, SP38, SP8, SM33, SP34, and SM35 [7].

2. METHODOLOGY

During flower-initiation stage, the prospective cross crops were covered with gauze. Emasculation of pollen in parent plants was done in early morning while the flowers were subsequently wrapped in transparent plastic bags to avoid contamination by other pollen. Pollen was taken from selected parent plants by cutting the flower containing mature pollen. The hybridization process was conducted in early morning from 5.00 a.m. to 6.00 a.m. The pollinated flowers were labeled numerically as pollination codes and further wrapped with gauze bags to guarantee its purity. After the pollination

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process, the soil moisture was maintained at adequate level. The gauze bags were opened 7 d after the pollination and any non-pollinated flowers were disposed off. Jatropha seeds were gradually harvested by firstly picking yellow fruits, peeling it out immediately after being harvested, and drying the seeds until their moisture was reduce to approximately 7 %.

3. RESULTS AND DISCUSSION

J. curcas oil is a non-edible and renewable oil source. In breeding program, any genetic information of varied germplasms that will be crossed must necessarily be recognized whether through phenotypic or molecular characterization activities. The variation of local *J. curcas* germplasm can be utilized for the variety improvement when there is available information on patterns of genetic variation and phylogenetic relationship among genotypes. Various analytical techniques have been used to study on the genetic relationships as well as individual performance within and among plant species, including Jatropha [9, 10].

From 42 cross combinations tested in this research, there were 10 combinations that did not result any seeds at all. The crosses among accessions that had been done were not entirely successful in obtaining fruits and seeds. The cross between SP8 × HS29 produced highest level of compatibility (88.33 %), followed by the cross between HS49 × SP38 (72.67 %). The highest production of dry seeds was obtained from the cross between SP8 × HS29 (569.14 g), followed by the cross between SM35 × HS49 (449.89 g). The dry weight of 100 seeds from this cross was 65.83 g to 72.84 g.

Pollination is the process by which pollen is transferred to the female reproductive organs of a plant that has been emasculated. The pollination of *J. curcas* was conducted in early morning, after which the flower crown was covered to avoid contamination by other pollen. The pollinated flowers were labeled numerically as pollination codes and further wrapped with gauze bags to guarantee its purity. Any non-pollinated flowers were disposed [11]. In this research, seeds were gradually harvested by firstly picking yellow mature fruits. The use of accessions SP16, SP8, SP38, SP33, SP34, and SM35 as parent plants was apparently less suitable since evidently there were several failures of seed production in some cross combinations.

4. CONCLUSIONS

The crosses among seven *J. curcas* accessions (i.e., HS49, SP16, SP38, SP8, SM33, SP34, and SM35) were not successful in obtaining fruits and seeds; in total, 14 cross combinations did not produce fruits nor seeds at all. The cross between SP38×HS49 produced the highest number of fruits and seeds, followed by the cross between SM35×HS49.

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