Characterization of Morphology and Potential of Garlic Genetic Resources in Jambi Province

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Abstract

Garlic is an important type of vegetable and one of the sources of new economic growth in agricultural development. Jambi Province, especially the Kerinci Regency has the potential for the development of garlic. Garlic can grow and produce tubers well in this area. Jangkiriah Adro Garlic are plant genetic resource (PGR) that must be maintained and secured from extinction and erosion of genetic potential. This is because the real PGR continues to be utilized for the survival and welfare of the community. The research purpose was to know the morphological of PGR garlic that have potential to grow, produce and adapt in Kerinci Regency, Jambi Province. Survey method was used in this research and conducted in Kayu Aro and Kayu Aro Barat Subdistrict, Kerinci Regency, Jambi Province in September 2017- April 2018. The results showed production of Jangkiriah Adro Garlic were 8-10 ton/ha. Jangkiriah Adro garlic has a characteristic with a sharp aroma, medium-sized tubers with a diameter of approximately 4.5 - 5.3 cm. Round egg shape, tapered and base tip, tuber length 3.2 - 4.5 cm with purplish white tuber color and number of cloves per tuber 9-13 cloves. Harvest age is ± 120 -160 HST and grows well at altitude of ≥ 1100 masl. Jangkiriah Adro garlic is visually similar to the superior varietas of New Tawangmangu. The results of DNA testing using the SSR method show that these two plants are different. Jangkiriah Adro garlic has been registered with the Indonesia Ministry of Agriculture.

Keywords: genetic resources, Jangkiriah Adro garlic, Kerinci Regency

1. Introduction

Garlic (Allium sativum L.) is an important vegetable, for its culinary and medicinal properties (Anti-infective properties such as anticancer) and one of the sources of new economic growth in agricultural development (Petropoulos et al., 2018; Egea et al. 2017; Rashwan et al. 2018). Garlic possesses typical pungent flavor and the garlic the flavour is due to the presence of chemical content diallyl disulphide (Dixit et al. 2018). The garlic is the second most important Allium species. It is grown worldwide as an important spice and medicinal plant. The bulb, composed of few to many cloves, is the main economic organ (Stavělíková, 2008). An important bulb vegetable is garlic with several nutritional and medicinal benefits: anti-infective properties such as anticancer (Sholihin et al., 2016). Garlic was considered a potential commodity especially for import substitution and foreign exchange savings. The production of garlic in Indonesia has not been able meeting the demand for food needs of the community so that it causes the difference and the big gap between consumption and production inside country (Wijaya et al., 2014). This event caused a production deficit that required the government imports...
to meet the consumption of these commodities. Since the last development (in 2006), to meet domestic consumption needs, Indonesian garlic imports amounted to 295 thousand tons with a value of not less than US $ 103 million or Rp. 927 billion (Dirjen Hortikultura, 2012).

The rely consumers in Indonesia on imported garlic is very high. Currently around 95% of garlic consumed in Indonesia comes from imported garlic from China. China is also the leading producer of garlic which contributes 75% of world production. Garlic imported from China is cheaper than the price of local garlic, besides the bulb size is also larger. The low price of imported garlic seems to be due to the high productivity of garlic in China, which is 25.3 tons/ha, compared to Indonesia which is only 8.7 tons/ha (FAOSTAT, 2014; Dirjen Hortikultura, 2015; Panse et al., 2013). To reduce the dependence on imported garlic, garlic production in Indonesian must be increased. Garlic vegetable commodities are a self-sufficiency target to meet the needs of Indonesian citizens. In an effort to increase the productivity of garlic vegetables, several efforts need to be carried out including the provision of quality seeds, the application of appropriate cultivation technology, and expansion of planting areas. To meet the needs of national garlic vegetables, the government is targeting the development of vegetables in 2018 covering an area of 6,900 ha for garlic. For this reason, it takes a lot of vegetable seeds.

The development of garlic in Indonesia is hampered due to the unavailability of varieties that are capable of high production. The average production potential of national garlic varieties is much lower than the potential yield of garlic in subtropical regions. Similarly, the level of entrepreneurs is limited to highland areas (> 800 m asl). With the limited superiority of the garlic varieties, identification and characterization of local garlic genetic resources (SDG) is important. This characterization can identify local accessions that have the potential to be developed directly or that have the potential to improve existing varieties (Rahayu et al., 2015).

Jambi Province, especially the Kerinci Regency has the potential for the development of garlic. Garlic can grow and produce bulbs well in this area. Local Kerinci garlic has a characteristic with a sharp aroma, medium-sized bulb with a diameter of approximately 5 cm. The area of garlic plantations in Jambi Province is not too extensive and decreases from year to year. This is due to the increasing number of imported garlic with cheaper selling prices so that local garlic is only grown for local consumption and certain demand from neighboring provinces such as Pekan Baru. The production of local Kerinci garlic is quite high at 9-10 tons/ha, so it has the potential to be developed.

Local garlic Kerinci are plant genetic resource (PGR) that must be maintained and secured from extinction and erosion of genetic potential. This is because the real PGR continues to be utilized for the survival and welfare of the community. For the development of suitable varieties of garlic, it is essential to evaluate the characters of the available genetic resource properly for selection (Alam et al., 2010). The research purpose was to know the morphological of PGR garlic that have potential to grow, produce and adapted in Kerinci Regency, Jambi Province.

2. Materials and Method

This research conducted in Kayu Aro and Kayu Aro Barat Subdistrict, Kerinci Regency, Jambi Province in 2017- 2018. The tools used are: stationery, calipers,
camera, meter, ruler, label paper, plastic, cutter, scales. Survey method was used in this research and conducted on highland dry land, altitude ≥ 1100 m asl. Observations were made on plant morphology in the vegetative (plant height, stem diameter, leaf length, leaf width, number of leaves, shape of leaves, color of leaves) and generative phases (bulbing period, shape of bulb, size of bulb, color of bulbs, color of bulb flesh, number of bulb per plant, bulb weight, bulb diameter, number of cloves per bulb, and production/ha.

3. Results and Discussion

Characteristics of The Kerinci Regency

Kerinci Regency area is 332,841 ha or 3,328,14 km². More than half from this regency area is Kerinci Seblat National Park and only 1,337,15 km² is used as agricultural and residential area. In 2017, average temperature in Kerinci Regency is 22.9 °C and humidity 80.75 and highest temperature 28.9 °C and humidity 94%, average precipitation in Kerinci Regency during 2017 is 150.6 mm³. The highest precipitation occur in May 283.2 mm³ with 23 rainy days (BPS Kabupaten Kerinci, 2018). Garlic grows well in areas that have cold temperatures (< 25 °C). The cold temperature is especially needed when forming and enlarging plant bulb (Dirjen Hortikultura, 2017). This temperature requirement is met in Kerinci Regency, so that garlic can grow and produce well. The height of the place also affects the growth of garlic. Kerinci local garlic grows well at an altitude of ≥ 1100 m asl).

Highland vegetable producing areas are Kayu Aro, Kayu Aro Barat and Gunung Tujuh sub-districts located around Mount Kerinci, the main types of horticulture are potatoes, chillies, tomatoes, carrots, shallots, garlic and leaf vegetables that grow well in cool climates with types volcanic soil. In the kind of vegetables, commodities that have the biggest harvested area in Kerinci Regency are potato, chili, cabbage, and Tomato, onion and garlic. Potato is the commodity with the biggest yield. In the kind of fruits, the biggest harvested area are banana, Siam orange, and mangosteen. Banana is the biggest yield fruits in Kerinci Regency. It produces 34.479 quintal in 2017.

Kerinci Regency has local garlic which has been planted for generations for decades and is currently registered with the Center for Plant Variety Protection and Agricultural Licensing under the name Jangkiriah Adro. Local garlic, which has not developed, has begun to emerge and its land area has increased along with the self-sufficiency target launched by the Minister of Agriculture. The follow up of the self-sufficiency target is the implementation of garlic seedling activities in 2017 by Jambi AIAT. In 2018 the area of garlic cropping increased by 2-3 times.

Morphological characters of Jangkiriah Adro Garlic

Jangkiriah Adro garlic has a plant height of 50-70 cm, stem diameter 2.5 - 3.0 cm, leaf length 45 - 65 cm and width 2.8 – 4.0 cm. The shape of leaves are flat, color of leaves are dark green and the number of leaves per plant was 6 – 10 leaves. The bulb was harvested at 120 - 135 days after planting. The characteristic of garlic that is ready for harvest is about 50% of the leaves have yellowed or dried and the stem is hard. Garlic bulbs are ready to harvest when they show the optimal cooking characteristics, i.e there is a change in the color of leaf stalks from fresh green to yellowish, the base of the stems hardens and the bulb begin to emerge on the ground becomes yellow with a wilting level of 35-60% (Hilman et al. 1997; Dinas Pertanian Magetan, 2015). Variety characteristics differ considerably with the
location of cultivation, and climate has a significant impact on garlic bulbing, florogenensis and flavor (Kamenetsky, et al. 2007).

The bulbing period of 45 days. This bulbing period is longer than local Sanur variety, Lumbu Kuning and Lumbu Putih which are 36 days (Sarwadana dan Gunadi, 2007). This is also the same as Sangga Sembalun variety grown in Kerinci Regency. The bulb has oval shape (egg like), tapered tip and flat base with white flesh and purplish white skin. The size of bulb is quite large with a diameter of 4.5 - 5.3 cm and length of 3.2 - 4.5 cm. Color of bulbs are purplish white, rings of bulb is thick, strength of medium bulb flesh and white flesh. The number of bulb per plant is one bulb, weighing 30-70 g/bulb and the number of cloves per bulb is 9-13 cloves. The morphological character of plant and bulb can be seen in Figure 1.

The results showed production of Jangkiriah Adro Garlic were 9-10 ton wet bulb/ha (This production is higher than the national garlic productivity of 8.7 tons/ha, Sandrakirana dan Baswarsiati, 2018). This result is also higher than the production of the Sangga Sembalun and Tawangmangu Baru varieties grown in Kerinci Regency, which are 7-8 tons / ha and 8-9 tons/ha respectively. Production differences besides being influenced by genetics are also influenced by environmental factors (Kumar, 2015; Yeshiwas, 2018). Jangkiriah Adro garlic has a characteristic with a sharp aroma and grows well at altitude of ≥ 1,100 m asl. Jangkiriah Adro garlic is visually similar to the superior variety of New Tawangmangu but the results of DNA testing using the SSR method show that these two plants are different. Jangkiriah Adro garlic has been registered with the Indonesian Ministry of Agriculture. Jangkiriah Adro Garlic can be released as national superior variety.

Potential Development of Jangkiriah Adro Garlic Genetic Resources

At present, farmers who grow garlic in Kerinci Regency are less than 2 - 3 decades before. In that era, every household could be said to cultivate garlic even though the scale was very limited. Since the end of 1990 - the beginning of 2000 the number of farmers seeking garlic has decreased significantly, even in 2017 the number of farmers who planted / cultivated garlic was approximately 10 people. According to one farmer who consistently planted / cultivated garlic, the number of farmers who planted garlic in the scope of Kayu Aro and Kayu Aro Barat Districts was not more than 10 farmers with a land area ranging from 1 - 1.5 plates or between 400 m² - 600 m². According to 2 local farmers and one field agricultural extension officer (PPL), the main factor that causes the reduction in the number and interest of farmers to grow/cultivate garlic in a sustainable manner is market factors.
and selling prices. Furthermore, it was stated, this has happened since the flood of imported garlic in Kerinci Regency and other Regency/cities in Jambi Province at a lower price compared to the price of garlic produced by farmers.

Yustika (2012) states that a large amount of dependence on commodity import supplies is certainly difficult to bring price stability, so garlic farmers and market participants find it difficult to predict prices and determine steps. Based on this, it is necessary to forecast the price of garlic in the market for the future, so that it can assist in planning and decision making, especially for garlic farmers.

The efficiency and means of information need to be increased for each commodity price in the market through improved marketing and government interference. The marketing system needs to be improved through institutional or farmer institutions and government institutions. The results of the study of Herdinastiti et al. (2013), all market levels of garlic in East Java and China are integrated, so careful consideration is needed in an effort to increase local garlic production and consumption, as well as reducing the amount of imported garlic from China. This is because market intervention can also cause a breakdown of prices between markets.

Jambi Assessment Institute for Agricultural Technology (AIAT) tried to lift the glory of garlic through garlic seeding activities. This is done by introducing superior varieties of Sangga Sembalun and New Tawangmangu. Both of these varieties can adapt and produce well in Kerinci Regency. The yield and size of bulb as well as local varieties are greater than the two varieties, so farmers prefer to plant local varieties. The results re-grow the interest of farmers to plant and cultivate garlic, support for the policy of limiting the import of garlic needs to be done.

The development of garlic aims to meet domestic consumption, decrease imports and self-sufficiency/self-sufficiency of garlic (Dirjen Horti, 2017).

Potential for the development of garlic according to Falo et al. 2016, i.e the potential of land, a favorable climate, farmers who have long cultivated garlic and capital owned by farmers to be able to compete. This potential must be supported by the local government, always existing market demand and long-term storage methods and increase promotion for a wider marketing reach.

4. Conclusion

Morphological character of Jangkiriah Adro garlic as sharp aroma, large bulb size, grows well at altitude ≥ 1,100 m asl, productivity 9 – 10 ton/ha potential for developed on upland dry land Kerinci Regency, Jambi Province.

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References


