

Seed characteristics of local rice accessions from East Barito reGENCY

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Abstract. Central Kalimantan has an abundance of local rice genetic resources scattered in every district. One of the districts with important local rice genetic resources is East Barito. This study aimed to seek unique characters of local rice varieties in East Barito Regency which could be useful for further genetic improvement. Local rice exploration was conducted during January to February 2018 to obtain local species in the East Barito District. The method of activity is purposive sampling by selecting 4–5 villages within the district based on information of diverse local genetic resources. The data collected consisted of the passport data and the present status of local paddy rice, as well as the character of the seeds to ensure that there was a difference of accession for local paddy genetic resources with the same name. Based on the exploration activity, a total of 27 local rice accessions have been explored from the region, and there were two cultivar local rice accessions that have the same name, i.e. Cantik Manis and Siam Cantik. However, they have different grain shape and other morphological characters.

Keywords: seed, distribution, exploration, character.

1. Introduction

Central Kalimantan with a total area of about 154,000 km² has very diverse genetic resources. The genetic resources consist of food, medicinal, ornamental, vegetable, fruits and plantation crops. Based on its agroecosystem, in a dryland with wet climate, many types of fruits, medicinal plants and ornamental plants are found. Whereas in swampland, both tides, lowlands and peat, there are many vegetable crops and other types of food, especially local rice. There were 136 local rice varieties that have been inventoried, and most are found on non-garden land or open lands, such as rice fields and moorland [1].

Rice is widely cultivated throughout the Central Kalimantan and has become the first most crucial food after maize and soybean in terms of cultivation. It is rich in genetic diversity, with hundreds of varieties grown throughout the Central Kalimantan and its economic importance related to agroecological adaptation, household food security, customs, nutritional diversification, income generation and employment. Local rice is genetic resource which has not been paid attention, especially for the effort to purify it, to register and to use it as a source of parents in plant breeding program.



One of the regencies in Central Kalimantan that has quite a lot of genetic resources for rice plants is the East Barito District. Some of these local rice varieties which have unique characters, such as taste quality, have economic value, and are resistant to biotic and abiotic stress [2–6]. This paper presented the results of exploration of cultivars local rice from the East Barito Regency and the identification of the rice grain characters. The objective of this study, therefore, was to seek the unique characters for further rice genetic improvement.

2. Materials and methods

The field surveyed method was used in this study. The field survey conducted in three sub-districts (Patangkep Tutui, Paku and Dusun Tengah) and six villages (Bentot, Jango, Kotam, Tampa, Talohen Hulu and Netampin). The activity was carried out in January–February 2018, by collecting several local rice cultivars grown by local residents. Information about the local names of cultivars was extracted from local farmers through direct interviews or certain people who knew about it, such as village heads and agricultural extension workers. The interview method was done unstructured through simple discussions and conversations. The agronomic character of hull was measured for data collection. All data were analysed by the Analysis of Variance (ANOVA) procedure using SAS software version 9.1. Differences were declared statistically significant when $P < 0.05$. If significant differences were detected, the means were separated by the least significant difference (LSD) at 5% probability level.

3. Results and discussion

The results of exploration conducted in East Barito District indicated that the high genetic diversity of local rice found in this district. A total of 27 local rice cultivars were successfully collected (Table 1). Based on agroecosystem, 9 out of 27 local rice cultivars were collected from irrigated land agroecosystem, while 18 rice cultivars were collected from dryland agroecosystem. Local rice originating from Patangkep Tutui Sub-district was dominated by rice with dryland agroecosystem, and local rice originating from Paku and Central Dusun Sub-districts were dominated by irrigated land paddy. According to the Central Statistics Agency of East Barito Regency (2016), the height of the Patangkep Tutui Sub-district is about 60 m dpl that is higher than the other two districts, Paku Sub-district (15 m dpl) and Central Dusun Sub-district (26 m dpl). The high genetic diversity of paddy rice can be utilized in plant breeding programs to improve the rice variety that has not been used optimally to support the availability of released varieties, so that it can increase the contribution of paddy rice to the national rice production which is still very low, because of its relative low productivity [7].

One of the morphological characters observed in this study was the shape of grain or seeds. This was also conveyed by Lesmana et al. [8] that one of the morphological characteristics used as a differentiator in local rice cultivars is the shape of grain. The shape of grain is also related to the amount of starch content that is different for each cultivar [9].

Grain characters were observed in the exploration, such as color of grain, color of lemma and palea apiculus, color of milled rice, length of grain, weight of grain, thickness of grain, dan weight of 1,000 grains. The mean values of the grain characters evaluated in this study are shown in Table 2. The cultivars showed significant differences for these traits ($P < 0.0001$) which suggest the existence of wide variation in the cultivars used in this study. The $LSD_{0.5}$ values indicate the occurrence of real differences among the accessions tested.

The mean of grain length among the cultivars was 0.187 ± 13.452 mm, which ranged from 0.70–1.10 mm. The Dite Intem (2) had the most extended grain length (1.10 mm) followed by Dite Intem (1), Cantik Manis (1) and Cantik Manis (2). They were significantly different from others. Weight of grain significantly varied from 0.17–0.37 mm with a mean value 0.243 ± 32.22 mm. Juntai had a higher value for the weight and thickness of the grain, 0.37 and 0.28 mm, respectively. The mean value of the thickness of the grain among 27 cultivars was 0.189 ± 3.931 mm. Meanwhile, weight of 1,000 grains ranged from 12.00 to 32.00 g with a mean value of 20.537 ± 24.083 g. Dite Intem (1) and Dite Intem (2) had the highest value for the weight of 1,000 grains. Significant variation was observed in the

agromorphological traits, $z < 0.2$ characters of the local rice grain in East Barito Regency tends to be lean, only a few cultivars with rounded grain.

Tabel 1. Local rice cultivars collected from different agroecosystems in East Barito Regency.

Rice cultivar	Agroecosystem	Type of rice	Location (village name)
Tampeko (aromatic)	Upland	Upland rice	Bentot
Lengkong Lehat	Upland	Upland rice	Bentot
Dite Intem (1) (black sticky rice)	Upland	Upland rice	Bentot
Taring Palanuk	Upland	Upland rice	Bentot
Longkong Weat	Upland	Upland rice	Bentot
Hiwau	Upland	Upland rice	Bentot
Dite Intem (2) (black sticky rice)	Upland	Upland rice	Bentot
Juntai	Upland	Upland rice	Jango
Cantik Manis (1)	Upland	Upland rice	Jango
Mayas Putih	Upland	Upland rice	Jango
Lakatan Uban	Upland	Upland rice	Jango
Lampung Gajah	Upland	Upland rice	Jango
Cantik Manis (2)	Upland	Upland rice	Jango
Tamba	Upland	Upland rice	Jango
Tipung	Upland	Upland rice	Jango
Raden Gunung	Upland	Upland rice	Jango
Cantik Manis (3)	Upland	Upland rice	Kotam
Siam Cantik	Irrigated land	Paddy rice	Tampa
Palui	Irrigated land	Paddy rice	Talohen Hulu
Siam Unus	Irrigated land	Paddy rice	Talohen Hulu
Kerdil Jawa	Irrigated land	Paddy rice	Talohen Hulu
Siam Kupang	Irrigated land	Paddy rice	Talohen Hulu
Siam Cantik (1) (harvested using machine)	Irrigated land	Paddy rice	Talohen Hulu
Siam Cantik (2) (manually harvested)	Irrigated land	Paddy rice	Talohen Hulu
Gedagai	Irrigated land	Paddy rice	Talohen Hulu
Lakatan	Irrigated land	Paddy rice	Talohen Hulu
Mainai	Irrigated land	Paddy rice	Netampin

Table 2. Qualitative dan quantitative characters of local rice cultivars in East Barito Regency.

Rice cultivar	Color of grain	Color of awn and steril lemmas	Color of milled rice	Length of grain	Weight of grain	Thick-ness of grain	Weight of 1,000 grains
Tampeko	Dark brown	Dark brown	Clear yellow with scented pandanus	0.80 e	0.25 b	0.21 a	21.50 b
Lengkong Lehat	Yellow straw	Yellow straw	Clear yellow	0.80 e	0.30 b	0.19 b	22.00 b
Dite Intem (1)	Brown	Brown	Black	1.00 a	0.25 b	0.19 b	29.00 a
Taring Palanuk	Yellow straw	Yellow straw	Clear white	0.70 g	0.30 b	0.18 b	19.00 b
Longkong Weat	Yellow straw	Yellow straw	Clear red	0.70 g	0.30 b	0.21 a	21.00 b
Hiwau	Yellow straw	Yellow straw	Clear red	0.80 e	0.20 c	0.19 b	18.00 b
Dite Intem (2)	Dark brown	Dark brown	Black	1.10 a	0.25 b	0.19 b	32.00 a
Juntai	Yellow straw	Yellow straw	Clear white	0.86 d	0.37 a	0.28 a	25.00 a
Cantik Manis (1)	Tawny	Light yellow	Clear white	0.98 b	0.20 c	0.178 b	18.00 b
Mayas Putih	Yellow straw	Yellow straw	Clear white	0.80 e	0.30 b	0.18 b	18.00 b
Lakatan Uban	Dark brown	Yellow straw	Clear yellow	0.90 d	0.25 b	0.20 b	20.50 b
Lampung Gajah	Light yellow	Light yellow	Clear white	0.95 b	0.25 b	0.20 b	23.00 b
Cantik Manis (2)	Brownish-yellow	Light yellow	Clear white	1.00 a	0.17 c	0.19 b	19.00 b
Tamba	Yellow straw	Yellow straw	Clear white	0.90 d	0.20 c	0.19 b	28.50 a
Tipung	Yellow straw	Browning yellow	Clear white	0.80 e	0.30 b	0.17 b	23.50 b
Raden Gunung	Yellow straw	Brown	Clear white	0.90 c	0.30 b	0.20 b	22.00 b
Cantik Manis (3)	Brownish-yellow	Light yellow	Clear white	1.00 a	0.18 c	0.19 b	17.50 b
Siam Cantik	Yellow straw	Light yellow	Clear white	0.80 e	0.25 b	0.17 b	17.00 b
Palui	Yellow straw	Yellow straw	Clear white	0.70 g	0.20 c	0.18 b	15.00 c
Siam Unus	Yellow straw	Yellow straw	Clear white	0.80 e	0.20 c	0.18 b	16.00 c
Kerdil Jawa	Yellow straw	Yellow straw	Clear white	0.70 g	0.20 c	0.17 b	19.00 b
Siam Kupang	Yellow straw	Yellow straw	Clear white	0.75 f	0.20 c	0.18 b	12.00 c
Siam Cantik (1)	Yellow straw	Light yellow	Clear white	0.80 e	0.20 c	0.17 b	14.50 c
Siam Cantik (2)	Yellow straw	Light yellow	Clear white	0.80 e	0.20 c	0.17 b	18.00 b
Gedagai	Yellow straw	Light yellow	Clear white	0.95 b	0.25 b	0.20 b	22.00 b
Lakatan	Brownish-yellow	Light yellow	Milky white	0.70 g	0.30 b	0.19 b	21.50 b
Mainai	Reddish-brown	Yellow straw	Clear white	0.85 d	0.20 c	0.18 b	22.00 b
Mean ± SE				0.187 ±13.452	0.243 ±32.22	0.189 ±3.931	20.537 ±24.083

The yellow straw was dominant of hull color and part of the end of the hull, except for Mainai and Lakatan (Figure 1 and 2). While the polished rice is dominating color for milled rice, except for Lengkong Weat, Hiwau and Lakatan Uban. Desrosiev [10] mentioned that most rice farming carried out in developing countries uses varieties that are appropriate to their environment, and the land to be planted in rice is fully processed and then planted with rice seedlings by means of transplanting.



Figure 1. Mainai and Lakatan hulls.



Figure 2. Dite Intem and Juntai hulls.

The rice produced from each variety is different, some are red, black or purple. The color of rice grain can be given by various things such as red rice seeds that give a reddish color. Anthocyanin color and pigmentation in rice hull apiculus are the factors that affect all aspects of the rice quality in brown rice when harvested, but the compilation of the outer layer of bran that is rich in nutrients is removed, so the rice turns white. Thus, the color of rice grain in addition to being an attraction as well as an indicator of the nutritional content of the rice [11,12].



Figure 3. Local rice cultivars (rounded grains).



Figure 4. Local rice cultivars (long grains).

According to Grubben and Partohardjono [13], differences in grain shape indicate the genetic diversity of the cultivars. Local rice cultivars that have rounded grains (Figure 3) included Lengkong Lehat, Taring Palanuk, Lengkong Weat, Juntai, Mayas Putih, Tipung, Raden Gunung and Lakatan are thought to belong to the *japonica* or *javanica* subspecies. Meanwhile, other cultivars are dominated by long grain shape and slim shape, belonging to the *indica* subspecies (Figure 4). In addition, there were cultivars having the same local name but have different grain shape, such as Dite Intem, Cantik Manis and Siam Cantik. This confusion of naming may occur because farmers often plant more than one cultivar, therefore, it is possible that the seeds are mixed. Taken together, such exploration and characterization of local varieties could be useful for their optimal utilization in their future.

4. Conclusions

East Barito was dominated by upland rice with white rice type. The grain characters that use to exploration are color of grain, color of part of the end of grain, color of milled rice, length of grain, weight of grain, thickness of grain and weight of 1,000 grains. Yellow straw color was dominating grain color. Long grain was the most dominant character found for local rice in this area.

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