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Abstract. Brown rice is known to be a good source of antioxidants, due to the presence of anthocyanin pigments that produce antioxidants, which makes it very well consumed because it can brownuce the risk of diabetes and other degenerative diseases. The aims of this research are to characterize morphology, determine kinship patterns, and anthocyanin content from brown rice (*Oryza nivara* L.). The study was carried out in Munte and Payung Subdistricts, Karo District. Descriptive survey method uses the International Rice Research Institute (IRRI) guide. The technique of determining the location intentionally and sampling by chance. The most dominant differences in morphological characters in brown rice in the three land locations in two sub-districts are the flag leaf shape, panicle appearance, age of flowering, grain length, rice shape and colour of the rice. The anthocyanin content test used analytical methods by homogenizing the sample. Exploration results obtained 72 accessions divided into three land locations. Based on the test of anthocyanin content obtained land A has the highest content of 0.5 mg/100 g and the lowest is B area of 0.08 mg/100 g.

1. Introduction

Brown rice contains a number of bioactive components, such as pigments and flavonoid compounds that can act as antioxidants. Antioxidant compounds function to ward off free radicals, so it is very useful for cancer prevention, premature aging, and other degenerative diseases. Brown rice contains much higher nutrition than white rice varieties. This resulted in a higher selling price of brown rice on the market compabrown to white rice. The price of brown rice can reach twice the price of high-quality white rice [1].

Brown rice is rarely cultivated by Indonesian farmers because of its long life (average 134 days) and high plant morphology (average 164 cm) so that it is easy to fall. The length of the harvest age is considered brown by the farmers to cultivate brown and black rice because the longer the harvest age, the costs needed for maintenance will increase. Brown rice contains a number of bioactive components, such as pigments and flavonoid compounds that can act as antioxidants. Antioxidant compounds function to ward off free radicals, so it is very useful for cancer prevention, premature aging and other degenerative diseases [2].

The role of antioxidants for human health is to prevent some liver diseases (hepatitis), colon cancer, stroke, diabetes, are essential for brain function and brownuce the effects of brain aging, the anthocyanin content in each gamut of brown rice is still very diverse and ranges from 0.34 to 93.5 μg [3], while [4]

anthocyanin levels in brown rice ranged from 0.33 to 1.39 mg/100 g. At this time the demand for brown rice is increasingly increasing and on the other hand, the availability of the market is very limited. The high demand of the community as a result of increasing public awareness of the importance of health [5].

Geographically, the location of Karo Regency is between 2º50 '- 3º19' North Latitude and 97º55 '- 98º38' East Longitude with an area of 2,127.25 Km^2 or 2.97% of the area of North Sumatra Province. The area of Karo Regency is at an altitude of 200 - 1,500 meters above sea level. Air temperature ranges from 15.6 ° C to 23.0°C with average air humidity as high as 89.12%. Administratively, Karo Regency consists of 17 sub-districts and 269 villages/kelurahan (259 villages and 10 villages).

2. Materials and Methods

This activity was carried out in three land locations in two subdistricts in Karo district, namely one Selakar Village, Munte District and two Batu Karang Village, Payung Subdistrict. This research was conducted in June 2017 to January 2018.

In conducting a survey of brown rice, the material used in this study is a rice plant owned by farmers in two sub-districts in Karo district. When carrying out the survey, the passport data and accession sampling are recorded. The passport data contains various information that comes from exploration activities. Because the information is inventoried during exploration in the field, the passport data generally contains general information. This information is very useful to provide a historical picture of the accessions collected.

The survey was conducted using purposive sampling method (intentionally) carried out in 2 villages in 2 sub-districts, namely Selakar village, Munte sub-district, and Batu Karang village, Payung sub-district, Karo district, and sampling was carried out by accidental sampling method, which was accidental sampling technique. Data collection was carried out by observing samples based on the guidebook description of rice International Rice Research Institute (IRRI).

The analysis of the anthocyanin content of the material used was brown rice with broken skin and 1% methanol. The tools used are centrifuge bottles for collecting supernatant containers, measuring cups for mixing containers, analytical scales for weighing broken brown rice, skin for evaporation, pH meter for measuring pH and spectrophotometer for measuring anthocyanin content and other supporting devices.

3. Results and Discussion

The results of a survey conducted in two subdistricts in Karo district, namely Munte sub-district and Payung sub-district, showed that a sample of brown rice was in the 400 m^2 Selakar Lahan A village with an area of 4 m^2 and 300 m^2 of Batu Karang Lahan B with an area of 3 m^2, Area C as large as 150 m^2 with an observation area of 1.5 m^2. The following is the location of identification of brown rice in Karo Regency and the number of samples (Table 1).

Table 1. Identification research location brown rice

Districts	Village	Land Location	Amount
Munte	Selakar	Land A	26 Sample
Payung	Batu Karang 1	Land B	23 Sample
	Batu Karang 2	Land C	23 Sample

Brown rice which is identified as brown rice cultivated by farmers with a genetic origin that has been passed down from generation to generation causing farmers to not know the type of brown rice planted. The production of brown rice is usually sold and also consumed by farmers. The results of interviews conducted on brown rice farmers said that the cultivation of brown rice was carried out similar to rice cultivation in general. The lack of interest of farmers to grow brown rice because there are still few rice

collectors who want to receive the yield of brown rice and the price is still low in farmers, so farmers who cultivate brown rice tend to be consumed by themselves.

Table. 2. Morphological characterization of brown rice in Selakar Village Munte District, Karo.

No	Parameters	Character
1	Root Lenght	15.41 cm
2	Root Weight	16.99 g
3	Number of seedlings	36 Seedlings
4	Number of Productive Seedlings	34 Seedlings
5	Plant Height	89.62 cm
6	Stem Diameter	3.81 cm
7	Stem Distribution Pattern	Semi-Upright
8	Stem surface type	Feathery
9	The colour of stem surface	Weak
10	Number of Nodes	4 nodes
11	Internode Length	3.86 cm
12	Anthocyanin in midrib leaf	Yes
13	Colour intensity on leaf	Weak
14	Leaf Length	39.76 cm
15	Leaf Width	1.16 cm
16	Feathers of Leaf Surface	Weakly
17	Ligule Length	1.62 cm
18	Ligule Colour	Colourless
19	Flag Leaf Angle	Semi Upright-Horizontal
20	Panicle Length	23.33 cm
21	Panicle Appearance	Semi Upright
22	Secondary Branch Type	Strong
23	Secondary Branch Pattern	Semi Upright
24	Pistil Colour	White
25	Flowering Age	68 Days
26	Grain Shape	Slim
27	Grain Length	9.59 mm
28	Amount Grain	99 Grains
29	Awn Length	1.94 cm
30	Harvest Age	121 Days
31	1000 Grains Weight	19.9 g
32	Grain Length	2.43 mm
33	Grain Surface Colour	Yellow straw
34	Rice Shape	Slim
35	Rice Length	7.05 mm
36	Rice Colour	Brown
37	Rice Width	2.22 mm

From several samples in the three land locations, it was found that morphological characters were generally obtained and the morphological characterization of the plant. From the field survey, there were three locations of land which generally can be seen the differences of morphological characters that are most dominant in each land location in two sub-districts namely, the pattern of stem distribution, the shape of the flag leaf, the appearance of panicles, the length of the tail of the grain, the shape of the grain, and the colour of rice.

In the morphological character of land A (Table 2) has a semi-erect trunk spreading pattern, semi-upright to horizontal flag shape, rather upright panicle appearance, rather erect secondary stem stems, grain shape, and slender rice form, has a grain tail, flowering reaches 68 days with a harvest of up to 121 days, and the colour of rice is brown. Land A has a colour of rice that is different from other fields.

This can be caused by differences in pigment content. The brown colour of rice is formed from pigments which are not only found in pericarp and tegmen but also in every part of the grain.

Table 3. Morphological characterization of brown rice in Batu Karang Village Payung District, Karo

No	Parameter	Character
1	Root Length	11.44 cm
2	Root Weight	66.24 g
3	Number of seedlings	24 Seedlings
4	Number of Productive Seedlings	18 Seedlings
5	Plant Height	90.87 cm
6	Stem Diameter	5.45 cm
7	Stem Distribution Pattern	Open
8	Stem surface type	Feathery
9	The colour of stem surface	Weak
10	Number of Nodes	4 nodes
11	Internode Length	1.73 cm
12	Anthocyanin in midrib leaf	Yes
13	Colour intensity on leaf	Weak
14	Leaf Length	41.30 cm
15	Leaf Width	1.26 cm
16	Feathers of Leaf Surface	Weak
17	Ligule Length	2.18 cm
18	Ligule Colour	Colourless
19	Flag Leaf Angle	Upright – Semi upright
20	Panicle Length	24.27 cm
21	Panicle Appearance	Drooping
22	Secondary Branch Type	Strong
23	Secondary Branch Pattern	Semi-Upright
24	Pistil Colour	White
25	Flowering Age	47 Days
26	Grain Shape	Slim-Medium
27	Grain Length	9.52 mm
28	Amount Grain	144 grains
29	Awn Length	0-0.77 cm
30	Harvest Age	114 Days
31	1000 Grains Weight	26.3 g
32	Grain Length	2.89 mm
33	Grain Surface Colour	Yellow Gold
34	Rice Shape	Medium
35	Rice Length	7.11 mm
36	Rice Colour	White – Brownish
37	Rice Width	2.53 mm

The morphological character of land B (Table 3) has a pattern of spread of the trunk is open the shape of the flag leaf is upright to semi erect, the appearance of panicles drooping, the pattern of distribution of secondary stems is rather upright, the shape of grain and the form of medium rice, some have grain tail, age flowering reaches 47 days with a harvesting period of up to 114 days, and the colour of rice is white chocolates. The difference in flowering age can also be influenced by environmental and genetic factors. [2] can be influenced by the environment and genetics of plants.

Figure 1. Pattern of stem spread, (a) Semi-upright, (b) Open, (c) Semi-upright

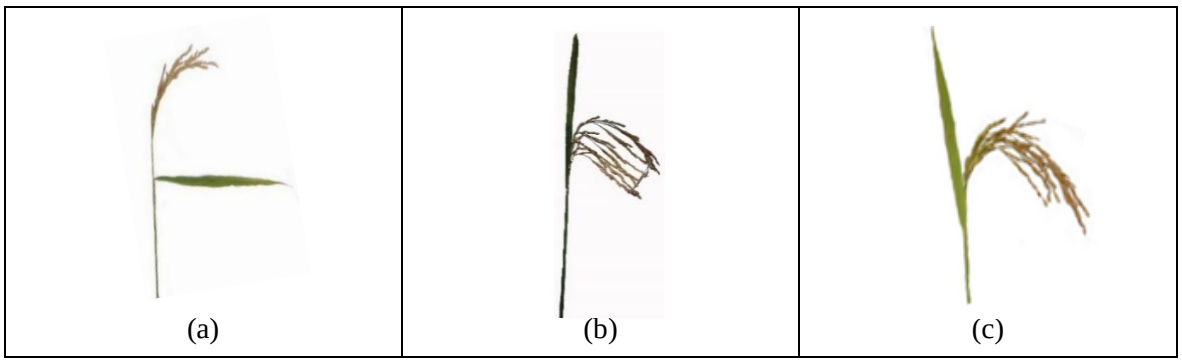

Figure 2. Flag leaf angle (a) Horizontal, (b) Upright, (c) semi upright

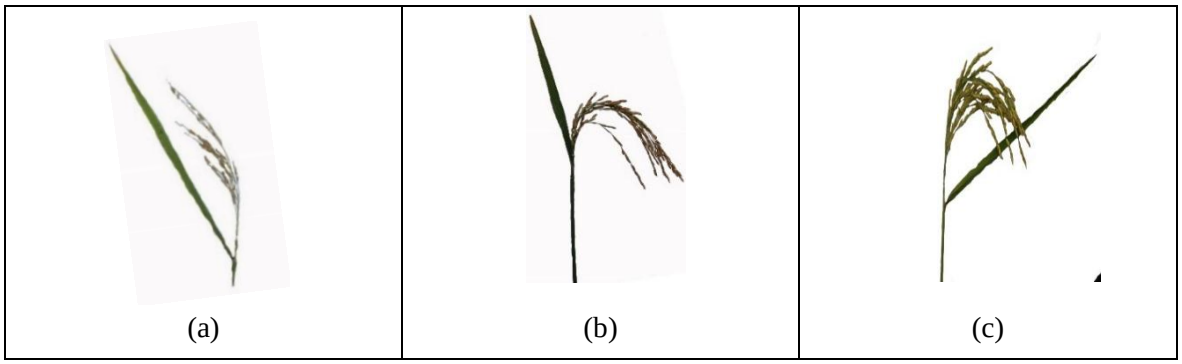

Figure 3. Panicle appearance (a) Semi-upright, (b) drooping, (c) drooping.

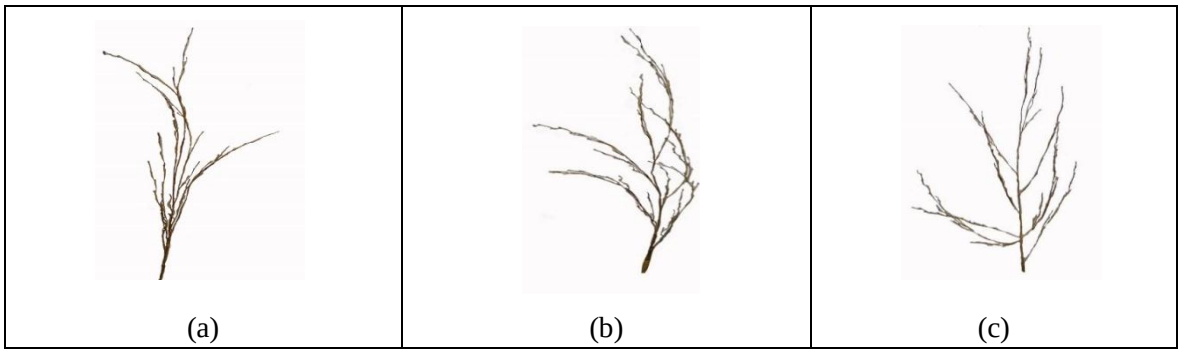

Figure 4. Secondary branch pattern (a) Semi Upright, (b) Semi Upright, (c) spreading.

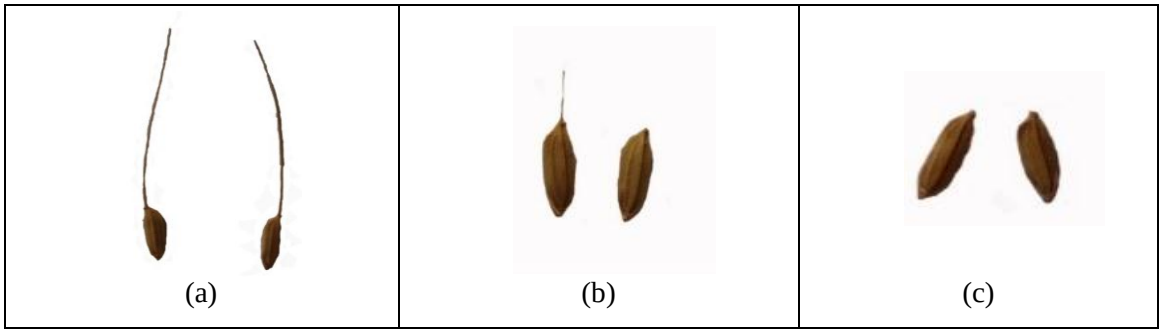

Figure 5. Tail and shape of grain (a) Slim, (b) Medium, (c) Medium.

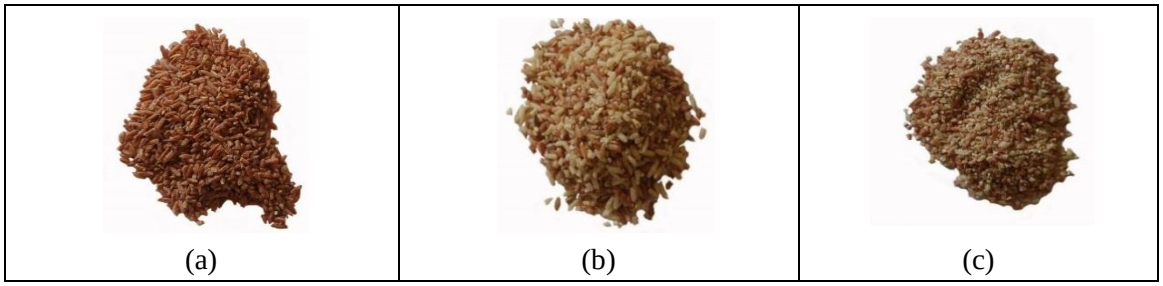

Figure 6. The colour of rice (a) brown, (b) white-brown spots, (c) white-brown spots

3.1. Relationship pattern

The results of the study of brown rice originating from Munte sub-district and Payung sub-district in Karo Regency, North Sumatra obtained 2 main groups can be seen in Figure 7 where each group formed 2 sub-groups. Sub-group 1a consists of 26 samples, 1b consists of 2 samples, 2a consists of 19 samples and 2b consists of 25. Dendrogram of relationship pattern which can be seen in Figure 7 below: Based on the dendrogram that is formed (Figure 7) four groups of relationship pattern on Euclidean distance scale are obtained 19. The smaller the Euclidean distance between the analysed objects, then the closer the relationship pattern of the object, the more similarities the character [6]. Analysis of kinship based on the morphological characteristics of the sample of brown rice on a scale of 19 shows that there are 4 groups of the plant (Figure 7).

Table 4. Anthocyanin levels (mg/100 g) in 3 samples of brown rice

No	Sample	Anthocyanin Levels
1	Selatar village	0,50 mg
2	Batu Karang 1 (Land B)	0,08 mg
3	Batu Karang 2 (Land C)	0,33 mg

Group 1 consisted of 26 samples of brown rice, namely G1, G2, G3, G4, G5, G6, G7, G8, G9, G10, G11, G12, G13, G14, G15, G16, G17, G18, G19, G20, G21, G22, G23, G24, G25, and G26 are united by six characters: the colour of the stem surface, the type of the stem surface, the colour of the leaf tongue, the shape of the grain, the shape of the rice and the colour of rice. The second group consisted of 2 samples of brown rice, namely G52 and G68 which were put together by five characters, namely the leaf shape of the flag, number of nodes, the appearance of panicle, the pattern of secondary branches, and shape of grain. The third group consists of 19 samples namely G27, G29, G30, G31, G32, G33, G35, G36, G37, G38, G40, G41, G42, G43, G44, G45, G46, G48, and G49 which are combined with five characters namely the colour of the stem surface, the type of surface of the stem, the colour of the

tongue, the width of the rice and the shape of the grain. The fourth group consisted of 25 samples namely G28, G34, G39, G47, G50, G51, G53 G54, G55, G56, G57, G58, G59, G60, G61, G62, G63, G64, G65, G66, G67, G69, G70, G71, and G72 which are combined with six characters namely grain length, flag leaf shape, stem surface colour, stem surface type, leaf tongue colour and width of rice. The grouping that formed is due to the similarities and differences of each character observed. This is consistent with the opinion of [7] which states that differences and similarities in the appearance of morphology outside species of a plant can be used to determine the proximity of kinship.

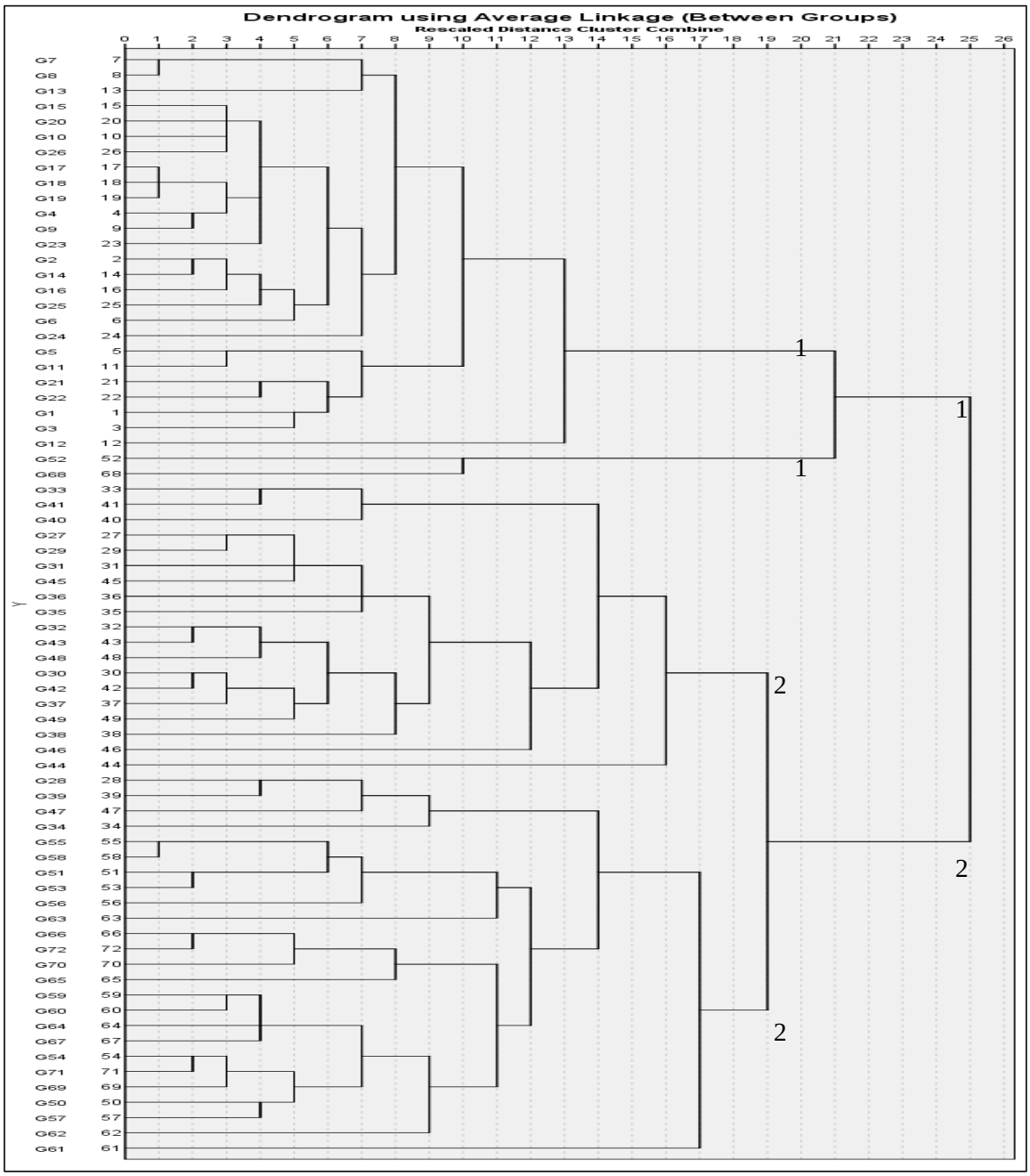

Figure 7. Dendrogram of the relationship of brown rice in the sub-district Munte and Payung sub-districts, Karo regency North Sumatra, 1a and 1b are subgroups 1, 2a and 2b are subgroup 2

3.2. Anthocyanin levels

From the results of the analysis that has been carried out in Table 4. it was found that the highest antosisanin levels in Land A samples were 0.50 mg/100 g and the lowest in the Batu Karang 1 samples was 0.08 mg/100 g, while the Batu Karang 2 samples had anthocyanin levels of 0.33 mg/100 g. Batu Karang 1 samples with anthocyanin content below the anthocyanin level contained in brown rice in general, this difference can be caused by differences in the accession of brown rice. This is in accordance with [4] namely the benefits of brown rice located in the groove layer, where the levels of brown rice anthocyanin ranged from 0.33 to 1.39 mg/100 g.

4. Conclusions

The most dominant differences in morphological characters in brown rice in the three land locations in two sub-districts are the flag leaf shape, panicle appearance, age of flowering, grain length, rice shape and colour of the rice. The highest anthocyanin content was found in brown rice in Selakar village Munte sub-district at 0.50 mg/100 g, and the lowest was in brown rice in the Batu Karang1 village Payung sub-district at 0.08 mg/100 g. This can be influenced by genetic and environmental factors.

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