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Identification of the Diversity of Morphological Characteristics of Some Local Upland Rice Cultivars in East Aceh

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ABSTRACT

It is important to characterize the traits of local cultivars both morphologically, physiologically, and genetically. Characterization is a process aimed at identifying important traits economically valuable and beneficial for agriculture or determining the relevant characteristics varieties. The objective of this study was to determine the diversity of several local upland rice cultivars from East Aceh and identifying the morphological characteristics of these cultivars. The research was conducted over 4 months, from October to February 2023, at the experimental field of the Faculty of Agriculture, Samudra University, Langsa City, Aceh, with an elevation of approximately 10 meters above sea level and a soil pH of 5.9. The study used data from both qualitative and quantitative traits, which were tabulated and then analyzed for kinship relationships using IBM SPSS software with hierarchical clustering analysis using Euclidean distance. The results indicated that the testing of several local upland rice cultivars from East Aceh, based on morphological characterization, showed differences in the number of tillers, flower characteristics, panicles, and leaf traits. However, there were no differences plant height, number of productive tillers, leaf blade color, and 1000-grain weight when observing grain weight. Differences in growth and production characteristics were due to interactions between genetic and environmental factors, leading to variability in traits among the tested cultivars. Based on the morphological characteristics of the 10 local upland rice cultivars from East Aceh, the Ramos Gunung and Sibontot cultivars were found to be among the most promising for development due to their highest production yields compared to other cultivars.

Keywords: Identification, Upland Rice, Cultivar, Characterization

1. Introduction

Rice is one of the main sources of food for the Indonesian population with the demand continuing to grow in line with population growth. In addition, with the reduction of rice fields due to conversion into settlements, plantations and so on, the availability of rice is decreasing. Indonesia's population consumes 95% of its food. By consuming rice, it can fulfill 63% energy and 37% protein needs. Based on the nutritional content, making rice commodities important for food needs so that it becomes a special concern in Indonesia in food fulfillment (Norsalis, 2011; Tarigan, 2013).

The agricultural sector is one of the main livelihoods of the Indonesian people, including in the province of Aceh, especially East Aceh District. With a harvested land area in 2019 reaching 28,576.22 hectares and rice production of 100,026.68 tons of GKG, East Aceh is one of the highest rice producers in Aceh Province. However, with this vast land potential, it is still possible to increase production by planting upland rice considering that many lands in East Aceh are in the form of shrubs that have the potential to be planted with upland rice with an area of 11,187 hectares and 3,749 hectares of newly planted upland rice. (BPS Aceh, 2020).

Upland rice is rice cultivated on rainfed land. In 2020 the productivity of upland rice averaged 3.3 t/ha, or about 60% of the productivity of paddy rice which reached 5.28 tons/ha (Badan Pusat Statistik, 2020). The physical and biological conditions of the soil on drylands cause the low productivity of upland rice. Common

physical problems found on drylands can be drought, soil acidity, Aluminum poisoning and low soil fertility (Toha et al., 2009). Therefore, it is necessary to find varieties that are adaptive to drylands.

East Aceh is rich in rice germplasm, especially local rice. Germplasm of food crops, especially rice, is a very valuable asset that needs to be preserved. There are approximately 3500 local rice germplasm collections in Indonesia. Local rice is a source of germplasm both potential and actual as a source of genes that can be utilized in the present and future. Syukur et al, (2015) stated that local rice cultivars are cultivars that have been cultivated for a very long time by a group of people/farmers for generations in optimal agricultural ecosystems and specific agricultural ecosystems so that they are resistant/tolerant to biotic and abiotic stresses.

It is important to characterize local cultivars morphologically, physiologically and genetically. Characterization is an activity in order to identify important traits that are economically valuable, and profitable for agriculture or determine the characteristics of the variety concerned. Morphological characters commonly used as rice characteristics are plant height, number of tillers, number of productive tillers, growth type, leaf curvature, flag leaf curvature, stem color, color, leaf surface, number of grains per panicle, grain shape, grain color, surface, and the presence of grain tails. In addition, inflorescence characters can also distinguish rice varieties (Wet et al. 1986). Each local rice can have similarities or differences in characteristics. Kinship relationship can be determined by the presence or absence of similarities between the observed characters. The more similarities in characteristics, the closer the relationship. Conversely, the more differences in characteristics, the more distant the kinship relationship. Based on the explanation above, the author is interested in conducting research with the title Diversity and Morphological Characteristics of Several Cultivars of East Aceh Local Upland Rice.

2. Materials and Methods

This research was conducted in the experimental garden of the Faculty of Agriculture, Samudra University Langsa City with an altitude of 10 m above sea level. This research was conducted for 4 months, starting in October 2022 until February 2023. The materials used in this study were seeds of upland rice cultivars Sileso, Gameso, Arias Kuning, Arias Putih, Arias Merah, Sigendul, Ramos Gunung, Sidol, Sibengkok, Sibontok, bamboo, nets, zinc plates, nails, paint, lime, insecticides Curater 3GR and Decis 2.5 EC, Urea, TSP, and KCl and kendang fertilizer. The tools used: hoe, tugal, meter, machete, pen, notebook, digital camera, digital scale.

Methods This study was conducted to observe data on qualitative and quantitative parameters, including:

1. Qualitative parameters: Leaf characters, leaf blade, leaf ear, flag leaf, grain shape. Data were collected based on the Descriptor Manual on rice plants (Descriptor for wild and Cultivated RICE (oryza spp). (Bioversity International, IRRI and WARDA. 2007).
2. Quantitative parameters: (plant height, number of tillers, number of productive tillers, age of panicle exit, panicle length, and weight of 1000 grains, and production/hectare). The data obtained in the study were analyzed using the F test with a mathematical model (Matjik and Sumertajaya, 2013) as follows:

Data from n qualitative characters were tabulated and then kinship analysis was carried out using the IBM SPSS Statistics program with Hirearchical Clustering technique cluster analysis with eucliden distance as follows:

$$d_{ij} = \sqrt{\sum_{k=i}^{p} (x_{ij} - x_{jk})^2}$$

By:

dij = distance between cultivar i and j
xij= value of cultivar i on the i-th variable
xjk= value of cultivar j on the k-th variable
p = number of observed characters

Quantitative data processing using the IBM SPSS Statistics program.

2.1. Observation Parameters

Observations were made on morphological characters in all populations including:

A. Qualitative Parameters
    1. Leaf blade color. Data Observation of leaf color is done visually using BWD (Leaf Color Chart).

2. Leaf ear color. Observations are made of the leaf ear located near the leaf tongue
3. Flag Leaf Attitude; observations are made on the youngest topmost last leaf:
4. Grain Shape: Hairy, oblong, ovoid

B. Quantitative Parameters

1. Plant height (cm) measured from ground level to the tip of the highest leaf. Measurements were taken when entering the generative phase at the age of 100 days after planting (observation was done). Observations of plant height were classified into three categories, namely: ≤ 100 cm classified as short (score 3), 100-125 classified as medium (score 5), and ≥ 125 classified as high (score 7). (Chaniago, N. 2016)
2. The number of tillers (stems) measured by counting the total number of tillers that appear on the plant was observed at the age of 90 days after planting. The total number of shoots from the mother plant. The observation of the number of tillers is classified into three categories, namely: ≤ 10 tillers classified as few (score 3), 11-20 tillers classified as medium (score 5), and ≥ 20 classified as many (score 7). Data on the average number of tillers of some local upland rice cultivars of East Aceh at the age of 90 HST. (Chaniago, N. 2016)
3. Flag leaf length and flag leaf width
4. The number of productive tillers (stems) was determined by counting the number of tillers that produced panicles in each clump, which was counted at the age of 90 days after planting. Observations of productive tillers were classified into three categories, namely: ≤ 10 tillers classified as few (score 3), 11- 20 tillers classified as medium (score 5), and ≥ 20 classified as many (score 7).
5. The age of panicle emergence (days) was observed by counting the number of days starting from the time of planting until the plant emits panicles on each plant. Panicle as a stalk for a series of upright and drooping fruits.
6. Panicle length (cm) measured from the base of the panicle to the tip of the panicle. classified four categories namely: ≤ 20 cm classified as short (score 3), 20-30 cm classified as medium (score 5), 31-40 cm classified as long (score 7) and≥ 40 cm classified as very long (score 9).
7. Weight of 1000 Grains, average weight of 1000 grains of some local rice cultivars of East Aceh. The total weight of 1000 grains consists of: three categories, namely:
   a) Weight: More than 5.1 gr
   b) Medium: 3.6 - 5.1 gr
   c) Mild: less than 3.6 g
8. Production per hectare data was obtained from the conversion of production per plot, to yield.

3. Results

3.1. Qualitative Parameters

3.1.1. Leaf Blade (Color)

Table 1. Characteristics of Leaf Blade Color of some Local East Aceh Gogo Rice Cultivars at 90 HST

No.	Cultivars	Leaf blade (color)
1	K_1 (Sileso)	Green
2	K_2 (Gameso)	Green
3	K_3 (Arias Yellow)	Light green
4	K_4 (White Arias)	Light green
5	K_5 (Arias Red)	Green
6	K_6 (Sigendul)	Green
7	K_7 (Ramos Mountain)	Green
8	K_8 (Sidol)	Light green
9	K_9 (Sibontot)	Light green
10	K_{10} (Sibengkok)	Green

From Table 1, it can be seen that the color of the leaf blade of 10 local upland rice cultivars of East Aceh observed 6 (six) cultivars showed green color, namely; Sileso cultivar, Gameso cultivar, Arias Merah cultivar, Sigendul cultivar, Gamos Gunung cultivar and Sibengkok cultivar, and the other four cultivars showed light green color, namely; Arias Kuning cultivar, Arias Putih cultivar, Sidol cultivar, and Sibontot cultivar.

Regarding leaf color characters, this character is classified as strongly influencing farmers' preferences for a new superior variety. Kobarsih and Siswanto (2015) reported that 70% of farmers make leaf color characters as a reference for harvest time. Green leaf color is most preferred by farmers compared to dark green or light green. Referring to the leaf color body (BWD) which is an IRRI product shows that the green color of scale 2 is an indication that the plant lacks nitrogen elements, scale 3-4 is an indication that the plant gets enough nitrogen intake, while scale 5 is an indication of excess nitrogen plants.

3.1.2. Leaf Ear Color (Color)

Table 2. Leaf ear color of some local upland rice cultivars in East Aceh at the age of 90 HST

No.	Cultivars	Ear Leaf Color	Characteristic Score
1	$_{K1}$ (Sileso)	Yellowish Green	2
2	$_{K2}$ (Gameso)	Light purple	4
3	$_{K3}$ (Arias Yellow)	Yellowish green	2
4	$_{K4}$ (White Arias)	Light purple	4
5	$_{K5}$ (Arias Red)	Vaginal discharge	1
6	$_{K6}$ (Sigendul)	Light purple	4
7	$_{K7}$ (Ramos Mountain)	Vaginal discharge	1
8	$_{K8}$ (Sidol)	Light purple	4
9	$_{K9}$ (Sibontot)	Vaginal discharge	1
10	$_{K10}$ (Sibengkok)	Light purple	4

Description: Numbers indicate morphological characteristic scores according to IBPGR, IRRI (1980) and IRRI 1996

Table 2 shows the results of observations of the color of the ear of the leaves of some local upland rice cultivars of East Aceh, namely the color of the ear of the leaves on the Sileso cultivar, the Arias Yellow cultivar, showing a yellowish green color, on the Gameso cultivar, the Arias White cultivar, the Sigendul cultivar, the Sidol cultivar and the Sibengkok cultivar show a light purple color, while the Arias Red cultivar, the Ramos Gunung cultivar and the Sibontot cultivar show a whitish color.

Rice is one type of graminose plant that has different leaves in shape, arrangement, and parts. The characteristic of rice leaves is the presence of scales and leaf ears. This feature distinguishes the color of rice leaves from other types of grass (Rembang et al., 2018).

3.1.3. Leaf Ear Color (Color)

Table 3. Attitude of Flag Leaves of some Local Upland Rice Cultivars of East Aceh at the Age of 90 HST

No.	Cultivars	Flag leaf stance	Characteristic score
1	$_{K1}$ (Sileso)	Horizontal	5
2	$_{K2}$ (Gameso)	Semi upright	3
3	$_{K3}$ (Arias Yellow)	Semi upright	3
4	$_{K4}$ (White Arias)	Semi upright	3
5	$_{K5}$ (Arias Red)	Horizontal	5
6	$_{K6}$ (Sigendul)	Semi upright	3
7	$_{K7}$ (Ramos Mountain)	Horizontal	5
8	$_{K8}$ (Sidol)	Declining	7
9	$_{K9}$ (Sibontot)	Horizontal	5
10	$_{K10}$ (Sibengkok)	Horizontal	5

The results of observations of the attitude of the flag leaf of some local upland rice cultivars in East Aceh on the Gameso cultivar, Arias Kuning cultivar, Arias Putih cultivar, and Sigendul cultivar semi-erect flag leaf attitude showed (score 3), for Arias Merah cultivar, Ramos Gunung cultivar, Sibontot cultivar and Sibengkok cultivar horizontal flag leaf attitude showed (score 5) while Sidol cultivar showed a downward flag leaf attitude showed (score 7). Of the 10 rice cultivars, the dominant flag leaf shape is Horizontal. The semi-erect flag leaf allows greater penetration and distribution of light and evenly to the bottom, so that photosynthesis increases. The flag leaf has a function as an assimilate producer during the seed filling process (Aryana et al., 2020).

3.1.4. Grain Shape

Table 4. Observations of Grain Shape on Some Local Gogo Rice Cultivars of East Aceh

No.	Cultivars	Grain Shape
1	$_{K1}$ (Sileso)	Fat
2	$_{K2}$ (Gameso)	Slim
3	$_{K3}$ (Arias Yellow)	Fat
4	$_{K4}$ (White Arias)	Fat
5	$_{K5}$ (Arias Red)	Slim
6	$_{K6}$ (Sigendul)	Round
7	$_{K7}$ (Ramos Mountain)	Slim
8	$_{K8}$ (Sidol)	Slim
9	$_{K9}$ (Sibontot)	Fat
10	$_{K10}$ (Sibengkok)	Slim

Table 4 shows that the shape of Gameso cultivar, Arias Kuning cultivar, Ramos Gunung cultivar, Arias Merah cultivar, Sidol cultivar and Sibengkok cultivar are slender, Arias Kuning cultivar, Sileso cultivar, Arias Putih cultivar and Sibontot cultivar are fat, while Sigendul cultivar has round grain.

The appearance of a plant in a growing environment is the impact of between genetic factors and the environment. The appearance of a genotype in different environments can be different, so what extent the interaction between genotype and environment (G X E) is a very important thing to know in a breeding program or in the context of its development (Mangoendidjojo, 2000).

3.2. Quantitative Parameters

3.2.1. Plant Height (cm)

Plant height observations were classified into three categories: ≤ 100 cm classified as short (score 3), 100 - 125 classified as medium (score 5), and≥ 125 classified as high (score 7). Data on average plant height can be seen in Table 5.

Table 5. Average Plant Height (cm) of Some Local Upland Rice Cultivars of East Aceh at Entry of Generative or Late Vegetative Phase

No.	Cultivars	Average Plant Height (cm)	Characteristic Score
1	$_{K1}$ (Sileso)	187,86	7
2	$_{K2}$ (Gameso)	177,89	7
3	$_{K3}$ (Arias Yellow)	182,39	7
4	$_{K4}$ (White Arias)	179,44	7
5	$_{K5}$ (Arias Red)	168,69	7
6	$_{K6}$ (Sigendul)	192,39	7
7	$_{K7}$ (Ramos Mountain)	192,36	7
8	$_{K8}$ (Sidol)	164,61	7
9	$_{K9}$ (Sibontot)	160,17	7
10	$_{K10}$ (Sibengkok)	168,86	7

In Table 5 based on the analysis conducted plant height of some local upland rice cultivars of East Aceh in the generative phase or the end of vegetative. The highest plant is obtained in Cultivar K6 (Sigendul) which is 192.39 cm, while the shortest plant is obtained in Cultivar K9 (Sibontot) which is 160.17 cm. However, based on the analysis of morphological characteristics of plant height of some local upland rice cultivars of East Aceh, where all cultivars show the characteristics of plant height which is classified as high with a score of 7.

Table 5 shows that each cultivar has a different plant height due to genetic differences from each cultivar observed, all cultivars are grown in the same environment so that the differences that appear can be ascertained due to genetic differences from the cultivars studied. Each individual will express traits controlled by genetics and the environment as well as the interaction between genetics and the environment. Genetic traits can be more dominant or vice versa or can be balanced between genetics and the environment. According to Makarim

and Suhartatik, (2009) short and stiff rice stems are the desired rice stem traits for assembling new superior rice varieties.

3.2.2. Flag Leaf Length and Flag Leaf Width (cm)

Table 6. Mean length of flag leaf, width of flag leaf of some local upland rice cultivars in East Aceh

No.	Cultivars	Average Flag Leaf Length (cm)	Average width of flag leaf (cm)
1	K_1 (Sileso)	50,83	16,31
2	K_2 (Gameso)	47,17	26,72
3	K_3 (Arias Yellow)	40,42	23,49
4	K_4 (White Arias)	50,22	19,44
5	K_5 (Arias Red)	47,06	23,86
6	K_6 (Sigendul)	46,11	24,50
7	K_7 (Ramos Mountain)	52,86	16,94
8	K_8 (Sidol)	35,08	19,67
9	K_9 (Sibontot)	41,39	18,58
10	K_{10} (Sibengkok)	43,17	18,86

From Table 6, it can be seen that the length of the flag leaf of some local upland rice cultivars in East Aceh 90 HST, the longest flag leaf length was obtained in the Ramos Gunung cultivar (52.86 cm), while the shortest flag leaf length was obtained by the Sidol cultivar (35.08 cm). While the widest flag leaf width was obtained in Gameso cultivar (26.72 cm), while the shortest flag leaf width was obtained by Sileso cultivar (16.31 cm). The flag leaf acts as an assimilate producer during the seed filling process. According to Limbongan et al. (2009), flag leaf length is positively correlated with grain yield. Flag leaf length and width are factors associated with canopy structure. The resulting canopy shape will play an important role to capture solar radiation, flag leaf length is positively correlated with grain yield.

3.2.3. Number of tillers (stems)

Observations of the number of tillers were classified into three categories, namely: ≤ 10 tillers classified as few (score 3), 11-20 tillers classified as medium (score 5), and ≥ 20 classified as many (score 7). Data on the average number of tillers of some local upland rice cultivars in East Aceh at the age of 90 HST can be seen in Table 7.

From Table 7. It can be seen that based on the number of tillers of some local upland rice cultivars of East Aceh. The highest number of tillers is found in Gameso cultivar (11.14 tillers), while the lowest number of tillers is in Sidol cultivar (6.94 tillers). Based on the morphological characteristics of the number of tillers of some local upland rice cultivars in East Aceh, where 1 cultivar shows a score of 5 and other cultivars show a small number of tillers (score 3).

Table 7. Average number of tillers of some local upland rice cultivars in East Aceh

No.	Cultivars	Average number of tillers (stems)	Characteristic Score
1	K_1 (Sileso)	10,06	3
2	K_2 (Gameso)	11,14	5
3	K_3 (Arias Yellow)	8,36	3
4	K_4 (White Arias)	7,31	3
5	K_5 (Arias Red)	7,94	3
6	K_6 (Sigendul)	7,69	3
7	K_7 (Ramos Mountain)	8,72	3
8	K_8 (Sidol)	6,94	3
9	K_9 (Sibontot)	8,86	3
10	K_{10} (Sibengkok)	8,00	3

According to Husna (2010) the number of tillers will be maximized if the plant has good genetic traits coupled with a favorable environmental condition or in accordance with the growth and development of plants, the maximum number of tillers is determined by the planting distance and the number of seeds or seedlings planted. This is because planting distance determines solar radiation, nutrients and minerals. Competition not only occurs between staple crops and weeds but also between staple crops if the spacing is too tight or the number of seeds or seedlings is too large. The planting distance used (30 x 30 cm) is ideal for upland rice.

3.2.5. Productive Tiller (Stem)

Observations of productive tillers were classified into three categories: ≤ 10 tillers classified as few (score 3), 11-20 tillers classified as medium (score 5), and≥ 20 classified as many (score 7). The average productive tillers of some local upland rice cultivars of East Aceh can be seen in Table 8.

Table 8. Average of Productive Tiller of Some Local Upland Rice Cultivars in East Aceh

No.	Cultivars	Average Tiller Productive (Stem)	Characteristic Score
1	K_1 (Sileso)	8,42	3
2	K_2 (Gameso)	7,92	3
3	K_3 (Arias Yellow)	6,86	3
4	K_4 (White Arias)	6,53	3
5	K_5 (Arias Red)	6,61	3
6	K_6 (Sigendul)	6,97	3
7	K_7 (Ramos Mountain)	6,89	3
8	K_8 (Sidol)	6,00	3
9	K_9 (Sibontot)	6,92	3
10	K_{10} (Sibengkok)	7,14	3

From Table 8, average productive tillers on some local upland rice cultivars of East Aceh Productive tillers of all cultivars showed relatively few tillers (score 3). According to Sudirman and Iwan (2001) that productive tillers are tillers that develop further and produce panicles. But this is not always the case because the formation of tillers is influenced by the environment.

3.2.6. Age at Panicle Out (Days)

In Table 9, it can be seen that the age of panicle discharge of some local upland rice cultivars of East Aceh. The cultivar with the fastest panicle exit age (79.81 days) is found in Sidol cultivar while the longest panicle exit age (89.11 days) is found in Arias Merah cultivar. The cultivar with the longest panicle size was Sileso (48.06 cm), while the cultivar with the shortest panicle size was Sidol (36.36 cm). The number of tillers of each cultivar may be influenced by genetic and environmental factors. According to Yunizar, (2014) the cause of the difference in the number of tillers of rice varieties with one another is due to differences in the genetic characteristics of each rice variety.

Table 9. Mean panicle exit age (days) of some local upland rice cultivars of East Aceh

No.	Cultivars	Age at Panicle Out (Days)
1	K_1 (Sileso)	86,67
2	K_2 (Gameso)	86,47
3	K_3 (Arias Yellow)	86,44
4	K_4 (White Arias)	84,58
5	K_5 (Arias Red)	89,11
6	K_6 (Sigendul)	86,08
7	K_7 (Ramos Mountain)	84,83
8	K_8 (Sidol)	79,81
9	K_9 (Sibontot)	85,94
10	K_{10} (Sibengkok)	82,97

3.2.7. Panicle Length (cm)

The observation of panicle length was classified into four categories: ≤ 20 cm classified as short (score 3), 20-30 cm classified as medium (score 5), 31-40 cm classified as long (score 7) and≥ 40 cm classified as very long (score 9). The average panicle length of 10 local upland rice cultivars in East Aceh is shown in Table 10.

Table 10. Mean panicle length (cm) of some local upland rice cultivars of East Aceh

No.	Cultivars	Mean Panicle Length (cm)	Charcteristic Score
1	$_{K1}$ (Sileso)	48,06	9
2	$_{K2}$ (Gameso)	45,28	9
3	$_{K3}$ (Arias Yellow)	46,14	9
4	$_{K4}$ (White Arias)	38,83	7
5	$_{K5}$ (Arias Red)	44,03	9
6	$_{K6}$ (Sigendul)	40,61	7
7	$_{K7}$ (Ramos Mountain)	40,75	7
8	$_{K8}$ (Sidol)	36,36	7
9	$_{K9}$ (Sibontot)	38,42	7
10	$_{K10}$ (Sibengkok)	38,81	7

Table 10 shows that based on the observation of morphological characteristics there are differences in the character of panicle length of some local upland rice cultivars of East Aceh, where the cultivars Sileso, Gameso, Arias Kuning, Arias Merah, classified as very long panicles (score 9), while the cultivars Arias Putih, Sigendul, Ramos Gunung, Sidol, Sibontok and Sibengkok classified as long panicles (score 7). According to Jumin (1989), each variety responds differently to the same environmental factors. Plants need optimum environmental conditions to express their genetic potential. It is further argued that the optimum environmental conditions can differ among plant species depending on the diversity of their genetic makeup. When the number of productive tillers is greater, the grain yield obtained is also more. According to, (Waluyo and Suparwoto, 2016) the more the number of productive tillers in rice, the higher the grain production that can be produced.

3.2.8. 1000 Grain Weight (gr)

Data on the observation of the weight of 1,000 grains of local upland rice grains in East Aceh are presented in Table 11: > 5.1 gr classified as heavy, 3.6-5.1 gr classified as medium, < 3.6 classified as light. The 1000-grain weight of 10 local upland rice cultivars of East Aceh is presented in Table 11.

From Table 11, it can be seen that the weight of 1000 grains of local upland rice in East Aceh shows that the heaviest grain is obtained in Ramos Gunung cultivar (33 grams), while the weight of 1000 grains of the lightest grain is obtained in Arias Merah cultivar (19 grams). The difference in the amount of production in each variety is because each variety has different adaptability in responding to the lack of light for seed filling. Each rice variety has its own adaptation to biophysical conditions of the environment (Gosh and Kashyap, 2003).

Table 11. Average weight of 1,000 grains of local upland rice in East Aceh

No.	Cultivars	Weight of 1,000 grains (gr)	Characteristic score
1	$_{K1}$ (Sileso)	23	Lightweight
2	$_{K2}$ (Gameso)	23	Lightweight
3	$_{K3}$ (Arias Yellow)	23	Lightweight
4	$_{K4}$ (White Arias)	30	Lightweight
5	$_{K5}$ (Arias Red)	19	Lightweight
6	$_{K6}$ (Sigendul)	26	Lightweight
7	$_{K7}$ (Ramos Mountain)	33	Lightweight
8	$_{K8}$ (Sidol)	27	Lightweight
9	$_{K9}$ (Sibontot)	28	Lightweight
10	$_{K10}$ (Sibengkok)	25	Lightweight

3.2.9. Production per Hectare (tons)

Table 12. Observation of crop production per hectare of some local upland rice cultivars of East Aceh

No.	Cultivars	Production per Hectare (tons)

1	K1 (Sileso)	4,72
2	K2 (Gameso)	4,19
3	K3 (Arias Yellow)	4,45
4	K4 (White Arias)	4,45
5	K5 (Arias Red)	4,72
6	K6 (Sigendul)	4,19
7	K7 (Ramos Mountain)	5,24
8	K8 (Sidol)	4,19
9	K9 (Sibontot)	5,24
10	K10 (Sibengkok)	4,45

It can be seen that the production per hectare of local upland rice in East Aceh shows the highest production per hectare is obtained in the Sibontot cultivar (5.24 tons) and Ramos Gunung cultivar (5.24 tons), while the lowest production is obtained in the Arias Kuning cultivar, Sigendul cultivar and Sidol cultivar (4.19 tons). This is because different varieties of rice planted on the same land will also affect rice production, resulting in differences in potential yield per hectare between varieties. This is influenced by the character of the genetic factors of the plant itself. These characters are determined by specific genes whose activities are influenced by environmental factors that have different genetic backgrounds (Ichan *et al.*, 2017).

Table 15 . Diversity of some local upland rice cultivars in East Aceh

No.	Character	Cultivar									
		K1	K2	K3	K4	K5	K6	K7	K8	K9	K10
1	Leaf blade	1.00	1.00	2.00	2.00	1.00	1.00	1.00	2.00	2.00	1.00
2	Ear Color Leaves	1.00	4.00	4.00	4.00	1.00	4.00	4.00	4.00	1.00	4.00
3	Leaf Length Flag (cm)	50.83	47.17	40.42	50.22	47.06	46.11	52.86	35.08	41.96	43.17
4	Flag Leaf Width (cm)	16.31	26.72	23.49	19.44	23.86	24.50	16.94	19.67	18.58	18.86
5	Flag Leaf Attitude	5.00	3.00	3.00	3.00	5.00	3.00	5.00	7.00	5.00	5.00
6	High Plant (cm)	187.86	177.89	182.39	179.44	168.69	192.39	192.36	164.61	160.17	168.86
7	Number of pups (stem)	10.06	11.14	8.36	7.31	7.94	7.69	8.72	6.94	8.86	8.00
8	Number of Productive Tillers (stem)	8.42	7.92	6.86	6.53	6.61	6.97	6.89	6.00	6.92	7.14
9	Age of Panicle Exit	86.67	86.47	86.44	84.58	89.11	86.08	84.83	79.81	85.94	82.97
10	Display Panicles	48.06	45.28	46.14	38.83	44.03	40.61	40.75	36.36	38.42	38.81
11	1000 Grain Weight	23.00	23.00	23.00	30.00	19.00	26.00	24.00	27.00	28.00	25.00
12	Production per hectare (tons)	19,14	16,04	18,52	18,20	16,66	15,43	19,75	15,74	19,75	18,52

Description; Cluster analysis table

3.3. Cluster Analysis with Hierarchical Method on Some Local Gogo Rice Cultivars in East Aceh

Cluster analysis was conducted on 12 local upland rice cultivar characters of East Aceh, namely: Leaf blade, leaf ear color, flag leaf length, flag leaf width, flag leaf attitude, plant height, number of tillers, number of productive tillers, panicle exit age, panicle length, 1000 grain weight and per hectare production. Figure 1 is a grouping of 10 local upland rice cultivars of East Aceh.

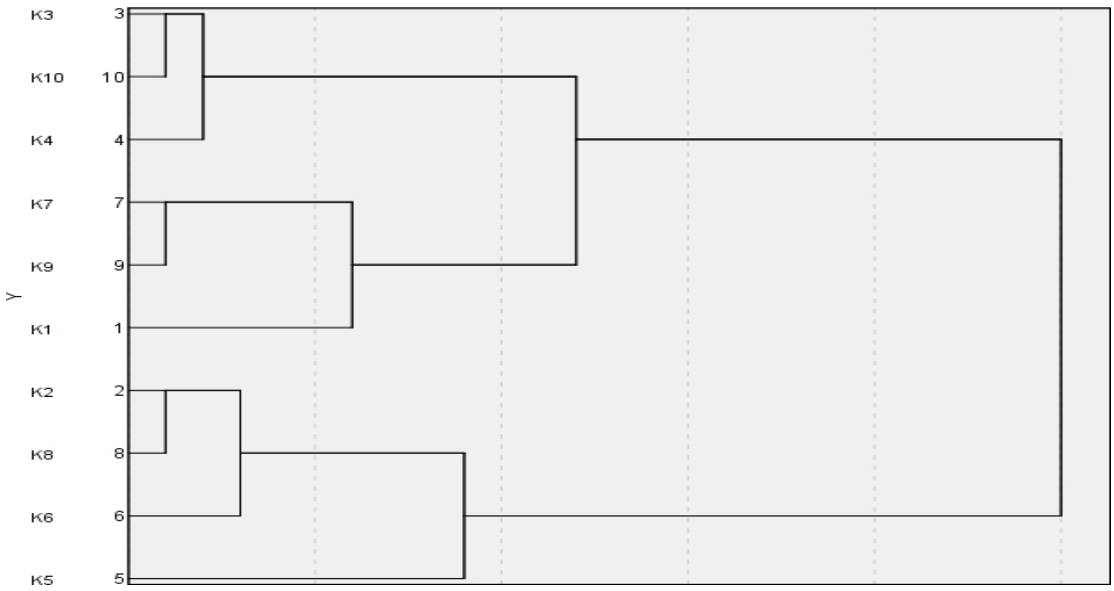

Figure 1. Dendrogram of the diversity of some local upland rice cultivars in East Aceh

The results of cluster analysis on the diversity of some local upland rice cultivars in East Aceh. Dendrogram formed from the hierarchical method with the calculation of similarity distance using Eucliden Distance is presented in Figure 1. Based on the average value of growth variables in each cluster has different morphological characteristics. Of the two clusters formed. Cluster 1 consists of Arias Kuning cultivar, Sibengkok cultivar, Arias Merah cultivar, Ramos Gunung cultivar, Sibontot cultivar and Sileso cultivar, while cluster 2 consists of Gameso cultivar, Sidol cultivar, Sigendul cultivar and Arias Merah cultivar. Within the same cluster, the relationship is genetically closer, although the closeness is relative. In cluster 1, between Arias Kuning cultivar and Sibengkok cultivar has the highest similarity based on the dendrogram produced, while the farthest kinship of cluster 1 is Sibontot cultivar and Sileso cultivar. Of the 10 local upland rice cultivars in East Aceh tested, 6 of them are included in cluster 1 (Arias Kuning cultivar, Sibengkok cultivar, Arias Merah cultivar, Ramos Gunung cultivar, Sibontot cultivar and Sileso cultivar) while (Gameso cultivar, Sidol cultivar, Sigendul cultivar and Arias Merah cultivar) are included in cluster 2. This kinship information can be useful for determining the next breeding steps.

According to Simarmata, (2010) upland rice cultivars that have different names but when tested by cluster analysis turns out to still have a very close kinship, occurs because the rice seeds obtained by many farmers come from seeds inherited from their parents and also obtained from other farmers in different places and then cultivated in other areas and there is a new name but actually comes from the same elders.

5. Conclusion

5.1. Conclusion

1. Morphological characters that contribute to diversity are leaf blade color, leaf ear color, flag leaf attitude, grain shape, flag leaf length, flag leaf width, panicle exit age, panicle length,
2. Based on the results of the hierarchical clustering analysis, there are 10 cultivars tested, divided into 2 clusters. In cluster 1, between Arias Kuning cultivar and Sibengkok cultivar have the highest similarity based on the dendrogram produced, while the farthest kinship from cluster 1 is Sibontot cultivar and Sileso cultivar. Of the 10 local upland rice cultivars in East Aceh tested, 6 of them are included in cluster 1 (Arias Kuning cultivar, Sibengkok cultivar, Arias Merah cultivar, Ramos Gunung cultivar, Sibontot cultivar and Sileso cultivar) while (Gameso cultivar, Sidol cultivar) Sigendul cultivar and Arias Merah cultivar) are included in cluster 2.
3. Differences in growth and production characters from the research results are caused by the interaction between genetic factors and the environment which causes a diversity of traits from each cultivar tested.
4. Based on the morphological characteristics of 10 local upland rice cultivars of East Aceh, it was found that Ramos Gunung cultivar and Sibontot cultivar are potential cultivars to be developed because they have the highest production yield among other cultivars.

5.2. Advice

To keep local cultivars from extinction, it is necessary to characterize other local cultivars so that they can be useful for plant breeding programs.

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