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# Morphological Characterization of Local Ambon Bananas in the Highlands Rejang Lebong Regency

**M. Arzandy Marsal[1], Mardia Apriani[2], Rizky Septika Utami[3], Adnan[4], Rini Suryani[5], Parwito[6]**

[1,2,3,4,5]Universitas Pat Petulai, Bengkulu, Indonesia
[6]Universitas Ratu Samban, Bengkulu, Indonesia
*Corresponding author : zandyxc2319@gmail.com

**ABSTRACT.** Curup local ambon bananas need to be developed and preserved so they don't lose their germplasm. Therefore, an exploration and characterization was carried out to obtain the types of local Ambon bananas in the highlands of Rejang Lebong district. This research was conducted from May to July 2023 in 4 Village Districts, namely Bermani Ulu District, Sukarami Village, Curup Tiimur District, Kampung Delima Village, Curup Utara District, Lubuk Kembang Village, and Selupu Rejang District, Pal Batu Village, Rejang Lebong District. The materials used in the study this is a sample of a banana plant. The method used is a direct survey to the field through interview techniques with banana farmers and distributing questionnaires to several banana farmers. The stage of this research was secondary data collection from the Rejang Lebong Regency Agriculture Office, then field exploration to obtain primary data in the field, both quantitatively and qualitatively. The exploration results showed that there were 5 genotypes of Rejang Lebong local Ambon bananas, namely green Ambon, yellow Ambon, Rejang Ambon, cold Ambon, and white Ambon. It is necessary to propagate banana seeds from tissue culture.

***Keywords :*** *Ambon banana, morphological characterization, highlands, Rejang Lebong*

## INTRODUCTION

Indonesia is one of the primary centers of banana diversity, both fresh, processed and wild bananas. More than 200 types of bananas are found in Indonesia. This high diversity provides an opportunity for Indonesia to be able to utilize and select the types of commercial bananas needed by banana consumers (Tyas, 2019).

The Central Bureau of Statistics (BPS, 2021) statedbanana productionin Indonesia reached 8.18 million tons in 2020. That number increased by 12.39% from 7.28 million tons in 2019. The highest banana production in 2020 occurred in the fourth quarter reaching 2.36 million tons with 83 plants producing bananas, 50 million clumps. Meanwhile, the lowest banana production occurred in the second quarter of 1.89 million tonnes with 73.38 million clumps. The province with the largest banana production was East Java. The province contributed 32% to national production, which reached 2.62 million tons and plants that produced 26.4 million clumps. Then, West Java contributed 15.44% with production reaching 1.26 million tons and plants that produced as many as 20.05 million clumps. Lampung Province contributed 14.77% with production reaching 1.21 million tonnes and plants producing 12.48 million clumps. For information, production is the amount of yield according to the specified yield form and is the sum of reports per unit. Meanwhile, the number of mature plants is the number of plants that are able to produce fruit based on the time of the harvest season. In terms of trend, Indonesia's banana production has tended to increase over the last five years. The highest increase occurred in 2020, while the lowest occurred in 2019 which increased 0.27% (Annisa, 2021).

Banana varieties that are widely cultivated include bananas kepok, raja, ambo, cavendish, raja sere, Baranga, Emas etc. The large selection of banana varieties offers a very high potential for germplasm generation. Based on fruit characteristics such as shape, smell and taste, every year efforts must be made to increase production by planting better seeds to meet the increasing demand at home and abroad. There are so many varieties of this plant that have high economic value, one of which is the Ambon banana. Research, identification and inventory of high yielding banana varieties are very important to reach a wider world market. The results of previous studies indicate that the quality of bananas circulating in the market still varies. In the long-term development plan (RPJP), banana plants whose fruit are of high quality, are in demand in the market, and have a uniform shape are needed for the development of agricultural businesses, the size and quantity to meet the ever-increasing demand.

Therefore, to find out which varieties are superior varieties and are feasible to develop, it is necessary to study and observe what ultimately produces information about plant morphology (characteristics) and the production potential of each. existing varieties so that people know the types of bananas and choose them for further development. Bengkulu is one of the potential banana production centers in Indonesia (Notonnagoro, 2010).

The huge potential of bananas has not been utilized properly and one reason is the lack of knowledge about existing banana research. Therefore, it is necessary to carry out a study/study to collect information and initial data regarding the physical characterization of existing banana plants to be used as input in developing the potential of Ambon bananas which are scattered in various banana production centers. in Bengkulu Province. (Notonnagoro, 2010). The purpose of this research isdetermine what varieties of local ambon bananas exist in Rejang Lebong district, and find out the morphology of local ambon bananas in Rejang Lebong district.

## MATERIALS AND METHODS

This research was carried out in May-July 2023 in four village sub-districts, namely Bermani Ulu sub-district, Sukarami Village, Curup Tiimur District, Kampung Delima Village, Curup Utara District, Lubuk Kembang Village and Selupu Rejang District, Pal Batu Village, Rejang Lebong District. The materials used in carrying out this research were samples from banana plants.

The method used is a direct survey to the field through interview techniques with banana farmers and distributing questionnaires to several banana farmers. The stage of this research was secondary data collection from the Rejang Lebong Regency Agriculture Office, then field exploration to obtain primary data in the field, both quantitatively and qualitatively.

## RESULTS AND DISCUSSION

Based on the results of survey observations in four sub-districts, namely Bermani Ulu District, Sukarami Village (BUSK), East Curup District, Kampung Delima Village (CTKD), North Curup District, Lubuk Kembang Village (CULK), Selupu Rejang District, Pal Batu Village, (SRPB), it was found as many as 5 varieties of Ambon banana presented in table 1.

Table 1. Ambon banana varieties and stem morphology found in 4 districts

| No | Research area | Sample | Pseudo stem color | Spots on pseudo stems | Stem circle | Stem height |
|---|---|---|---|---|---|---|
| 1 | Sukarami Village (BUSK) | Yellow Ambon variety | Blackish green | Chocolate | 78 cm | 5,3 m |
| 2 | Kampung Delima Village (CTKD) | Green | dark green | Black to brown | 87 cm | 5,9 m |
| 3 | Sukarami Village (BUSK) | Rejang | dark green | Dark brown | 86 cm | 3,6 m |
| 4 | Pal Batu Village (SRPB) | Cold | Light green | Dark brown | 64 cm | 2,2 m |
| 5 | Pal Batu Village (SRPB) | White banana | Dark green | Dark brown | 103 cm | 6,8 m |

Based on ariTable 1 shows that the color of the pseudo stem of each type of banana is different. Observations were made together observationalThe outline produces a pseudo-stem the color of Ambon Banana Table 1 shows that the color of the pseudo stem of each type of banana is different. Observations were made by observing the general characteristics, yellow pseudo ambon banana color belongs to the black green pseudo strain Green ambon banana belongs to the dark green pseudo strain Fresh ambon banana belongs to the pseudo green pseudo strain Yellow mbon belongs to the black green pseudo-stem Green Ambon banana belongs to the dark green pseudo-stem Fresh Ambonese belongs to the light green pseudo-stem Both bananas are white belonging to the dark green pseudo-stem . The results of this study, there are four types of pseudo stem color, namely: blackish

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green, dark green, light green, and dark green in Rejang Lebong Regency, stem morphological characteristics and spots on banana stems are presented in Figure 1 below.

(1) (2) (3) (4) (5)

Figure 1: pseudo stem color of all types of bananas, namely, (1) rejang (light green to purple), (2) cold (reddish green), (3) white banana (dark green), (4) Ambon Kuning (Old Hiau Blackish), (5) Green Ambon (Dark Green)

The color of the spots on the pseudo stems of several types of bananas are (1) Ambon Rejang has dark brown spots, (2) Ambon Cold has black spots, (3) Ambon Putih has red spots Ambon Raja has black spots, (5) Spots Green has black spots displays variations in pseudo stem color from 5 types of bananas which are identified in outline containing 6 colored stems.like a madman.

This means that according to IPGRI (1996), this type of banana has a false color. There were varieties to observe the color of the pseudo-stem spots studied, namely yellow Ambon bananas in brown, green Ambon bananas in black brown color, Ambon Rejang bananas in black brown color, cold Ambon bananas in dark brown color, white Ambon bananas in black brown color according to IPGRI (1996) where banana pseudo stem has spots of four colors.

Judging from the circumference of the hump, it is known that there are differences between the five bananas, the largest trunk circumference is the white Ambon banana which reaches 103 cm, while the smallest tumor circumference is the cold Ambon banana which reaches 103 cm in size 6 cm. The shape of the base of the leaf on the type of ambon banana that has been observed from 5 types of ambon banana has a different shape of the base of the leaf and there are also several types of ambon banana which have the same shape of the base of the leaf. the leaves are rounded and tapered, the green Ambon banana has both rounded leaf bases, the Ambon Rejang banana has both rounded leaf bases, the cold Ambon banana has both pointed leaf bases, and the white Ambon banana has both rounded leaf bases. The opinion of IPGRI (1996), that there are 3 variations of the shape of the base of the leaves of the banana plant.

1. Observations on the morphology of banana leaves included leaf structure, color of the edge of the pod, shape of the edge of the pod, shape of the base of the leaf, type of container, stains at the base of the midrib and color. Leaf midrib color, upper leaf color, lower leaf color, leaf width, petiole length, leaf length, leaf wingspan morphological characteristics of banana leaves

The results of observations of the basic shape of banana leaves are different which has been identified obtained 3 variants shown in Figure 2 below.

(1) (2) (3) (4) (5)

Figure 2. The shape of the base of the leaves of all types of bananas: namely (1) the type of base of the yellow Ambon banana leaf is rounded and tapered, (2) the type of the base of the green

Ambon banana leaf is both rounded, and (3) the shape of the base of the cold Ambon banana leaf is tapered on both sides (4) The type of the base of the Ambon Putih Banana leaf is both rounded.

The results of observations and measurements of the leaf morphological characterization of the 5 types of Ambon banana that have been observed are presented in Table 2.Table 2 shows the shape of the edge of the base (petiole) of the banana leaf. In general, there are 3 differences with the

| NO | SAMPLE | KD | WTPD | KTPD | BPD | TK | BPPPD | WBPD | WPAD | WPBD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | variety yellow ambon | upright | Young redness | Winged and Not Clamping Stem | rounded and Sharp | Open.with Edge Widen to the side | Chocolate Black | Light purple | Dark green | Whitish green |
| 2 | Green | Medium erect | Deep Purple | Winged and wavy | Circling the Second | Edge closing | Merry chocolate han | Reddish purple | Dark green | Light green |
| 3 | Rejang | upright | Chocolate | Winged and wavy | Circle the two | Open with up right edge | Dark brown | Chocolate time | Dark green | Light green |
| 4 | Cold | upright | Green | Winged and.not clamping the stem | His second pointy | Open with edges that widen to the sides | Reddish brown | Dark brown | Dark green | Light green |
| 5 | White banana | upright | Deep purple | Wings clamp the stem | Circle the two | Open with straight edges | Dark brown | Deep purple | Dark green | Whitish green |

shape of the edge of the base of the banana leaf.

Table 2. Results of Leaf Morphological Characterization of 5 Variants of Ambon Banana Species in the Highlands of Rejang Lebong Regency

Note: KD (straightness of the leaves), WTPD (color of the edge of the leaf sheath), KTPD (state of the edge of the leaf midrib), BPD (shape of the base of the leaf), TK (canal type), BPPPD (spots on the base of the leaf sheath), WBPD (color of the spots midrib), WPAD (top surface color of leaves), WPBD (top surface color)

2. Observation of the shape of the character from the edge of the frondThere are differences in the types of bananas found on banana leaves, bananas that hold tightly to the stem on the edge of the leaf midrib are white Ambon bananas, including the type that does not hold tightly to the stems, and Yellow Ambon Bananas, which are wavy bananas, are Green Ambon Bananas, Ambon Rejang bananas and so on. This is in accordance with IPGRI (1996) which states that the shape of the edge of the banana leaf sheath has three basic shapes of the edge of the banana leaf.

(1) (2) (3) (4) (5)

Figure 3. Leaf midrib morphology of all types of bananas (1) Yellow-winged Ambon without pinnate (2) White-winged Ambon without pinnate (3) Green Ambon with wavy wings (4) Rejang Ambon with wavy wings (5) Stem-winged Ambon.

The edge color of the banana leaf midrib from Rejang Lebong Regency also shows variations such as brown, dark purple, and reddish purple. The color of the petiole margin from IPGRI (1996)

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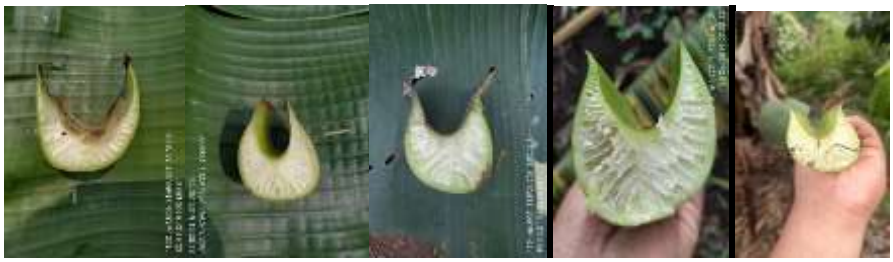
also shows three colors of the petiole midrib. Leaf midrib color was confirmed in 5 types of bananas. In general, there are three color variations of the leaf sheath as shown in Figure 3 above. The color of the leaf margins of all banana cultivars : (1) Ambon Dark purple green, (2) Cold Ambon green, (3) Ambon Rejang brown (4) Ambon Yellow dark purple (5) Ambon White reddish purple.

3. Observations on the type of canals owned by the 5 Ambon Banana varieties found in Rejang Lebong Regency haveDifferent Types of Canals, Different Types of Canals in Rejang Lebong Regency. Three channel types were studied from five banana species and are shown in Fig. 4.



(a) (b) (c) (d) (e)

Figure 4: Channel Type, (a) open with straight edges, (b) closed edges, (c) open with wide lateral edges.

Observations on channel banana plants: There are four major groups of five types of bananas. Figure 6 shows the variations in the shape of the channel type. Open the yellow Ambon banana with a wide edge on the side, green Ambon banana with closed canal type, Rejang Ambon banana has open canal type with upright edges, cold Ambon banana has open canal type with wide sideways edges, and white Ambon banana has open canal type with upright edges.According to IPGRI (1996), there are five types of canals in banana plants, namely: open with wide ends, open with wide and upright ends, upright with upright ends, closed ends, and closed ends.

4. There are only two variations in the observation of spots on the base of the leaf sheath. On the examined bananas, two large and small dots were found at the base of the leaf midribs of five types of bananas, as shown in Figure 5., Rejang Ambon bananas, and cold Ambon bananas have spots on the base of the large leaf sheaths and yellow Ambon bananas, green Ambon bananas, and white Ambon bananasThere is a small spot. According to IPGRI (1996), there are three forms of spots on the base of banana leaves, namely large spots, small spots, and no spots..

After tracing, it turned out that there are two types of spots in Rejag Lebong Regency, namely big spots and small spots, as shown in the picture.5.

(1) (2) (3) (4) (5)

Figure 5. Spots found at the base of the leaf sheaths of all types of bananas, namely (1) large spots and (b) small spots.

Of the 5 types of Ambon banana that were observed to have spots on the base of the banana leaf sheath, there were only two variants, namely large spots and small spots, which can be grouped into types of bananas that have large spots, including (1) Ambon Rejang banana, (3) Ambon Banana Cold and (5) Yellow Ambon Bananas, as for the types of Ambon Bananas that have types of small spots including (2) White Ambon Bananas, (4) and Green Ambon Bananas.

This is in accordance with IPGRI (1996) which has three different color variations of leaf midrib spots: reddish brown, dark brown, and blackish brown, in accordance with the identification of five types of bananas. Ambon in Rejang Lebong district. The observation results are presented in Figure 6.

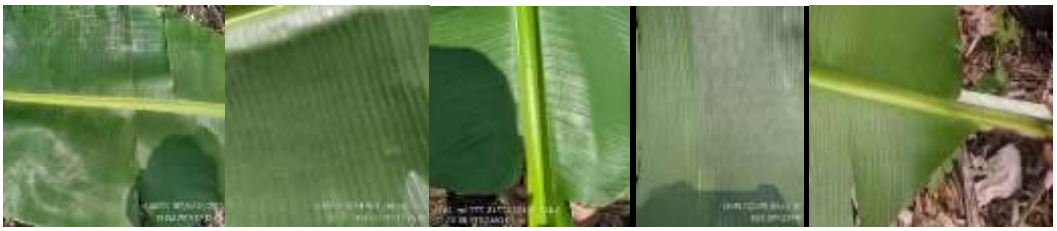
(1) (2) (3) (4) (5)

Figure 6. The color of the spots on the leaf sheaths of all types of bananas: (1) brown, (2) dark brown, (3) blackish brown (4) brown and (5) dark brown

Yellow Ambon bananas are blackish brown, green Ambon bananas are reddish brown, Ambon Rejang bananas are dark brown, cold Ambon bananas are reddish brown, and white Ambon bananas are the same color as yellow Ambo bananas, namely brown. black.

Leaf color in plant species can vary according to growing conditions and is closely related to water and food supplies and lighting. Likewise with the findings of Kusumawati and Syukriani (2008) that colors do not differ much. The figure shows the results in Fig 7.

There was no difference in the color of the upper surface of the Ambon banana leaves, including: Yellow Ambon Banana, Green Ambon Banana, Rejang Ambon Banana, Cold Ambon Banana, and White Ambon Banana.



(1) (2) (3) (4) (5)

Figure 7. The color of the upper surface of the banana leaf is: green from the image presented above where samples 1,2,3,4 and 5 have the same color on the top of the leaf.

5. In addition, the color of the underside of the banana leaf is also not very diverse, and this type of banana has a green color on the leaf surface vaginal discharge, which is found in yellow Ambon bananas and white Ambon bananas, while green Ambon bananas, Rejang Ambon bananas, and cold Ambon bananas have a light green color on the underside of the leaves. the color of the leaves of a plant species can change according to the conditions in which it grows and is closely related toWater and food supplies, as well as irradiation. Likewise, the research by Kusumawati and Syukriani (2008) found that the color did not change much. Observations are presented in Figure 8.

(1) (2) (3) (4) (5)

Figure 8. Color of the lower surface of banana leaves: whitish green (1), (3), (5), light green (2), (4).

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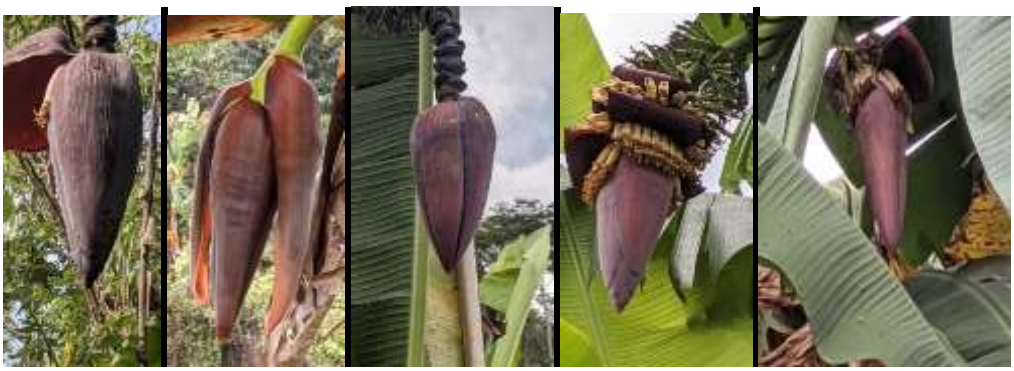
It can be seen from the picture above that there is a difference in the color on the underside of the banana leaf between them, namely Yellow Ambon Banana has a color on the underside of the leaf, namely whitish green (1) and Ambon Putih (5), and vice versa, Ambon banana which has a green color The young ones at the bottom are Green Ambon Bananas (2), Cold Ambon (3) and Ambon Rejang (4).

Table 3 Results of measurements of the 5 types of banana plant leaves in Rejang Lebong district

| Banana type | Leaf width cm | Petiole length | Leaf length | Leaf width |
|---|---|---|---|---|
| Varietas mist take | 89 cm | 312 cm | 297 cm | 51 cm |
| Green Ambon variety | 75 cm | 278 cm | 268 cm | 48 cm |
| Rejang ambon variety | 70 cm | 278 cm | 258 cm | 38 cm |
| Cold Ambon variety | 56 cm | 168 cm | 158 cm | 18 cm |
| White Ambon variety | 88 cm | 371 cm | 141 cm | 43 cm |

Table 3This shows that the measurements of leaf width, petiole length, leaf blade length, and leaf blade width differ greatly, the longest leaf is owned by the yellow Ambon banana with a stem height of 312 cm, and the shortest leaf is owned by the cold Ambon banana. It's 168cm. This is in accordance with the statement of Tjitrosoepomo (2001) that the shape and size of the petiole varies greatly between plant species and can vary in size and shape even within the same plant. Banana is an upland plant and is tolerant of drought. Banana plants grow from the lowlands to the mountains with altitudes reaching 1000 meters above sea level.

The flowers of the banana plant are oval in shape with a pointed tip, the newly emerged banana flower is called a banana heart, the banana flower is composed of a flower stalk, a flower supporting leaf or sheath and a flower crown. Cahyono, (2009) states that banana flowers are covered by red protective leaves The purplish surface covered with protective leaf wax is called the bractea, the function of the bractea is to protect banana flowers which fall off easily. Observations of banana flowers including the shape and color of the bractea in the banana heart are presented in the following figure:



(1) (2) (3) (4) (5)

Figure 9. Color and shape of banana flower/heart Ambon (1) Ambon cold (2) Ambon Green (3) Ambon putih (4) Ambon arejang (5) Ambon kuning.

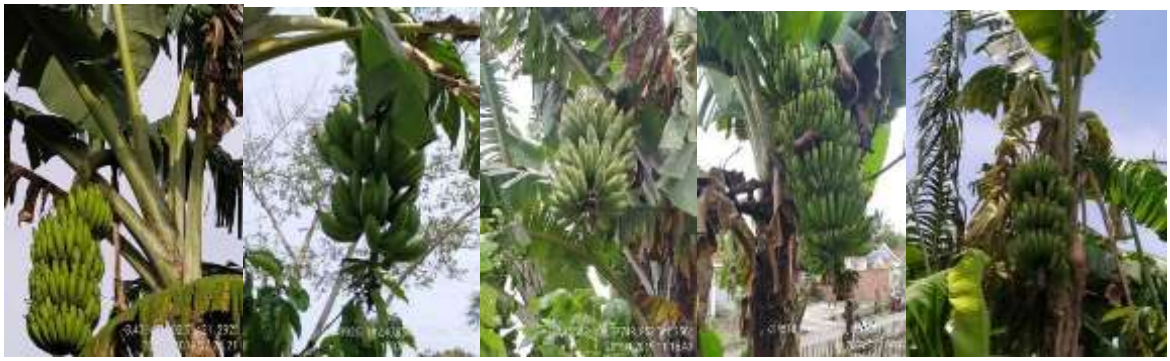
It can be seen from the picture above that there is a slight difference, namely where the shape of the banana flower is only 2, namely top/oval and lanceolate/tapered where the shape of the Ambon banana flower is cold, white Ambon and Ambon Rejang have almost the same shape and color, namely a top/top shape. oval with a dark purple color while yellow Ambon bananas and green Ambon bananas have a slanted/ tapered shape and almost the same color, namely reddish purple.

Observations on measurement, shape, color, number of combs, number of persimmons of the 5 types of Ambon bananas found in Rejang Lebong district have different variations which are presented in the following table:

Table 4. Results of Observation of Color, measurement and weight of fruit from 5 Ambon plants bananas in Rejang Lebong district.

| Types of Bananas | Fruit shape | Fruit length | Fruit weight | The color of the skin of the raw fruit | The color of the skin of ripe fruit | Number of Combs | Number of Fruits / Comb |
|---|---|---|---|---|---|---|---|
| Varietas mist take | Elongated square | 19 cm | 130 gr | Light green | Yellow To Orange | 8 combs | 20 pieces |
| Green Ambon variety | Rounded square | 16 cm | 118 gr | Dark green | Yellow | 5 comb | 14 pieces |
| Rejang ambon variety | Rectangle | 14 cm | 100 gr | Old Green | Greenish Yellow | 10 comb | 18 pieces |
| Cold Ambon variety | Oval rounded square | 14 cm | 104 gr | Light green | Light yellow | 6 combs | 19 pieces |
| White ambon variety | Elongated square | 15 cm | 108 gr | Dark green | Yellow | 7 comb | 18 pieces |

From Table 4 it can be seen from the observations above that Ambon bananas have varied shapes, sizes and weights, among which there is a significant difference that can be seen from the longest size and heaviest weight, namely the yellow Ambo banana has a longer fruit size of 19 cm and has a the heavier weight is 130 grams, as well as the shortest and lightest variant, the Ambon Rejang banana which is only 14 cm long and only 100 grams in weight, while the Ambon banana has the highest number of combs, namely the Ambon Rejang banana which has the most number of combs, namely 10 combs. and as for the bananas that have the least number of combs, namely green Ambon bananas, namely only 5 combs, and from the table above it can be seen that the highest number of fruits in one comb are owned by Yellow Ambon bananas, namely as many as 20 fruits and the fewest number of fruits in one comb are owned by bananas Green Ambon, namely only 14 pieces in one comb. The results of observations of bananas are presented in Figure 9.



(1) (2) (3) (4) (5)

Figure 9. Morphology of Ambon Bananas in Rejang Lebong district.

From the picture above, it can be seen that there are significant differences from the several types of Ambon bananas that have been observed, including Ambon Putih Bananas (1), Ambon Green Bananas (2), Cold Ambon Bananas (3), Ambon Rejang Bananas (4), and Yellow Ambon Bananas. (5).

Optimal productivity is achieved if bananas are planted on flat land below 500 meters above sea level (Cahyono, 2002). Banana plants usually grow and produce best in areas with elevations between 400 and 600 m above sea level. In the highlands, changes in the age of banana trees result in a longer harvest season and thicker skin. The altitude of a place affects the types of organisms that live there, because different altitudes have different physical and chemical conditions. The higher an area, the colder the temperature in that area. Conversely, lower temperatures mean higher temperatures in the region. The higher a location, the lower the temperature and light intensity at that location (Goldsworthy and Fisher, 1992).

Another factor is the mating of two individual creatures. The offspring of a cross have a set of genes from both parents, resulting in individual diversity within a species. Diversity that occurs naturally is the result of adaptation or adaptation to each individual's environment. Besides being determined by genetic factors (genotype), environmental factors also affect the appearance of an individual (phenotype). Genetic variation can occur through random mating, spontaneous or man-made mutations, and phenotypes can also be altered by changes in environmental factors. Banana diversity comes from somatic mutations that show diversity in bananas. The existence of species variations can be identified from differences in color, shape and size of individuals within a species (IPGRI 1996).

## CONCLUSION

1. The Ambon banana varieties found in the highlands of Rejang Lebong district have as many as 5 varieties, namely Yellow Ambon, Green Ambon, Rejang Ambon, Cold Ambon, and White Ambon.
2. Ambon bananas were found to have many variations and could be distinguished during the vegetative period based on the different colors of the pseudostem, spots on the pseudostem, leaf shape, color on the edges of the leaf sheaths, conditions on the edges of the leaf sheaths, color of leaf midribs spots, color of the upper surface. leaves, and the color of the upper part of the leaves, where from the 5 samples that were obtained at the time of the study there were significant differences so that novice farmers and old farmers could easily distinguish which types of yellow Ambon bananas, Ambon bananas, green, Ambon Rejang bananas , cold pisanngambon, and white ambon bananas, based on these data so that when selecting seeds/prospective banana tillers the farmers no longer wait until the bananas bear fruit to find out the types of the ambon bananas.

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