

MORPHOLOGICAL CHARACTERISTICS OF SUPERIOR PURPLE AND LOCAL RED CORNS

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ABSTRACT

Before crossing plants, it's critical to understand their morphological characteristics. Differences in plant morphological features distinguish the advantages of each plant. The objective of this study was to determine the morphological characteristics of superior purple and local red corn cultivated at the height of 22 meters above sea level, as well as their adaptability. Kalukubula Village, Sigi Biromaru District, Sigi Regency, Central Sulawesi was the site of this study. The research took place between October 2020 and February 2021. A Randomized Block Design was used in this investigation, with two corn kinds as treatments: The experiment was repeated 16 times with purple superior corn and red corn, yielding 32 experimental units. The quantitative data was examined using ovarian analysis (ANOVA) followed by a 5% Tukey HSD test to assess the difference between the two corns. Plant height, number of leaves, leaf length, stem diameter, age of male flower appearance, harvest age, fruit diameter with husk, length of cob, number of seeds per fruit, the weight of kernel per fruit, and dry kernels production of tons/ha were all found to have a higher growth rate than purple corn kernels. The qualitative characters of superior purple corn kernels include: leaf veins and leaf bases are purple, stems are purplish-green, female flowers are white with anger, the husk is purplish-green, and kernels are purple-black. Local red corn include white leaf veins, light green leaf bases, purple stems, light green female flowers, purple husk, and red kernels.

Keywords: Purple-Red Corn, Morphology, Characters.

INTRODUCTION

After rice and sago, corn is the most common food item in Indonesia, and there are many different types of corn consumed and processed. Information on physical features, genetic potential, and plant adaptability are all important factors

in constructing a new variety. Plant breeders can use this information to choose plants with desirable features before crossing them (Mustakim et al., 2020; Samudin, 2008)

According to the findings of Widodo et al. (2007), purple corn is a form of corn high in anthocyanin elements that

help to neutralize free radicals and act as a cardiovascular anti-mutagenic (blood pressure), cholesterol-lowering, anti-diabetic, and antioxidant.

Antioxidant-rich red corn is a great source of nutrition. Mineral content is also high, and vitamin C concentration is higher than that of yellow or white hybrid corn. Lycopene's nutritional composition can help prevent heart disease and cancers such as prostate cancer (Herlinda et al., 2018).

Combining crosses on the two corns is advantageous for corn plant breeding, especially if the goal is to create different color features by combining anthocyanin and antioxidant capabilities (Samudin, 2009; Maulidha and Sugiharto, 2019).

The goal of this study was to determine the morphological characteristics of superior purple and local red corn kernels, as well as their adaptability.

MATERIALS AND METHODS

This research was conducted in Kalukubula Village, Sigi Biromaru District, Sigi Regency, Central Sulawesi. The study started from October 2020 to February 2021.

The tools used in this study were hoe, machete, bucket, waring, meter, calliper, analytical scale, plastic, writing utensil, and camera. Materials used in superior purple and red corn kernels, insecticides, NPK Mutiara (16:16:16) fertilizer at a dose of 300 tons/ha.

This study was a Randomized Block Design with two kind of corn as treatment: JU = superior purple corn JM = local red corn, which were repeated 16 times so that 32 experimental units were obtained. The samples used in this study were four plants in the center of the plot.

The variable observed were plant height, number of leaves, leaf length, stem diameter, fruit height position from soil, age of male flower appear, age of harvest, the diameter of fruit without husk, length of fruit, number of kernels per fruit, weight of fruit kernels, and dry kernel production of tons/ ha (moisture content 14%).

$$PPK = \frac{ha}{JRK} + BBPB$$

where PPK is dried kernel production, ha = Area of 1 ha in m², and BBPT is weight of fruit kernel.

The quantitative data obtained were analysed using analysis of variance (ANOVA) followed by a 5% Tukey HSD test to determine the difference between the two corns.

RESULTS AND DISCUSSION

Quantitative Properties. The treatment had no significant effect on the measured variables of plant height, number of leaves, diameter of fruit without cob, and length of fruit, according to the analysis of variance (ANOVA). It can be deduced that the plant height, number of leaves, diameter of the fruit without corns, and length of the fruit did not differ significantly between purple and red corn.

The red corn had a higher average plant height, more leaves, a larger fruit diameter without husk, and a longer fruit length than purple corn, according to the study results (Figure 1). The treatment had a significant effect on the observed variables of leaf length, stem diameter, panicle appearance age, fruit height position, harvest age, number of kernels per fruit, kernel weight, and dry kernel production (ton/ha), according to the results of the analysis of variance (ANOVA). Leaf length, stem diameter, age panicle appearance, fruit height position from soil, harvest age, number of kernels per fruit, kernel weight, and dry kernel production (ton/ha) were all shown to be significantly different between purple and red corn.

Red corn kernels produced a longer average leaf length, larger stem diameter, faster male flower maturity, faster harvesting age, higher number of kernels per fruit, higher kernel weight, heavier fruit, and production of more dry kernels than purple corn kernels, according to the

results of the 5% HSD test. Purple corn kernels were notably different from red corn kernels in that they resulted in a lower average height of the fruit.

Qualitative Properties

Leaf Color. The study's findings (Figures 2 and 3) reveal that the two corns' leaf color characters differ in the color of the leaf bones and the base of the leaves. Red veins go through purple kernel corn, and the base of the leaves is also red. Red corn kernels, on the other hand, have white veins and light green leaf bases.

Stem Color. Purple corn kernels have purplish-green stems that are more dominant in green, and red corn kernels

have purple stems, as seen in the results (Figures 4 and 5). Purple corn kernels feature reddish-white female flowers that are mostly white, with a red color at the base of the female flowers, as seen in the results (Figures 6 and 8). Female flowers on red kernel corn are light green, however there is a red color at the end of the female flowers,

Female flower color and husk. The study results (Figures 8 and 9) can be seen that there are differences in the color of the husks of the two corns. Purple corn has purplish-green husks but are more dominant to green, while red corn kernels have purple husk.

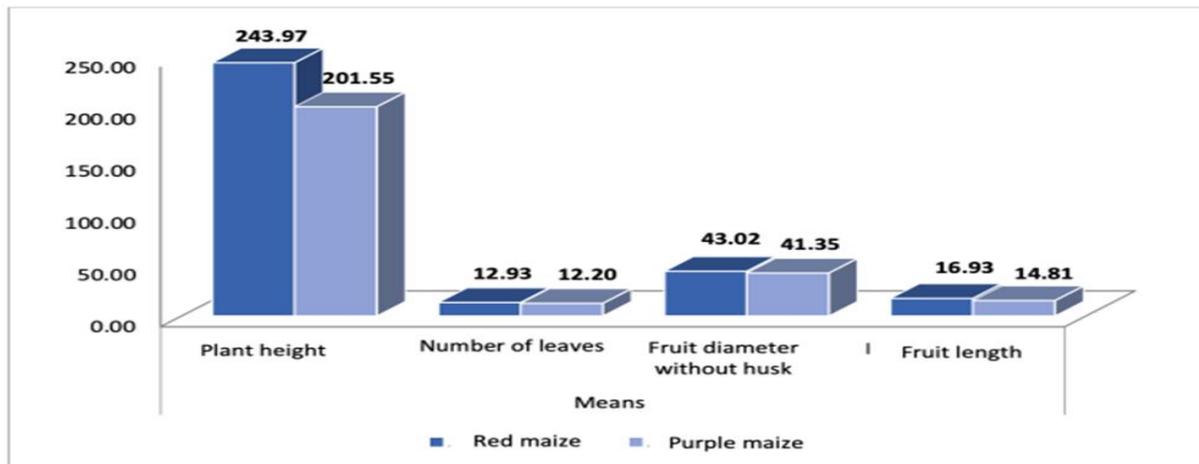


Figure 1. The average value of plant height (cm), number of leaves (strands), the diameter of fruit without husk (mm), and length of fruit (cm).

Table 1. The average value of leaf length (cm), stem diameter (mm), male flower appearance (days), fruit location height (cm), harvest age (days), number of seeds per fruit (seeds), seed weight per fruit (grams), dry shelled production (tons/ha).

Treatment	Means							Yield
	PD	DB	UKBJ	TLT	UP	JBPT	BBPT	
Red corn	99.68 ^b	18.13 ^b	48.87 ^a	110.53 ^b	86.53 ^a	359.13 ^b	86.63 ^b	10.40 ^b
Purple corn	90.33 ^a	15.86 ^a	52.27 ^b	99.07 ^a	94.13 ^b	259.27 ^a	71.39 ^a	8.57 ^a
HSD 5%	3.07	0.49	0.26	2.90	0.46	12.84	3.61	0.43

Description: Numbers followed by the same letter in the same column (a, b) do not show a significant difference. Leaf length (PD), stem diameter (DB), age of male flower appearance (UKBJ), fruit height position (TLT), harvest age (UP), number of kernels per fruit (JBPT), the weight of kernels (BBPT) and dry kernels production (ton/ha, Yield).



Figure 2. Leaf color of purple corn



Figure 3. Leaf color of red corn



Figure 4. Stem color of purple corn



Figure 5. Stem color of red corn



Figure 6. Female flower color of purple corn



Figure 6. Female flower color of red corn



Figure 7. Husk color of purple corn



Figure 8. Husk color of red corn



Figure 10. Color of purple corn kernels when harvesting consumption (young)



Figure 11. Color of purple corn kernels at harvest of dry husk (old)



Figure 12. Color of red corn kernels when harvested for consumption (young)



Figure 13. Color of red corn kernels at harvest of dry husk (old)

Kernel Color. The study's findings (Figures 10 and 11) show that purple corn kernels have a blackish-red color when collected for consumption, but are more dominant to red when harvested for consumption (young). Meanwhile, when harvested dry, the (old) husk turns a dark purple-black color, with black being the dominating color. Figures 12 and 13 depict red corn kernels with a yellowish-red color that is more prevalent when collected for consumption (young) and changes to red when dry harvested (old).

Discussion

The red kernel is local corn from North Luwu Regency, South Sulawesi Province. Purple kernel corn is high-yielding free-variety corn from the Corn Research Institute, Maros Regency, South Sulawesi Province.

The results showed that red corn kernels had better quantitative characteristics than purple ones. The study found that red corn produced higher plant height, more leaves, longer leaf length, larger stem diameter, faster male flower appearance, faster harvest age, larger diameter of the

fruit without the husk, longer fruit length, more kernels on the fruit, heavier kernels, and more dry kernel production.

The results of the study (Suleman et al., 2019) reported that the morphological characteristics of Momala Gorontalo corn were the average plant height of 146.47 cm; the mean fruit height is 73.88 cm; average stem circumference 8.46 cm; the average number of leaves is 12; the average leaf length was 86.59 cm; the average leaf midrib length is 16.25 cm; the average leaf width is 8.71 cm; the average direction of the leaf blade is slightly curved; mean leaf axillary angle 39.95°(degrees); the average shape of the tip of the leaf is pointed; the mean of anthocyanin staining on the segments was 5.086%; on grains 5.86%; on corn silk 83.76%. The average length of the fruit is 12.58 cm; mean fruit diameter 3.34 cm; the average weight of cobs with husks is 88.58 g, the average weight of cobs without husks is 60.74 g, the average number of seeds per row is 20 seeds, the weight of 1000 grains is 272 g.

The results of the study of Wijayanto (2007) reported that of the ten

germplasms that managed to grow well, it was seen that there was quite a large variation in the observed quantitative traits. The characteristics of male flower age varied between 43-55 days and female flower age between 45-57 days (the shortest age for these two traits was owned by germplasm numbered ST-28, ST-35 and SE-43); Mature age varies between 78-88 days, where the shortest age is owned by germplasm numbers ST-24, ST-35 and ST-98; and the nature of the weight of 300 seeds varied between 65.4 -74.8 grams (the largest in ST-35).

The results showed that local red corn kernels could be used as parents to assemble a new variety because it has more dry kernel production and better adaptability than high-yielding free pollinated corn. The appropriate growing environment strongly influences corn production. Each type of corn has a different growing environment (Harli et al., 2017). Maximum production of corn can be obtained if the environment grows according to plant needs, namely temperature, humidity, light, water, and hormones in plants (Amzeri, 2015).

The results also showed that the qualitative character of the superior corn free pollinated with purple kernels had purple leaf troughs and purple leaf bases, purplish-green stems, reddish-white female flower colors, purplish-green hulls, and black-purple kernels. Meanwhile, the qualitative character of local red corn kernels has white leaf troughs and white leaf bases, purple stem color, whitish-green female flower color and pink color at the tip of the female flower, purple husk color, and red kernel color.

Purple corn is known to contain anthocyanins and is known as a flavonoid (Kristiari et al., 2013). Meanwhile, red corn kernels contain high antioxidants, high mineral content, vitamin C content, and nutritional content in the form of lycopene (Herlinda et al., 2018).

The qualitative character of the two corns is a characterizing character or identity of each corn because the

qualitative character will not change even though the growing environment changes. This is because qualitative characters have traits that are only controlled by a few genes (simple genes). According to (Syukur et al., 2012), qualitative traits are certain characteristics in plants that are controlled by simple genes (one or two genes) and are not or very little influenced by the environment. The study results (Herlinda et al., 2018) reported that the qualitative characters with the variables of seed color, male flower color, stem color, and female flower color were controlled by 2-3 genes with the action of the Epistasis gene.

CONCLUSION

Local red corn had better growth compared to superior purple corn, producing the best quantitative characteristics, including plant height, number of leaves, leaf length, stem diameter, age of male flower appearance, age of harvest, the diameter of fruit without husk, fruit length, number of kernels, the weight of fruit kernels, and dry kernel production of tons/ha. This corn has better adaptability than purple kernel corn.

The qualitative characters of superior purple corn include: leaf veins and leaf bases are purple, stems are purplish-green, female flowers are white with anger, the husk is purplish-green, and kernels are purple-black. Local red corn kernels include white leaf bones, light green leaf bases, purple stems, light green female flowers, purple husk, and red kernels.

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