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MORPHOLOGICAL CHARACTERISTICS OF *Cocos nucifera* L. ORIGIN BONE AND SELAYAR DISTRICT, SULAWESI SELATAN

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ABSTRACT

Selayar Islands Regency is one of the coconut (*Cocos nucifera* L.) producing centers in South Sulawesi. *C. nucifera* from this area is one type of coconut that fills the market spread across several areas in South Sulawesi. Coconut character as a determinant of consumer attractiveness. In addition, the character of a plant can be used as a step in conservation, cultivation, and germplasm efforts. One solution is to characterize the morphology of these plants. This study aims to analyze and determine the morphological characters of *C. nucifera* from Bone Selayar Islands district. This research was conducted in the mountainous area of Bone Regency and the coastal area of Selayar Islands Regency. The coconut plant samples observed were deep type coconut plants (*C. nucifera* L. var typical). Each area was observed as many as 10 accessions of *C. nucifera* which were randomly selected in the farmer's. The object of the analysis used a descriptive method based on the International Plant Genetic Resources Institute (IPGRI) coconut descriptor manual (International Plant Genetic Resources). The sampling technique was carried out by accidental sampling. Morphological characters *C. nucifera* observed were tree height, stem diameter, number of fruits, fruit size, and leaf color. The results showed that coconut plants from Bone and the Selayar Islands generally had almost the same morphological characters, the only difference being in the average number of fruits per tree, fruit size, trunk diameter and tree trunk height.

Keywords: C. nucifera, Characteristics, Morphology**.**

INTRODUCTION

C. nucifera is a member of the Cocos genus, Arecaceae family. Has a tree habitus, unbranched, rounded trunk, midrib leaves; fruit, oblong; the color of the fruit is green, bright orange, and yellow. This plant consists of two varieties, namely the deep coconut (*C. nucifera* L. var typical) and the early coconut (*C. nucifera* L. var Griff). (Chan & Elevitch, 2006).

The inner type coconut (*C. nucifera* L. var typical) is generally cross pollinated, the tree height is about 15 - 35 m, the base of the tree has a bulb (the base of the stem looks like swelling), the length of the leaves ranges from 5-7 meters, generally flowers 7-10 years after planting, it takes 12 months after pollination to produce the first ripe fruit. *C. nucifera* plant age is estimated to reach 80-90 years (Tjitrosoepomo, 1989). This type of coconut takes many roles in people's lives. According to Kriswiyanti (2013) of the 11 coconut cultivars used in religious ceremonies on the Bali Province is better most of them are deep type coconuts (*C. nucifera* var. typical).

Coconut (*C. nucifera*) is a strategic commodity that has social, cultural, and economic roles in the lives of Indonesian people. The benefits of coconut plants lie not only in the flesh of the fruit which can be processed into coconut milk, copra, and coconut oil, but all parts of the coconut plant have great benefits. (Lenrawati & Purnamasari, 2020).

The main reason that makes coconut a commercial commodity is that all parts of the coconut can be used for various purposes. This plant has high economic value (Leterulu et al., 2019). All parts of the coconut tree can be used for human benefit, so this tree is often called the tree of life. Roots, stems, leaves and fruit can be used for daily human needs. According to research results (Diba et al., 2018) conducted with literature studies, interviews, surveys and observations showed that there were 68 types of medicinal herbs used by the The Sultanate of Yogyakarta royal family made from coconut.

This plant with a million benefits comes from the coastal areas of tropical Asia and the Pacific. While the center of diversity is spread almost all over the world. In general, this plant likes humid tropical areas and grows well at an altitude of 100-500 m above sea level (Hartawan & Sarjono, 2016).

Selayar Islands is one part of South Sulawesi which is known as a center for producing coconut (Cocos nucifera L.). This area is unique because the land is characterized by a undulating earth morphology so that it has many hills, but the eastern part of Selayar Island is directly adjacent to the sea,

Eleven sub-districts of the Selayar Islands Regency can produce as much as 25,138.99 tons of coconut, with a plantation area of 19,808.00 Ha. (RPI2JM, 2013). Coconuts from plantations are generally used by the Selayar people for daily needs, traditional ceremonies and for trading (Lenrawati 2020).

Almost all areas of South Sulawesi have coconut plantations. So it can be assumed that each region has a specific diversity of C. nucifera germplasm origin. (Novarianto & Tempeke, 2007).

It has been found that the superior type of deep type coconut plant is specific for Gorontalo Province. There are several advantages, namely the potential to produce >3 tons of Copra ha^{-1} y^{-1}, and contain oil content above 61%. (Heliyanto & Tenda, 2010). Morphological characterization of *C. nucifera* L. var typical has never been done in South Sulawesi. This research is the first step to find coconut plants that have superior characters. The effort taken is to characterize the morphology of several coconut plants that are popular in the local market. The diversity of morphological characteristics of plants is an important thing to study. because it is a guide to get important characters that can be used for conservation, germplasm, and cultivation purposes (Reed, 2008). There are several environmental factors that can affect morphological characters including climate, temperature, soil type, soil conditions, altitude, and humidity (Sitompul & Guritno, 1995). Based on this description, researchers are interested in identifying the character of coconuts that grow in different areas. The purpose of the study was to determine the morphological character of the deep coconut plant that grows in the Bone Regency and Selayar Islands Regency.

MATERIALS AND METHODS

a. Research Time and Place

This research was conducted on March 30–April 10, 2020 in two places, namely: 1) in the mountainous area of Lamuru Village, Tellu Siattinge District, Bone Regency. 2) in the coastal area of Lalang Bata Village, Buki District, Selayar Islands Regency.

b. Research tools and materials

The materials used in this study were 10 accessions belonging to farmers in Lamuru Village, Tellu Siattinge District, Bone Regency and 10 accessions in Lalang Bata Village, Buki District, Selayar Islands Regency.

The tools used include global positioning service (GPS), meters, rulers, camera to take pictures of coconut plants, and stationery.

c. Research methods

The research begins by determining the research locations based on the ecology of the land. Furthermore, each land ecology selected plantations intentionally (purposive sampling) and determined two sample farmers who have coconut plantations (Damayanti et al., 2018).

The sampling method uses the accidental sampling method (Damayanti et al., 2018) namely random sampling technique. The plants that were sampled were seen by the coordinates and altitude of the place using GPS. Observations were made by visiting coconut plantations owned by farmers in Bone and Selayar Islands districts. The sample plants observed were deep coconut plants with a production age of 15-25 years.

This research is descriptive research. The data were obtained by looking at the morphological characteristics of deep coconut plants which include a) Tree trunk height using the method of estimating the length of coconut plants, b) Stem diameter/circumference, using a meter. It is calculated by taking the average stem circumference at the base of the stem; c) The length of the frond is measured by measuring the old frond so that it can be measured from the base of the frond to the tip of the frond by using a tape measure; d) Fruit circumference by measuring the circumference of ripe fruit using a measuring tape; e). The number of fruit per tree is calculated by counting manually on a coconut tree; g) Leaf color seen with the naked eye on the average leaf in the area, h). Soil characteristics in Bone and Selayar (IPGRI, 2015).

The data obtained from the field were analyzed using a comparison method between coconut plants growing in mountainous areas (Bone) and coconut plants growing in coastal areas (Selayar). The results of the analysis are then averaged and poured in tabulated form.

RESULTS AND DISCUSSION

Based on the results of research that has been carried out on 20 deep coconut accessions in Lamuru Village, Tellu Slattinge District, Bone Regency and in Lalang Bata Village, Buki District, Selayar Islands Regency, the average results are as presented in table 1.

Table 1. Characters observed, average observations of C. nucifera in Bone District and Selayar Islands District

NO	Observed characters	Kab. Bone	Kab. Selayar
1	Tree tHeight	8-15 meter	15-20 meter
2	Circumference or Diameter of the rod	20-30 cm	20-40 cm
3	Long Sheath	70-100 cm	70-100 cm
4	Circumference or Diameter of the fruit	(4x5)+ (4x5)	(5x5)+ (5x5)
5	Number of fruit per tree. (Average)	6-10 fruit	10-20 fruits
6	Leaf Color	Dark Green	Dark Green
7	Soil texture	Clay	Sandy (colour : faded dark brown)

Ten accessions of C. nucifera observed in each area showed similar characteristics to the population. This research is in line with (Makmur et al., 2020) who identified 27 accessions of basil (*Ocimum* x *africanum* Lour.). All of the observed *O. x africanum* accessions came from several regions in Indonesia. The analysis was carried out by reviewing morphological characters based on descriptor guidelines and genetic characters using ISSR (Inter Simple Sequence Repeat) molecular markers. The results of the analysis built in the dendrogram tree and PCA showed that each accession was clustered with other accessions from the same region.

Cocos nucifera L. var. typical in Bone shows the character of plant height 8-15 meters, circumference or diameter of the trunk 20-30 cm, the average number of fruit per tree is 6-10 fruit. In Selayar, the deep coconut has a plant height of 15-20 meters, trunk circumference or diameter 20-40 cm, the average number of fruit per tree is 10-20 fruit. Morphological character data of *C. nucifera* var. typical shows that coconut from the Selayar Islands district has superior characters, namely in terms of the number of fruits per tree, fruit size and stem size. Morphological characters are the result of the interaction between the genotype and the environment in which a plant grows. The optimal environment will support the optimal expression of plant genes as well.

The plantations of *C. nucifera* var typical from the Selayar Islands Regency which are used as observation locations are coastal areas. Coastal areas are characterized sandy soil. Sandy soil is soil that contains as much as 70% sand. Soil dominated by sand has many macro pores so that the water and nutrient storage capacity is low. Conditions like this are generally less beneficial for the plants that grow on them (Henrianto et al., 2019).

The water holding capacity and the depth of the soil are important for maintaining optimum coconut growth. Sandy soils are usually less fertile than clayey soils, because sand-dominated soils have many macro pores while clay-dominated soils will have many micro pores. (Henrianto et al., 2019). The storage capacity of water and nutrients in sandy soil is also very low so it is not profitable for the plants that grow on it.

Each plant has different growing conditions. As in C. nucifera var typical, it prefers a sandy loam texture (Konan et al., 2008). This is in line with this study, namely that coconut plants from the Selayar Islands Regency that grow on sandy land produce more fruit per tree than coconuts grown on bone which grow in plantations with a clay texture.

Good drainage conditions can also optimize the growth and production of coconuts. Coconuts from the Selayar Islands Regency that live near the coast can bear as many as 10-20 fruit per tree. Coconut trees that grow in places close to moving water such as on the banks of rivers, near the coast, generally grow very well. This is because the moving water contains a lot of oxygen (O_2), which is important for root respiration. The soil pH also plays an important role in the growth of coconut plants (Konan et al., 2008). According to (Konan et al., 2008) coconut plants require soil pH 4.5-8.0 (top layer: 0-30), at an effective depth of >50 cm.

C. nucifera var typical fruit from Selayar Islands Regency has a larger fruit circumference than the coconut from Bone Regency. Fruit size is affected by photosynthetic activity. The low photosynthetic activity of coconut plants in the highlands causes low photosynthesis and energy for the development of coconut fruit (Taiz & Zeiger, 2009). Slow fruit development causes fruit circumference and fruit weight with coconut fibre in the highlands to be smaller and lighter than coconuts in the lowlands and mediumlands. (Hartawan & Sarjono, 2016). Although the fruit development of coconut trees in the highlands was slower, usually the weight of seeds or weight of uncoated coconuts in the highlands was not significantly different from the weight of seeds or uncoated fruit in other areas. This is because the food reserves of coconut plants in the highlands are mostly stored in seeds so that although they are small, they have a heavy mass. (Hartawan & Sarjono, 2016).

Figure 1. a). The population of deep coconuts in the Selayar Islands district, b). coconut tree trunks in Selayar, c) population of deep coconuts in bone, d). deep coconut tree trunk in Bone

Based on the data above, it shows that the inner coconut growing in Selayar has a more fertile impression because the stem appears fatter than the inner coconut in Bone (figure 1). The difference in phenotype is influenced by the ecology in which it grows (Hartawan & Sarjono, 2016). The ecology of the place where it grows has an impact on the fulfillment of light intensity, the highland sky is generally filled with clouds, thereby reducing the intensity of light that will be received by plants. The influence of light is not limited to the intensity of light, but there are more than one factor in light, namely the wavelength of the light (Konan et al., 2008).

Plants in the mediumland produce more photosynthesis than plants that grow in the highlands. Photosynthate is the result of the photosynthesis process of plants in the plains getting good lighting and a pH that supports the plant growth process. The growth frond length, stem size and number of fruit in each bunch is influenced by the amount of photosynthesis produced. Plants that can produce a lot of photosynthate then plant growth and development of reproductive cells will be good and if the photosynthate produced by plants is low then plant growth and reproduction will be hampered (Taiz & Zeiger, 2009).

C. nucifera naturally grows in coastal areas up to the mountains reaching a height of ± 30 m (Konan et al., 2008). The ecology of each observation site has its own character. Selayar Islands Regency has a lowland ecology while Bone Regency is a highland regency. A suitable growing environment will produce plants that grow optimally. The temperature of the coastal area is capable of making coconut plants from this area grow well. The tropics with an average temperature of 27°C can help coconuts grow optimally (Konan et al., 2008).

CONCLUSION

Based on the research that has been done, it can be concluded that:

1. *Cocos nucifera* var typical in the Selayar Islands district has the characteristics of higher stem size, larger stem diameter, larger fruit size, and more fruit per tree than C. nucifera var typical growing in Bone district.
2. *Cocos nucifera* var typical which grows in sandy soil structure has the characters of longer stem height, larger stem diameter, larger fruit size, and coconut production and fruit production which is much higher than C. nucifera var typical which grows in the mountains with a higher structure Clay.

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