

Morphological and Anatomical Characteristic Kinship of Faloak Plant (*Sterculia quadrifida* R.Br) as Learning Source for Morphology and Anatomy of Plant Course Based on Local Natural Resources

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Abstract—This study aims to determine the morphological and anatomical characteristic kinship of faloak plant (*Sterculia quadrifida* R.Br) growing in Kupang Regency as learning source for morphology and anatomy of plant course based on local natural resources. The study was conducted at the Laboratory of Biology Education Study Program, Kupang Muhammadiyah University from March to May 2019. This study used a qualitative descriptive approach with cluster analysis method. To see the kinship of the plant, this study used UPGMA method of Nei and Li's coefficient similarity through the MVSP software program version 3.2. The results of this study show that faloacic kinship from the three locations in Kupang Regency had a value of 77%. Meanwhile, anatomical characteristics show that the highest stomata density value was 5.6 stomata/ μm and the lowest stomata density value was 2.9 stomata/ μm .

Keywords: Faloak, Morphology and Anatomy, Learning Source

I. INTRODUCTION

Kupang Regency is one of the regions in East Nusa Tenggara Province which has a tropical and dry climate where the rainy season is very short, i.e. 3-4 months, while the dry season lasts 8-9 months [1]. Climatic and geographic conditions in Kupang Regency which have semi-arctic soil structure with rocky sand allows faloak plants (*Sterculia quadrifida* R.Br) to grow naturally since it is one of the specific plants of dry land [2]. The specialty of this plant is be able to survive in degraded land and has benefit as traditional medicine. Local people take the bark of faloak to boil, then consume it. Empirical evidence shows that the bark of the faloak tree is effective in treating diseases such as digestive disorder, rheumatism, malaria and hepatitis. Therefore, the experience of people who recover after consuming faloak's boiled bark skin has made faloak increasingly famous in the society.

Considering that faloak plant is expected to become one of the new growths of forest products which has the potential as traditional medicine. Thus, an effort to make faloak as a good potential should begin now. Silitonga [4] states the steps that need to be taken as the effort to provide genetic material for crop improvement include exploration,

conservation and evaluation of the character of the crop so that the knowledge about plant germplasm needs to be known and it can be used as a learning medium.

Plant morphology and anatomy is one of the study subjects in Natural Sciences especially biology that requires innovative learning media. Therefore, this research is needed to increase learning resources in the form of media that can be used by lecturers Kupang Muhammadiyah University, especially lecturers who teach plant morphology and anatomy course. Learning media prepared conventionally have not been managed and utilized maximally. Knowledge of morphological and anatomical structures of the handbook used by lecturers (educators) has not contributed knowledge as a comprehensive learning resource, so it needs to be given an additional form of interesting and creative media that can be drawn from local natural resources. As a result, learning activity can be developed more attractively for students because it utilizes local potential as a learning medium for learning biology.

II. MATERIAL AND METHOD

A. Tools and Materials

In this research, the tools used were altimeter, camera, notebook, pen/pencil, electron microscope, object glass, dropper and razor blade. Meanwhile, the materials used were faloak plant (*Sterculia quadrifida* R.Br), 0.05% safranin solution and sterile water.

B. Method

This research used explorative descriptive to describe and interpret the morphology and anatomy of the faloak plant (*Sterculia quadrifida* R.Br) and the method of the research referred to the steps of Research and Development. [6] The research began by analyzing the material requirements. This research was conducted based on the fact observation as a systematic sign of plants. The sampling technique used purposive sampling that the sample was based on certain considerations aiming to obtain a sampling unit that fulfill the characteristics required.

Table 1. Morphological Character of Faloak (*Sterculia quadrifida* R.Br) Leaf

Sample	Parameter Observation						
	BD	TD	UD	STD	LD	PTD	PHD
Taebenu District							
Taebenu 1	Jtg	Rt	Mrc	Myp	7.5 cm	6,5 cm	13 cm
Taebenu 2	Jtg	Rt	Mrc	Myp	10 cm	7 cm	14 cm
Taebenu 3	Jtg	Bgl	Mrc	Myp	8.7 cm	5 cm	13,5 cm
Kelapa Lima District							
Kelapa Lima 1	Jtg	Rt	Tpl	Myp	12 cm	7,5 cm	15 cm
Kelapa Lima 2	Bt	Bgl	Mrc	Myp	6.3 cm	1,5 cm	16,3 cm
Kelapa Lima 3	Jtg	Bgl	Mrc	Myp	11,5 cm	6 cm	18 cm
Information of Table 1:				STD	: Arrangement of Leaf Bone		
BD : Leaf Shape				Myp	: Pinnate		
Rt : Flat				LD	: Leaf Width		
TD : Leaf Edge				Jtg	: Heart		
Mrc : Taper				PTD	: Length Petiole		
UD : Leaf Tip				Bgl	: Wavy		
Tpl : Blunt				PHD	: Length Leaf Blade		

III. RESEARCH PROCEDURE

A. Observation of Local Corn Plant Morphology

Observation of the faloak plant morphology began with observation on the leaf morphology, namely: leaf surface color, leaf surface appearance, leaf length compared to leaf width, leaf tip shape and leaf edge shape.

B. Observation of Local Corn Plant Anatomy

At this stage, observation only saw the anatomical structure of epidermal cell by slicing the leaves and each slice was placed on a slide and dropped with water. To get clearer result, according to [8], a drop of 0.05% safranin solution can be added to clarify observation. The preparation was covered with cover glass and observed in an electronic microscope at 2.5×10 magnification for cross section and 10×10 for longitudinal section. Then the next picture was taken to describe.

C. Scoring and Morphological Data Analysis of Local Corn

Data analysis referred to the quantitative descriptive analysis method. Afterwards, phenotypic data analysis in quantitative character was carried out to see the diversity in the population. Cluster analysis brought the dendrogram result that was used to see patterns of diversity from survey data [9]. To find out the phenotypic diversity and kinship relationship between maize plant and the morphology of each maize plant, it was processed using a matrix data analysis (cluster analysis) with qualitative data grouping the difference with 1 value if it was visible and 0 if it was not visible and making dendrogram with the UPGMA method (Unweighted Pair Group Method Arithmetic) based on the coefficient of Nei & Li similarity through the MVSP (Multi Variate Statistical Package) software program version 3.1

Table 2. Morphological Characteristics of Faloak Fruit (*Sterculia quadrifida* R.Br)

Sample	Parameter Observation		
	Fruit Weight	Fruit Color	Fruit Texture
Tebenu District			
Taebenu 1	23 grams	Orange	Rough
Taebenu 2	40 grams	Orange	Rough
Taebenu 3	17 grams	Orange	Rough
Kupang Barat District			
West Kupang 1	20 grams	Red	Rough
West Kupang 2	26 grams	Red	Rough
West Kupang 3	25 grams	Orange	Rough

[10]

Table 3. Morphological Characteristic of Faloak Plant Seed (*Sterculia quadrifida* R.Br)

Sample	Parameter Observation			
	Number of Seeds	Seed Weight	Seed Color	Seed Texture
Taebenu District				
Taebenu 1	11	4 grams	Black	Rough
Taebenu 2	12	7 grams	Black	Rough
Taebenu 3	11	3 grams	Black	Rough
Kupang Barat District				
West Kupang 1	5	0.7grams	Brown	Rough
West Kupang 2	6	3 grams	Light Brown	Mushy
West Kupang 3	19	7 grams	Black	Rough

IV. RESULT AND DISCUSSION

A. Morphological Character of Faloak Plant

From the result of research conducted in two districts, three locations were chosen in each district and each location was a common area covered with faloak plant in Kupang regency to get data for compilation of faloak plant description based on morphological characters. Description of each morphological character observed in Taebenu and West Kupang District can be seen in the following table.

Data of observation result of parameter on the morphological character of faloak plant leaves in two sampling districts in Kupang Regency can be seen in Table 1.

Data of the observation of parameter on the morphological character of faloak fruit in two districts in Kupang Regency (Taebenu and West Kupang districts) are presented in Table 2.

Data of observation of parameter on the morphological character of the seed of faloak plant in two districts in Kupang Regency (Taebenu and West Kupang Districts) are presented in Table 3 below.

Based on quantitative and qualitative data, faloak plant growth in two districts in Kupang Regency showed variation or diversity. Furthermore, to strengthen the results (Table 1 to Table 3), testing was done using MVSP software based on the similarity of Nei and Li's similarities by involving all morphological characters of faloak plant that was studied. After conducting the analyzing, the dendrogram obtained was shown in Figure 1.

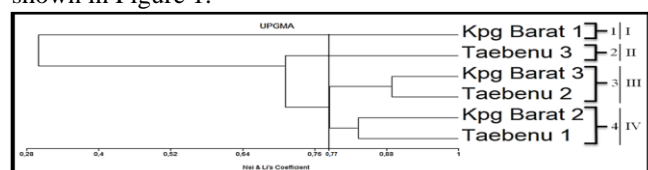


Figure 1. Dendrogram of 6 samples of faloak plants (*Sterculia quadrifida* R.Br) based on the similarity of Nei & Li's coefficient.

The numbers below the dendrogram show the Nei & Li's Coefficient value, the numbers to the right of the dendrogram indicates grouping.

Based on Figure 1, it can be seen that 6 samples of faloak plants formed 4 sub-groups and 4 main groups on the similarity coefficient value of 0.77 or 77%. The first sub-group formed 1 sub group consisting of 1 group namely West Kupang 1, the second sub-group formed 1 sub-group consisting of 1 group namely Taebenu 3, the third sub-group formed 1 sub-group consisting of 2 groups namely West Kupang 3 and Taebenu 2, and the fourth sub group formed 1 sub-group consisting of 2 groups namely West Kupang 2 and Taebenu 1.

B. Anatomical Characteristic of Faloak Plant

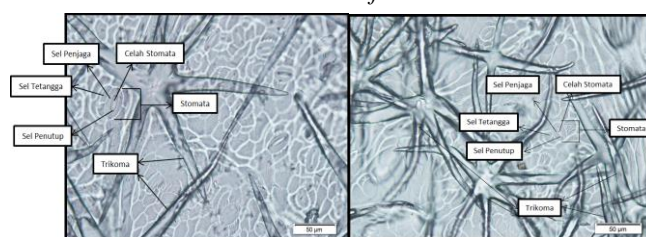


Figure 2. Leaf anatomy of the faloak plant (*Sterculia quadrifida* R.Br) (a) West Kupang District (b) Taebenu District Kupang Regency with an enlargement of 10×40 .

V. DISCUSSION

Based on the result of the 6 samples dendrogram analysis of morphological diversity of faloak plant in the West Kupang and Taebenu districts, the grouping of faloak plant population in Kupang Regency was related to its geographical position, meaning that the grouping of plant showed that the closer the geographical distance of a population, the closer the genetic distance in form of morphological diversity between populations. However, there were some populations that showed different tendencies, e.g. the population of West Kupang 3 has a closer kinship relationship with Taebenu 2 and West Kupang 2 with Taebenu 1. These four population areas were

both in the Kupang Regency, however, geographically, the location area was different.

It is not in line with [12] stating that the spread of faloak plant carried by animals (forest doves and bats) as well as geographical condition of growing area of faloak plant that allowed seeds to be carried out by water from one region to another. In addition, as general forest plant, faloak plants do cross-breeding (outcrossing) assisted with wind randomly allowed the process of gene transfer or migration through pollen migration that could cover a fairly wide spread area. Outcrossing woody plants have great variability or diversity. Besides, species that were wider in distribution with large and close together population have high productivity and great genetic diversity.

Based on the result of the study of the faloak plant anatomy stomata that have been obtained with a longitudinal cross section of the two Districts in Kupang Regency, there is similarity in the form or type of Actinocytic stomata. Besides, stomata in faloak plant leaf also has cover cell, neighboring cell and stomata cleft. Each closing cell was accompanied by a neighboring cell with a closing cell axis that was parallel to the axis of the neighboring cell and the stomata gap, the stomata closing cell was located parallel to the epidermis cell (Nurhayati, 2016). Stomata in faloak leaf has a round shape.

Faloak leaf stomata obviously seen showed that the faloak plant was included in leaf type of xerophyte plant. Xerophyte is an anomocytic stomata type, a cover cell surrounded by a number of cells that do not differ in size and shape from epidermal cell. According to Retno (2015), xerophyte is plant that grows in dry area and very low humidity in which transpiration is very small. The characteristics of xerophyte growth are small cell, thick cell wall, tight vascular system, pile tissue, while spongy tissue is reduced, and in general, xeromorphic leaf is covered by trichome.

VI. CONCLUSION

The grouping of faloak plant population in Kupang Regency is related to its geographical position, indicating the closer the geographical distance of a population, the closer the genetic distance in form of morphological diversity between populations. From the faloak leaf stomata seen, it showed that faloak plant belong to the type of xerophyte of leaf plant. Xerophyte is an anomocytic stomata type, a cover cell surrounded by a number of cells that do not differ in size and shape from epidermal cell.

VII. REFERENCES

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