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ICOMSET 2017

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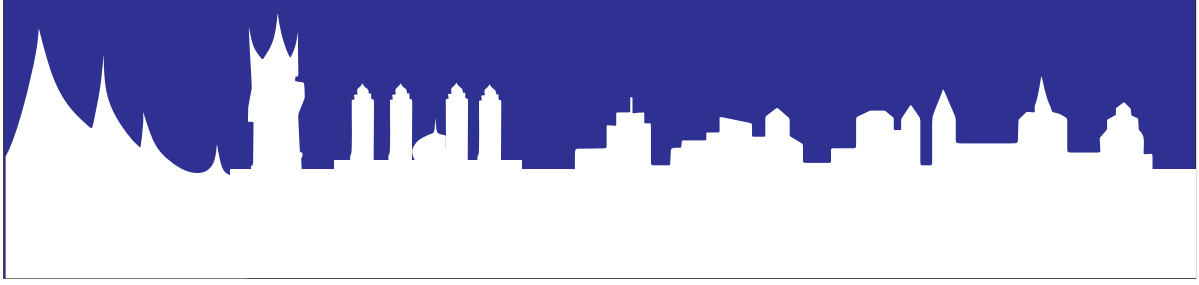

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PREFACE

On behalf of the Steering Committee, I would like to thank you for your participation in the 2nd International Conference on Mathematics, Science, Education and Engineering (ICOMSET2017) which has been held at Grand Inna Muara Hotel and Convention Center in Padang, West Sumatera, Indonesia from October 5 (Tuesday) through 6 (Friday), 2017.

This 2nd ICOMSET is organized by the Faculty of Mathematics and Natural Science, Universitas Negeri Padang. The main objective of this conference is to provide an international platform for researchers, Academicians as well as industrial professionals from all over the world to present Their research results in Mathematics, Science, Education, Technology, and other related fields. This conference also provides opportunities for the delegates to exchange new ideas and application experiences, to establish research relations and to find partners for future collaboration.

I would like to express my sincere appreciation to all the participants, financial sponsors, exhibitors, supporting organizations and all the committee members who has made ICOMSET 2017 successful. With these strong support, we are sure ICOMSET will be beneficial to all the participants, and you enjoy Padang.

We are looking forward to meeting you in the next ICOMSET.

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Pollen Morphology of *Caesalpinia pulcherrima* (L.) Swartz in Highland and Lowland West Sumatra

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Abstract. Determine the morphology structure of pollen on some variation colour of corolla *Caesalpinia pulcherrima* L. (Swartz) in highland and lowland West Sumatra has been conducted. The result reveals that topography and variation colour of corolla *C. pulcherrima* L. (Swartz) affects the shape of pollen. Pollen *of C. pulcherrima* L. (Swartz) has single grains or monad, isopolar polarity, radial symmetry, and size categories large. The length of polar axis (P) 58.16 to 74.11 µm, the length of the equatorial diameter (E) 59.86 to 75.97 µm, so that pollen can be classified into sub-spheroidal sub-oblate, spheriodal sub-spheroidal oblate, and sub-spheroidal prolate. Ornamentation of *C. pulcherrima* (L.) Swartz was reticulate. The pollen has aperture 3, the type pore and located in equatorial. From these data can be concluded that pollen from varying colour of corolla *C. pulcherrima* (L.) Swartz has same in terms of unit, polarity, symmetry, size, and type aperture, but it different in terms of shape.

1. Introduction

Caesalpinia pulcherrima (L.) Swartz is a species of sub-family Caesalpinoideae. The Caesalpinoideae consists of 150 genera, 2700 species and one of them is *C. pulcherrima* (L.) Swartz. Distribution of Caesalpinoideae includes tropical, subtropical and temperate regions [1]. *C. pulcherrima* (L) Swartz has variation of corolla. Coloured corolla of *C. pulcherrima* (L.) Swartz is red or yellow. Many *C. pulcherrima* (L) Swartz cultivated ornamental plants and sometimes as wild plants [2]. Based on observations of previous researchers found that corolla of *C. pulcherrima* (L.) Swartz has 3 colours (Figure 1). Colour corolla *C. pulcherrima* (L.) Swartz is orange, yellow, and pink [3].

Pollen morphology can be used as the taxon identification at the level of family, genera, species, and even varieties [4, 5]. The morphological differences of pollen found in Bauhinia L. and Phanera Lour. They are members of the subfamily of Caesalpinioideae. Due to the difference in the pollen structure, the two genera separated [6]. The outer pollen structure, including shape and size of the pollen can be used to distinguish genera and species levels of the Rhizophoraceae mangrove plant [7].

Differences in morphological structure of plants can be influenced by several factors such as genetic factors and environmental factors. Environmental factors that can affect changes in plant morphology include climate, temperature, soil type, soil conditions, altitude, and humidity. If environmental factors are stronger than genetic factors, then plants in different places with different environmental conditions will have varying morphology [8]. Examples of plant-morphological variations that are influenced by the environment are *sambiloto* (*Andrographis paniculata*). In this plant shows that there are variations of leaf size, stem height, number of branches, and also number of

leaves. this occurs because of differences in location grow (there are differences in height of the growing location or topography). Based on this, it can be predicted that pollen morphology can also be influenced by environmental factors such as topography [9]. The present study is based on variation pollen morphology *C. pulcherrima* (L.) Swartz in highland and lowland West Sumatra.

Figure 1. Colour Variation of Corolla of *C. pulcherrima* (L.) Swartz.

2. Materials and Methods

Pollen samples were obtained from highland (Bukittinggi City) and lowland (Padang City) West Sumatra. The pollen grains were prepared for light (LM) and Scanning Electron Microscope (SEM) by the standard acetolysis methods [10]. Observed the pollen unit, polarity, symmetry, size, shape, type of aperture, and surface shape of pollen. The size of the pollen was measured by polar axis and equatorial axis. The terminology used is in literature and book identification like *Pollen Terminology* (Hesse *et al*., 2009) [11] and *Pollen Morfology and Plants Taxonomy* (Erdmant, 1972) [12].

3. Results and Discussion

Observation of pollen morphology result study that pollen unit of *C. pulcherrima* (L.) Swartz were only monad (Figure 2). Others research found that pollen unit of *C. pulcherrima* (L.) Swartz also has unit pollen monad [3] [13] [14]. Pollen grains isopolar, radially symmetry, and size categories large (51–100µm) because diameters pollen is 58,16–74,11µm. Hesse et al. reveal that *C.pulcherrima* (L.) Swartz has pollen with isopolar polarity because they have exact same distal and proximal part [11].

Comparison of length axis polar (P) and diameter equatorial (E) in highland and lowland West Sumatra present in Table 1. Pollen of *C. pulcherrima* (L.) Swartz in the highland found have three shapes are *sub-spheroidal sub-oblate, sub-spheroidal oblate spheriodal,* and *sub-spheroidal prolate*. While in the lowland found have two shapes are *sub-spheroidal oblate spheriodal,* and *sub-spheroidal prolate*. The length axis polar (P) pollen in the highland ranges from 58,16–74,11µm and length diameter equatorial (E) ranges from 60,80–75,97µm. The length axis polar (P) pollen in the lowland ranges from 59,17–70,30µm and length diameter equatorial (E) ranges from 59,86–70,23µm.

Figure 2. Pollen of *C. pulcherrima* (L.) Swartz have Unit Monad.

Table 1. Comparison of Pollen Shapes on Variation *C. pulcherrima* (L.) Swartz

No.	Colour Corolla	Length Axis P and Diameter E (µm)		Index P/E.100 (µm)	Shapes	Aperture		
		P	E			Total	Type	Position
A. *Caesalpinia pulcherrima* (L.) Swartz in Highland West Sumatra (Bukittinggi City)								
1.	Orange	58,64–70,28	61,28–65,97	95,69 – 106,53	Sub-spheroidal Oblate Spheriodal – Sub-spheroidal Prolate	3	Pore	Equatorial
2.	Yellow	58,16–74,11	67,65–75,97	85,97 – 97,55	Sub-spheroidal Sub-oblate – Sub-spheroidal Oblate Spheriodal	3	Pore	Equatorial
3.	Pink	62,93–67,75	60,80–66,53	101,83 – 103,50	Sub-spheroidal Prolate	3	Pore	Equatorial
B. *Caesalpinia pulcherrima* (L.) Swartz in Lowland West Sumatra (Padang City)								
1.	Orange	59,17–67,08	61,58–69,57	96,09 – 96,42	Sub-spheroidal Oblate Spheriodal	3	Pore	Equatorial
2.	Yellow	63,46–70,30	64,65–70,23	98,16 – 100,10	Sub-spheroidal Oblate Spheriodal – Sub-spheroidal Prolate	3	Pore	Equatorial
3.	Pink	60,47–67,36	59,86–66,03	101,02 – 102,01	Sub-spheroidal Prolate	3	Pore	Equatorial

In general, the pollen form (shape) all variations of *C. pulcherrima* (L.) Swartz includes sub-spheriodal (P/E × 100 = 75 – < 133µm) with 5 variations of sub-oblate, spheriodal oblate, spheriodal prolate, and prolate. Previous research results also support this research. Previous research has revealed that Spheriodal Oblate and Spheriodal Prolate included in the Subspheriodal types[13][15][16]. The form of pollen *C. pulcherrima* (L.) Swartz looks polar is circular.

The surface shape or ornamentation of *C. pulcherrima* (L.) Swartz is reticulate (Figure 3). The pollen has 3 apertures with pores type and located in the equatorial section (Figure 4). Previous research has revealed that ornamentation of its plant is reticulate[3][15][16]. However, other research results reveal ornamentation of *C. pulcherrima* (L.) Swartz is psilate perforate [13]. This aperture has three intertice each with double pores (tricolporate). The pollen morphology *C. pulcherrima* (L.) Swartz for all variations can be seen in Table 2.

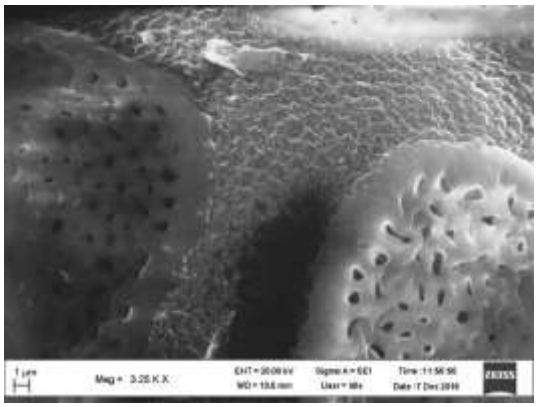

Figure 3. Ornamentation of Pollen *C. pulcherrima* (L.) Swartz was Reticulate with SEM.

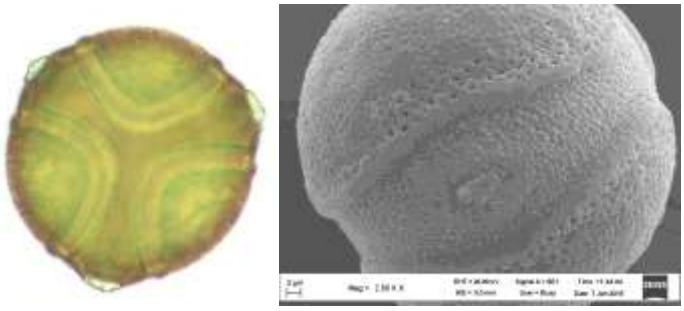

Figure 4. Aperture of pollen *C. pulcherrima* (L.) Swartz Observered on Polar and Equatorial with LM and SEM.

According to Table 1, it is knows that the pollen form (shape) of *C. pulcherrima* (L.) Swartz with the colour corolla variation of the pink flower from the highland and lowland is the same. While the colour corolla variation of orange and yellow flowers was different. The colour corolla variation of yellow flower from the highland is smaller than the lowlands, and the colour corolla variation of orange flower the highland is greater than the lowlands.

Table 2. Pollen Morphology of *C. pulcherrima* (L.) Swartz in Highland and Lowland West Sumatra (Analyze with SEM)

No.	Position	Coloured Corolla		
		Orange	Yellow	Pink
A.	***Caesalpinia pulcherrima* (L.) Swartz in Highland West Sumatra (Bukittinggi City)**			
1.	Equatorial			
2.	Polar			
B.	***Caesalpinia pulcherrima* (L.) Swartz in Lowland West Sumatra (Padang City)**			
1.	Equatorial			
2.	Polar			

4. Conclusion

In the result reveals that the topography and variation colour of corolla *C. pulcherrima* L. (Swartz) affects the shape of pollen. Pollen *of C. pulcherrima* L. (Swartz) has single grains or monad, isopolar polarity, radial symmetry, and size categories large. The length of polar axis (P) 58.16 to 74.11 μm, the length of the equatorial diameter (E) 59.86 to 75.97 μm, so that pollen can be classified into sub-spheroidal sub-oblate, spheriodal sub-spheroidal oblate, and sub-spheroidal prolate. Ornamentation of *C. pulcherrima* (L.) Swartz was reticulate. The pollen has 3 aperture, the type pore and located in equatorial. From these data can be concluded that pollen from variations colour of corolla *C. pulcherrima* (L.) Swartz has same in terms of unit, polarity, symmetry, size, and type aperture, but it different in terms of shape.

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