

Analysis Morphological Character and Relationship of Suweg (*Amorphophallus campanulatus*) Plant in Jombang District

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ABSTRACT

Suweg is one of the tuber-producing plants in Jombang. Suweg plants in Jombang have not been cultivated regularly, but actually, suweg tubers have great potential to be used as food diversification material in the future. The development of suweg plants, for example assembling varieties has not been done much. The first step in assembling varieties that must be done is germplasm exploration. This study aims to obtain information on the suweg plant in Jombang, to find out the differences in plant characteristics and the kinship relationship of the suweg plant in the same sub-district or in different sub-districts. The research was carried out in Jombang district, covering the Districts of Wonosalam, Kesamben, Ngusikan, Together, Kudu and Plandaan. The location selection is determined based on the results of the preliminary survey. The research was conducted from April to June 2020. The data analysis used a descriptive method, namely simplifying and organizing the data to obtain an overall picture of the object being observed. In addition to the use of descriptive analysis, kinship analysis was carried out using cluster data analysis. In the kinship analysis, the similarity matrix was calculated manually, while the dendrogram was made using NTSys software. The results obtained 9 plant samples from 6 locations. Two samples from Wonosalam location 1 and Wonosalam location 2, One sample from Kesamben location 1, One sample from Ngusikan location 1, Three samples from joint location 1, Together with location 2, Together with location 3, One sample from Kudu location 1 and one sample from Location plan 1. Kinship analysis showed various relationships with a similarity matrix value of 0.52 – 1.00, this indicates that the diversity of suweg plants in Jombang is very high.

Keywords: *Characterization; Suweg; Exploration; Kinship Analysis; Amorphophallus.*

INTRODUCTION

Indonesia has a variety of traditional food ingredients that have a high enough potential to be developed as functional food but have not been used optimally. Some foodstuffs that have not been utilized optimally, one of which is suweg tubers (Izzati and Widyaningsih, 2014). This plant can grow in the plains up to an altitude of 900 m above sea level. Suweg usually grows in secondary vegetation, groves, secondary forests, gardens, and dry fields. Suweg has an important value in terms of food and medicine. Suweg tubers can be used as an alternative food ingredient because they contain high levels of dietary fiber, carbohydrates and protein (Harijati et al. 2010).

Therefore, further information is needed regarding the character of these plants that can be used as a guide in plant breeding and cultivation research. In agriculture, germplasm is widely studied and collected in order to improve agricultural products and food supply because germplasm is a useful source of genes for plant improvement such as genes for resistance to diseases, insects, weeds and genes for resistance to abiotic environmental stresses (Amrullah, 2010).

The initial step needed in general breeding is to find out the kinship that exists between these varieties (Martasari et al., 2009). The kinship relationship between two individuals or populations can be measured based on the similarity of a number of characters (Purwantoro et al., 2005).

In kinship, taxa are classified based on the overall similarities or dissimilarities between two or more taxa (Saupe, 2005 in Prayekti, 2007). So it is possible that plants that are still in the same taxa will

have similar morphology and biochemical content. This proves that the closer the kinship between two individuals, the greater the degree of similarity between the two individuals.

Therefore, it is necessary to conduct a study that examines the diversity of morphological characteristics and the relationship between varieties in *Amorphophallus campanulatus*. through a morphological approach and analyzed the relationship phenetics.

METHOD

This research was carried out from May to July 2020. Exploration of suweg plants was carried out in 7 sub-districts where suweg plants were found, namely in Wonosalam, Ngusikan, Bareng, Kudu, Kesamben, Plandaan & Kabuh sub-districts. This research is descriptive . This study uses the phenetic method, namely direct sampling from observation locations in 7 sub-districts spread across Jombang Regency, with the provisions of 5 vegetation analysis observation plots with a size of 10x10 m from the land area. Observational variables were measured (leaves, stems, tubers) and abiotic variables (altitude, rainfall, humidity, light intensity, climate).

RESULT AND DISCUSSION (font size 12pt)

Research Result

- The value of the main component of the suweg character (*Amorphophallus campanulatus*) of the suweg plant in 7 sub-districts spread across Jombang district

The results of a survey conducted in 7 sub-districts with 9 research locations spread across Jombang district by observing the morphological character of the suweg plant, 13 morphological character assessments of the suweg plant were taken with the aim of making it easier for researchers to observe each genotype of the suweg plant character. From the survey conducted, the following data were obtained:

Table 1. Morphological Characters of Suweg Plants from Wonosalam, Kesamben and Ngusikan sub-Districts

Leaf Morphology	Wonosalam		Kesamben	Ngusikan
	Arjosari	Sumberjo	Kedungmlati	Cupak
Top Surface	Smooth	Smooth	Smooth	Smooth
Bottom Surface	Rough, Fingering	Rough, Fingering	Rough, Fingering	Rough, Fingering
Leaf Length	16 cm	18 cm	14 cm	25 cm
Leaf Shape	Small, Pointed Edge, Glossy Young	Small, Pointed Edge, Glossy Young	Small, Pointed Edge, Glossy Young	Small, Pointed Edge, Glossy Young
Leaf Width	6 cm	8 cm	7 cm	8 cm
Plant Stem				
Stem Height	103 cm	107 cm	80 cm	150 cm
Stem Color	Green/Black White Spots	White Spotted Green	White Spotted Green	White Spotted Green
Rod Diameter	24 cm	14 cm	14 cm	28 cm
Stem Circumference	75.5 cm	44 cm	44 cm	88 cm
Rod Surface	Smooth	Smooth	Smooth	Smooth
Bulbs				
Bulb Diameter	12 cm	13 cm	12 cm	17 cm
Bulb Weight	5 ons	8 ons	2 ons	2 kg
Bulb Color	Dark Chocolate, Rough Surface	Dark Chocolate, Rough Surface	Dark Chocolate, Rough Surface	Dark Chocolate, Rough Surface

Table 2. Morphological Characters of Suweg Plants from Wonosalam, Kesamben and Ngusikan sub Districts










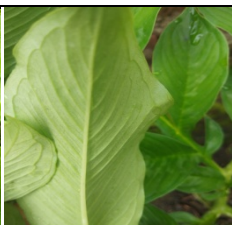


Leaf Morphology	Bareng		Kudu	Plandaan	Kabuh
	Ngampungan	Karangan	Kepuhrejo	Klitih	Pengampon
Top Surface	Smooth	Smooth	Smooth	Smooth	Smooth
Bottom Surface	Rough, Fingering	Rough, Fingering	Rough, Fingering	Rough, Fingering	Rough, Fingering
Leaf Length	13 cm	14 cm	15 cm	13 cm	16 cm
Leaf Shape	Small, Pointed Edge, Glossy Young	Small, Pointed Edge, Glossy Young	Small, Pointed Edge, Glossy Young	Small, Pointed Edge, Glossy Young	Small, Pointed Edge, Glossy Young
Leaf Width	10 cm	8 cm	7 cm	8 cm	6 cm
Plant Stem					
Stem Height	102 cm	80 cm	103 cm	102 cm	103 cm
Stem Color	Green/Black White Spots	White Spotted Green	White Spotted Green	White Spotted Green	White Spotted Green
Rod Diameter	18 cm	14 cm	14 cm	14 cm	14 cm
Stem Circumference	56.6 cm	44 cm	44 cm	44 cm	75.5 cm
Rod Surface	Smooth	Smooth	Smooth	Rough	Rough
Bulbs					
Bulb Diameter	12 cm	12 cm	16 cm	12 cm	12 cm
Bulb Weight	5 ons	2 ons	5 ons	5 ons	6 ons
Bulb Color	Dark Chocolate, Rough Surface	Dark Chocolate, Rough Surface	Dark Chocolate, Rough Surface	Dark Chocolate, Rough Surface	Dark Chocolate, Rough Surface



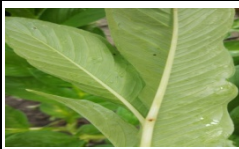
Discussion

- Analysis of Relationships of Suweg (*Amorphophallus campanulatus*) Plants in Jombang Regency by Phenetic Method

According to Arrijani (2003) is a pattern of relationships or similarities between groups of plants based on certain traits or characteristics of each of these plant groups.

Table 3. Suweg Plant Stature Data

Research Sites	Plant Stature			
	Leaf Top Surface	Leaf Lower Surface	Stem	Bulbs
Location 1	Wonosalam			
Arjosari				
Sumberjo				
Location 2	Bareng			
Ngampungan				

Karangan				
Location 3	Kesamben			
Kedungmlati				
Location 4	Ngusikan			
Cupak				
Location 5	Kudu			
Kepuhrejo				
Location 6	Kabuh			
Pengampon				
Location 7	Plandaan			
Klitih				

Source: Personal Documentation 2020

Grouping analysis to determine the similarity relationship between suweg (*Amorphopallus campanulatus*) and outgroup plants was carried out based on 13 morphological characters using the NTSYS program. The thirteen morphological characters used as the basis for grouping consisted of 5 stem characters, 5 leaf characters, and 3 tuber characters. Descriptive data is assessed numerically by giving a score that describes the difference while quantitative data is obtained from direct measurements. The grouping is done using classify hierarchical cluster analysis and PCA (Principal Component Analysis) analysis as a complement. The analysis of classify hierarchical clusters is carried out based on the measurement of similarity between operational taxonomic units (OTU) with the agglomerative method based on average linkage (Table 5.2) using simple matching coefficients for binary data. The results of calculating the similarity index of the simple matching coefficient (Table 5.1) were obtained from data that had been scored and processed with the NTSYS program.

Table 4. The Results of Calculating The Similarity Index with The Coefficient of Simple Matching

Case	Koefisien Simple Matching								
	R1 (WS1)	R2 (WS2)	R3 (KS1)	R4 (NG1)	R5 (BR1)	R6 (BR2)	R7 (KD1)	R8 (PL1)	R9 (KB1)
R1 (WS1)	1.0000000								
R2 (WS2)	7.6923076	1.0000000							
R3 (KS1)	7.6923076	8.4615384	1.0000000						
R4 (NG1)	6.1538461	5.3846153	3.8461538	1.0000000					
R5 (BR1)	6.9230769	9.2307692	9.2307692	4.6153846	1.0000000				
R6 (BR2)	6.9230769	9.2307692	9.2307692	4.6153846	1.0000000	1.0000000			
R7 (KD1)	6.9230769	7.6923076	7.6923076	6.1538461	6.9230769	6.9230769	1.0000000		
R8 (PL1)	6.1538461	8.4615384	8.4615384	5.3846153	9.2307692	9.2307692	7.6923076	1.0000000	
R9 (KB1)	1.0000000	7.6923076	7.6923076	6.1538461	6.9230769	6.9230769	6.9230769	6.1538461	1.0000000

Information :

Table of similarity index/similarity index of several samples of suweg plants spread over 7 sub-districts in Jombang district based on calculations using the NTSYS application.

Table 5. Grouping of Morphological Characteristics Based on Average Linkage

Tahap	Kombinasi Kelompok		Koefisien Kesamaan
	Kelompok 1	Kelompok 2	
1	R1,R5	R9,R6	1.000
2	R2,R3,R5,R6	R5,R6,R8	.923
3	R2,R3	R3,R8	.846
4	R1,R2,R3	R2,R3,R7,R9	.769
5	R1,R5,R6	R5,R6,R7	.692
6	R1,R4,R8	R8,R9	.615
7	R2,R4	R4,R8	.538
8	R4	R5,R6	.461
9	R3	R4,R7	.384

Information:

- ✓ The numbers listed in the column for group 1 and group 2 indicate the code of the OTU being compared.
- ✓ The number listed in the similarity coefficient column shows the magnitude of the phenetic similarity of the two OTU groups being compared and causes the 2 OTUs being compared to clump together.
- Suweg Plant Dendrogram

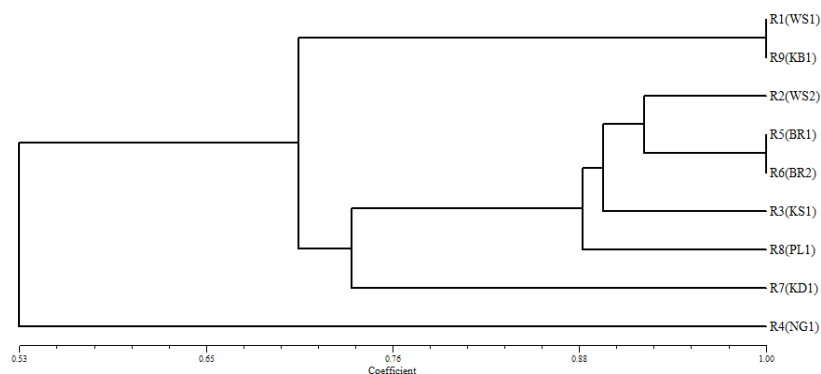


Figure 1. Dendrogram of Phenetic Relationship Between 2 Varieties of Suweg (*Amorphophallus campanulatus*) and The Outgroup Studied by Analysis of Morphological Characteristics.

Information :

The dendrogram of suweg plants in 7 sub-districts spread across Jombang district based on observations of morphological characters.

There were 9 plant samples that were found from 9 locations. The low sample size was caused by research conducted in the dry season, so that many suweg plants were dormant. Sample plants that have been found are based on the color of the petiole. Variant 1 is suweg which has a light green leaf stalk color - green. In Wonosalam District, two plant samples were found from two locations, the first location was in Arjosari Village, the second location was Sumberjo Village. In Bareng Regency, plant samples were obtained from two locations, both locations were in Ngampungan Village & Karanganyar Village. In Ngusikan District, one sample was also obtained from one location, namely in the village of Cupak. The Kudu sub-district also only found one sample in one location, namely in Kepuhrejo Village. In the Plandaan sub-district, they only found one sample from one location, namely in Klitih village. Then in the Kabuh sub-district also only found one sample, namely in the village of pengampon. Based on the results of the characterization, it is known that the samples of Wonosalam Plants Location 1 and Kudu Location 1 are Suweg variant 2, while the other samples include Suweg variant 1, Suweg samples were found at an altitude of 300 – 1200 mdpl with a temperature of 26 – 31°C. Pitojo (2007) stated that the most striking difference from variants one and variants of Suweg plants was found in the color of the petiole, in the variant two the leaf stalks were very dark. Meanwhile Hettterscheid, W and Ittenbach, S (1996) stated that the most striking difference between variant one and variant two was the roughness of the petiole, the surface of the petiole in variant two was rougher than variant one.

From the results of the kinship analysis, it was found that the value of the similarity matrix of the samples obtained was 0.88 – 1.00, this indicates that the diversity of suweg plants in East Java is very high. Fatimah (2013) states that the more similarities the character has, the greater the similarity value so that the closer the kinship relationship. The highest similarity matrix values were found in samples R1 (Wonosalam location 1), R5 (with location 1), R6 (with location 2) and R9 (Return location 1) while the lowest value was between samples R4 (Ngusikan location 1), based on the results of the dendrogram on Figure 5.3, the sample plants obtained were divided into 3 groups (clusters). The first group consisted of samples R1 (Wonosalam Location 1) & R9 (Kabuh Location 1) then group 2 R5 (With Location 1), R6 (With Location 2), R2 (Wonosalam Location 2), R3 (Kesamben Location 1), R8 (Planaan Location 1). Meanwhile, group 3 consisted of R4 sample (Ngampungan Location 1). Ghasemi., et al (2014) stated that samples from the same group described kinship relationships between samples, samples from the same group had close kinship relationships.

Julisaniah et al (2008) stated that the further the kinship between the samples, the smaller the success of the cross, but the possibility of obtaining a superior genotype is greater if the cross is successful. The genetic diversity of the suweg plant in Jombang has high diversity because the distance between the coefficient matrix values is very large.

- Diversity of Leaf Morphology of Suweg Plant (*Amorphophallus campanulatus*)

Leaves are the most important part of the plant, generally owned by plants in large numbers. Leaves are only found on the stem, not found in other parts. The green color is due to the chlorophyll content. The function of the leaves is as a factory or producer of carbohydrates that function as food (Tjitrosoepomo, 1993)

Tables 1 and 2 show that the results of observations of leaf morphological characters in Wonosalam, Kesamben, Ngusikan, Bareng, Kudu, Plandaan and Kabuh sub-districts consisted of the upper surface, lower surface, leaf length, leaf shape and leaf width. On the upper surface parameters with fine leaf characters in each research location. On the lower surface parameters the leaves tend to be rough and finger on the leaf bones. In the leaf shape parameter with a pointed leaf base character, the color of the young leaves is shiny.

In the parameter of leaf length with small leaf characters (13-15cm) found in the districts of Bareng, Kesamben, Plandaan and kudu, while the longer leaves (16-25cm) were found in Wonosalam, Ngusikan, and Kabuh districts. In the parameter of leaf width with smaller leaf width (6-7cm) it was found in the sub-districts of Kabuh, Kudu, Kesamben, and Wonosalam location 1 while the wider leaf character (8-10cm) was found in the sub-districts of Plandaan, Bareng, Ngusikan and Wonosalam location 2.

- Stem Morphological Diversity of Suweg Plant (*Amorphophallus campanulatus*)

Stem is a part of the plant body that produces leaves, reproductive structures and is generally erect in the air (Heddy, 1987). The characteristics of the rods are generally long, round, cylindrical, segmented, usually going upwards (Tjitrosoepomo, 1993).

Tables 1 and 2 show that the results of observations of stem morphological characters conducted in Wonosalam, Kesamben, Ngusikan, Bareng, Kudu, Plandaan and Kabuh sub-districts consisted of stem height, stem color, stem diameter around the stem and stem surface. In the stem color parameter, the stems are green with white spots found in all research locations. On the stem surface parameters with smooth stem characters found in each plant.

The stem height parameter with an average height (80-103cm) was found in the Bareng, Kesamben, Plandaan, Kudu, Kabuh, Wonosalam sub-districts at location 1 while the stem height (107-150cm) was found in the Wonosalam sub-districts in location 2 and Ngusikan. In the parameters of stem diameter with a diameter of (14cm) found in the sub-districts of Kabuh, Plandaan, Kudu, Bareng location 2, Kesamben, Wonosalam location 2 while stems with a diameter of (18-28cm) were found in Bareng sub-district location 1, Wonosalam location 1 and Ngusikan. In the parameters of the circumference of the trunk with a circumference (44-56.6cm) found in Wonosalam sub-districts location 2, Kesamben, Bareng, Kudu, Plandaan while the circumference of the trunk with a diameter (75.5-88cm) was found in Wonosalam sub-districts location 1, Ngusikan, and Kabuh.

- Morphological Diversity of Suweg Plant Bulbs (*Amorphophallus campanulatus*)

Tubers are vegetable materials that can be obtained from the soil. Bulbs can be said to be an organ of a plant which is a modification of other organs and functions as a store of certain substances as carbohydrates that function as energy reserves. Tubers are important as carbohydrates, especially as a source of starch. In addition, the tubers can be dried and made into flour. One of the other chemical constituents in tubers is carotenoids which also affect their physical properties with the natural color of the tubers (Tarwotjo, 1998).

Tables 1 and 2 show that the results of observations of the morphological characters of tubers in Wonosalam, Kesamben, Ngusikan, Bareng, Kudu, Plandaan and Kabuh sub-districts consisted of tuber diameter, tuber weight and tuber color. In the parameter of tuber color, the character of the tubers is dark brown with a relatively rough surface of the tubers, found in all sub-districts of the research location. On the parameters of the tuber diameter with a diameter of (12-13cm) found in the sub-districts of Wonosalam, Kesamben, Bareng, Plandaan and Kabuh while the diameter (16-17cm) was found in the districts of Kudu and Ngusikan. On the parameters of tuber weight with tuber weight (2-5 ounces) found in Wonosalam sub-districts location 1, Kesamben, Bareng, kudu and Plandaan while the average tuber weight (6 ounces-2kg) was in Kabuh, Ngusikan and Wonosalam sub-districts location 2.

- Abiotic Components

According to Sulistyorini (2009), the abiotic component is everything that is inanimate, such as soil, air, water, climate, humidity, light and sound.

Table 6. Abiotic Components of Suweg Plant (*Amorphophallus campanulatus*)

Districts	Height	Humidity	Rainfall	Climate	Light
Wonosalam	100-1000	67-84 %	1500-2000 mm/year	Tropical	144-297 per month
Bareng	50-100			Tropical	
Kesamben	0-25			Tropical	
Kudu	25-50			Tropical	
Ngusikan	25-500			Tropical	
Plandaan	50-500			Tropical	
Kabuh	25-500			Tropical	

Source: BPN Jombang Regency

Table 6 shows that the state of the research location in each region is different, including the altitude in the Jombang area on average ranging from 0-500 masl. At monthly humidity, it ranges from 67-84% per month. As well as rainfall, the annual rainfall ranges from 1500-2000 per year, with light in each region 144-297 per month, and has a tropical climate.

CONCLUSION

Suweg plants as a result of exploration obtained 9 plant samples. The kinship relationship between suweg plant samples shows that there are samples that have close and distant relationships, both in the same sub-district and in different sub-districts. Based on the value of the coefficient matrix which is at a value of 0.88 - 1.00, the genetic diversity value of the suweg plant in Jombang has a high diversity because the distance between the coefficient matrix values is very large.

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