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## Morphological Characteristics and Kinship Relationship of Mushroom *Schizophyllum commune* Fr.

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### Abstracts

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*Schizophyllum commune* is a mushroom from the division of Basidiomycota which abundance at rainy season on wood that have been moldered for its habitat. *S. commune* has been distributed widely at various types of wood habitat (jack fruit, bamboo, rubber, mango etc). Existence of this mushroom has not been known as well as any mushroom are able to be consumed/edible yet. In Java, the societies who have known it as consumption mushroom called it with local name *jamur gigit*. *Jamur gigit* is potential to become food material and based on organoleptic test indicates that *jamur gigit* is more delicious from oyster mushroom. The purpose of research is to investigate the morphology character of *S. commune* at various growth phases and to study the *S. commune* relationship in Java. The result of this research is expected can give information about morphology character of *S. commune* in each its growth phase and to understand *S. commune* relationship in Java. Sample for research has been collected in 3 areas in Java. The macroscopic morphology character and microscopic character of *S. commune* were observed. The character that had been obtained is used to compile description and be analyzed by cluster using SPSS 13.0 to study the kinship relationship. The result of research indicates that morphology character of *S. commune* in Java of fruit body when old and young phase was different, while the microscopic character almost same to the obtained sample. The result of analysis cluster indicated that at similar level of 38,1 % there were two clusters, first cluster was Sidoarjo a *S. commune* and *S. commune* Yogyakarta. The second cluster has member the Sidoarjo b *S. commune*, Malang *S. commune*, Tangerang *S. commune*, Semarang *S. commune* and Kuningan *S. commune*. © 2015 JNSMR UIN Walisongo. All rights reserved

**Key words:** Morphology; Basidiomycota; *Schizophyllum Commune*; Relationship.

## 1. Introduction

*Schizophyllum commune* Fr. is a macroscopic mushroom from the division of Basidiomycota which abundance at rainy season. This mushroom is lived with *saprobik* on died wood such as mango, jack fruit, bamboo, rubber, etc [1]. Cook in James et.al.[2] said that this species is found as decompose for more over 150 of flower plant species.

Kuo[3] said that *S.commune* have wide distribution area, it is almost in all the continent except in Antarctica because in this continent have not wood substrate. *S. Commune* has local name as *jamur gigit (java)* and *Tirau* (Sumatra). *Jamur gigit* has not been known by society as mushroom that can be consumed whereas the existence is abundant in rainy season. According to research that conducted by Prasetyaningtyas *et. al* [4] *Jamur gigit* is potentially as consumed substance because it contained of carbohydrate, protein, fat, and saltpetre and also cyanide acid that toxic characterized. Based on organoleptic test to the *jamur gigit* is more delicious than oyster mushroom. Beside as *edible mushroom*, *S. commune* is producer of schizophyllan. Schizophyllan is *polisacarida ekstraseluler* (metabolite primer) that produced by *S. commune* in liquid medium with high concentrate of carbohydrate. Schizophyllan with intensive can be used for cervix cancer medical treatment [5].

Research about *S. commune* in Indonesia is still limited. The research that conducted is to the point on their ability in decayed the wood. *S. commune* is a wood decayed mushroom that their ability is decayed the *rasamala* wood amounted 15,32% [6]. research about morphology characteristic, morphology variation, and kinship relationship of *S. commune* in Indonesia especially in Java is have not been done so that there is need a research about it.

The research purpose is to know about the morphology characteristic of *S. commune* in Java at various growth phases and to understand the kinship relationship of *S. commune* in Java. The result of this research is

expected can give information about morphology characteristic of *S. commune* in each its growth phases and to understand the kinship relationship of *S. commune* in Java.

## 2. Research Method

Sample of *S. commune* mushroom is taken from three area in Java, and gain seven samples: SCT (*S. commune* Tangerang), SCSMG (*S. commune* Semarang), SCSa (*S. commune* Sidoarjo<sup>a</sup>), SCSb (*S. commune* Sidoarjo<sup>b</sup>), SCYG (*S. commune* Yogyakarta), SCM (*S. commune* Malang), SCK (*S. commune* Kuningan). Then, sample of *S. commune* mushroom is made *spore print* by the way of the fruit body is face downward in black *manila* paper (*lamela* part is down), in down part is given a water to become moist and let it be in three days. And then it is isolated the until growth as *hifa* primer in PDA medium (Photato Dextrose Agar). The morphology observation of mushroom blood smear that done in pin head phase, young phase, and mature phase, consist of macroscopic and microscopic morphology characteristic. Macroscopic morphology consist: *tudung/pileus*, *lamella*, *stipe*, growth type, and sticky type of fruit body. Microscopic morphology consist of spore, *hifa primer*, *hifa sekunder*, *hifa tersier*, *Basidium* and *cystidia*.

Determination of kinship relationship is done with cluster analysis with helped by SPSS 13.0 system. The scoring morphology character is used to data collection. Scoring is done with *multistage character* (0,1,2,3,...), after that is doing quantification of index similaritas (IS) with coefficient of *simple matching* that produced closeness matrix. To grouping used *agglomerative* method (grouping approach) and cluster method of *average linkage* (grouping based average). The result of grouping is *dendogram*.

## 3. Result and Discussion

### *Morphology Characteristic*

The result of morphology characteristic towards seven sample is presented in Table 1 and different of *tudung* shape is presented in

picture 1. Mushroom of *S. commune* in Java have three various fruit body shape that defined by *tudung* shape, that is: *flabelliform*, *orbicular* and *semi-circular*. Fruit body of SCT and SCK is form of *flabelliform* in young phase and form of *semi-circular* in old phase. Fruit body of SCSa and SCYG is form of *orbicular*. The fruit body of SCSMG, SCSb, SCM is form of *flabelliform*. The different shape of fruit body is caused by the contradiction of *strain S. commune* that influence by genetic factor. The shape alteration of fruit body from young phase to the old phase is caused by the certain *strain* for West Java area that different from other area, its because *S. commune* have 28.000 sex system so that it might be formed new *strain* in certain area [7].

The difference of *tudung* shape is influence the shape side of *tudung*, if its seen in across. The side form of *flabelliform* in across is form of *decurved*, while the *orbicular* and *semi-circular* shape in cross is form of *plane*. If it is seen from the surface of *tudung* shape side, there is no different between *flabelliform*, *orbicular* and *semi-circular* it is form of *crenate*.

The top surface of *tudung* in pin head phase is entirely white color while in young and old phase is variation in young light yellow until old light yellow. It is appropriate with Kuo [3] that said the color of *tudung* have variation from white until light yellow, Larhent [8] also said that there is take place the changing of *tudung* color in different age. The under surface color of *tudung* in pin head phase have variation from white until light yellow while in young and old phase have variation from light yellow until dark light yellow. It is related to formed of spore in young and old phase so that the color is change to become more old [8].

The size of *tudung* in pin head phase have variation from 1 mm-5mm, young phase have variation from 4,5mm-10mm, old phase have variation from 7mm-70mm. The *lamella* character is almost same for all sample, except in distance and color of *lamella*. The distance of *lamella* is different in *pileus* size, more small of *tudung* size is more tight of *lamella* distance while the different color of *lamella* is related to

the form of *basidiospora* by *basidium*. The different stalk character in the size and color of the stalk. The color of the stalk is same as the top surface *tudung* while the size of the stalk is variation. In the form of *orbicular* and *semi-circular*, the size of stalk is small that *flabelliform* shape.

In general, they have similar microscopic character, the different is in the sopro size, *hifa* size, *hifa* partition, *hifa* branch and the existence of *clamp connection* in primer and seconder *hifa*. The spore size have variation from 3,5  $\mu\text{m}$  - 4,2  $\mu\text{m}$  x 1,4  $\mu\text{m}$ -2,2  $\mu\text{m}$ . It is according to the Kuo (2003) said that spore of *S. commune* have a measurement of 3-4  $\mu\text{m}$  x 1-1,5  $\mu\text{m}$ . *Hifa* partition of *S. commune* is very thin so that it can be seen only in primer and seconder *hifa*, while in tertiary *hifa* can not be seen the partition because the tertiary *hifa* is very complex arranged by generative *hifa*, skeletal *hifa* and ligative *hifa* (*band net*) [8].

#### The fenetic kinship relationship of *S. commune* mushroom

Morphology character that scoring used to grouping is 18 (Table 1). Scoring is done with *multistage character* (0,1,2,3,...), after that conducting after that is doing quantification of index similaritas (IS) with coefficient of *simple matching* that produced closeness matrix (Table 2). In grouping used *agglomerative* method (grouping approach) and cluster method of *average linkage* (grouping based average) (Table 3). The result of grouping is *dendogram* (Fig. 2). All the data analysis process is conducted used SPPP 13.0 system.

Based on dendogram above with similarity value 38,1%, there is can be made two group of *S. commune* mushroom in Java based on macroscopic and microscopic morphology character. The member of first group is *S. commune* Sidoarjo<sup>b</sup> (SCSb), *S. commune* Malang (SCM), *S. commune* Semarang (SCSMG), *S. commune* Kuningan (SCK) and *S. commune* Tangerang (SCT). the member of second group is *S. commune* Sidoarjo a (SCSa) and *S. commune* Yogyakarta (SCYG).

**Table 1.** Variety of morphology character of . commune

No	Character	Sample						
		SCT	SC SMG	SCS <sup>a</sup>	SCS <sup>b</sup>	SC YG	SCM	SCK
1.	<i>Pileus shape (side appear)</i>							
	Pinhead phase	pin head	pin head	pin head	pin head	pin head	pin head	pin head
	Young phase	uplifted	uplifted	plane	uplifted	plane	uplifted	uplifted
	Old phase	plane	uplifted	plane	uplifted	plane	uplifted	plane
2.	<i>Pileus shape (top appear)</i>							
	Pinhead phase	pin head	pin head	pin head	pin head	pin head	pin head	pin head
	Young phase	flabeliform	flabeliform	orbicular	flabeliform	Orbicular	flabeliform	flabeliform
	Old phase	Semi-circular	flabeliform	Orbicular	flabeliform	orbicular	flabeliform	Semi-circular
3.	<i>Pileus side (cross section)</i>							
	Pinhead phase	pin head	pin head	pin head	pin head	pin head	pin head	pin head
	Young phase	decurved	decurved	plane	decurved	plane	decurved	decurved
	Old phase	plane	decurved	plane	decurved	plane	decurved	plane
4.	<i>Pileus color (top surface)</i>							
	Pinhead phase	white Pale Light	white	white	white	white	white	white
	Young phase	yellow pale Light	Light yellow	Light yellow	Light yellow	white	Light yellow	Light yellow
	Old phase	yellow	Light yellow	Light yellow	Light yellow	Light yellow	Light yellow	Light yellow
5	<i>Pileus color (under surface)</i>							
	Pinhead phase	Light yellow	Light yellow	white	Light yellow	white	krem	white Dark Light
	Young phase	Light yellow	Light yellow Dark Light	Light yellow	Light yellow Dark Light	Light yellow	Light yellow	Light yellow Dark Light
	Old phase	Light yellow	yellow	Light yellow	yellow	Light yellow	Light yellow	Light yellow
6	<i>Pileus color when it splash water</i>							
	Pinhead phase	white	Brown	Brown	Brown	white	Brown	Brown
	Young phase	white	Brown	Brown	Brown	white	Brown	Brown
	Old phase	white	Brown	Brown	Brown	white	Brown	Brown
7	<i>Pileus size</i>							
	Pinhead phase	2 mm	5 mm	1 mm	2 mm	3 mm	2 mm	1,5-2 mm
	Young phase	10 mm	10 mm	7 mm	4,5 mm	8 mm	7 mm	5 mm
	Old phase	37 mm	24 mm	15 mm	20 mm	13 mm	30-70 mm	7 mm
8	<i>Lamella distance</i>							
	Pinhead phase	-	-	-	-	-	-	-
	Young phase	0,5 mm	0,3 mm	0,2 mm	0,05 mm	0,25 mm	0,25 mm	0,1-0,25 mm
	Old phase	1 mm	0,5-1 mm	0,25 mm	0,1 mm	0,5 mm	0,1-0,2 mm	0,25-0,5 mm
9	<i>Lamella color</i>							
	Pinhead phase	Light yellow	Light yellow	white	Light yellow	white	Light yellow	white Dark Light
	Young phase	Light yellow	Light yellow Dark Light	Light yellow	Light yellow Dark Light	white	Light yellow	Light yellow Dark Light
	Old phase	Light yellow	yellow	Light yellow	yellow	Light yellow	Light yellow	Light yellow
10	<i>Glutinos of stipe with pileus</i>							
	Pinhead phase	lateral	lateral	central	lateral	central	lateral	lateral
	Young phase	lateral	lateral	central	lateral	central	lateral	lateral
	Old phase	lateral	lateral	central	lateral	central	lateral	lateral
11	<i>Stipe color</i>							
	Pinhead phase	white pale Light	white Light	white Light	white Light	white	white	white
	Young phase	yellow pale Light	yellow Light	yellow Light	yellow Light	white Light	Light yellow	Light yellow
	Old phase	yellow	yellow	yellow	yellow	yellow	Light yellow	Light yellow
12	<i>Stipe size</i>							
	Pinhead phase	1 mm	2 mm	0,25 mm	0,5 mm	0,05 mm	0,5 mm	1,5 mm
	Young phase	2mm	2,5 mm	0,2 mm	1,5 mm	0,1 mm	0,5-1 mm	3 mm
	Old phase	5 mm	6 mm	0,1 mm	3 mm	0,1 mm	3 mm	2 mm

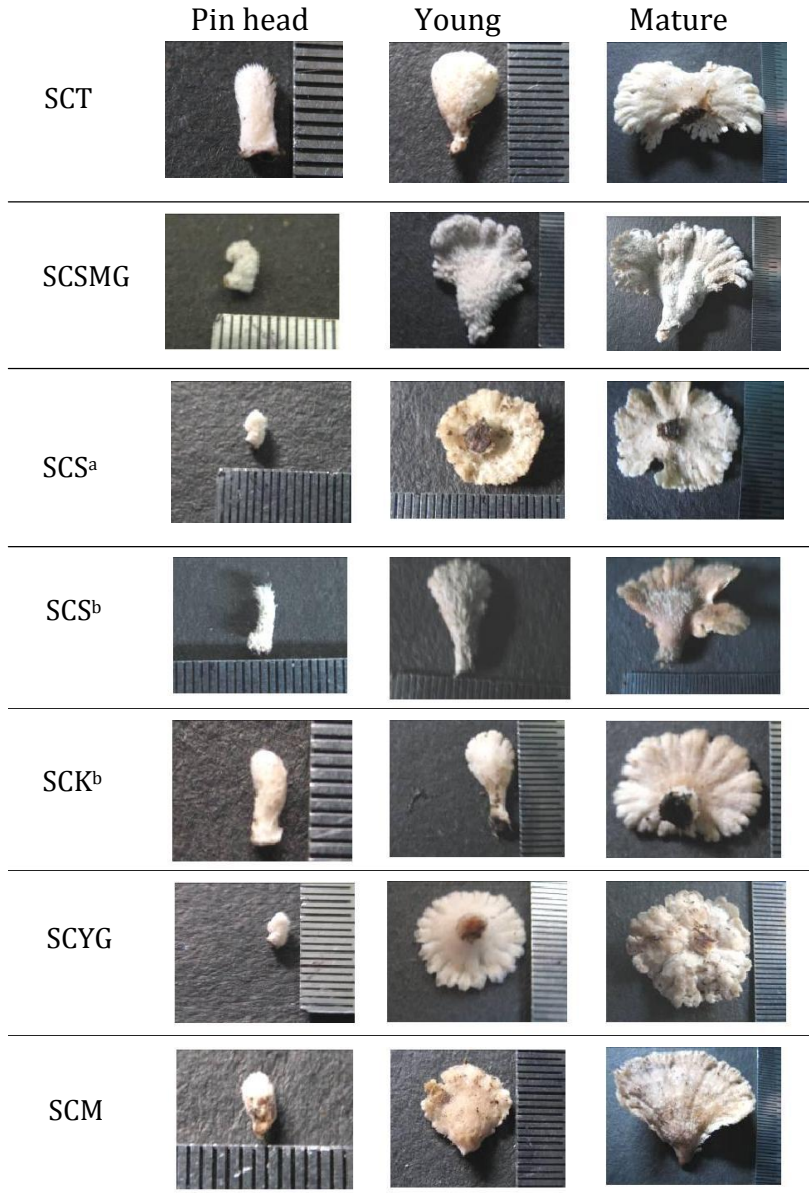
11	<i>Stipe color</i>							
	Pinhead phase	white	white	white	white	white	white	white
	Young phase	Young Light yellow	Light yellow	Light yellow	Light yellow	white Light yellow	Light yellow	Light yellow
	Old phase	Young Light yellow	Light yellow	Light yellow	Light yellow	white Light yellow	Light yellow	Light yellow
12	<i>Stipe size</i>							
	Pinhead phase	1 mm	2 mm	0,25 mm	0,5 mm	0,05 mm	0,5 mm	1,5 mm
	Young phase	2mm	2,5 mm	0,2 mm	1,5 mm	0,1 mm	0,5-1 mm	3 mm
	Old phase	5 mm	6 mm	0,1 mm	3 mm	0,1 mm	3 mm	2 mm
13	<i>Growth type</i>							
	Pinhead phase	scattered	scattered	solitary	solitary	solitary	scattered	solitary
	Young phase	scattered	scattered	solitary	solitary	solitary	scattered	solitary
	Old phase	scattered	scattered	solitary	solitary	solitary	scattered	solitary
14	<i>Spora size (p, diamtr)</i>	3,56 µ; 1,4 µ	3,5 µ; 1,6 µ	3,6 µ; 1,9 µ	4 µ; 2 µ	3,6 µ; 1,5 µ	4,1 µ; 1,7 µ	4,2 µ; 2 µ
15	<i>Hifa partition sekunder</i>	have	have	Have not	Have not	have	Have not	have
16	<i>Hifa branch</i>							
	Primer	have	have	Have not	Have not	have	have	have
	Sekunder	Have not	Have not	Have not	Have not	have	Have not	have
17	<i>Clamp conection</i>							
	primer	have	have	Have not	Have not	have	have	have
	sekunder	Have not	have	Have not	Have not	have	Have not	have
18	<i>Hifa size</i>	1,4 µ	3,3 µ	1,7 µ	3,2 µ	8,1µ	3,4 µ	2,9 µ

**Table 2.** Index of similarity with simple matching coefficient

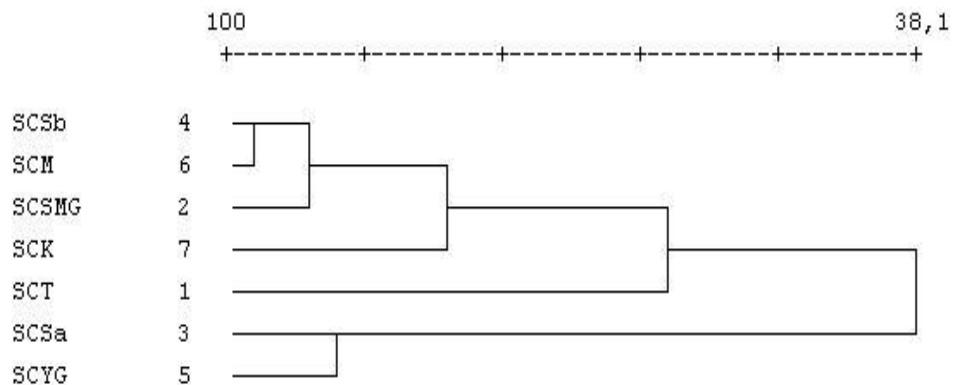
	Simple matching coefficient						
	SCT	SCSMG	SCSa	SCSb	SCYG	SCM	SCK
SCT	1.000						
SCSMG	.622	1.000					
SCSa	.324	.324	1.000				
SCSb	.459	.730	.541	1.000			
SCYG	.351	.351	.703	.297	1.000		
SCM	.595	.703	.459	.757	.270	1.000	
SCK	.405	.676	.486	.730	.405	.541	1.000

**Table 3.** Agglomerative based on average linkage

degree	Cluster combination		coefficient
	Cluster1	Cluster 2	
1	4	6	.757
2	2	4	.716
3	3	5	.703
4	2	7	.649
5	1	2	.520
6	1	3	.381



**Figure 1.** Morphology of tudung shape of *S. commune* sample



**Figure 2.** Dendrogram of 7 OTU of *S. commune* in Java based on morphology character of macroscopic and microscopic.

The formed of those two group is because of the contradiction of *tudung* shape. The first group have *tudung* shape of *flabelliform* and the second group have *tudung* shape of *orbicular*. The calculation with *agglomerative* method can be known the closeness between *S. commune* mushroom in Java, that is: *S. commune* Sidoarjo b and *S. Commune* Malang amounted 0,757; *S. commune* Semarang with *S. commune* Sidoarjo b amounted 0,716; *S. commune* Sidoarjo a with *S. commune* Yogyakarta amounted 0,703; *S. commune* Semarang with *S. commune* Kuningan amounted 0,649; *S. commune* Tangerang with *S. commune* Semarang amounted 0,520; *S. commune* Tangerang with *S. commune* Sidoarjo a amounted 0,381. The near closeness relationship (IS value 0,757) between *S. commune* Sidoarjo b and *S. commune* Semarang is caused of the similarity of *flabelliform tudung* shape and the size of *tudung* in mature phase that is 20 mm-24 mm. The formed of similarity value 0,703 between *S. commune* Sidoarjo a and *S. commune* Yogyakarta is caused of the similarity of *orbicular tudung* shape.

#### 4. Conclusion

The morphology character of *S. commune* in Java in growth phase is different on *tudung* shape between pinhead phase and young or mature phase and the closeness kinship relationship based morphology character is *S. commune* Sidoarjo b and *S. commune* Malang with similarity value 75,7% and the distant kinship relationship is *S. commune* Tangerang and *S. commune* Sidoarjo a with similarity value 38,1 %.

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