Morphology Characterizaton of *Trichoderma* Isolate from Three Regencies in Maluku

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Abstract

Maluku consists of many islands in nine districts. The purpose of this study was to characterize the morphology of *Trichoderma* isolates from Maluku. The study was conducted in the Seed Science and Technology laboratory of the Agriculture Faculty of Pattimura University from March to July 2018 using six isolates of *Trichoderma* results of isolation of explored samples from banana, coconut, cocoa, corn rhizosphere in three districts in Maluku. Macroscopic characterization was observed in colony color and diameter variables, and microscopic characteristics included conidiosfor and fialid lengths and conidial diameters. The results showed that the color and diameter of the colony and the length of conidiosfor and fialid and conidia diameter of the six isolates from Rumakai and Nurue villages in West Seram regency, Ambon, Central Maluku district and Kisar island, West Seram district, respectively green and white, 70.70 mm, 35.37 mm, 9.51 µm, 4.80 µm; dark green, light green and white, 76.47 mm, 9.82 µm, 2.42 µm, 2.78 µm; light green and white, 71.22 mm, 29.32 µm, 2.69 µm, 7.46 µm; dark green and white, 69.68 mm, 21.61µm, 1.91 µm, 3.15 µm; light green and white, 71.89 mm, 30.02 µm, 2.44 µm, 10.32 µm; light green and white, 70.74 mm, 63.31µm, 4.11 µm, 6.52 µm. The conclusion of the study is that the macroscopic characteristics are relatively the same, but microscopically are different.

Keywords: Maluku, *Trichoderma* characterization, morphology

Introduction

Maluku consists of 600 islands scattered on the islands of Seram, Buru, Ambon, Banda, Wetar, Babar, Tanimbar, Kei, Aru. These islands are rich in various types of plants having various types of food crops both local and general and plantations. In the rhizosphere of these plants and the immovable land, there are *Trichoderma species* fungi. *Trichoderma* develops very quickly, has a high adaptation that is symbiotic with plant roots so *Trichoderma* can be used to deal with plant damage problems caused by pathogenic fungi because it produces protease and chitinase enzymes that can diffuse through the dialysis membrane and degrade cell wall of pathogenic fungi during parasitic interactions. Thus, it can inhibit the growth of

pathogenic fungi. Trichoderma species are effective as biocontrol agents in inhibiting plant pathogens (Ze et al., 2007; Abed Fatah et al., 2007).

This fungus functions as a parasite and antagonist of phytopathogenic fungi that protect plants from diseases, such as Fusarium verticiloides and Rhizoctonia solani (Abot, 2002; Baaszcczyk et al., 2011; Suhaida and NurAinizzati, 2013; Gerbawy et al., 2014; Asad et al., 2014). Currently, *Trichoderma* species are used as biological pesticides, biological fertilizers and can improve soil fertility. This is because the *Trichoderma* species develop very quickly and have a high adaptation that is forming a symbiotic relationship with plant roots. Thus, *Trichoderma* species are very useful in agriculture (Vinale et al., 2008)

The purpose of this study was to determine the morphological characteristics of 6 *Trichoderma* isolates isolated after being explored from three districts in Maluku. Morphological features were observed macroscopically through the growth of colonies on PDA media and microscopically.

Materials and Method

Exploration of soil samples and isolation of *Trichoderma* species
6 samples from rhizosphere of banana, coconut, advocate and cocoa plants were explored from the village of Rumahkai, West Seram district, Kisar island, Southwest Maluku district, Ambon city, Nurue village, Central Maluku district in March 2018. 4 sub-samples were taken randomly use a soil drill at a depth of 3 centimeters from the top soil layer. All sub samples were mixed, stored at room temperature and sieved using a 2 mm sieve.
1 g of the sample was mixed with 9 ml of distilled water, then vented. The supernatant was poured into a petri dish containing PDA media (potato dextrose agar) and incubated at 28OC. The colonies formed were isolated to petri dishes containing new PDA media, then macroscopically and microscopically observed after 7 days. Colonies that show the characteristics of *Trichoderma* sp. purified on the test tube containing PDA media. The characteristics of colonies were observed macroscopically and microscopically to obtain *Trichoderma* isolates of species, which were then propagated to morphological observations.

Morphological and microscopic observation of morphology

Macroscopic morphological observations included colony color and colony diameter, while microscopic observations included characteristics of conidiospores, fialid features, conidial forms, conidiosfor lengths and phialides and conidial diameters.

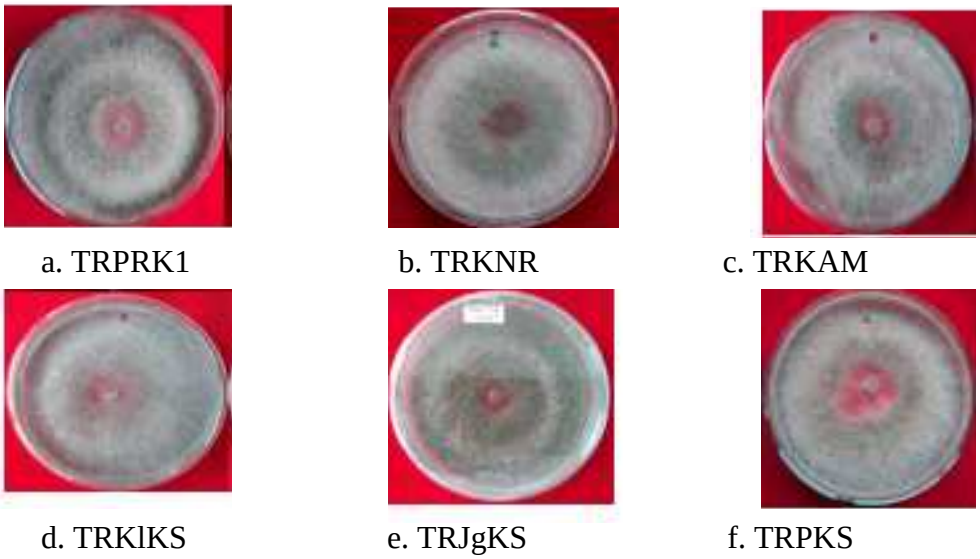
Results and discussion

Colony color and colony diameter from macroscopic observations are presented in Table 1 and Figure 1 a to Figure 1 f, while the characteristics and length of conidiosfor, characteristics and fialid length and conidial shape and diameter are presented in Table 2 and Figure 7 up to 2 g up to 2 l and table 3.

Table 1. Diameter and color of local *Trichoderma* spp colonies

Isolate	Coloni diameter (mm)	Coloni color
TRPRK1	70,70	dark green, light green and white
TRKNR	71,22	light green and white
TRKlAM	76,47	light green, yellowish green and white
TRKlKS	69,68	dark green and white
TRJgKS	71,89	light green and white
TRPKS	70,74	light green and white

Colony diameters of 6 isolates varied from 69.68 mm namely TRKlKS isolates up to 71.22 mm, namely TRKNR isolates. Colony color of 6 isolates is dominated by light green to dark green and white.



a. TRPRK1 b. TRKNR c. TRKAM

d. TRKlKS e. TRJgKS f. TRPKS

Figure 1. Growth and color of colonies from 6 *Trichoderma* isolates 7 days after isolation

The results of microscopic observations show that the characteristics of conidiosors are long and branched (Table 2 and Figure 2 g to Figure 2 l).

Table 2. Characteristic of conidiosphores, phialides and conidia shape of isolates

Isolate	Conidiosphores character	Phialide character	Conidia shape
TRPRK1	Long, quite branched	Frequently paired	Globose to ellipsoidal
TRKNR	Long, branched, verticilate	Frequently paired	Sub cylindrical to narrow ellipsoidal
TRKlAM	Branching, verticillate	Phialid more elongated	Globose to ellipsoidal
TRKlKS	Infrequently, branching	Lageniform	Obovoid
TRJgKS	Branching, verticillate	Slightly inflated	Ellipsoidal
TRPKS	Verticillate, frequently branching	Frequently paired, lageniform, convergen	Globose to ellipsoidal

Under a binocular microscope, the TRPRK1 conidial diameter is wider than the diameter of the other conidia. Likewise, the length of the fialid varies between 6 isolates.

Colony color and characteristics of conidiosfor, fialid and conidial forms of 6 isolates are similar, but quantitatively speaking, conidisophore and fialid length and conidial diameter are not the same. This shows the possibility of different Trichoderma species.

The length of conidiosfor of 6 isolates varied from 3.21 µm which was owned by TRKlNR isolates up to 63.13 µm owned by TRPKS isolates (Table 3). The fialid length varies from 1.35 - 4.30 µm, while the conidial diameter varies between 0.70 - 4.80 µm .

Table 3. Conidiosphore length, conidia diameter and phialides length of *Trichoderma*

lsolat	Conidiosphores length (µm)	Conidia diameter (µM)	Phialides length (µm)
TRPRK1	24, 44 – 35,57	2,73 – 4,80	9,05 – 9,51
TRK1NR	3,21 – 9,82	1,35 – 2,42	2.78
TRKAM	29,32	2,19 – 2,69	3,78 – 7, 46
TRKlKS	21,61	0,70 – 1,91	3,15
TRJgKS	30,02	1,62 - 2,44	10,32
TRPKS	63,31	2,94 – 4,11	5,17 – 6.52

Conclusions and recommendations

Six Trichoderma isolates of explored species from different plant rhizosphere in villages found in three districts in Maluku had colony diameters, lengths of conidiosfor and fialid and different conidial diameters, despite colony color, characteristic of conidiosfor, ialid and conidial forms almost same.

Biomolecular observations to find out local Trichoderma species need to be done.

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