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SCIENTIFIC FUNGAL REPORT OF MOLDY JEANS IN INDONESIA

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ABSTRACT

Mold are multicelular -microscopic fungi known as heterotrophic-cosmopolitan organism which exist almost at any place in the environment. Textiles, particularly those composed of natural organic such as jeans are easily colonized by mold. Till time, there is no report ever found regarding fungal of moldy jeans in Indonesia. This study aimed to isolate fungi from moldy jeans, identified, and described it. The result revealed that the isolate studied was Chaetomium globosum, by using several macroscopic and microscopic characters. However, since Chaetomium are known as species complex fungi, further observation is needed using molecular approach. Therefore, author consider that the isolate should be treated as Ch. globosum sensu lato for time being. Interestingly, Ch. globosum was frequently reported as endophytic fungi, which pose the potency to be used as biocontrol and bioinducer in agriculture. Further research is needed to test the isolate potency as plant pathogenic biocontrol and plant growth inducer.

Keywords: *Chaetomium globosum, Indonesia, Jeans, Mold.*

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INTRODUCTION

Fungal growth obviously rely on their physiological and biochemical characteristics, as well as the accessible of nutritive substances and proper conditions (Kim, 2011). Fungal can attach and grow on materials resulting corresponding biodeterioration under appropriate conditions. Textiles are organic material in nature and hence are susceptible to be colonized by mold, especially in the tropical country climatic conditions, and Indonesia is no exception. Biodeterioration likely occure due to extremely high relative humidity (Soytong *et al.,* 2005). Fungi are capable of occupying various substrates and are well-known for their capacity to degrade cellulose and also to produce a wide range of bioactive metabolites (Baldrian and Valaskova, 2008). There is no doubt that most serious havoc in textiles are caused by fungi (Chadeganipour *et al.,* 2013).

Mold are microscopis-multicelular fungi which capable to grow on the surface of jeans. A moldy jeans is often acidic, the

acidity arising from the mould growth (Kim, 2001). Mold often produces a mass of black, grey specks, or green which are thousands of tiny mycelia linked and mixed with those of the textile fibres (Kim, 2001). Fungal hyphae are the destructive phase of mold which living in textile material. It swiftly destroys fibers and makes holes (Kim, 2011). Fungal growth on a textile causes loss of strength and elongation, discolouration and changes in appearance.

Many organic materials degraded by some groups of fungi, especially those belonging to the genera of *Microsporum, Trichophyton, Fusarium, Rhizopus, Chaetomium, Aspergillus* and *Penicillium* (Zhang and Yang, 2007; Kim, 2011; Soytong *et al.,* 2005). Molds excrete enzymes which support them to digest organic materials, altering, and weakening those materials. In addition, a number of molds contain colored substances which caused stains and spots on textiles and decrease the strength of the fabric. However, till time, there is no such information in the form of scientific publication regarding mold, which colonized textiles material, particularly jeans in Indonesia.

On the other hand, many species of molds studied with the potential as biological control agents, inhibit the growth of pathogenic bacteria and fungi through competition, mycoparasitism, antibiosis, or their various combinations (Zhang and Yang, 2007). Till date, more than 200 compounds with a wide range of bioactive effects have been successfully isolated from mold, and most of them posed antifungal activity against plant pathogenic fungi (Zhang *et al.,* 2012). Some species of *Chaetomium* have been reported to be used as biocontrol against several plant pathogens (Park *et al.,* 2005; Charoenporn *et al.,* 2010). Therefore, this peliminary study aimed to provide the basic information regarding fungal which grow on moldy jeans. This study divide into some steps : isolate fungi from moldy jeans, identified, and characterized it before testing its potential as plant pathogenic biocontrol and plant growth inducer.

RESEARCH METHODS

The study was conducted at Mycology Laboratory, Department of Biology, IPB University, in October 2016. The fungi was isolated from biodeteriorated textile samples (jeans). The hyphae and spore were transferred by using sterilized tweezers on on potato dextrose agar (PDA) and incubated at 25˚C for 7 days. Mycelia which growing were isolated and purified by hyphal tip method using fine tungsten needle in the PDA media. The fungi observed on the bases of their colony appearance on PDA such as colony shape, color, elevation, texture, mycelia type, edges, density, and diameter. Morphological identification was done reffering to Wang *et al.,* (2016).

RESULTS AND DISCUSSION

Results

The ascocarp of fungi which mixed with spore were isolated from moldy jeans (Figure 1). After purification, the fungal isolate shown unique macroscopis characteristics as shown in Figure 2. The colony shape was filamentous, grey to greenish in colour (above), raised typed of elevation, velvety texture, aerial mycelial type, filiform edge, and dense in the growth at 7 days after incubation (Figure 2). Identification was done using macroscopic and microscopic characters, in the key to the most common Chaetomiaceae species (or species complex) from the indoor environments (Wang *et al.,* 2016). The result revealed that the isolate studied was *Chaetomium globosum*. This ascomycetous species is characterized by ostiolate ascomata covered with hairs or setae (Figure 3, fusiform, septate, dark pigmented hyphae (Figure 4), evanescent asci, and brown to grey-brown, single-celled ascospores (Figure 5) with one or two germ pores. However, since *Chaetomium* are known as species

complex fungi, further observation is needed using molecular approach. Therefore, author consider that the isolate should be treated as *Chaetomium globosum* sensu lato for time being.

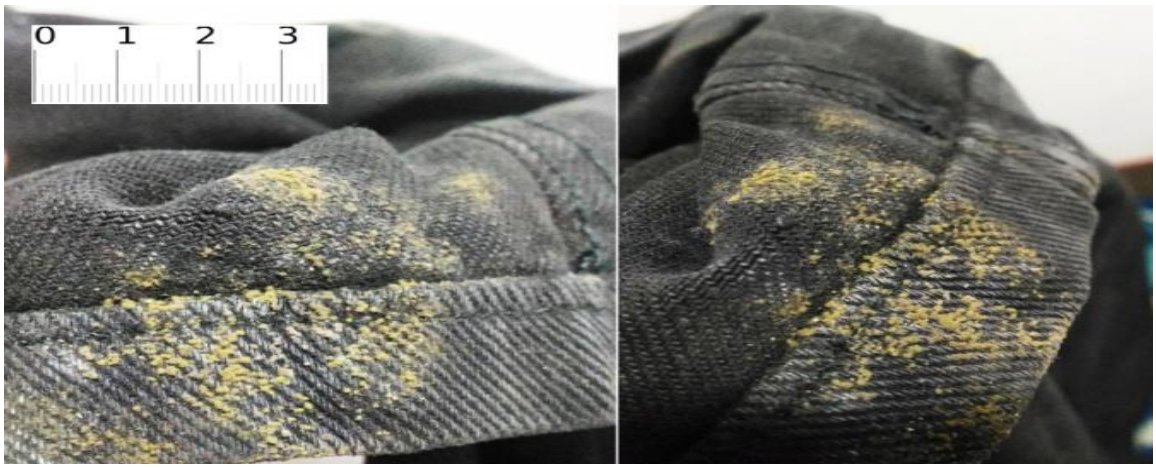

Figure 1. Ascocarp of fungi on moldy jeans

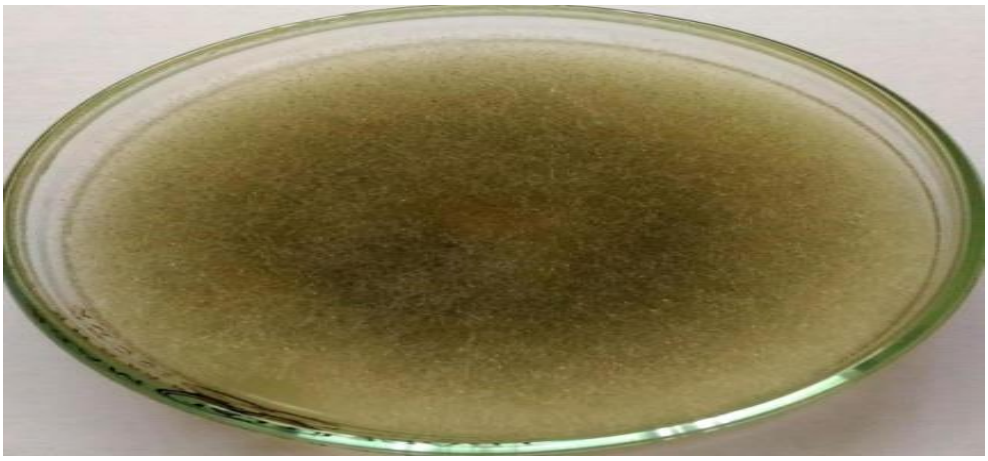

Figure 2. Colony of *Chaetomium* in PDA after 7 days

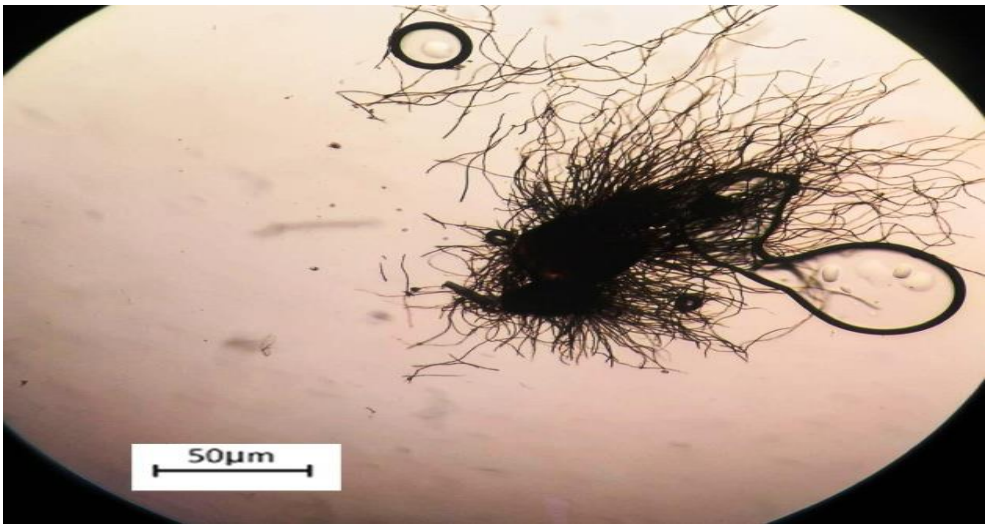

Figure 3. Ascomata with setae of *Chaetomium*

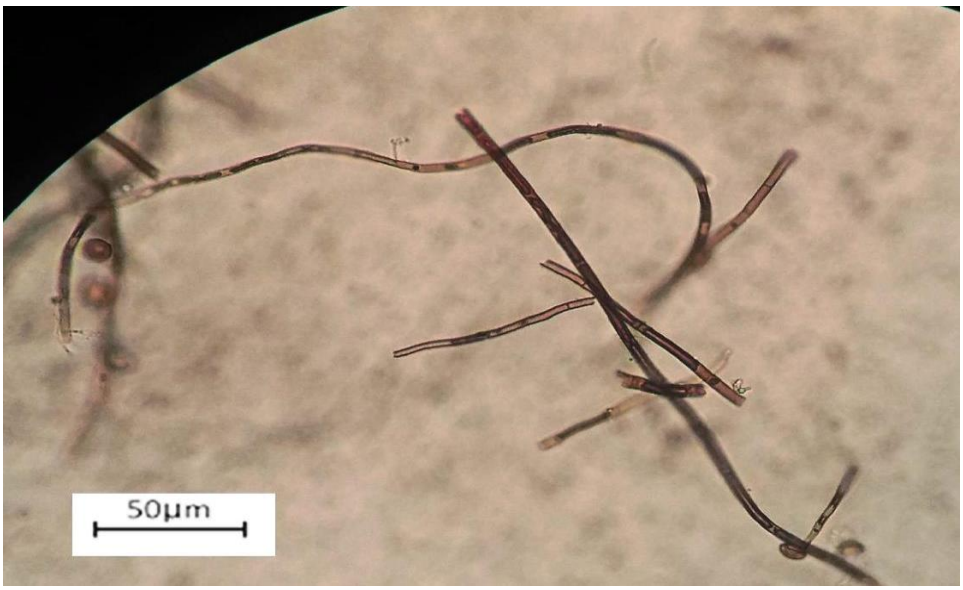

Figure 4. Hyphae characters of *Chaetomium*

Figure 5. Ascospores characters of *Chaetomium*

Discussion

Fungi colonize organic material when their spores germinate, which hyphae and/or mycelia grow in or over the material. This growth usually lead up to with a massive spore production (sexual or asexual). Spore formation is prime aspect for survival, replication, and fungal dispersion and often regarded as the most widespread airborne fungal particles. Mold are normally found in soil and organic compost, degrade cellulose and other organic materials relying on producing lytic enzymes (Soytong *et al.*, 2005), and textile material is no exception.

Phenotypically, the identification of *Chaetomium* has been difficult as a large proportion of them not producing typical diagnostic structures in culture and molecular data is needed for describing complex species (Najafzadeh *et al.,* 2014; Vinod Mootha *et al.,* 2012). *Chaetomium* contains more than 300 described species, but modern descriptions of most taxa are lacking, and very few have been circumscribed with DNA data. Therefore, author consider that the isolate should be treated as *Chaetomium globosum* sensu lato for time being, before proceed to the further confirmation.

Chaetomium are typically of common fungi which are cosmopolitan, usually found in soil, air, textiles, growing on plant debris, and around human habitations with many species preferring materials with high cellulose content (Rodriguez *et al.,* 2002; Abdullah and Saleh, 2010; Doveri 2013; Chowdhary *et al,*. 2014). This fungi has also been isolated from paper (Das *et al.,* 1997), air dust particles (Abdel-Hafez *et al.,* 1990), and residential indoor air (Ayanbimpe *et al.,* 2010; Fogle *et al.,* 2007). *Chaetomium* belongs to Chaetomiaceae molds fungi family. It is the most common species found in buildings and indoor environment (Andersen and Nissen, 2000). In This research, *Chaetomium* is very easy inhabited jeans textil material causing disfiguration and discoloration. The fungus known to secrete cellulases, similar exudate to *Aspergillus fumigatus* and *Trichoderma viride*, grouped as cellulolytic fungus (Wang *et al.,* 2016). To the best of author's knowledge, this is the first scientific report of moldy jeans in Indonesia.

Many researchers have been reported the potency of *Chaetomium* in the world. *Ch. globosum* has been investigated as biocontrol organism which might be able to provide protection to plants by antagonizing plant pathogenic fungi through the activity of secondary metabolites and enzymes such as chitinases (Liu *et al.,* 2008) and glucanases (Shanthiyaa *et al.,* 2013). Antagonistic activity of possible use for biocontrol has been reported also against a wide range of pathogens, including, *Alternaria alternata* (Li *et al.,* 2013; Naik *et al.,* 2009), *Aspergillus niger* (Sharma and Srivastava, 2011), *Cercospora sorghi* (Li *et al,*. 2011), *Colletotrichum gloeosporioides* (Soytong *et al.,* 2005), *Fusarium oxysporum* (Charoenporn *et al.,* 2010), *Fusarium solani* (Asran-Amal *et al.,* 2010); *Fusarium sulphureum* (Li *et al.,* 2011), *Fusarium graminearum* (Ye *et al.,* 2013), *Nigrospora oryzae* (Naik *et al.,* 2009), *Pestalotia species* (Phong *et al.,* 2016), *Phoma sorghina* (Naik *et al.,* 2009), *Phytophthora infestans* (Shanthiyaa *et al.,* 2013), *Rhizoctonia solani* (Awad *et al.,* 2014), *Sclerotinia sclerotiorum* (Kumar *et al.,* 2013), *Sclerotinia rolfsii* (Awad *et al.,* 2014), and *Trichophyton mentagrophytes* (Jiao *et al.,* 2004). In addition, plant growth promotion by *Ch. globosum* and *Ch. globosum* culture filtrates has been demonstrated by Khan *et al.,* (2012). The growth promotion observed was thought to result from the production of gibberellins and indole acetic acid by *Ch. globosum* (Khan *et al.,* 2012).

However, limited report found regarding the potential use of this fungi in Indonesia. The only available data was provided by Suryadi *et al.* (2019), in the topic of potential of cellulase of *Ch. Globosum* for preparation and characterization of microcrystalline cellulose from water hyacinth (*Eichhornia crassipes*). In the previous report, Putra *et al.* (2015) isolated endophytic *Ch.globosum* from domesticated zingiberaceae , and they did not found the fungi in the same host species in natural area. Since, *Ch. Globosum* found in this study colected from indoor environment, following research is needed to test the capability of the fungi in the term of plant pathogenic biocontrol as well as plant growth inducer.

CONCLUSION

This study succesfully isolated, identified, and characterized the fungi from

moldy jeans in Indonesia. The result revealed that the isolate studied was *Chaetomium globosum*. However, author consider that the isolate should be treated as *Chaetomium globosum* sensu lato for time being.

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