

Early Report on Fungal Rhizosphere of Rice Variety *Kewal Bulu Putih* of Banten Origin

*Nani Maryani

*Department of Biology Education, Faculty of
education and Teacher Training, UNTIRTA,
Indonesia Centre of excellence for Food
Security (I-CIFORY), UNTIRTA (Local Food
Innovation),
Serang, Banten*

*Email: nani.maryani@untirta.ac.id.

Iing Dwi Lestari

*Department of Biology Education, Faculty of
education and Teacher Training, UNTIRTA
Serang, Banten*

Email: iingdwiles@untirta.ac.id

Susiyanti

*Department of Agroecology, Faculty of
Agriculture, UNTIRTA,
Indonesia Centre of excellence for Food
Security (I-CIFORY), UNTIRTA (Local Food
Innovation)*

Serang, Banten

Email: susiyanti@untirta.ac.id

Nurmayulis

*Department of Agroecology, Faculty of
Agriculture, UNTIRTA,
Indonesia Centre of excellence for Food
Security (I-CIFORY), UNTIRTA (Local Food
Innovation)
Serang, Banten*

Email: upik_nurma@yahoo.co.id

Abstract— Fungal rhizosphere plays a very important role for soil fertility. Its compositions effects plant growth and resistance to diseases. This study aims to explore and to identify the diversity of fungi from rice rhizosphere of Banten origins. In this report, we describe the diversity of fungi from paddy rice field variety *Kewal Bulu Putih* in Kabupaten Serang Kecamatan Anyar, Banten. Soil samples was taken from Desa Siring Kecamatan Anyar. Isolation and identification were carried out at the Biology Education Laboratory. Six fungal isolates were successfully isolated and purified. Morphology identification indicated that these isolates are belongs to the fungal group *Aspergillus* and others are under further identification. Further identification and characterization are needed to be able to know the role and importance of these fungi in the rhizosphere of paddy rice.

Keywords: *Banten, fungi, rhizosphere, rice*

I. INTRODUCTION

Sustainable agriculture is the main concern of food security for feeding the predicted 9.8 billion people by 2050 (Population Reference Bureau, www.prb.org). More than half of those population eat rice as their staple food. Thus, increasing rice production is crucial for rice consuming countries like Indonesia (www.fao.org). The IsDB (Islamic Development Bank) research consortia 4 in 1 Biotechnology consist of Universitas Sultan Ageng Tirtayasa, Universitas Jember, University Negeri Malang, and Universitas Mulawarman were conducted research project entitle "Rice Cultivars Improvement Using Molecular Approach" in 2016-2018. It is resulted important findings such as the inventory of rice germplasm in Indonesia, the identification and characterization of those germplasm, and genetic manipulation some of local rice varieties [1]. Of the identification of local rice varieties, 8 varieties were from Banten province i.e. *Kewal Bulu Hideung, Sereh, Waren, Pare Jaketra, Tambleng, Bulu Putih, Kewah Gudril* and *Pare Caok*. These local varieties are known to be resistant to biotic (disease and pests) and abiotic stresses (drought, high salinity etc.). It is also known that microbial community in the soil plays important role in increasing plants productivity and its adaptability to stress from the environment [2], [3]. However,

microbial composition in the local rice varieties from Banten is unknown. Our hypothesis is, the variation of adaptability of different local rice varieties from Banten is influenced by its microbial composition in the rhizosphere. Thus, conducting such studies is necessary.

Local varieties of plants are defined as varieties that has been long adapted to certain regions. These varieties commonly have good characters of which benefit the plants [4]. *Kewal Bulu Putih* is one of the examples of local rice varieties from Banten. This variety has good adaptability to environment, requires less fertilizer, and has good aromatic sense. However, it can only be harvest after 150 days and the plants are very fragile to fall off. Therefore, this variety is not favorable by the farmers compared to other varieties which have relatively short harvest time. Nonetheless, local varieties are the source of resistant genes of local germplasm.

Plants are niches for many of microorganism that colonized roots, leaves, stems and rhizosphere. Rhizosphere is soil area around the roots [5]. Microbial community in the rhizosphere known to be widely diverse and very important for soil fertility. Some of these microbes play a role in the nutrient cycle, soil formation, plant growth, and biological control of root pathogens. Microbial populations in the rhizosphere are more abundant and diverse compared to non-rhizosphere soil. The microbes composition could be a member of bacteria, fungi, protozoa, and cyanobacteria.

Dynamics of microbial activity in the rhizosphere is highly influenced by roots exudates. Interaction between plants and microbes in this area of soil could be beneficial for both plants and the microbes such as plant growth promoting bacteria and fungi and microbe that can be used as biological control of diseases from roots. Therefore, knowing the composition of plants rhizosphere is important as it also can be used as biofertilizer to increase soil fertility and plants productivity.

We aim to explore microbial rhizosphere from different local rice varieties of Banten origin. We identify and analyze different type of fungi that could be found in the soil rhizosphere of local rice varieties. In this paper, we report diversity of fungal rhizosphere that were isolated from rice variety *Kewal Bulu Putih* from *Kecamatan Anyar, Kabupaten Pandeglang, Banten*.

II. MATERIALS AND METHODS

The first exploration was conducted in June-July 2019 at *Desa Siring, Kecamatan Anyar, Kabupaten Serang, Banten*. The soil was collected at 5 different area of rhizosphere's rice plants. 250 grams soil was collected at each point in the depth of 10-20 cm below ground (Figure 1.). Samples were labelled and further analyzed at the laboratory of Biology Education, Untirta.

Fungal isolation was done using serial dilution culture methods following the protocol of Crous (2006) and Prambudi with modification [6] [7]. 10 grams of soil was diluted with 90 ml of physiological NaCl solution. Serial dilution was performed and 1 mL of final concentration 10^{-6} was plate on PDA media with antibiotics and incubated at 25°C for 18 hours. Fungal colonies grown on PDA were transferred to new PDA plates. Fungal identification was performed based on their morphology and microscopic characters following Barnet & Hunter (1972) and Samson *et al.* (2016) [8].



Figure 1. Soil rhizosphere of paddy rice plants.

III. RESULTS AND DISCUSSION

Local varieties of rice are relatively rare to be cultivated by farmers. We found *Kewal Bulu Putih* at Kecamatan Siring, Anyar, Banten (Figure 1.). One of the local varieties which have relatively long-life cycle (long harvest time) of six months.



Figure 2. Characters of Kewal Bulu Putih

6 fungal isolates were obtained from the rhizosphere of rice variety *Kewal Bulu Putih* (Figure 2). Morphology identification refers two of the isolates belongs to the group *Aspergillus* (NKBP-ReIs-01 dan NKBP-ReIs-02) and others are not yet identified to belong any groups of fungi. Isolate NKBP-ReIs-01 has slow growth colony with yellowish green color, the reverse colony is light green. The hyphae structures are septate, hyaline, conidiophores with a round head (vesicles). These morphological characters are clearly belonging to the genus *Aspergillus*.

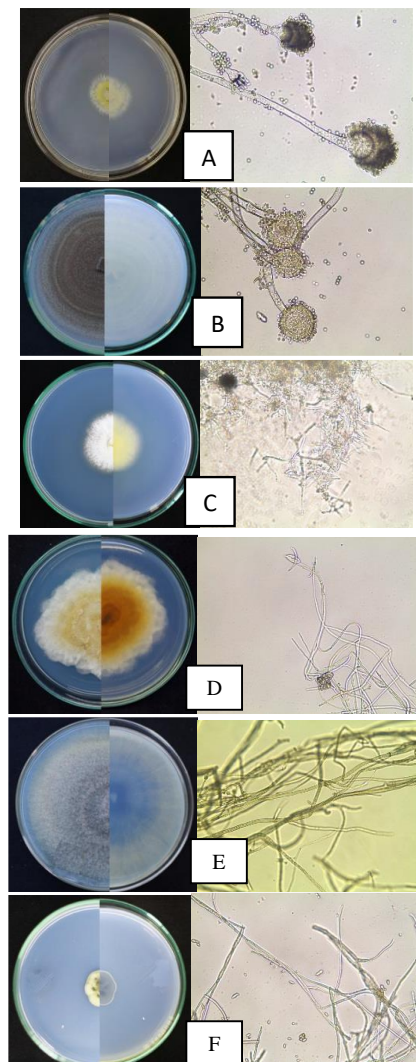


Figure 3. Macroscopic and microscopic character of fungal isolates (A) NKBP-ReIs-01 is *Aspergillus 1*, isolate (B) NKBP-ReIs-02 is *Aspergillus 2*, isolate (C) NKBP-ReIs-07, isolate (D) NKBP-ReIs-03, isolate (E) NKBP-ReIs-04, and isolate (F) NKBP-ReIs-05.

The isolate (NKBP-ReIs-01 and NKBP-ReIs-01) is a relatively fast-growing fungus. Colony color is black conidia and reverse colony is grayish-white. The characteristics of hyphae hyaline, septate, and with black conidia. These characteristics are belonging to the genus *Aspergillus*. The other four isolates are very difficult to identified solely based on their morphological characters. More characters like sexual phase and morphology on different media are needed to be able to identified these isolates. These results are preliminary, further identification and characterization are absolutely needed. The exploration to different area of Banten are still undergo.

IV. DISCUSSION

Rice is one of the earliest crops to be cultivated by men. More than half of human population are consumed rice as their staple food especially of Asian countries like Indonesia. Domestication and hybridization of rice has occurred thousands of years in its place of origin, in the foothill of Himalayan as well as in other places where rice are introduced. This resulted in local varieties or landraces varieties. Indonesia owned some of the local varieties which are unique in every region. These are germplasm that need to be preserved and conserved for better improvement of rice. Banten is one of the regions that has local varieties of at least 21 has been identified [1] [9].

Local varieties are known to be resistant to stress whether biotic or abiotic. However, these varieties are rarely cultivated by farmers due to their long-life cycle. Some studies suggest that the composition of the rhizosphere affects plant growth and its resistant to stress. In our study, we demonstrate that fungal community are present in the rhizosphere of local rice varieties. Fungal rhizosphere is very important component of microbial population in the soil [11]. Its role as saprobes provides nutrients in the soil [13] [14]. Thus, soil fertility is increase that can support plant growth.

Interaction of plants-microbes in the soil could be beneficial for both. For example, nitrogen fixation microbe, disease suppresses and soil bioremediation. In this report, we haven't found yet the role of these fungi. Future study will help us identified more diversity on the fungi so that it can be tested to other rice varieties as soil fertilizer or others function.

V. CONCLUSION

Fungal rhizosphere from local rice variety Kewal Bulu Putih was successfully isolated and identified. Six fungal isolates were isolated and purified. Morphology identification indicated that 2 of these isolates are belongs to the fungal group *Aspergillus* and others are under further identification. Further identification and characterization are

needed to be able to know the role and importance of these fungi in the rhizosphere of paddy rice.

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