International Conference on Agriculture, Environment, and Food Security

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Conference Information

Dates : November 7 - 8, 2017

Organizer : Faculty of Agriculture
Universitas Sumatera Utara

Venue : Arya Duta Hotel Medan
Jalan Kapten Maulana Lubis No. 8 Medan, Sumatera Utara, Indonesia Phone: +62 61 4572999
Web: http://www.aryaduta.com

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Conference Website : https://ocs.usu.ac.id/AEFS/AEFS2017/index
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Introduction and Photographs

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Introduction

First of all let us praise and thank the presence of Allah Almighty, for the abundance of grace and the joy all of us can still gather in this place in good health. We would like to take this opportunity to tell you that this is our honour and privilege to welcome you here.

The honorable:
- Rector of Universitas Sumatera Utara, Prof. Dr. Runtung, MHum
- Dean of Faculty of Agriculture Universitas Sumatera Utara: Dr. Ir. Hasanuddin, M.S.
- Keynote Speakers:
  1. Prof. Dr. Chris Franco (University of Flinders, Australia)
  2. Prof. David Herak (Czech University of Life Science, Prague)
  3. Mirza Hasanuzzaman (Sher-e-Bangla Agricultural University, Bangladesh)
  4. Dr. Janice Sher Huay Lee (Nanyang Technology University, Singapore)
  5. Dr. Ir. Anton Apriyantono, MS (Former Minister of Agriculture, Indonesia)
- The distinguished guests from all around the world

I am greatly honored to welcome you to the first International Conference on Agriculture, Environment and Food Security (AEFS) 2017. AEFS conference aims to offer the opportunity for knowledge sharing, networking, and collaboration between engineers, scientists, and technologists as well as academician and researchers working in the specific areas of agriculture, social economics, biosystems engineering and food technology. For this year the committee has chosen “Agriculture, Plantation and Livestock for World Food Security” as the main theme, with 6 selected tracks including Agricultural Engineering, Agricultural Economics, Plant Science (Agronomy and Plantation, Plant Breeding, Biotechnology, Integrated Pest Management and Soil Science), Animal Science, Food Science and Technology, Marine and Fisheries Sciences. This conference is organized by The Faculty of Agriculture, University of Sumatera Utara (USU) as an annual event to celebrate the faculty anniversary and fully supported by Czech University of Life Sciences, Prague (CULS), The Institution of Engineers Indonesia (IEI/PII), Indonesian Association of Food Technologist (IAFT/PATPI), Indonesian Society of Agricultural Economics (ISAE/PERHEPI), Indonesian Association of Biochemistry and Biology Molecular (IABBM/PBBMI), The Indonesian Agronomy Association (IAA/PERAGI), Weed Science Society of Indonesia (WSSI/HIGI), Indonesian Phytopathological Society (IPS/PFI) and The Indonesian of Plant Breeding Society (IPBS/PERIPI). The AEFS 2017 program consists of the interactive presentation sessions, keynote speaking and social events including networking dinner and post-conference tour.
There are 220 papers that have been submitted to AEFS’ committee, but after the reviewing process there are 142 papers which have been approved. International seminar has been held for 2 days from 7th – 8th of November 2017 in Aryaduta Hotel with various important agenda.

I would like to express my appreciation to the presenters who are coming from the university in Indonesia, Czech Republic (Czech University of Life Science Prague), Australia (The University of Queensland), Ghana (CSIR - Council for Scientific and Industrial Research - Ghana · SARI), Japan (University of the Ryukyus, Nishihara), Turkey (Ondokuz Mayis University, Samsun) and chairs of all the sessions. You deserve it and I think we would all agree that the quality of the presentations and the papers for this conference have been of a very high standard.

I hope you will have a pleasant post-conference tour and journey to your home countries. I look forward to seeing you on second ICAEFS 2018.

My personal respect and thanks goes out to all of you

Chair of the Organizing Committee of ICAEFS 2017

Dr. Ir. Tavi Supriana, MS
Peer review statement

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Peer review statement

All papers published in this volume of *IOP Conference Series: Earth and Environmental Science* have been peer reviewed through processes administered by the proceedings Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.
Morphological characterization of several strains of the rice-pathogenic bacterium *Burkholderia glumae* in North Sumatra

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Morphological characterization of several strains of the rice-pathogenic bacterium *Burkholderia glumae* in North Sumatra

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Abstract. *Burkholderia glumae* is a quarantine seed-borne bacterial pathogen causing panicle blight disease on rice. This pathogen has been detected in some locations in Java, and recently, farmers in North Sumatra have reported rice yield loss with symptoms similar with those on rice infested by the rice-pathogenic bacterium *B. glumae*. This research was aimed to isolate several bacterial strains from several rice varieties in various locations in North Sumatra and characterize the morphology of the strains to detect and identify the unknown bacterial strains presumably *B. glumae*. Several rice seed varieties were collected from Medan and Deli Serdang Districts. The seed samples were extracted, isolated and purified, then grown in semi-selective media PPGA. The morphological characteristics of the bacterial strains were determined including Gram staining, bacterial colony’s and bacterial cell’s morphology. The results showed that of eleven strains isolated, two strains were Gram negative and nine strains were Gram positive. On the basis of colony morphology, all strains had circular form, flat elevation and cream colour while the colony margin varied, i.e. entire and undulate. Most strains had bacillus/rod shape (8 strains) and only 3 strains were coccus.

1. Introduction

Rice (*Oryza sativa* L) is the main staple food for more than two million people worldwide, mostly live in Asia including in Indonesia. Rice contains high carbohydrate for human’s source of energy. Of the total rice production in the world, i.e. 490,6 million tons [1], more than 90% is produced and consumed in Asia. Rice consumption of Indonesian people has ranked as the first position in the world which resulted in high rice demand [2].

Rice production in Indonesia is forecast to decline in 2016 [1]. In North Sumatra, rice production has been fluctuated with 4,06 million tons in 2015, which is slightly increase 11,40% compared to 2014 [3].

A number of factors affect the decrease of rice production in Indonesia including un-remunerative prices, unseasonable weather, lack of good quality of seed and pest and diseases [1]. Bacterial panicle blight (BPB) on rice was first reported in Japan in 1950s and the disease has been one of serious plant diseases in the world [4]. BPB has been reported in rice producing countries including Southern and Middle America (Dominique Republic, Venezuela, Equador, Brazil, Panama, Columbia, Nicaragua and Costarica), Southern Africa and Tanzania, Asia (Japan, Korea, Vietnam, Phillipines, India, Indonesia, Malaysia, Thailand and China) [5]. Rice panicle blight can cause yield losses up to 75% in...
several states in the USA and more than 40% crop losses in Panama and several tropical and sub-tropical countries have considered BPB as potential risk disease on rice [6,7].

Recent report from Dr. Suryo Wiyono, a lecturer at Bogor Agricultural Institute, confirmed the occurrence pathogen of *B. glumae* in hybrid rice seeds in Tegal (Middle Java) and Blitar (East Java), although Ministry of Agriculture of Indonesia denied his statement [8]. Similarly, BPB has been detected in Southern Sulawesi [9]. In Indonesia, panicle blight was a minor rice disease since 1987, however no report causing significant crop losses after that [10]. Indonesian government has listed *B. glumae* as a quarantine pathogen (Group I, Category of A2), which cannot be removed from the carrier through quarantine treatments [11]. This disease has become an emergence disease that affects rice production in several locations in Indonesia since 2015 [12]. The infected rice plants produce empty panicle which causes crop failure. Recently, similar symptoms have been found in several rice fields in North Sumatera and have caused serious concerns to the farmers. As there is no information and research about this disease in North Sumatera, therefore research on detection and identification of this disease is urgently required. This research was aimed to characterize the morphology of several bacterial strains isolated from several symptom and symptomless rice seeds in North Sumatera. Bacterial morphology is one aspect of bacterial identification.

2. Materials and methods

2.1 Rice seed samples

Rice seed samples were collected from several places in North Sumatra. 90 g of the seeds were placed in a polyethylene plastic bag and labelled, then brought to the Laboratory of Plant Disease, Faculty of Agriculture, University of Sumatera Utara for further analysis.

2.2. Seed extraction, isolation and purification

The seeds sample were extracted, isolated and purified to obtain pure cultures on semi-selective media PPGA and King’s B media according to Safni *et al.* [13] and IRRI [14] with modification. The seeds were surface-sterilization with NaClO 0.5% for three minutes to sterilize the pathogens on the seed surface.

2.3. Morphology test

2.3.1. Cellular morphology

Cellular morphology of the bacteria included the cell shape which was observed under the microscope and Gram-staining. Gram-staining test was performed according to Schaad *et al.* [15]. Bacterial cell shape and color was observed using microscope with 1,000 times magnification. Gram-negative bacteria is red or pink color while Gram-positive bacteria expose blue or purple color.

2.3.2. Colony morphology

The colony morphology was determined after 48 hours of incubation on the basis of colony’s color, shape, elevation and margin according to Bergey’s Manual of Systematic Bacteriology [16].

3. Results and discussion

3.1. Rice seed samples

From four different locations, eleven bacterial strains were collected (Table 1). Eight strains were isolated from Deli Serdang and three strains were isolated from Medan.
Table 1. Bacterial strains from several rice varieties isolated from two locations

<table>
<thead>
<tr>
<th>No</th>
<th>Bacterial strains</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IR64 M</td>
<td>Medan</td>
</tr>
<tr>
<td>2</td>
<td>CH MD</td>
<td>Medan</td>
</tr>
<tr>
<td>3</td>
<td>CH M</td>
<td>Medan</td>
</tr>
<tr>
<td>4</td>
<td>IP30</td>
<td>Deli Serdang</td>
</tr>
<tr>
<td>5</td>
<td>IP32</td>
<td>Deli Serdang</td>
</tr>
<tr>
<td>6</td>
<td>ME</td>
<td>Deli Serdang</td>
</tr>
<tr>
<td>7</td>
<td>SIB</td>
<td>Deli Serdang</td>
</tr>
<tr>
<td>8</td>
<td>CIB</td>
<td>Deli Serdang</td>
</tr>
<tr>
<td>9</td>
<td>CID</td>
<td>Deli Serdang</td>
</tr>
<tr>
<td>10</td>
<td>IR64 SR</td>
<td>Deli Serdang</td>
</tr>
<tr>
<td>11</td>
<td>CH SR</td>
<td>Deli Serdang</td>
</tr>
</tbody>
</table>

3.2. Morphology test
Morphology results of cell shape, Gram staining and colony’s morphology tests are displayed in Table 2. It showed that only 5 strains were Gram negative, IR64 M isolated from Medan and ME, SIB, IR64 SR and CH SR isolated from Deli Serdang. The rest strains (6) were confirmed as Gram positive bacteria. The cell shape majority was rods/bacillus (8 strains) and only 3 strains were coccus. The colony’s color, shape and elevation were similar for all strains, i.e. cream, circular and flat respectively. For colony’s margin varied with entire margin for 5 strains and undulate margin for 6 strains.

According to Brenner et al. [16] in Bergey’s Manual of Discriminative Bacteriology, B. glumae is characterized as rods/bacillus, 0.5-0.7 x 1.5-2.5 μm, Gram negative. On the basis of these characteristics, the possible bacterial strains of B. glumae are strains of IR64 M isolated from Medan, and SIB isolated from Deli Serdang.

For further work, biochemical characteristics as well as molecular essay are required for bacterial identification.

Table 2. Morphology of bacterial strains isolated from rice seeds

<table>
<thead>
<tr>
<th>No</th>
<th>Bacterial strains</th>
<th>Cell shape/ Arrangement</th>
<th>Size</th>
<th>Gram-staining</th>
<th>Colony’s morphology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Color</td>
</tr>
<tr>
<td>1</td>
<td>IR64 M</td>
<td>Bacillus</td>
<td>0.69 μm x 0.59 μm</td>
<td>-</td>
<td>Cream</td>
</tr>
<tr>
<td>2</td>
<td>CH MD</td>
<td>Bacillus</td>
<td>3.24 μm x 0.74 μm</td>
<td>+</td>
<td>Cream</td>
</tr>
<tr>
<td>3</td>
<td>CH M</td>
<td>Bacillus</td>
<td>2.29 μm x 0.67 μm</td>
<td>+</td>
<td>Cream</td>
</tr>
<tr>
<td>4</td>
<td>IP30</td>
<td>Bacillus</td>
<td>2.53 μm x 0.61 μm</td>
<td>+</td>
<td>Cream</td>
</tr>
<tr>
<td>5</td>
<td>IP32</td>
<td>Bacillus</td>
<td>3.13 μm x 0.78 μm</td>
<td>+</td>
<td>Cream</td>
</tr>
<tr>
<td>6</td>
<td>ME</td>
<td>Coccus</td>
<td>0.85 μm x 0.45 μm</td>
<td>-</td>
<td>Cream</td>
</tr>
<tr>
<td>7</td>
<td>SIB</td>
<td>Bacillus</td>
<td>1.076 μm x 0.48 μm</td>
<td>-</td>
<td>Cream</td>
</tr>
<tr>
<td>8</td>
<td>CIB</td>
<td>Bacillus</td>
<td>3.24 μm x 0.66 μm</td>
<td>+</td>
<td>Cream</td>
</tr>
<tr>
<td>9</td>
<td>CID</td>
<td>Bacillus</td>
<td>2.43 μm x 0.86 μm</td>
<td>+</td>
<td>Cream</td>
</tr>
<tr>
<td>10</td>
<td>IR64 SR</td>
<td>Coccus</td>
<td>1.03 μm x 0.39 μm</td>
<td>-</td>
<td>Cream</td>
</tr>
<tr>
<td>11</td>
<td>CH SR</td>
<td>Coccus</td>
<td>0.93 μm x 0.42 μm</td>
<td>-</td>
<td>Cream</td>
</tr>
</tbody>
</table>

4. Conclusions
It is concluded that on the basis of morphological characteristics of eleven bacterial strains isolated from several rice varieties and two districts in North Sumatra, one strain isolated from Medan (IR64 M) and one strain isolated from Deli Serdang (SIB) are presumably confirmed as B. glumae, the causal bacterial pathogen of rice panicle blight.
References
[1] Food and Agriculture Organization of the United Nations 2016 Rice market monitor Volume 19 (2) 1-37

Acknowledgement
The authors gratefully acknowledge that this research was supported by Grant of TALENTA 2017, Universitas Sumatera Utara, Indonesia (Contract number 285/UN5.2.3.1/PPM/KP-TALENTA USU/2017).