Agro-climate and intensity of the disease rot of bacteria in two planting seasons

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Abstract. Bacterial grain rot caused by bacteria Burkholderia Glumae (BG), is a new disease found in South Sulawesi. Maros area as one of rice production centers began to be detected by BG attack in 2015 from the results of monitoring BBKP Makassar, but there are no further studies on the epidemiology of the disease in cropping. BBB disease can easily infect through the seeds. The spread of seedlings without the seed health test and the inclusion of the hybrid import seeds also spur the spread and malignancy of BBB disease in the field. Extreme weather changes are one of the factors that cause an explosion of the disease in various countries so that it can cause a loss of results ranged from 40-70%. This research aims to determine the agroclimatic relationship to the intensity of BBB disease. Based on the observation of the agroclimatic and the intensity of the BBB disease in Maros Regency for two planting seasons (IP 300-Rendan) shows that the dominant disease attack occurs during the rainy season (November-March) in the planting season of IP 300 and With air temperature ranging from 32°C and humidity 67%. The disease intensity of some varied varieties ranges from 17.5-73%

1. Introduction

Efforts to increase rice productivity (Oryza sativa L.) continue to be carried out to increase its role in maintaining domestic food security and increasing agricultural development [1]. Besides, increasing rice productivity is one manifestation of the Ministry of Agriculture's program, namely rice self-sufficiency and food sovereignty in 2045. This program predicted to realized because the target of the Ministry of Agriculture in 2018, rice production of 80 million tons, can be achieved. Based on the trend data of rice production of the Central Statistical Agency (BPS) in the last ten years continues to increase. Production increase over the last ten years is the result of the consistency of increased rice production through the help of seeds, mentoring, agricultural machine tools, and increased planting area [2].

The increase of rice production that continues to be done by the government does not necessarily run smoothly and free from various obstacles. One of the obstacles faced is pest and disease attacks [3]. Lately, in Indonesia, there is a new type of disease that is the rot of bacteria (bacterial grain root/BBB) caused by bacteria Burkholderia Glumae and has spread to various regions in Indonesia, especially in South Sulawesi. Initially, this bacterium belongs to the type I of the rice plant A2, which means that the OPTK has been reported to exist in Indonesia, but only limited to specific regions and
control measures performed. However, since it is widespread and found in various regions, the status is changed from the OPTK A2 of the group I to an OPT. Monitoring result of Makassar agricultural Quarantine (BBKP) since the year 2015, B. Glumae has spread on Nine regencies in South Sulawesi, among others, Gowa, Takalar, Jeneponto, Bulukumba, Sinjai, Bone, Maros, Pangkep, and Selayar.

B. Glumae should be wary of considering that this bacteria causes blight disease in malai and a grain of rice that is known as the disease bacterial grain rot (foul-ear bacteria) or Bacterial Panicle Blight (Hawar bacteria in Malai). The disease can develop from inoculum in infected seeds from the previous year, in the soil, and weeds in the field. In the process of infection, host vulnerabilities, Incoum density, and climate factors played a key role [4]. BG disease will be hazardous because it can carry the seed and inflict the void in the Malai to reduce the production of 40% to 70%. Even though it designated as an OPT, there have been no detailed studies on the influence of Agro-climate and the intensity of the disease because it misinterpreted other OPT presence such as stem drilling, walang, and neck rot. If no more careful observation is done, then this disease will be very harmful and difficult to control because the symptoms will only appear in the generative phase and have been very late to control. Research is conducted to determine climate influence on the intensity of BG disease in the field.

2. Methods

The research conducted in two places, namely the district of Lau and Bantimurung Sub-district, Maros Regency South Sulawesi province for two planting seasons, namely IP-300 (2016) and Renwith (2017). Variable observations include symptoms of the disease, the influence of Agro-climate, the use of urea (N) and the intensity of disease to 6 varieties of rice consists of 3 varieties of inbred (Ciherang, Cisantana, Mekongga) and three varieties of hybrid (SL 8 SHS, Pioneer).

Daily temperature and humidity observed using Digital Thermo-Hygrometer performed at night (at 20.00 wita), while daily rainfall data obtained Maros Klimatology station. Observations of the intensity of the bacterial scat disease [4] Using scale 0-9 (table 1).

| Scale | Disease symptoms                      |
|-------|--------------------------------------|
| 0     | There are no symptomatic tillers     |
| 1     | 10% symptomatic tillers              |
| 2     | > 10% of symptomatic tillers         |
| 3     | > 20% of symptomatic tillers         |
| 4     | > 30% of symptomatic tillers         |
| 5     | > 40% of symptomatic tillers         |
| 6     | > 50% of symptomatic tillers         |
| 7     | > 60% of symptomatic tillers         |
| 8     | > 70% of symptomatic tillers         |
| 9     | % 80% of symptomatic tillers         |

The intensity of the disease attack calculated by the following formula: "Intensity of disease attack = " "Σ (n x v) " / "(N x Z) " x 100% ", with N, number of plants with symptoms of each score; V, the score value of disease symptoms; N, the number of plants observed; Z, scores score the highest symptoms of the disease.

3. Results and discussion

3.1. Agro-climate influence on bacterial rot

Agro-climate includes temperature, humidity, and rainfall have a significant influence on the development of the disease rot of bacteria in paddy plants. The planting season of IP 300 lasts during...
August – December, where symptoms begin to appear in the Generative phase (95-97 HST) when warm nighttime temperatures range from 30°C – 32, 10°C for six consecutive days with high humidity ranging from 80 – 90%.

Figure 1. The relationship of Agro-climate (rainfall, temperature, humidity) in the planting season of IP 300 (2016) against the appearance of symptoms of rotten diseases of bacteria in rice plants.

The planting season takes place during December – March, where symptoms also begin to appear in the generative phase of the flowering stadia. Based on observations in the field in the spring planting season, rainfall, temperature, and humidity tend to be higher. Recorded temperatures at night warmly ranged > 30°C occurs several times during the planting season (Figure. 2).

Figure 2. Observations in the field in the spring planting season, rainfall, temperature, and humidity.

This condition strongly supports the development of bacterial rot. In this study, it found that the optimum temperature, supported by rainfall and high humidity, occurred when entering the generative period causing the disruption of plants in the process of filling the ears. The incidence of disease arises and tends to increase in intensity when several factors support each other, creating optimal conditions for the development of the pathogens. The optimum temperature for the development of B. glumae ranges from 380 C-400 C. [4] High levels of humidity at the flowering stage are reported to be highly conducive for grain infections. [5] High temperatures also spur the production of phytotoxin in the
form of bright yellow pigment toxoflavin and Fervenulin isomers [6]. The production of Toksoflavin depends on the growth temperature and reaches a maximum level of 37°C; at a temperature of 25°C to 28°C the production of Toksoflavin is not detected [7]. Toksoflavin is what causes the symptoms of chlorosis in rice panicles.

3.2. The intensity of BBB disease

The intensity of a rotten disease of bacteria in rice plants varies based on its variety and season. Paddy hybrid varieties Brang Biji, SL8-SHS, and Pioneer planted in the planting season IP 300 in Bantimurung sub-district have a relatively low attack intensity compared to inbred rice varieties Cisantana, Ciherang, and mekongga that planted in the season Planting in the district of Lau (table 2).

**Table 2.** The intensity of bacterial rot disease in the two growing seasons.

| Variety         | The intensity of Disease (%) | Location and Planting season |
|-----------------|------------------------------|------------------------------|
| Brang Biji      | 37                           | Kec. Bantimurung              |
| SL 8 SHS        | 21.5                         | IP 300                       |
| Pioneer         | 17.5                         |                              |
| Cisantana       | 63                           | Kec. Lau                     |
| Ciherang        | 73                           | Rendengan                    |
| Mekongga        | 46                           |                              |

Source: Primary data, 2016-2017

The high intensity of disease in the district of Lau occurs due to temperature influences, in which the generative phase when the flowering stage occurs, an increase in nighttime temperature with humidity and high-tends rainfall. The level of disease intensity strongly supported by various factors, such as environmental factors, seed sources, varieties, and cultivation systems, are less precise, e.g., the use of improper fertilizer dose and time [8]. This condition is very optimum for the development of B. Glumae to infect plants and produce toxoflavin and resulted in disruption of the process of filling the foam so that it has a void. Agro-climate, which supports the development of B. Glumae in the Bantimurung sub-district, occurs at the maturity stage of the milk, so it does not cause pests, but the ears turn into brown until blackish.

4. Conclusion

Based on the research that done, it concluded that the intensity of the disease rots in rice bacteria in Maros Regency strongly influenced by the Agro-climate, namely temperature, humidity, and high rainfall in the generative period.

References

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