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# Examination of Multiple Rice Varieties (*Oryza sativa* L.) to the Development of Leaf Blight Disease Caused by Curvularia oryzae

*Uji Beberapa Varietas Padi Sawah* (*Oryza sativa L.*) *terhadap Perkembangan Penyakit Bercak Daun yang Disebabkan oleh Curvularia oryzae*

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## ABSTRAK

Padi merupakan komoditas pangan utama di Indonesia, karena sebagian besar penduduk Indonesia makanan pokoknya adalah beras. Salah satu penyakit yang umum menyerang tanaman adalah serangan bercak daun yang disebabkan oleh patogen *Curvularia oryzae*. Tujuan penelitian adalah untuk mengetahui reaksi ketahanan lima varietas padi sawah terhadap penyakit bercak daun yang disebabkan oleh *Curvularia oryzae*. Penelitian dilaksanakan di kebun percobaan dan Laboratorium Fitopatologi Jurusan Hama dan Penyakit Tumbuhan Fakultas Pertanian Universitas Sriwijaya pada bulan Agustus sampai dengan Desember 2016. Penelitian ini menggunakan metode Rancangan Acak Kelompok (RAK) dengan 5 perlakuan, dan 10 ulangan. Hasil penelitian menunjukkan bahwa rerata persentase serangan penyakit tertinggi terdapat pada perlakuan P3 (varietas Inpari 30) sebesar 22,36% dan persentase serangan terendah terdapat pada P5 (varietas IR 10) sebesar 2,85%.

Kata kunci: bercak daun, *Curvularia oryzae*, varietas

## ABSTRACT

Rice is the main food commodity in Indonesia, since the majority of Indonesian populations use rice as their staple food. One of the common diseases that attack rice plants is leaf blight caused by pathogenic *Curvularia oryzae*. The objective of this research was to determine the reaction of five varieties of rice resistance to diseases caused by *Curvularia oryzae*. This research was conducted at Experimental Research Station and Phytopathology Laboratory of the Departement of Plant Pest and Disease, Faculty of Agriculture, Sriwijaya University from August to December 2016. Randomized block design was applied in this experiment by using 5 treatments and 10 replications. The Results showed that the highest percentage of leaf blight disease occured in P3 (Inpari 30) by 22,36% and the lowest percentage was found in P5 (varieties IR 10) by 2,85%.

Keywords: *curvularia oryzae*, leaf blight, rice varieties

## INTRODUCTION

Rice (*Oryza sativa* L.) is main commodity crop in Indonesia, since most of population use rice as main food. Rice consumption increases as the population increases. National and local rice production need to be stabilized since the increase of indonesian population. As consequency, every effor to increase rice yield must take into account. One of main problems to increse rice production is attachment of plant pest and disesase. Plant disesase can develop if there are three mains factors occured such as: availability of vulnerable hosts, virulen patogen and better environmental condition. Plant disease which was cause by fungi contributes high impact to yield both national and international.

One of plant disease which causes leaves blight which attached by patogen was mainly found in aduld leaves, their attachments are not significantly cause real damage. The color were varied ie. Yellow, choclate, black and some of them have ring which was centralized (Semangun, 2007). Fungi of *Culvularia sp.* Especially species of *Culvularia oryzae* was firsly found different color of paddy seeds. Fungi of *Culvularia sp. Was* parasit or saprofit that were occured in paddy, wheat and shorgum (Sanchez Marquez *et al*., 2008; Busi *et al*., 2009; Butt *et al*., 2011).

Besides it attached leaves, this fungi is also attached the seeds which is about 66%. It occured in lemma or palea, as a result there will be change color in seeds which becames black color, degeneration of endosperm. It also infected the embyo which caused lost of seed viability almost 100%. Fungi of *Curvularia oryzae* which attached paddy eventhough it did not decrease productivity under normal condition, but it will decrese the rice cost. (Moody, 1995; Mew dan Gonzales, 1999; Rashid, 2001; Singh *et al*., 2001). The report of disease caused by *Curvularia oryzae* in Indonesia is still limited.

The seedlings were healty, free from pests and disesases and uniform. All the seedings were planted on media which were prepared by using two seedling on each pot with 3-4 cm depth. The objective of this research was to determine the reaction of five varieties of rice resistance to diseases caused by *Curvularia oryzae*.

## MATERIALS AND METHODS

### Maintenance

Maintenance activities were included replanting, weeding and watering. Replanting was conducted early in the morning or evening when it found damaged or dead plant. In addition, weeding was conducted if there were a lot of weeds occured. It was done naturally. Watering was conducted during vegetative stage and generative stage which depended on water condition in the media.

### Propagation of *Curvularia oryzae Isolates*

Before development of isolate propagation of *C. oryzae*, identification of attachement plant of *C. oryzae* which were found from Srimulyo village Air Saleh district of Banyuasin Sumatera Selatan province was done. Development of *C. oryzae* isolate was done in laboratory of Phytopathology Protection study program Faculty of Agriculture Sriwijaya University. Plants were growth in PDA (*Potato Dextrose Agar*) media. PDA media was put in petridish in laminar air flow cabinet. After PDA media was ready, *C. oryzae* was growth and incubated. After that the mycelium of fungi was purified (Crous *et al*., 2009; Kittimorakul *et al*., 2013; Lestari *et al*., 2014).

### Aplicasion of *Curvularia oryzae*

Isolate of *C. oryzae* which was aplicated by pasted on rice plant stems by using plastic isolation. The isolates were cut by using *bor gabus* after they were pasted (Dhingra and Sinclair, 1995).

**Observations:**

**The growth of *C. oryzae* on PDA Media**

Observation of growth of *C. oryzae* macroscopicly.

**Attachment Symptoms**

After the plant was infected with *C. oryzae* fungi, the attachment symptoms in the leaves were observed.

Percentage of attachment

Observation of disease attachment was carried out by calculate number of rice plants which were attached by calculate using the formula as followed:

$$P = n/N \times 100\%$$

Note:

P = Percentage of attachment

n = Number of plants being attached

N = Number of plants being observed

**Severity of Disease**

Observation was done at the firt time of infection and continued every four days. Observation was done 10 times. The severity of disesase was counted by disease score with catagory as followed:

0 : No symptom of disease

1 : less than 25% infected leaves

2 : 25% - 50% infected leaves

it was usually form group (Figure 1).

3 : 50% - 75% infected leaves

4 : more than 75% infected leaves

Score value which was collected would be converted to the severity of diseseases (KP) Based on formula as followed:

$$KP = \frac{\sum(ni \times vi)}{(N \times Z)} \times 100\%$$

Descriptions:

KP = Severity of diseases

ni = Number of infected leaves

vi = Score value

N = Number of Leaves per clump which were observed

Z = The highesr score value

**Data Analysis**

Data was analysed by ANOVA BNJ 5%.

## RESULT AND DISCUSSION

**The growth of *C. oryzae* on PDA media**

The result of identification of colony *C. oryzae* on PDA media was macroscopicly gray to black in color such as the color of cotton and in the middle part were white (Figure 1), after identification by using microskop, the conidia was chocolate and had 3-4 septa. Usually, in the middle part of septa was bent in shape. In other word


Figure 1. The growth of *Curvularia oryzae* on PDA media (a), conidia of *C. oryzae* with enlargment of 400x (b)

Michel *et al.* (2013) stated that chocolate conidia which consisted of 3– 4 septa were irregular shape which bended on the second or the third cell with the size of 16-26 um x 8-12 um. Susanto *et al.* (2013) stataed that the conidium with sized of 14-28 × 7-13 µm in dark chocolate color and usually has 3 septa. *Curvularia* sp. was blackist brown with colony surface looks like velvet. Conidiosphore of *Curvularia* sp. was usually single or in groups which had chocolate color or light brown. Conidiospore has lenght of 650 µm and wide of 5-9 µm. *Curvularia* sp. had three septa which bended on the second cell and the third cell which more wider and more chocolate with thin walled and size of (20-30) x (9-15) µm (Gandjar, 1999).

**Symptoms of Attachment**

Leaf blight disease in rice plant occured after 12 days after inoculation in each variety of P1 (variety of Ciherang), P3 (variety of Inpari 30), P4 (variety of Inpara 5), and P5 (variety of IR 10) while P2 (variety of Ciliwung) occured 15 days after inoculation. The dominan part of attachment occured in plant stems (Figure 2) and leaves (Figure 2). Part of attachment looked like yellow after that there would be necrosis which made all leaves dry and dead. The spotting produced conidium and spreaded in other part of the plant such as leaves and stems and other part of rice plant. Infection would occured after plant produced the panicles. Infected rice grains would changed to black chocolate in color. Infected rice grains would grow the miselium and formed heavy black coating (Figure 2). Infected rice grains would be easy to determinate by color. Yellow color was uninfected plant. This disesase could caused rice plant was not able to do fotosyntesis as a result the plant would slow in growth especially panicles formation. Severe attachment would cause dead plant.

Figure 2. Good paddy leaves (a), Paddy which was attaced by *Curvularia oryzae* (b), Paddy leaves attached by *C. oryzae* (c), Rice which was attched by *C. oryzae* (d)

**Percentage of Attachment**

Varians analysis showed that percentage of attachment of leaf blight disease caused by *C. oryzae* were significant different on varieties being used to percentage of attachment. BNJ results showed that the average of diseases showed the highest attachment occured in P3 (variety of Inpari 30) of 22,36% and the lowest attachment in P5 (variety of IR 10) which was 2,85%. This indicated that treatment of P3 (variety of Inpari 30) was dignificant different to all treatments included P5 (variety of IR 10), P4 (variety of Inpara 5), P2 (variety of Ciliwung), P1 (variety of Ciherang). While the treatments of P4 (variety of Inpara 5) was not signifiacnt different to P5 (variety of IR 10) and P2 (variety of Ciliwung) (Table 1).

Figure 3. showed that the percentage of attachments of *C. oryzae* on five rice varieties from fisrt observation to ten observation were significant. The highest percentage of attachment occured in P3 (variety of Inpari 30). While the lowest attacment occured in P5 (variety of IR 10). Rice leaves which were attached of leaf blight disease would be necrosis and dead. The development of this leaf blight disesease was influence by environmental condition. During study the temperature was about 26°C-32°C. Westcott (1971) stated that optimum temperature for development of fungi was 23,89$^{o}$C to 29,44$^{o}$C and there was no infection in temperature below 12,78$^{o}$C, and the fungi could save in the soil for three years.

Figure 4 indicated that intencity of disease attachemnt of leaf blight caused by *C. oryzae* at five varieties started from first to final observation showed significant different among varieties. These were caused by biotic and abiotic factors. The highest level of resistence level of plant would decrease disease attachment. During the study it found that intensity of disease attachment was increase in number of rice varieities. This indicated that the more infected leaves would more spread out to other part of rice plant. The sopre which blowed by the wind or carried by rain moved to other plant so all plant would attach by disease. Rain would carry all disease to other part of the plant.

Table 1. Persentage of leaf blight disease caused by *C. oryzae* (%)

| Treatments | Intencity of Leave Blight Disease (%) | BNJ 5% = 1,712 |
|---|---|---|
| Ciherang | 9,87 | c |
| Ciliwung | 5,32 | b |
| Inpari 30 | 22,36 | d |
| Inpara 5 | 4,01 | ab |
| IR 10 | 2,85 | A |

Note: Numbers which foloowed the same letter at the same colom indicated no significant different at 5%

Table 2. BNJ result of attachment intensity of leaf blight disease in paddy (%)

| Treatments | Average of Disease Intensity Leave Blight (%) | BNJ 5% = 1,940 |
|---|---|---|
| Ciherang | 29,33 | d |
| Ciliwung | 20,50 | c |
| Inpari 30 | 34,71 | e |
| Inpara 5 | 16,21 | ab |
| IR 10 | 14,42 | a |

Note: Numbers which foloowed the same letter at the same colom indicated no significant different at 5%

Table 3. Rice resistance to leaf blight disease caused by *C. oryzae* based on the symptom and percent of disease severity (Taufik *et al.,* 2012)

| Severity | Disease Symptom | Disease severity (%) |
|---|---|---|
| Resistant | low | 0-25 |
| Less Susceptible | medium | ≥ 25-50 |
| Susceptible | big | ≥ 50-100 |

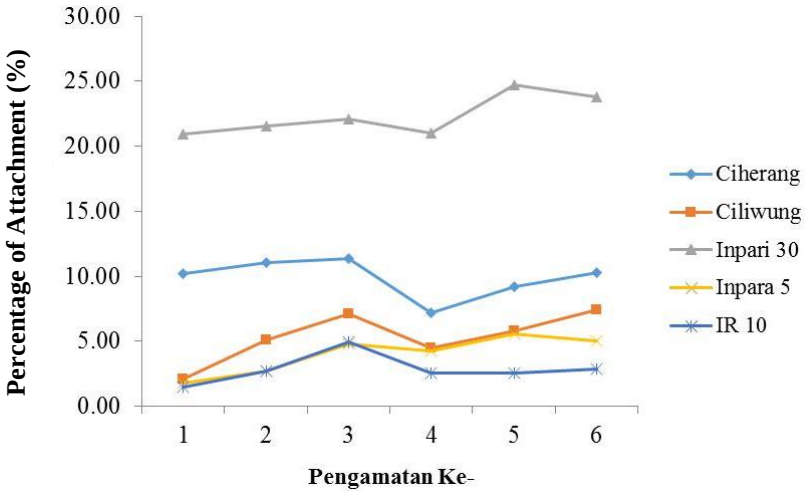


Figure 3. Percentage of leaf blight disease caused by *C. oryzae* in paddy

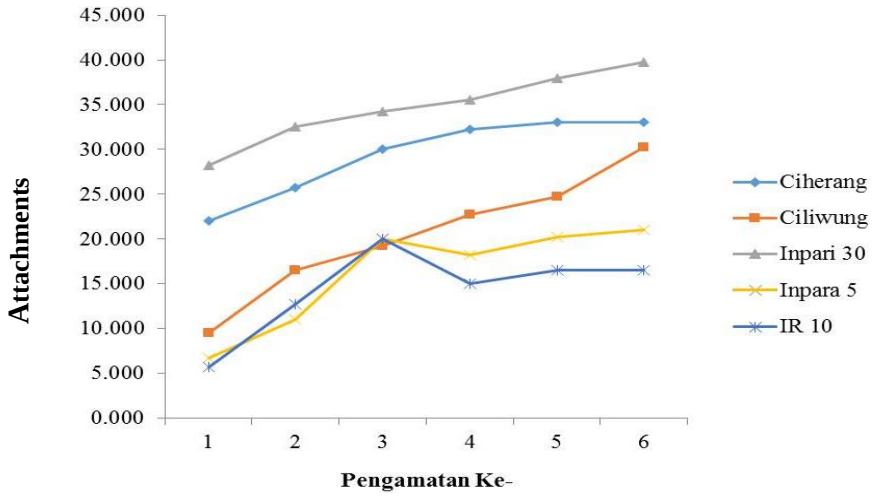


Figure 4. Intensity of leaf blight disease cause by *C. oryzae*

Table 4. Rice resistance to leaf blight disease caused by *C. oryzae*

| Treatment | Recistance Criteria | Disease Symptom | Severity of Disease (%) |
|---|---|---|---|
| Ciherang | Less Susceptible | medium | 29,33 |
| Ciliwung | Resistant | low | 20,50 |
| Inpari 30 | Less Susceptible | medium | 34,71 |
| Inpara 5 | Resistant | low | 16,21 |
| IR 10 | Resistant | low | 14,42 |

Susanto *et al.* (2013) stated that spot with size of 0,5 cm would form conidium and spread out to other part of the plant which formed new spot of leaf blight diseases. Leaf blight diseases attachment caused by *C. oryzae* were highest during observation in P3 (variety of Inpari 30) followed by P1 (variety of Ciherang), P2 (variety of Ciliwung), P4 (variety of Inpara 5) and variety P5 (variety of IR).

## Attachment Intensity

Anova analysis showed that attachment intensity of leaf blight caused by *C. oryzae* showed five rice varieties were significant different during observation. BNJ showed that intensity of attachment of leaf blight diseases during observation show the highest attachment occured in P3 (variety of 30) which was about 34,71% and the lowest attachment was in P5 (variety of IR 10)

which was about 14,42%. This showed that intensity of attachment of P3 (variety of Inpari 30) was significant different to other treatments which included P5 (variety of IR 10), P4 (variety of Inpara 5), P2 (variety of Ciliwung), P1 (variety of Ciherang). while P5 (variety of IR 10) was no significant different to P4 (variety of Inpara 5) (Table 2). Taufik *et al.* (2012) stated that to know the type of variety which was to evaluate the resistencae of rice varieties to leaf blight disease caused by *C. oryzae* was described in the attachment (Table 3). The result showed that intensity of leaf blight disease caused by *C. oryzae* during study would be group based on resistance tipe condition. (Table 4).

## CONCLUSION

Leave Blight disesease caused by *C. oryzae* was attached five of rice varieties being studied. The symptom occured 12 days after inoculation which were on P1 (variety of Ciherang), P3 (variety of Inpari 30), P4 (variety of Inpara 5), P5 (variety of IR 10), and 15 days after inoculation on P2 (variety of Ciliwung). Percentage of disease attachment from leaf blight disease caused by *C. oryzae* during evaluation indicated that low attachement occurred in P5 (variety of IR 10) i.e 2,14% while the highest attachment occured in P3 (variety of Inpari 30) which was 19,09%. Average result of attachment intensity and group of rice intensity to leaf blight disease were as followed: P2 (variety of Ciliwung), P4 (variety of Inpara 5), P5 (variety of IR 10) were resistent, while P1 (variety of Ciherang) and P3 (variety of Inpari 30) were susceptible to leaf blight disease caused by *C. oryzae*.

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