



Utilization of Piper Caninum Blume Leaf Extract Combined with Compost to Suppress Blast Disease and Increase the Growth of Local Rice Bali (Oryza Sativa) in Vivo



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Keywords

blas disease;
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Abstract

Blast disease is a disease that attacks rice plants. The control of this disease is still using a synthetic fungicide that is very harmful to the environment. The purpose of this research is to know the effect of the combination of *Piper caninum* leaf extract with compost to blast disease and rice plant growth. This research was conducted in vivo in the glasshouse of Senganan village, Penebel Tabanan. Bali. This study used a randomized block design. In this study, the extracts were combined with organic fertilizer which was made by biotechnology *stater starmic ok*. Fo = control (soil 100%). F1= (soil 90% + compost 10% + extract 0,5%). F2 = (soil 80% + compost 20% + extract 1%) F3 = (soil 70% + 30% + extract 1.5%). F4 = (soil 60% + compost 40% + 2% extract), do repeat 4 times. The results show that the formulas F3 effectively reduce the intensity of blast disease by inhibition of 79.09%, significantly affect the number of rice leaves, and the number of rice tillers increases but in treatment, F4 decreased. The height of the rice plant from F1 to F4 decreases, it is great because it reduces the fall when the rice is fruitfull. This is due to the disruption of growth hormone by the extract.

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1. Introduction

One of the important diseases in rice is blast disease, caused by the fungus *P. oryzae*. This fungus can infect rice plants at different growth stages (Yolanda, 2013). Blast disease is capable of lowering the enormous yield, causing production loss up to 50% in endemic areas. Blast disease poses two typical symptoms, i.e. leaf blast and panicle blast. Blast leaves are dark brown spots, rhombic with white patches center. Panicle blast is in the form of dark brown spots on the base of the neck that can cause neck panicles not to be able to sustain and get broken. Control of this disease is very difficult, but it is generally done by planting resistant varieties interchangeably to anticipate changes of blast race very fast (Utami, 2006).

Control of blast disease by farmers is still using synthetic fungicides if done less precisely; it can have a negative impact on the ecosystem of paddy crop. The use of botanical pesticides for controlling plant diseases is one alternative that is safe for environment control, but its use has not been widely practiced in Indonesia (Rahmawati & Corlina, 2009). Blast disease can be controlled by using microbial antagonists such as *Enterobacter agglomerans*, *Serratia ligulifaciens*, *Xanthomonas lumenescens*, and *Tricoderma harzianum* (Suprpta, 2012; Suprpta *et al.*, 2014; Gouramanis, 1997). Many types of plants in Indonesia contain active ingredients that can be used as a plantpesticide. In applying the plant pesticide, usually, one thing that needs to be done is the making of an effective formula, which is done on the greenhouse scale research and continued in the field (Suprpta, 2014). Blast disease can be controlled by using compost extract and leaf *Piper caninum* extracted by inhibitory 83,31% at a concentration 2,5% (Suwandi *et al.*, 2012; Suriani *et al.*, 2015).

But research using this extract has a weakness because too many extracts are used. Based on the above, there needs to be integrated blast disease control so that the extract used is not too much. Blast disease control by combining plant extract with compost organic fertilizer has not been done especially in Bali. This control will produce appropriate technology that is environmentally friendly. This method is one way that supports the government program that is developing organic farming. The purpose of this research is to explore the optimal potency of chili leaf extract combined with compost organic fertilizer as a biopesticide against blast disease in rice plant and to get the right formula from the extract which combined by compost in pressing blast disease on rice and spur rice plant growth.

2. Materials and Methods

P. caninum leaf samples were taken from the Senganan Penebel Tabanan area of Bali. Samples were taken at noon, the samples were cut into small pieces and air-dried for 5 days, then blended and soaked with methanol for 3 days, then filtered with gauze. Then evaporated using an evaporator. The crude extract is ready to use. This research was conducted at the UNUD biopesticide lab.

In this study the extracts were combined with organic fertilizer which was made by biotechnology *stater starmik ok*. Fo = control (soil 100%). F1= (soil 90% + compost 10% + extract 0,5%) .F2 = (soil 80% + compost 20% + extract 1%) F3 = (soil 70% + 30% + extract 1.5%). F4 = (soil 60% + compost 40% + 2% extract), do repeat 4 times. Green house experiments were carried out in the village of Senganan, Penebel District, Tabanan Regency, Bali Province using a randomized block design (RBD) consisting of 5 treatments: Each experimental unit consisted of 10 clumps rice plants . Implementation of the experiment include: seeding, planting media preparation, fertilizing, plant maintenance, inoculation of pathogenic fungi (*P. oryzae*), vegetable fungicide application.

The observed parameters covered intensity of blast disease, growth parameters (plant height, number of tillers, amount of leaf) Measurement of the intensity of the blast disease was done by the following formula (Sinaga, 2006). $IP = \frac{\sum_{i=0}^i (ni.vi)}{NV} \times 100\%$. Where IP = Intensity of disease (%), ni = Number of leaves with score i, vi = Value of each category of disease scores, N = number of leaves were observed, V = highest score.

3. Results and Discussions

3.1 Intensity of Disease

The results showed that the treatment of chili leaf extract combined with compost gave a significant effect ($P < 0.05$). Suppressing blast disease in red Bali rice plants after 8 MST (Table 1). 1.5% extract combined with 30% compost and 70% soil have the highest inhibitory (Figure 1). The higher concentration of organic extract and fertilizer then the intensity of blast disease decreased until the concentration of extract 1.5% and the concentration of organic fertilizer 30%. While the concentration of 2% extract combined with 40% organic fertilizer increases disease intensity, which shows more blotches (Figure 1). This possibility is due to the presence of toxic factors by the extract so that the resistance of rice plants weakens. The extract contains polar and non polar compounds, non-polar substances are destructive to wax coating on leaves if the concentration is excessive (Suprpta, 2014; Sukada *et al.*, 2019). In addition, it can also be caused by the content of substances contained allelopathy extract that can disrupt the growth of plants. Research Djazuli (2011), showed that the allelopathic substances on nilam leaves damage the soil. The concentration of organic fertilizer is too high in the soil also causes a nutrient imbalance in the soil, there the micro-nutrients are reduced so that can not be absorbed by plants. It is also shown by Padmanabha *et al.*, (2014), research that the addition of organic fertilizer is too high cause the decrease of yield and growth of rice plants.

Table 1
The intensity of blast disease and inhibiting activity after 9MST

No	Treatment	Intensity of blast disease (%)	Inhibiting activities (%)
1	F0	79,10a*	-
2	F1	50,14b	28,96
3	F2	30,07c	49,30
4	F3	9,01e	79,09
5	F4	15,14d	63,96

* Figures followed by the same letter do not show significant difference based on Duncan multiple range test at the level of 5%. (F0= control; F1=extract 5 %+ compost10%; F2= extract 1% + compost 20%; F3= extract 1,5% + compost 30%; F4= extract 2% + compost 40%).

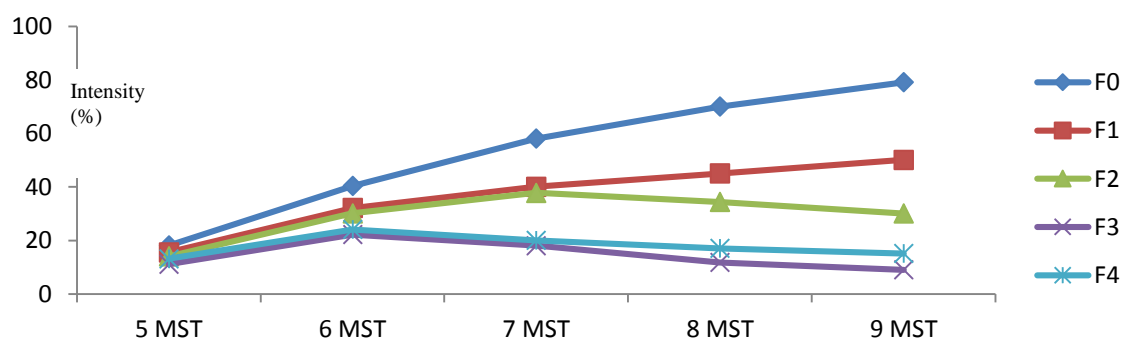


Figure 1. Intensity development of blast disease during spraying with extracts

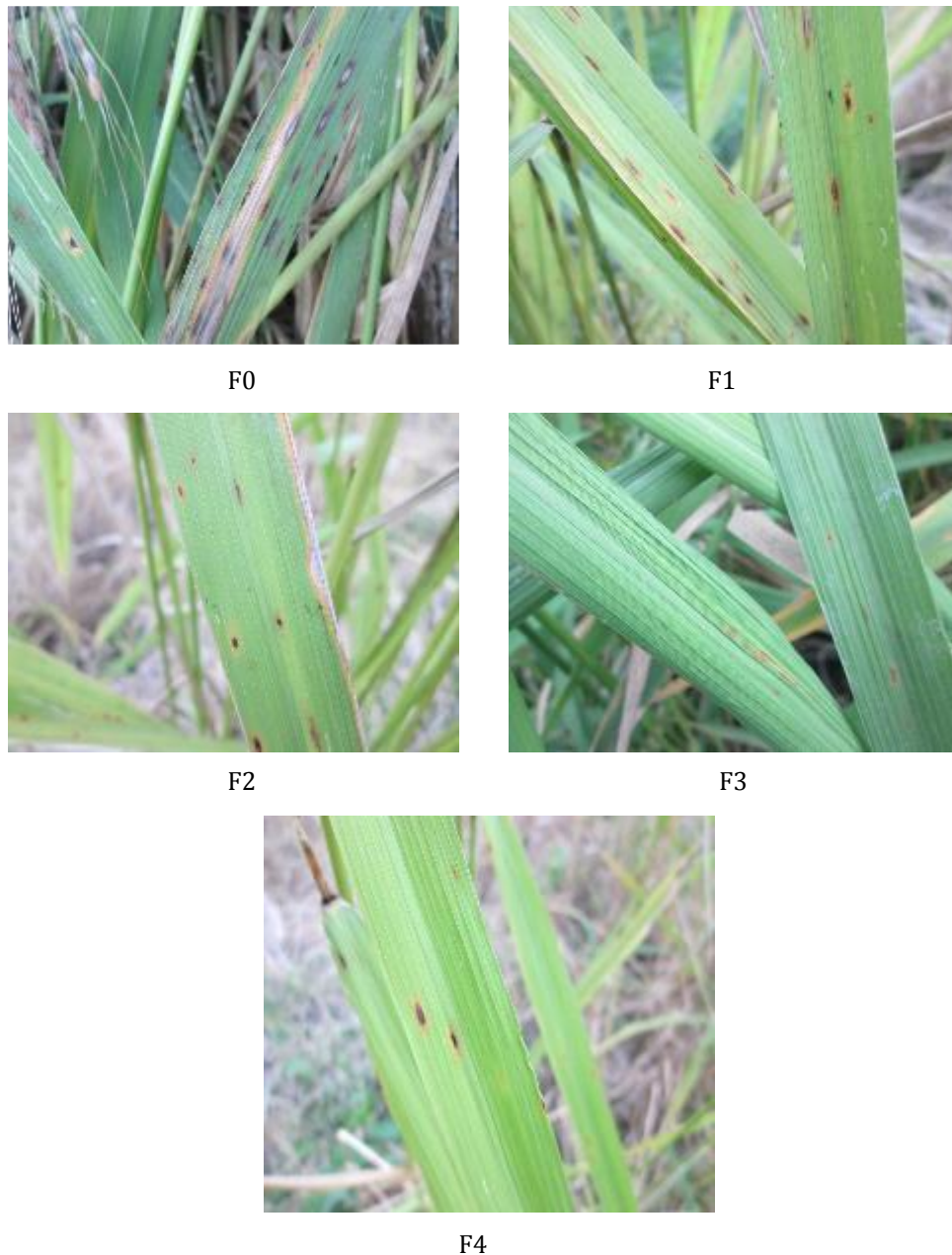


Figure 2. Spotting blast disease for each treatment

3.2 Growth of Rice Plant

The result of the research showed that the combination of chili leaf extract had a significant effect on the number of tillers (table 2) and the number of leaves (Table 3) ($P < 0,05$). The higher the treatment concentration, the number of tillers and the number of leaves increased until treatment F3: 1.5% extract concentration and 30% compost concentration and decreased at 2% extract concentration and 40% compost. This is caused by the higher the concentration of treatment, the intensity of blast disease decreases until the treatment of F3. While the treatment of F4 blast disease intensity decreased, this is probably due to decreased resistance of rice crops so that the intensity of blast disease increased. Suriani research (2015) chili leaf extract can suppress the highest blast disease intensity at 2.5% concentration and decrease its inhibitory

concentration at 3.5% in ciherang rice plant. Research [Irsan et al., \(2012\)](#), states that the compost extract significantly affects the growth of rice plants, increasing K. uptake.

According to [Suriani \(2016\)](#); [Suriani \(2018\)](#); and [Suriani et al., \(2019\)](#), treatment of compost extracts and organic fertilizer on rice plants can increase plant growth, because the extract contains growth hormone and compost contains nutrients needed by plants. The extract also suppresses blast disease because it contains phytochemicals [\(Salleh et al., 2011; 2015\)](#) If the extract is too high, it causes the waxy coating on the leaves to be damaged so that photosynthesis will be disrupted [\(Suprpta, 2014\)](#). The results of the study for the parameters of plant height showed that there was a decrease from F2 to F4. The higher the treatment concentration, the higher the crop begins the treatment of 1% extract and 20% compost, the height of the rice plant decreased (Table 3). This is probably due to disruption of growth hormone by the extract, and the absorption of nutrients is not balanced so that the rice crop becomes shorter. This is very advantageous in the field because with the reduced height of the plant, then reduces the fall when the rice is fruitfull. Research [Padmanabha et al., \(2014\)](#), that the addition of organic fertilizer is too high cause the decrease of rice plant growth.

Table 2
Effect of the extract on the average number of tillers of the rice plant
(age 60 days after planting)

Treatment (%)	Number of tillers
F0	8,10a*
F1	9,50ab
F2	11,15c
F3	13,69d
F4	10,46bc

Table 3
Effect of extract on the average number of the height of rice plant
(age 60 days after planting)

Treatment (%)	Plant Height (cm)
F0	187,77a*
F1	187,12a
F2	173,75c
F3	161,50d
F4	157,88b

Table 4
Effect of extract on the average number of leaf of rice plant
(age 60 days after planting)

Treatment (%)	Number of leaf
F0	28,39 a*
F1	30,55a
F2	35,12b
F3	40,02c
F4	31,30a

4. Conclusion

Leaf extract of forest chili in combination with compost significantly affects the growth and production of Bali red rice. The most appropriate formula to increase production is 1.5% extract concentration combined with 30% compost. 3. 1.5% extract concentration combined with 30% compost can increase the growth of Bali red rice.

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