

# EFFECTIVENESS TEST OF THE APPLICATION OF THE BIOPESTICIDE FOBIO IN CONTROL OF BROWN SPOT DISEASE (CURVULARIA SP.) ON RICE PLANTS (ORYZA SATIVA L.) IN RICE FIELDS IN PUTON VILLAGE, JOMBANG REGENCY, EAST JAVA

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## Abstract

Brown spot (*Curvularia* sp.) is a plant disease that poses a serious threat to cultivated crops such as rice. This study aims to test the effectiveness of the biopesticide FOBIO in suppressing the intensity of this disease and supporting rice plant growth. The study was conducted in Puton Village, Jombang, using a factorial randomized block design with a combination of FOBIO concentrations (0, 5, and 10 ml/L) and seed soaking times (10, 20, and 30 minutes). The results showed that FOBIO treatment, especially at a concentration of 10 ml/L for 30 minutes, effectively reduced disease intensity and increased plant growth rates. FOBIO has the potential to be an environmentally friendly alternative solution in an integrated pest control system that can be used in the long term.

**Keywords:** *FOBIO, Rice, Brown Spot, Biopesticides.*

## INTRODUCTION

Synthetic fungicides are widely used, but their indiscriminate use can lead to environmental pollution and the killing of non-target organisms. Therefore, it is necessary to seek environmentally friendly control alternatives, such as biological control. Fobio biopesticide is an environmentally friendly product designed for the biological control of plant diseases. The composition of Fobio biopesticide used in this study includes khalmir, phosphate-solubilizing bacteria, *Lactobacillus* sp., *Rhizobium* sp., amylolytic bacteria, proteolytic bacteria, photosynthetic bacteria, ammonifying bacteria, and nitrifying bacteria (Rahayu et al., 2021). This study was motivated by farmers' continued use of chemical fungicides to address plant diseases caused by fungi or plant pests, necessitating an approach to minimize the use of chemical-based treatments in plant care. Therefore, it is necessary to conduct experiments on natural and environmentally safe control methods, specifically by using a Fobio Biopesticide solution at a dosage of treatment groups P0 (without Fobio), P5 (5 ml/L), and P10 (10 ml) to minimize the negative impacts of fungicide use in Puton Village, Diwek Subdistrict, Jombang Regency, East Java.

## METHOD

The study was conducted in Jombang Regency, Diwek Subdistrict, Puton Village, East Java, on rice fields owned by farmers. The research period lasted approximately 4 months, from August to November 2023. This study used a Randomized Block Design (RBD) with a factorial layout, consisting of 3 treatments and 3 replications. Two factors were investigated in this study: the application dose of Fobio (P) at 0.5 and 10 ml/L, and the soaking duration (W) of 10, 20, and 30 minutes. P0W10 (0 ml/L / 10 min), P0W20 (0 ml/L / 20 min), P0W30 (0 ml/L / 30 min), P5W10 (5 ml/L / 10 min), P5W20 (5 ml/L / 20 min), P5W30 (5 ml/L / 30 min), P10W10 (10 ml/L / 10 min), P10W20 (10 ml/L / 20 min), P10W30 (10 ml/L / 30 min). Observation parameters included disease severity (%), plant height (cm), number of leaves, and number of tillers (stems). Data analysis used the F-test from the ANOVA table; if a treatment had a significant or highly significant effect, it was followed by an Honest Significant Difference (HSD) test at the 5% level.

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**RESULTS AND DISCUSSION**

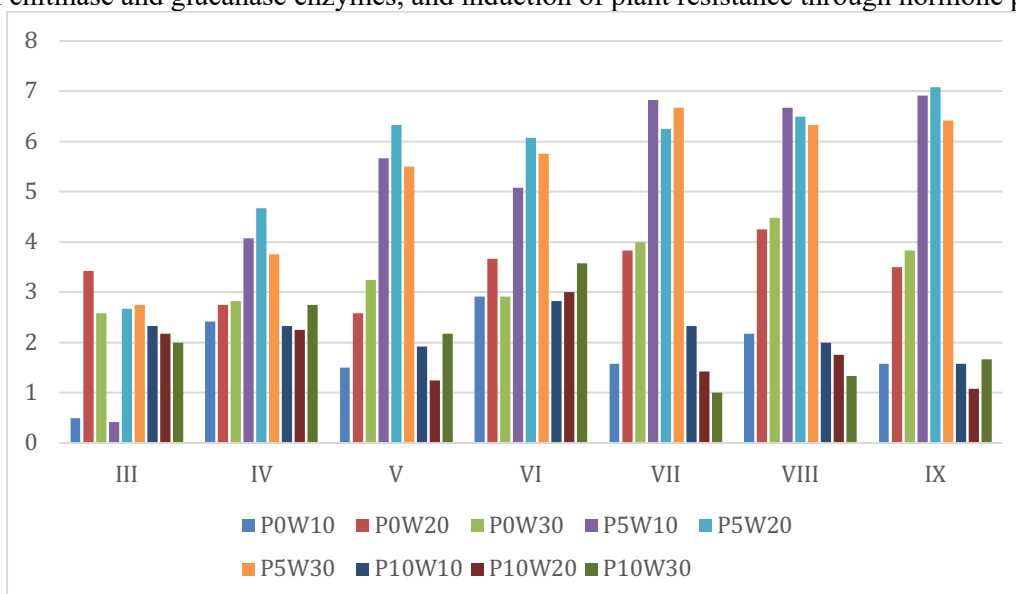
**Disease Infestation Intensity**

The F-table results from the analysis of variance indicate that the use of FOBIO significantly reduces disease infestation intensity (Table 1). Based on the results in Table 1, the use of FOBIO in the P10 treatments (P10W10, P10W20, P10W30) showed the lowest disease incidence, in contrast to the other treatments, particularly treatments P5 (P5W10, P5W20, P5W30) and P0 (P0W10, P0W20, P0W30).

**Table 1.** Intensity of *Culvularia* sp. Brown Spot Disease Infection in Rice Plants

Treatment	III	IV	V	VI	VII	VIII	IX
P0W10	0.50 a	2.42 a	1.50 a	2.92 a	1.58 a	2.17 a	1.58 a
P0W20	3.42 b	2.75 ab	2.58 ab	3.67 ab	3.83 b	4.25 b	3.50 b
P0W30	2.58 b	2.83 ab	3.25 b	2.92 a	4.00 b	4.58 b	3.83 b
P5W10	0.42 a	4.08 bc	5.67 c	5.08 bc	6.83 c	6.67 c	6.92 c
P5W20	2.67 b	4.67 c	6.33 c	6.08 c	6.25 c	6.50 c	7.08 c
P5W30	2.75 b	3.75 abc	5.50 c	5.75 c	6.67 c	6.33 c	6.42 c
P10W10	2.33 b	2.33 a	1.92 ab	2.83 a	2.33 ab	2.00 a	1.58 a
P10W20	2.17 b	2.25 a	1.25 a	3.00 a	1.42 a	1.75 a	1.08 a
P10W30	2.00 b	2.75 ab	2.17 ab	3.58 ab	1.00 a	1.33 a	1.67 a
BNJ 5%	1.65	1.50	1.65	1.59	2.12	1.42	1.28

The increased disease intensity in the P5 and P0 treatments indicates that they are not yet sufficiently effective in enhancing plant resistance to the pathogen. Conversely, the P10 treatment—involving the addition of a 10 ml/L dose of fobio solution—suppressed disease development, particularly when combined with longer seed-soaking periods (W20–W30). Seeds with optimal soaking durations can enhance plant vigor, thereby reducing susceptibility to disease. cause the microorganisms contained in the suspension originate from the rhizosphere of coconut, sugarcane, siwalan, prop roots, and mangrove roots, including phosphate-solubilizing bacteria, *Lactobacillus* sp., *Rhizobium* sp., amylolytic bacteria, proteolytic bacteria, photosynthetic bacteria, ammonifying bacteria, and nitrifying bacteria, which are capable of enhancing plant resistance to pathogen attacks (Wiyatiningsih et al., 2021). Another component, yeast, can also control diseases. It is agreed that the mechanisms by Hutagalung et al. (2023) which yeast controls plant diseases include competition, attachment of yeast cells to fungal hyphae, production of chitinase and glucanase enzymes, and induction of plant resistance through hormone production.



**Figure 1.** Average Results of Disease Intensity

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**Plant Height**

The F-table results from the analysis of variance indicate that the use of FOBIO significantly reduces disease attack intensity, as shown in Table 4.2. Based on the results in the table, there were significant differences in weeks 1, 2, 5, 6, 7, 8, and 9, and no significant differences in weeks 3 and 4.

**Table 2. Rice Plant Height (cm)**

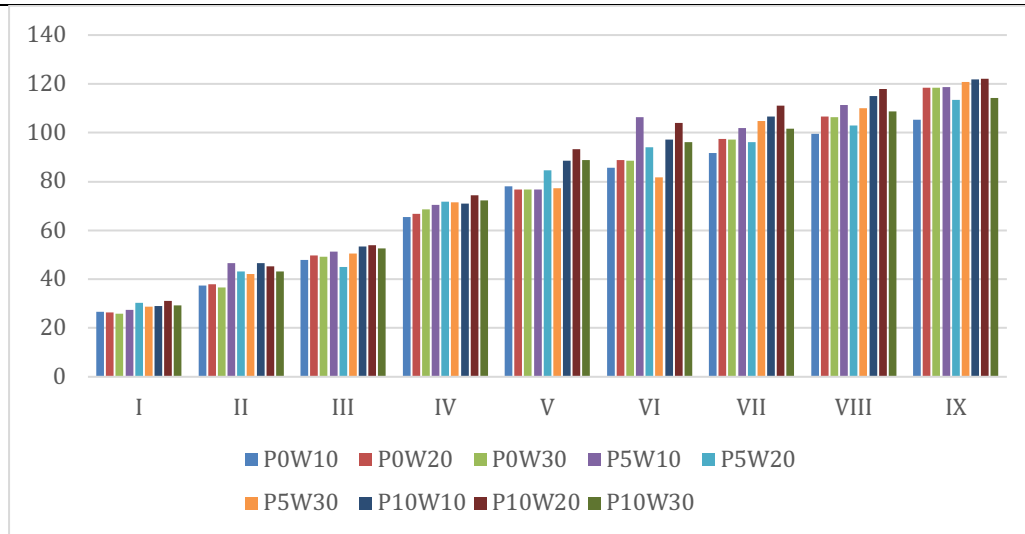
Treatment	I	II	III	IV	V	VI	VII	VIII	IX
P0W10	26.50 ab	37.44 ab	48.00 a	65.37 a	78.13 a	85.74 ab	91.79 a	99.47 a	105.25 a
P0W20	26.42 a	37.83 ab	49.67 a	66.67 a	76.75 a	88.83 ab	97.42 abc	106.55 abc	118.33 ab
P0W30	25.75 a	36.58 a	49.25 a	68.58 a	76.83 a	88.50 ab	97.08 abc	106.25 abc	118.33 b
P5W10	27.52 abc	46.67 c	51.35 a	70.49 a	76.68 a	106.46 c	101.95 bcd	111.30 abc	118.73 b
P5W20	30.25 de	43.25 ab	44.85 a	71.68 a	84.66 ab	94.04 abc	96.18 ab	102.98 ab	113.53 ab
P5W30	28.64 bcd	42.17 c	50.65 a	71.44 a	77.17 a	81.64 a	104.77 cde	110.13 abc	120.88 b
P10W10	29.08 cde	46.67 c	53.33 a	70.93 a	88.63 ab	97.08 bc	106.55 de	114.92 bc	121.83 b
P10W20	31.12 e	45.13 c	54.00 a	74.38 a	93.20 b	104.04 c	110.95 e	118.00 c	122.17 b
P10W30	29.35 cde	43.21 c	52.71 a	72.37 a	88.69 ab	96.16 abc	101.57 bcd	108.67 abc	114.17 ab
BNJ 5%	2.18	4.89	tn	tn	12.05	14.76	8.36	14.29	10.12

Rice plants sprayed with the biopesticide Fobio are taller than average. Rice plants using IR 64 seeds typically have an average height of 110–120 cm, whereas spraying with the biopesticide Fobio increases plant height to 110–140 cm. This aligns with the benefits of the Fobio biopesticide, which contains microorganisms that act as biological agents, decomposers, and PGPR (*Plant Growth-Promoting Rhizobacteria*), thereby enhancing crop production and yield (Fitriana et al., 2020).

The increased plant growth in the treated plants, which received organic fertilizer and Fobio, is influenced by the presence of PGPR—a group of beneficial bacteria that live in the plant’s root zone and help the plant grow by increasing nutrient availability and producing compounds that stimulate plant growth. Among the elements contained in PGPR that aid in accelerating growth are nitrogen (N), phosphorus (P), and potassium (K). This aligns with the finding of Putra et al. (2022) that soil nitrogen (N) is crucial and closely linked to plant growth; therefore, applying nitrogen-containing fertilizers is essential to support growth and boost productivity.

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**Figure 2:** Average Plant Height

**Number of Leaves**

The F-table results from the analysis of variance indicate that the use of FOBIO significantly reduces disease severity (Table 3). Based on the results in Table 3, from the seventh to the ninth week, the consistent dominance of treatment P10 was very clear; treatments P10W10, P10W20, and P10W30 were always in the highest notation group (notation (b)), indicating a significant difference from the other treatment groups. Meanwhile, treatments P0 and P5 tended to fall into the (a) category, indicating lower leaf growth.

**Table 3.** Number of Rice Plant Leaves (Leaves)

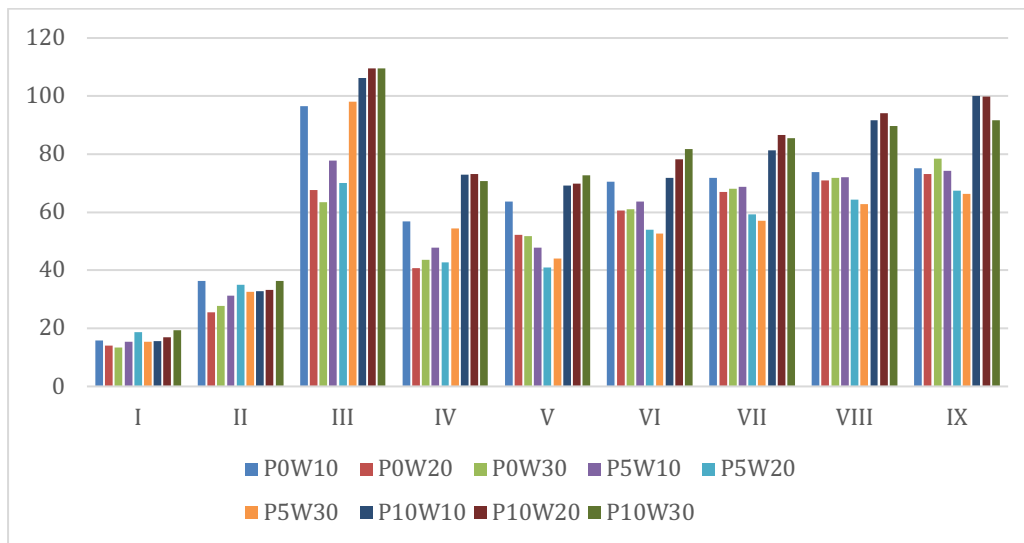
Treatment	I	II	III	IV	V	VI	VII	VIII	IX
P0W10	15.83 abc	36.25 c	96.46 b	56.92 abc	63.75 cde	70.58 bcd	71.92 abc	73.92 a	75.08 a
P0W20	14.08 ab	25.58 a	67.69 a	40.83 a	52.25 abcd	60.58 abc	67.00 ab	71.00 a	73.08 a
P0W30	13.50 a	27.67 ab	63.38 a	43.58 a	51.75 abc	61.08 abc	68.17 ab	71.75 a	74.50 a
P5W10	15.42 abc	31.33 abc	77.69 a	47.83 a	47.75 ab	63.58 abc	68.75 ab	72.00 a	74.33 a
P5W20	18.75 bc	34.92 bc	70.15 a	42.75 a	40.92 a	54.00 ab	59.33 a	64.33 a	67.50 a
P5W30	15.42 abc	32.67 abc	98.00 b	54.50 ab	44.00 a	52.75 a	57.00 a	62.75 a	66.25 a
P10W10	15.50 abc	32.83 abc	106.31 b	72.83 c	69.08 cde	71.83 cd	81.42 bc	91.58 b	100.00 b
P10W20	16.92 abc	33.25 abc	109.54 b	73.25 c	69.92 de	78.33 cd	86.67 c	94.17 b	99.775 b
P10W30	19.25 c	36.42 c	109.54 b	70.75 bc	72.75 e	81.83 d	85.58 c	89.75 b	91.67 b
BNJ 5%	4.75	8.16	15.71	16.73	18.14	17.76	16.54	15.13 b	14.35

This aligns with previous research on red onion plants, which found that applying Fobio increased plant height and the number of red onion shoots (Hasyidan et al., 2021), because its PGPR content stimulates the growth of new shoots in rice plants. Similar research was also conducted by (Farisa et al., 2023), who stated that Fobio is able to suppress diseases in the plant roots and enhance plant growth, thereby making the rice plants healthy and capable of forming tillers.

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This aligns with the benefits of the bio-pesticide Fobio, which contains microorganisms that act as biological agents, decomposers, and PGPR (*Plant Growth-Promoting Rhizobacteria*), thereby enhancing crop production and yield (Fitriana et al., 2020).



**Figure 3:** Average Number of Leaves

**Number of Tillers**

The increase in tiller number is an important indicator of rice plant vigor during the vegetative phase. The F-table results from the analysis of variance indicate that the use of FOBIO significantly reduces the intensity of disease attacks, as shown in Table 4.

**Table 4.** Number of Rice Tillers (Per Clump)

Treatment	III	IV	V	VI	VII	VIII	IX
P0W10	23.17 e	19.92 bc	20.42 b	20.00 b	18.17 abc	19.00 abc	18.92 ab
P0W20	21.83 de	23.83 c	24.42 b	25.08 c	23.75 d	22.25 bc	21.33 b
P0W30	21.33 cde	24.83 c	24.17 b	25.00 c	23.83 d	22.75 c	21.50 b
P5W10	11.50 ab	12.75 a	14.67 a	15.57 a	16.42 ab	18.08 a	18.08 ab
P5W20	10.33 a	11.67 a	13.00 a	14.00 a	15.00 a	16.83 a	16.83 a
P5W30	13.58 ab	14.83 ab	14.58 a	15.50 a	16.67 ab	18.00 a	18.00 ab
P10W10	14.42 ab	21.00 c	20.42 b	20.75 bc	18.83 abc	16.42 a	14.92 a
P10W20	16.42 bcd	23.75 c	20.42 b	20.25 b	20.00 bcd	18.75 abc	17.42 ab
P10W30	15.92 abc	2.67 c	22.08 b	22.92 bc	21.42 cd	20.33 abc	17.58 ab
BNJ 5%	4.62	5.38	4.72	4.41	4.49	4.22	4.26

Based on the results in Table 3, the P5 treatment consistently produced a significantly higher number of tillers than the other treatment groups. In the 9th week, the P5W20 treatment produced the highest number of tillers (7.08), followed by P5W10 and P5W30. This differed significantly from the P0 and P10 treatment groups. Meanwhile, the treatment with a solution dose of 10 ml/L (P10) consistently produced a low number of tillers (< 2).

Similar results were also reported in studies indicating that excessive application can reduce tiller number and plant height by increasing root respiration. Meanwhile, longer seed soaking times (W20–W30) are thought to improve seed viability and initial plant growth vigor, thereby supporting the formation of more tillers early in the growth phase.

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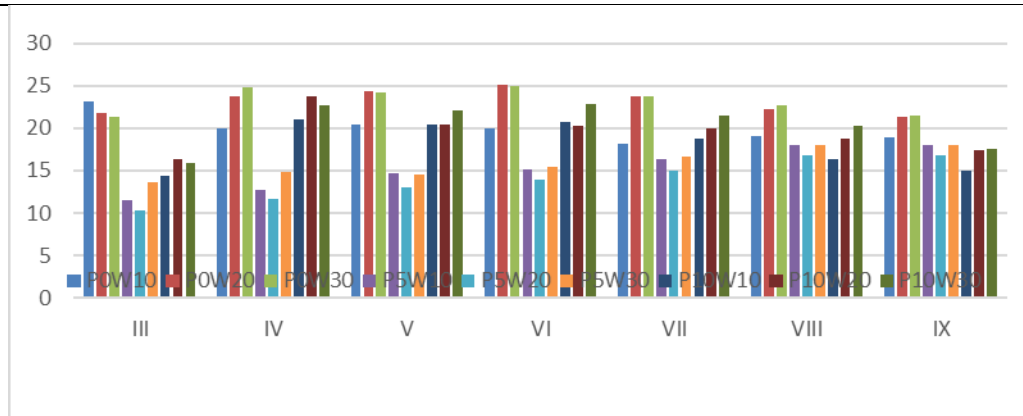


Figure 4: Average Number of Tillers

## CONCLUSION

The application of FOBIO significantly reduced disease severity, as evidenced by treatment P10, which provided the greatest resistance to disease compared to treatments P5 and P0. Additionally, the FOBIO application significantly affected plant height, leaf number, and tiller number in rice plants.

## REFERENCES

- Farisa, F., Wiyatiningsih, S., & Megasari, D. (2023). Pengaruh Biopestisida Fobio dan Agens Hayati *Trichoderma* sp. terhadap Penyakit Layu *Fusarium* pada Bawang Merah. *Agriprima: Journal of Applied Agricultural Sciences*, 7(1), 50–57.
- Fitriana, I., Suryaminarsih, P., Mindari, W., & Wiyatiningsih, S. (2020). STUDI PERTUMBUHAN MULTIANTAGONIS *TRICHODERMA* SP. DAN *STREPTOMYCES* SP. DALAM SUSPENSII AKAR, HUMAT CAIR DAN EKSTRAK KENTANG GULA. *BERKALA ILMIAH AGROTEKNOLOGI - PLUMULA*, 7, 25–32. <https://doi.org/10.33005/plumula.v7i1.19>
- Hasyidan, G., Wiyatiningsih, S., & Suryaminarsih, P. (2021). Aplikasi biopestisida fobio dan *Streptomyces* sp. untuk mengendalikan penyakit moler pada tanaman bawang merah (Application of biopesticide fobio and *Streptomyces* sp. to control moler disease in onion plants). *Jurnal Agrohitia*, 6(2), 168–173.
- Hutagalung, N. A., Rasyidah, R., & Mayasari, U. (2023). Penapisan Bakteri Kitinolitik Dari Limbah Cangkang Rajungan (*Portunus pelagicus*) Sebagai Daya Hambat Terhadap Jamur Patogen *Sclerotium rolsfii*. *BEST Journal (Biology Education, Sains and Technology)*, 6(2), 829–835.
- Putra, D. A., Adam, D. H., Mustamu, N. E., & Harahap, F. S. (2022). Analisis status nitrogen tanah dalam kaitannya dengan serapan N oleh tanaman padi sawah di Kelurahan Ujung Bandar, Kecamatan Rantau Selatan, Kabupaten Labuhan Batu. *Jurnal Pertanian Agros*, 24(2), 387–391.
- Rahayu, D. R., Wiyatiningsih, S., & Suryaminarsih, P. (2021). Pengaruh Perendaman Bibit Bawang Merah Dengan Formulasi Biopestisida Untuk Mengendalikan Penyakit Moler (*Fusarium oxysporum*). *Agritrop: Jurnal Ilmu-Ilmu Pertanian (Journal of Agricultural Science)*, 19(2), 121–129.
- Wiyatiningsih, S., Suryaminarsih, P., & Hasyidan, G. (2021). Utilization of Fobio and *Streptomyces* sp. in Improving the Growth of Shallots. *Nusantara Science and Technology Proceedings*, 39–45.