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Effect Of Liquid Organic Fertilizer Doses And Rhizoctonia Binuclate Fungi On The Growth Of Vanilly Seedlings (Vanilla planifolia Andrews)

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Abstract

Vanilla (Vanilla planifolia Andrews) is a plantation crop that has high economic value, especially because its seeds are used as the main raw material in the food and beverage industry. *Rhizoctonia* binucleate fungus and liquid organic fertilizer can prevent stem rot disease in vanilla plants by competing directly with disease-causing pathogens. The aim of this research was to determine the effect of administering *Rhizoctonia* binucleate fungus and liquid organic fertilizer on the development of stem rot disease in vanilla plants (Vanilla planifolia Andrews). The treatments carried out were designed in a factorial experiment in a complete Randomized Block Design. Liquid organic fertilizer doses: 0, 5, 10, 15, 20, and 25 ml/plant, 5g *Rhizoctonia* binucleate (BNR) dose, without BNR and BNR treatment, giving *Fusarium oxysporum* f. sp. vanillae 5 grams and without giving *Fusarium oxysporum* f. sp. vanillae. The results showed that administration of *Rhizoctonia* binucleate and *Fusarium oxysporum* f. sp. vanillae (R1), *Fusarium oxysporum* f. sp. vanillae (R2) and liquid organic fertilizer (P) have a significant effect on the growth of vanilla seedlings, namely on the number of leaves parameter, while on the parameters of plant height, leaf area, fresh plant stover weight, plant dry stover weight, fresh root weight and root dry fruit, these interactions do not have a significant effect.

Keywords: *Fusarium*, *Rhizoctonia* binuleate, liquid organic fertilizer, *oxysporum* f. sp,

Introduction

Vanilla (Vanilla planifolia Andrews) is a plantation crop that has high economic value, especially because its seeds are used as the main raw material in the food and beverage industry. The quality of vanilla from Indonesia is highly appreciated by consumers, both at home and abroad, and is recognized as having superior quality standards than other types of vanilla (Nurawan, 1995). However, vanilla production is often faced with various challenges, one of which is the attack of stem rot disease caused by the Phytophthora fungus. This disease can cause a decrease in vanilla yield and quality, which has a negative impact on the sustainability of production (Haryuni et al., 2018)

By understanding the interaction between the dose of liquid organic fertilizer and the presence of the Rhizoctonia binucleate fungus, this research aims to determine the effect of the dose of liquid organic fertilizer and the application of the Rhizoctonia

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binucleate fungus on the development of stem rot disease on vanilla plants. Apart from that, it is also hoped that the results of this research can become a scientific basis for the development of agricultural technology that is more environmentally friendly and increases vanilla productivity in a sustainable manner.

Method

This research was carried out from February to July at the Green House, Faculty of Agriculture, Tunas Pembangunan University, Surakarta, using Andosol type soil obtained from Rejosari, Jambu sub-district, Semarang district and an altitude of 105 meters above sea level.

Research Materials and ToolsTools: hoe, knife, scissors, scales, bucket, ruler, polybag, raffia rope, labels, and other tools needed for research.

Ingredients: vanilla plants, Rhizoctonia binucleate fungus, liquid organic fertilizer, soil, etc.

The first factor is Rhizoctonia binucleate and Fusarium oxysporum f. sp. Vanillae (R1) and Fusarium oxysporum f. sp. Vanillae (R2) consists of 3 levels:

R0: without Rhizoctonia binucleate and Fusarium oxysporum f. sp. Vanillae

R1: administration of Rhizoctonia binucleat and Fusarium oxysporum f. sp. Vanillae 5 grams

R2: administration of Fusarium oxysporum f. sp. Vanillae 5 grams

The second factor, namely Liquid Organic Fertilizer (P), consists of 6 levels:

P0: application of 0 ml liquid organic fertilizer

P1: application of 5 ml liquid organic fertilizer

P2: application of 10 ml liquid organic fertilizer

P3: application of 15 ml liquid organic fertilizer

P4: application of 20 ml liquid organic fertilizer

P5: application of 25 ml liquid organic fertilizer

From these two treatments, 18 treatment combinations were obtained, as follows R0P0, R0P1, R0P2, R0P3, R0P4, R0P5, R1P0, R1P1, R1P2, R1P3, R1P4, R1P5, R2P0, R2P1, R2P2, R2P3, R2P4, R2P5

Research Parameters

The research parameters observed were growth components and laboratory test result parameters :

1. Plant height (cm)
2. Number of leaves (strands)
3. Leaf area (mm)
4. Weight of fresh plant stover (g)
5. Weight of dry plant stover (g)
6. Fresh weight of roots (g)
7. Root dry weight (g)
8. Microscopic observation

Data analysis

To determine the effect of the Rhizoctonia binucleate fungus and liquid organic fertilizer on the growth and yield of vanilla plants, analysis of the observation data was carried out using ANOVA (Analysis of Variance). If there is a real effect, further testing is carried out with the DMRT test (Duncan Multiple Range Test) at a confidence level of 5%.

Result And Discussion

Effect of Giving *Rhizoctonia* Binucleate Fungus, *Fusarium oxysporum* f. sp. Vanillae and Liquid Organic Fertilizer for Vanilla Seeds (Vanilla planifolia Andrews)

Table 1 Duncan's Multiple Distance Test - Average Effect of Giving *Rhizoctonia* binucleat and *Fusarium oxysporum* f. sp. Vanillae (R1) and *Fusarium oxysporum* f. sp. Vanillae (R2) Against Vanilla Seeds (Vanilla planifolia Andrews)

Treatment	Plant Height (cm)	Number of Leaves (Strands)	Leaf Area (cm^2)	Weight of Fresh Plant Stove (g)	Plant Dry Stove Weight (g)	Root Fresh Weight (g)	Root Dry Weight (g)
Rhizoctonia binukleat (R)							
R_0	39,56	12,44 b	230,56	30,84 b	2,71 b	2,20 b	0,41 b
R_1	50,56	16,06 a	238,31	39,54 a	4,86 a	2,75 a	0,82 a
R_2	30,78	10,67 b	225,17	29,70 b	1,90 b	1,58 b	0,14 b

Note: In each treatment, numbers followed by the same letter are not significantly different in Duncan's Multiple Range Test at the 5% level.

Based on Table 1, from the treatment of *Rhizoctonia* binucleate fungi and *Fusarium oxysporum* f. sp. Vanillae (R1) and *Fusarium oxysporum* f. sp. Vanillae (R2) in vanilla seedlings was significantly different in the parameters of number of leaves, plant fresh stover weight, plant dry stover weight, fresh root weight, root dry weight, and not significantly different in the parameters of plant height and leaf area.

Table 2. Duncan's Multiple Distance Test Average Effect of Liquid Organic Fertilizer (P) on Vanilla Seedlings (Vanilla planifolia Andrews)

Treatment	Plant Height (cm)	Number of Leaves (Strands)	Leaf Area (cm^2)	Weight of Fresh Plant Stove (g)	Plant Dry Stove Weight (g)	Root Fresh Weight (g)	Root Dry Weight (g)
Liquid organic fertilizer (P)							
P_0	30,67 b	12,56	231,41	28,06	2,45	1,63 b	0,41
P_1	51,11 a	15,00	244,20	42,75	3,51	3,26 a	0,63
P_2	40,56 ab	13,00	219,00	33,95	3,59	2,54 ab	0,70
P_3	37,67 ab	12,00	232,03	31,29	3,06	1,78 ab	0,27
P_4	44,67 ab	14,33	232,63	34,39	3,65	2,24 ab	0,45
P_5	37,11 ab	11,44	228,81	29,72	2,69	1,61 b	0,28

Note: In each treatment, numbers followed by the same letter are not significantly different in Duncan's Multiple Range Test at the 5% level.

Based on Table 1, from the treatment of *Rhizoctonia* binucleate fungi and *Fusarium oxysporum* f. sp. Vanillae (R1) and *Fusarium oxysporum* f. sp. Vanillae (R2) in vanilla seedlings was significantly different in the parameters of number of leaves, plant fresh stover weight, plant dry stover weight, fresh root weight, root dry weight, and not significantly different in the parameters of plant height and leaf area.

Table 3. Duncan's Multiple Distance Test Average Combination of Administration of *Rhizoctonia* binucleate fungus, *Fusarium oxysporum* f. sp. Vanillae (R1) and *Fusarium oxysporum* f. sp. Vanillae (R2) and liquid organic fertilizer (P) for vanilla seeds (Vanilla planifolia Andrews)

Treatment	Plant Height (cm)	Number of Leaves (Strands)	Leaf Area (cm^2)	Weight of Fresh Plant Stove (g)	Plant Dry Stove Weight (g)	Root Fresh Weight (g)	Root Dry Weight (g)
A combination of Rhizoctonia binucleat (R1) and the fungus Fusarium oxysporum f. sp. Vanillae (R2) and Liquid organic fertilizer (P)							
R_0P_0	24,67	11,00 cdefg	221,65	25,72	2,11	1,80	0,16
R_0P_1	55,33	16,67 abc	243,11	37,50	3,60	3,90	0,70
R_0P_2	30,33	8,67 efg	224,05	24,62	1,78	2,24	0,47
R_0P_3	33,00	9,67 defg	226,28	27,52	2,32	1,61	0,29
R_0P_4	42,00	14,67 abcde	225,90	31,86	2,88	1,62	0,31
R_0P_5	52,00	14,00 abcde	242,39	37,80	3,58	2,04	0,50
R_1P_0	49,33	19,67 a	247,99	38,39	4,47	1,98	0,73
R_1P_1	50,33	15,00 abcd	238,44	38,92	4,01	2,38	0,93
R_1P_2	58,33	18,00 ab	241,16	49,65	6,85	3,81	1,52
R_1P_3	46,00	13,33 bcdef	232,72	33,01	4,37	2,43	0,43
R_1P_4	60,67	17,33 ab	244,26	47,09	5,97	3,76	1,00
R_1P_5	38,67	13,00 bcdefg	225,27	30,17	3,50	2,11	0,32
R_2P_0	18,00	7,00 g	224,58	20,06	0,77	1,10	0,33
R_2P_1	47,67	13,33 bcdef	251,04	51,82	2,91	3,49	0,24
R_2P_2	33,00	12,33 bcdefg	191,80	27,58	2,14	1,58	0,13
R_2P_3	34,00	13,00 bcdefg	237,08	33,35	2,48	1,29	0,09
R_2P_4	31,33	11,00 cdefg	227,72	24,21	2,11	1,33	0,05
R_2P_5	20,67	7,33 fg	218,78	21,20	1,00	0,68	0,01

Note: In each treatment, numbers followed by the same letter are not significantly different in Duncan's Multiple Range Test at the 5% level.

From Table 3, it can be seen that the combination of giving *Rhizoctonia* binucleat fungus and *Fusarium oxysporum* f. sp. Vanillae (R1), *Fusarium oxysporum* f. sp. Vanillae (R2) and liquid organic fertilizer (P) have a significant effect on the growth of vanilla seedlings, namely on the number of leaves parameter, while on the parameters of plant height, leaf area, fresh plant stover weight, plant dry stover weight, fresh root weight and root dry fruit, these interactions do not have a significant effect.

Table 4. Average results of interactions between the fungus *Rhizoctonia* binucleat and *Fusarium oxysporum* f. sp. Vanillae (R1), *Fusarium oxysporum* f. sp. Vanillae (R2) and liquid organic fertilizer (P) for vanilla seeds (Vanilla planifolia Andrews)

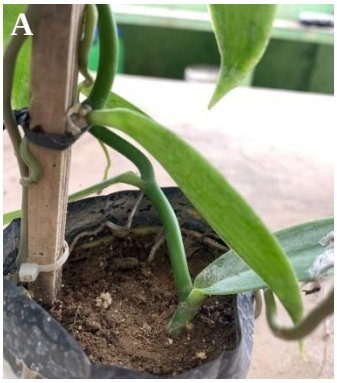
No.	Parameter	R	P	Interaksi (R x P)	Nilai	
					Tertinggi	Terendah
1	Plant Height (cm)	ns	**	ns	60,67 (R_1P_4)	18,00 (R_2P_0)
2	Number of Leaves (Strands)	**	ns	**	16,67 (R_0P_1)	7,00 (R_2P_0)
3	Leaf Area (cm^2)	ns	ns	ns	251,04 (R_2P_1)	191,80 (R_2P_2)
4	Weight of Fresh Plant Stove (g)	*	ns	ns	51,82 (R_2P_1)	21,20 (R_2P_5)
5	Plant Dry Stove Weight (g)	**	ns	ns	6,85 (R_1P_2)	0,77 (R_2P_0)
6	Root Fresh Weight (g)	*	*	ns	3,90 (R_0P_1)	0,68 (R_2P_5)
7	Root Dry Weight (g)	**	ns	ns	1,52 (R_1P_2)	0,01 (R_2P_5)

Note: (ns) = not significantly different
(*) = significantly different
(**) = very significantly different

From the results of the research that has been carried out, it can be seen in Table 3 and Table 4 that the interaction between the fungus *Rhizoctonia* binucleat and *Fusarium oxysporum* f. sp. vanillae (R1), *Fusarium oxysporum* f. sp. vanillae (R2) and liquid organic fertilizer (P) are very significantly different in the parameters of plant height, number of leaves, fresh stems of plants, fresh weight of roots, dry weight of roots and are not significantly different in parameters of leaf area.

Results of Microscopic Observations of the Fungi *Rhizoctonia* binucleat and *Fusarium oxysporum* f. sp. Vanillae Against Vanilla Plants (Vanilla planifolia Andrews)

- Observation of vanilla stems affected by the fungus *Rhizoctonia* binucleat and *Fusarium oxysporum* f. sp. Vanillae



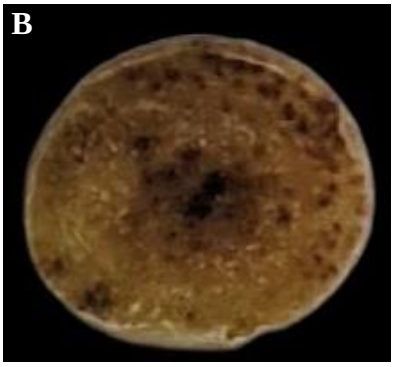


Figure 1. (A) Vanilla plants affected by the fungi *Rhizoctonia* binucleate and *Fusarium oxysporum* f. sp. Vanillae, (B) Vanilla stems affected by the fungus *Rhizoctonia* binucleate and *Fusarium oxysporum* f. sp. Vanillae.

Based on observations of vanilla plants affected by the fungi *Rhizoctonia* binucleate and *Fusarium oxysporum* f. sp. Vanillae If the vanilla stem is cut thinly you will see black and brown spots at the end of the stem and in the middle of the stem. On the surface of the beaks you often find white to yellowish spots which are a collection of fungal conidiophores and conidia (Pinaria et al. 2015).

- Observation of the morphology of *Rhizoctonia* binucleate and *Fusarium oxysporum* f. sp. Vanillae

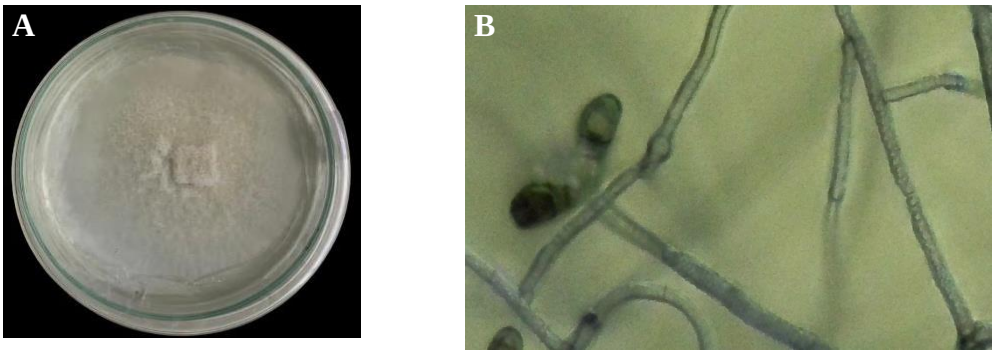


Figure 2. (A) Hyphae colonies of *Rhizoctonia* binucleat and *Fusarium oxysporum* f. sp. Vanillae, (B) Hyphae of *Rhizoctonia* binucleate and *Fusarium oxysporum* f. sp. Vanillae

Morphological observations of *Rhizoctonia* binucleate and *Fusarium oxysporum* f. sp. Vanillae in image A above shows that the hyphae developing from the *Rhizoctonia* binucleate isolate are yellowish white while the hyphae of *Fusarium oxysporum* f. sp. Vanillae is white. From picture B above it shows that *Fusarium oxysporum* f. sp. Vanillae have a long and oval shape and the binucleate *Rhizoctonia* fungus shows that their hyphae have septa. According to Pratiwi, (2008:38) fungi can be divided into two groups, namely partitioned hyphae (Nonsepta) and partitioned hyphae (Septa).

Results of Microscopic Observations of the *Rhizoctonia* binucleate Fungus on Vanilla Plants (Vanilla planifolia Andrews)

- Observation of vanilla stems affected by the *Rhizoctonia* binucleate fungus

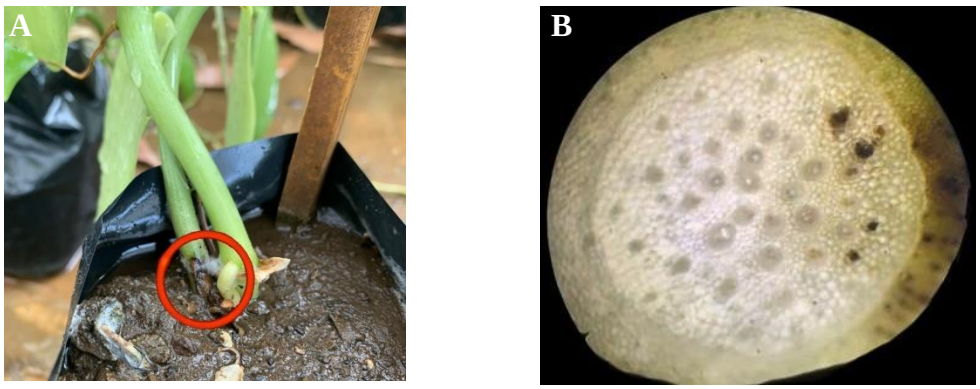


Figure 3. (A) Vanilla plants affected by *Rhizoctonia* binucleate fungus, (B) Vanilla stems affected by *Rhizoctonia* binucleate fungus

Based on observations, vanilla plants infected with the *Rhizoctonia* binucleate fungus have symptoms of black spots mixed with brown on the part of the stem close to the ground. If you cut the vanilla stem thinly, you will see black and brown spots at the end of the stem. The disease spreads through the movement of contaminated soil, plant materials, equipment and utensils.

- Observation of the morphology of binucleate *Rhizoctonia*

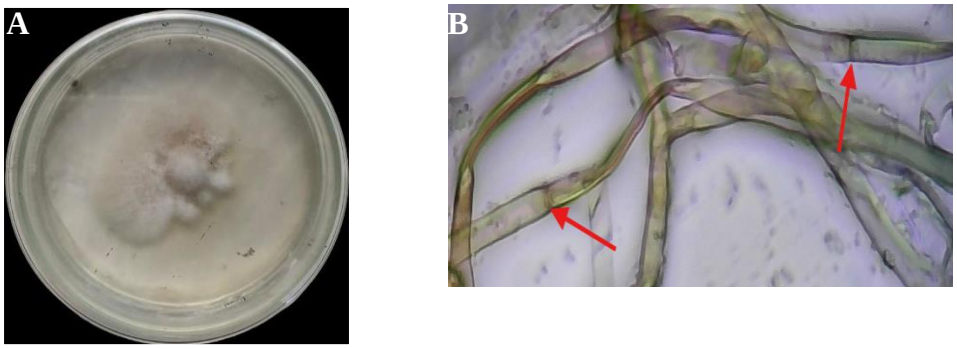


Figure 4. (A) Colony of binucleate *Rhizoctonia* hyphae, (B) Binucleate *Rhizoctonia* hyphae

Observation of the morphology of BNR (*Rhizoctonia* binucleat) in image A above shows that the hyphae developing from the *Rhizoctonia* binucleate isolate are yellowish white. This is in accordance with the observations of (Soelistijono et al., 2011) that most of the *Rhizoctonia* binucleate isolates have a brownish white/light brown color. From picture B, it can be seen that the results of microscopic observations of the cultured *Rhizoctonia* binucleate fungus show that their hyphae have septa (separations).

Results of Microscopic Observations of the Fungus *Fusarium oxysporum* f. sp. Vanillae Against Vanilla Plants (Vanilla planifolia Andrews)

- Observation of vanilla stems affected by the fungus *Fusarium oxysporum* f. sp. Vanillae

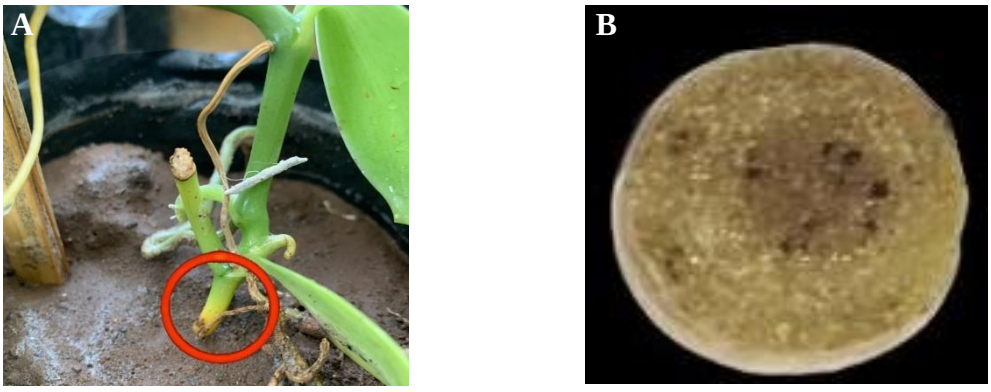


Figure 5. (A) Vanilla plants affected by the fungus *Fusarium oxysporum* f. sp. Vanillae, (B) Vanilla stems affected by the fungus *Fusarium oxysporum* f. sp. Vanillae

The initial symptoms of stem rot disease occur due to the fungus *Fusarium oxysporum* f. sp. Vanillae. with symptoms of brown spots on the stem, which when cut

using a knife or cutter will form a pencil-like shape on the inside of the stem. The affected part of the stem shrivels and dries, the color turns brown. Over the long term, the color will change from cream to black. The disease extends up and down the affected internodes. In conditions that are unfavorable for the development of disease, namely dry and less humid conditions, the attack by pathogens will be lighter and the decay that occurs will only be in the form of elongated spots measuring 1 - 3 cm, besides that the boundary between diseased and healthy tissue is clear.

- *Fusarium oxysporum* f. sp. *Vanillae*

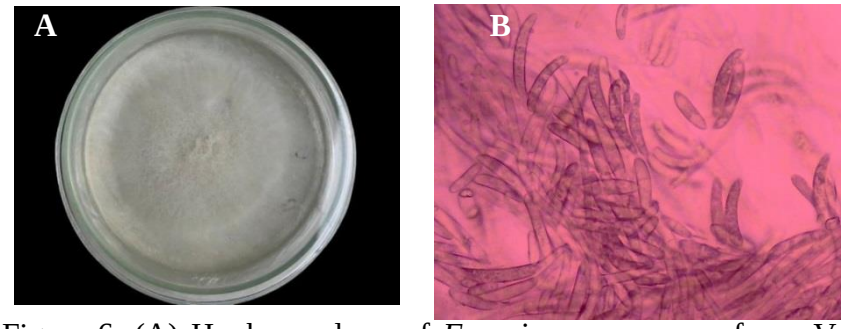


Figure 6. (A) Hyphae colony of *Fusarium oxysporum* f. sp. Vanillae, (B) Hyphae of *Fusarium oxysporum* f. sp. Vanillae

The results of microscopic observations with 40x magnification show that fungi are associated with plants attacked by *Fusarium oxysporum* f. sp. Vanillae have long, crescent-shaped and oval macroconidia with blunt ends, 1-5 septa. and the numbers are abundant, so the results of microscopic morphological identification show that the fungus associated with the plant is thought to be Fusarium sp.

Conclusion

The application of Rhizoctonia binucleate significantly improved the growth of vanilla seedlings compared to both the control and the treatment with Fusarium oxysporum f. sp. vanillae, which showed negative effects on plant development. Liquid organic fertilizer also supported growth, particularly at certain concentrations. The interaction between fungi and fertilizer significantly affected the number of leaves, but not other growth parameters. Microscopic observations confirmed the pathogenic characteristics of Fusarium and the beneficial traits of Rhizoctonia. Overall, Rhizoctonia binucleate combined with liquid organic fertilizer shows potential as an effective treatment to enhance vanilla seedling growth and suppress disease

References

Haryuni, H., Supriyadi, T., Dewi, T. S. K., Suprapti, E., Priyatmojo, A., & Sitompul, A. A. A. E. (2018). Pengaruh Dosis Fosfor Dan Urin Sapi Terhadap Perkembangan Penyakit BBV (Busuk Batang Vanili) Dan Pertumbuhan Tanaman Vanili (Vanilla planifolia). Jurnal Ilmiah Agrineca, 18(1).

Nurawan, A., M. Tombe dan K. Matsumoto, 1995. Penelitian Daya Antagonisme Isolat Bakteri yang Diisolasi Dari Rhizosfera Berbagai Jenis Tanaman Terhadap Patogen Busuk Batang Vanili. Dalam Parman dkk. (Penyunting), Risalah Kongres Nasional XIII dan Seminar Ilmiah PFI di Mataram. 356 – 359.

Pinaria AG, Laurence MH, Burgess LW, Liew ECY, 2015. Phylogeny and origin of Fusarium oxysporum f. sp. vanillae in Indonesia. Plant Pathology 64, 1358–65.

Pratiwi, S. T. (2008). Mikrobiologi Farmasi. Jakarta: Erlangga. Soesanto, L. (2020). Kompendium Penyakit-Penyakit Kopi. Yogyakarta: Lily Pub

Soelistijono, S., Priyatmojo, A., Semiarti, E., & Sumardiyono, C. (2011). Karakterisasi isolat Rhizoctonia sp. patogenik dan Rhizoctonia mikoriza pada tanaman anggrek tanah Spathoglottis plicata. Biota: Jurnal Ilmiah Ilmu-Ilmu Hayati, 371-380.