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FINAL REPORT

IN VITRO EVALUATION OF SHUKAKU RIKI AGAINST FUSARIUM WILT DISEASE (*Fusarium oxysporum f.* sp. Cubense) TROPICAL RACE 4 OF CAVENDISH BANANA

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ABSTRACT

Panama disease caused by Fusarium oxysporum sb. p. cubense Tropical Race 4 is the most serious disease problem in banana industry in Mindanao Region. This study was aimed to evaluate the efficacy of Shukaku Riki at different concentrations against Fusarium wilt disease of Cavendish banana thru In Vitro assay test. A Completely Randomized Design (CRD) with three replicates was used to assess the performance of four treatments of Shukaku Riki such as 5 ml, 10 ml, 15 ml and 20 ml per liter water in comparison with Untreated Control.

Results in this study showed that the rate of 20 ml Shukaku Riki per liter water gave lower mycelial growth of Foc during the 3rd, 5th, 7th and 14th day of observations. This means that the highest rate of Shukaku Riki the better control of the disease. However, Shukaku Riki at 15ml followed the best treatment to inhibit the growth and development of the disease. The two lower rates of Shukaku Riki can also inhibit the growth and development of Foc but the ability of these treatments was not able to compete the performance of the two highest rates of Shukaku Riki. However, these four tested rates of Shukaku Riki were evaluated effective to control Foc TR4 under In Vitro assay test.

Keywords: Shukaku Riki, *Fusarium* oxysporum f. sp. cubense, In vitro test, Cavendish banana

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INTRODUCTION

Fusarium wilt disease caused by *Fusarium oxysporum* sb. p. cubense Tropical Race 4 is one of the serious disease problems in banana. Some of the chemicals or biorational products are still under trial investigation. Todate, proper quarantine and tools disinfection were the immediate options that were initiated in the farms in order to prevent the spread of the disease. Using organic product or biocontrol agents can help contain the deposition of *Foc* inoculum. Therefore, this *In Vitro* assay test of Shukaku Riki at varying rates was done to have preliminary evaluation of the product against *Foc* TR4.

METHODOLOGY

The performance of Shukaku Riki for Fusarium wilt control was conducted in comparison with Untreated Control in *In Vitro* test. A completely randomized design (CRD) was used having 5 treatments replicated 3 times. The plates were labelled according to its treatment, incubate under room temperature and observed at 3, 5, 7 and 14 days after inoculation. The following were the materials used in *In Vitro* assay: prepared Potato Dextrose Agar (PDA), pure cultured *Foc* TR4, petri dishes, paper disks, ruler and Shukaku Riki at different rates: 5 ml, 10 ml, 15 ml and 20 ml per liter of water. The test pathogen, *Fusarium oxysporum f.* sp. cubense Tropical Race 4 was mass produced in ERDS Laboratory.

The *In Vitro* test was done by following the paper disc technique. Sterile plates were poured with 20 ml PDA and allowed to congeal. The 10 mm diameter block of pure culture *Foc*

TR4 was then placed at the center of petri plate. The 4 cut sterile filter paper discs measuring 5mm diameter was soaked in Shukaku Riki solution. Suspended sterile filter paper discs with Shukaku Riki solution were blot-dried for 1 minute and placed the four (4) filter paper discs equidistantly near the periphery of the plates. Sterile distilled water was used for the untreated control.

DATA GATHERED

1. Measurements (mm) of mycelial growth of *Foc* was done at 3, 5, 7 and 14 days after inoculation by a ruler.
2. Percent control. This was computed based on the formula below;

$$\% \text{ control} = \frac{\text{Untreated control-treated}}{\text{Untreated control}} \times 100$$

Arbitrary rating scale of the degree of control

% Degree of Control	Degree of effectiveness
1-20	Not Effective (NE)
21-40	Less effective (LE)
41-60	Moderately Effective (ME)
61-80	Effective (E)
81and above	Very Effective (VE)

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RESULTS AND DISCUSSION

Mycelial growth inhibition of *Foc* TR4

The different concentrations of Shukaku Riki were tested as preventive and curative control against Fusarium wilt thru *In Vitro* Assay test. Result showed that the mycelial growth of *Foc* TR4 observed in the two lower rates of Shukaku Riki at 5 ml and 10 ml was advanced and measured greater than the *Foc* mycelial growth that measured in the 2 highest rates of Shukaku Riki at 15ml and 20 ml per liter water at the 3rd day after inoculation (Table 1). On the 5th day, although *Foc* continues to grow but the development of the disease was slower in Shukaku Riki at 20 ml having 18.33 growth length. The same trend of growth development of *Foc* in Shukaku Riki treatments during the 7th and the 14th day after inoculation. Results further testify that the slower growth and development of *Foc* from the 7th to the 14th day of observation showed that Shukaku Riki treatments can control the spreading of *Foc* and thus prevent further infection of the disease to the plant. Thus, despite *Foc* began to grow, but the development of the fungus was a bit inhibited by Shukaku Riki as the microorganisms contained in SR began to proliferate and develop. The slow growth development of *Foc* in Shukaku Riki described that the treatments showed good control as verified in Untreated Control where the quick development of *Foc* was remarkable at the start of monitoring towards the last day of observation (Plate 1).

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Table 1. Mycelial growth diameter (mm) of *Fusarium oxysporum f. sp.* Cubense TR4 as treated by different concentrations of Shukaku at 3, 5, 7 and 14 days after incubation.

Treatments (per liter water)	Mycelial Growth of *Foc* TR4 (DAI) [a/]			
	3rd	5th	7th	14th
T1-Untreated Control	31.78 [c]	54.78 [b]	73.89 [b]	79.00 [b]
T2-SHUKAKU RIKI at 5ml	19.89 [b]	22.11 [a]	23.44 [a]	25.00 [a]
T3-SHUKAKU RIKI at 10ml	19.11 [b]	21.89 [a]	23.11 [a]	24.56 [a]
T4-SHUKAKU RIKI at 15ml	16.89 [ab]	21.00 [a]	22.44 [a]	23.89 [a]
T5-SHUKAKU RIKI at 20ml	14.89 [a]	18.33 [a]	21.67 [a]	23.11 [a]
CV (%)	14.69	23.65	29.01	29.13

a/ Means having common letters superscript are not significant at 1% level, DMRT.

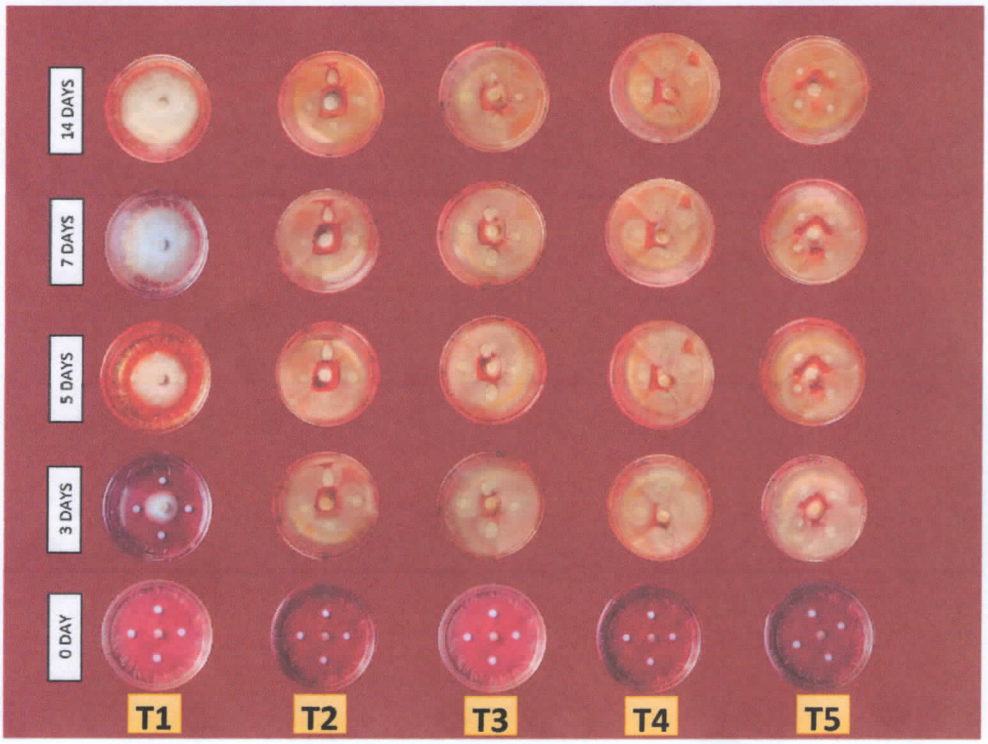

Plate 1. Mycelial growth inhibition of *Foc* TR4 as affected by different concentrations of Shukaku Riki.

Percent Control

The ability of the highest rate of Shukaku Riki at 20 ml to control *Foc* disease was noticeable. The effectiveness of this treatment was consistently good to suspend the growth of the disease as shown to have the highest control in four observations. Shukaku Riki at 15 ml and the rest of the treatments followed the best treatments to control the growth and development of *Foc* disease (Table 2).

Table 2. Percent Control of *Fusarium oxysporum f.* sp. Cubense TR4 as affected by different concentrations of Shukaku Riki in PDA medium at 3, 5, 7 and 14 days after incubation.

Treatments (per liter water)	Percent Control (days) a/				Degree of Effectiveness
	3DAYS	5DAYS	7DAYS	14DAYS	
T1-Untreated Control	0.00 ^{c}	0.00 ^{b}	0.00 ^{b}	0.00 ^{b}	-
T2-SHUKAKU RIKI at 5ml	37.37 ^{b}	59.63 ^{a}	68.27 ^{a}	68.36 ^{a}	*Effective*
T3-SHUKAKU RIKI at 10ml	39.80 ^{b}	60.03 ^{a}	68.72 ^{a}	68.91 ^{a}	*Effective*
T4-SHUKAKU RIKI at 15ml	46.77 ^{ab}	61.64 ^{a}	69.62 ^{a}	69.75 ^{a}	*Effective*
T5-SHUKAKU RIKI at 20ml	53.18 ^{a}	66.51 ^{a}	70.67 ^{a}	70.74 ^{a}	*Effective*
CV (%)	12.59	14.86	15.75	15.77	

a/ Means having common letters superscript are not significant at 1% level, DMRT.

SUMMARY AND CONCLUSION

The effectiveness of Shukaku Riki at varying rates on mycelial growth inhibition of *Foc* TR4 was evaluated and conducted at ERDS laboratory on September 2021. There were 5 treatments laid out in a Completely Randomized Design (CRD) with three replicates.

Shukaku Riki at 20 ml per liter water gave lower mycelial growth of *Foc* during the 3rd, 5th, 7th and 14th day of observations. Shukaku Riki at 15ml followed the best treatment to

inhibit the growth and development of the disease. The two lower rates of Shukaku Riki can also inhibit the growth and development of *Foc* but the ability of these treatments was not as good with the two highest rates of Shukaku Riki. These four tested rates of Shukaku Riki were determined effective to control *Foc* TR4 under *In Vitro* assay test.

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