Agripreneur, 11 (2) (2022) pp.100-105
Published by:IOCSCIENCE
Agripreneur: Journal of Agribusiness Agriculture
Journal homepage:www.iocscience.org/ejournal/index.php/Agripreneur

Test of Various Media of Antagonistic Agents Paenibacillus polymyxa Cav. Against Bacterial Leaf Blight Attack Intensity Growth and Yield of Rice Plant Varieties (Oryza sativa L.)

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Abstract
An experiment was carried out in Margasari Village, Dawuan District, Subang Regency, from July 2022 until November 2022. The purpose of this research studied the efficacy of media types of Paenibacillus antagonist agents. polymyxa in controlling Bacterial Leaf Blight on several varieties of rice plants and to obtain the most effective medium for controlling Bacterial Leaf Blight. The method used in this study was an experimental method, with a randomized block design, factorial pattern, which consisted of two treatment factors, namely factors of various Paenibacillus polymyxa media and varieties and repeated three times. The first factor was various Paenibacillus polymyxa (M) media consisting of three treatment levels, namely: m1 (Potato extract, m2 (Sweet potato extract) and m3 (Taro extract). The second factor variety (V) consisted of three levels, namely : v1 (Sidenuk), v2 (Padjajaran) and v3 (Cakrabuana). The results showed that (1) There was an interaction between P. polymyxa Antagonist Agent media on potato extract and Cakrabuana rice variation on the intensity of Bacterial Leaf Blight at 28 HST 0.09% and 35 HST 0.09% and obtained a seed weight per plot of 5.4 kg (8.64 tons ha-1) (2) Media treatment of P. Polymyxa antagonist agent on potato extract affected the intensity of Bacterial Leaf Blight, plant height. , number of productive tillers, 1000 grain weight, number of panicles clump, seed weight clump and seed weight plot (3) The cakrabuana rice variety affects the intensity of bacterial leaf blight, the number of productive tillers, the weight of 1000 grains,. the number of panicles clump and the seed weight plot, while the sidenuk rice variety was significantly different on plant height and seed weight clump.

Keywords: Paenibacillus polymyxa, Rice Varieties and Bacterial Leaf Blight

1. Introduction

Rice is a staple food consumed by the majority of the Indonesian population. Based on data from the Central Statistics Agency (2022), Indonesia's population in 2020 was 269 603.4 million people, the average population growth rate was 1.40% per year and rice consumption was 114 kg per capita per year. The need for rice continues to increase along with the rate of population growth and the increase in population. The decline in rice production in Indonesia is caused by several factors, including the conversion of agricultural land to development, global warming, and pest and disease attacks. According to BBPOPT Jatisari (2021), the application of P. polymyxa antagonist agents is generally able to inhibit the early symptoms of the main diseases of rice plants, including Cescospora sp, HDB and Blas. Many farmers have used P. polymyxa antagonist agents to control HDB disease in the field, however, information regarding the type of P. polymyxa antagonist media that is effective in reducing the intensity of HDB disease attacks on several rice varieties is not widely known so it needs to be researched.

2. Methods

This research was carried out using an experimental approach through field trials. The experiment will be carried out in Margasari Village, Dawuan District, Subang Regency. The experiment will be carried out in July - November 2022. The materials used in this activity are rice seeds of the Cakrabuana Agritan, Padjajaran Agritan, and Sidenuk

varieties, potatoes, sweet potatoes, taro, glaswall, potassium permanganate (KMNO4), Paenibacillus polymyxa isolate/starter, media NA (Nutrient Agar), manure, urea fertilizer, SP-36 fertilizer, KCL fertilizer and sterile water/distilled water. The tools used are: colony counter, test tube, petridish, tube needle, pipette, test tube rack, vortex mixer, jerry can, aerator, hose, L hose connection, knife, pan, stove, cutting board, plastic bottle, scale, stake, treatment labels, electric handsprayer, measuring cups, filters, stationery and cameras. The experiment used a factorial Randomized Block Design (RAK) consisting of two factors. The first factor was Various Media Agens Antaronis P. polymyxa (m) with three levels and the second factor was variety (v) with three levels, repeated three times, so that in each repetition there were nine treatment combinations placed randomly.

Table 1. List of Treatment Combinations

Various Media P. polymyxa (m)	Variety (V)		
	v1 (Sidenuk)	v2 (Padjadjaran)	v3 (Cakrabuana)
m1 (Potato Extract)	m1v1	m1v2	m1v3
m2 (Yam Extract)	m2v1	m2v2	m2v3
m3 (Taro Extract)	m3v1	m3v2	m3v3

Table 2. Operational Independent Variables and Dependent Variables

No.	Variable Type	Sub Variable	Variable Indicator
1.	Independent Variable (Independent Variable) / Treatment	1. Various Media Agents Antagonist P. polymyxa (m)	m1 = Potato Extract m2 = Sweet Potato Extract m3 = Taro Extract
		2. Variety (v)	v1 = Sidenuk v2 = Padjajaran v3 = Cakrabuana
2.	Dependent Variable (Deoendent Variable) / Response	1. Intensity of HDB Disease Attacks	1. HDB attack intensity level (%)
		2. Growth	1. Plant Height 2. Number of offspring
		3. Results	1. Number of panicles per clump 2. Weight 1000 Items 3. Seed weight per hill 4. Seed weight per plot

Table 3. List of Factorial Pattern Randomized Group Design Analysis.

Variety Source	DB	JK	KT	Fh	F0.05
1. Deuteronomy (r)	2	ΣXj..2/tX...2/rt	JKr/DBr	KTr/KTGalat	3.44
2.Treatment (t)	(8)	ΣX.kl2/rX...2/rt	JKt/DBt	KTt/KTGalat	2.82
Paenibacillus media p. (m)	2	ΣX.k. 2/rv-X...2/rt	JKK/DBK	KTA/KTGalat	3.05
Variety (v)	2	ΣX..l2/rk-X...2/rt	JKV/DBV	KTI/KTGalat	3.44
Interaction (mv)	4	JKt-JKk-JKv	JKKV/DBKV	KTAI/KTGalat	2.55
3. Error	16	JKtotal-Jkr-JKt	JKError/DBError	-	-
4. Total	26	ΣXjkl2 - X...2/rt	-	-	-

Source: Toto Warsa and Cucu SA (1982)

Source: Toto Warsa and Cucu SA (1992)

Information : DB = Degrees of Freedom JK = Sum of Squares Fh = Fcount
KT = Middle Square F0.05 = F Table level 5%

3. Results and Discussion

3.1 Intensity of HDB Disease Attacks

The results of variance analysis calculations showed that various P. polymyxa media treatments had a good effect on the intensity of HDB attacks.

Table 4.4a. Interaction Effect of Various P. polymyxa Media and Varieties on the intensity of HDB disease attacks at the age of 28 HST.

Media	HDB Attack Intensity (%)					
	v1(Sidenuk)		v2 (Padjadjaran)		v3(Cakrabuana)	
m1 (Potato Extract)	0.36 B	b	0.22 A	a	0.09 A	a
m2 (Yam Extract)	0.44 C	b	0.27 AB	a	0.27 BC	a
m3 (Taro Extract)	0.13 A	a	0.87 B	c	0.69 C	BC

Note: The average numbers marked with the same lowercase (horizontal) and uppercase (vertical) letters are not significantly different according to Duncan's Multiple Range Test at a 5% significance level.

Table 5.4b. Interaction Effect of Various P. polymyxa Media and Varieties on the intensity of HDB disease attacks at the age of 35 HST

Media	HDB Attack Intensity (%)					
	v1(Sidenuk)		v2 (Padjadjaran)		v3(Cakrabuana)	
m1 (Potato Extract)	0.38 A	b	0.27 A	a	0.09 A	a
m2 (Yam Extract)	0.49 AB	a	0.36 AB	a	0.27 AB	a
m3 (Taro Extract)	1.00 B	a	1.48 B	BC	1.49 B	c

Note: Average numbers marked with the same letter in each column are not significantly different according to Duncan's Multiple Range Test at a 5% significance level.

3.2 Plant Height

The results of the variance analysis calculation showed that P. polymyxa media showed significantly different effects at 21 DAP, 28 DAP, 35 DAP, 42 DAP, 49 DAP and 56 DAP on plant height.

Table 6. Effect of Various P. polymyxa Media and Varieties on Plant Height at 21 HST, 28 HST, 35 HST, 42 HST, 49 HST, and 56 HST

Treatment	Plant Height (cm)					
	21 HST	28 HST	35 HST	42 HST	49 HST	56 HST
Influence of Various Media						
m1 (Potato Extract)	122.00 c	139.33 b	163.00 c	180.00 c	209.33 c	239.33 c
m2 (Yam Extract)	119.33 b	139.00 b	155.33 b	171.00 b	196.67 b	231.67 b
m3 (Taro Extract)	114.67 a	133.67 a	150.67 a	165.67 a	188.67 a	219.33 a
Effect of Variety						
v1 (Sidenuk)	131.67 c	149.67 c	167.33 c	183.33 c	209.33 c	250.33 c
v2 (Pajajaran)	103.67 a	123.67 a	142.67 a	163.00 a	181.67 a	210.00 a
v3 (Cakrabuana)	120.67 b	138.67 b	159.00 b	170.33 b	203.67 b	230.00 b

Note: Average numbers marked with the same letter in each column are not significantly different according to Duncan's Multiple Range Test at a 5% significance level.

3.3 Number of Panicles per Clump

The results of the analysis of variance calculation showed that the treatment of various m1 media was significantly different from the treatment of various m2 and m3 media, as well as the treatment of v1 varieties was significantly different from the treatment of v2 and v3 varieties.

Table 7. Effect of Various P. polymyxa Media and Varieties on the Number of Panicles Per Clump

Treatment	**Average Panicles Per Clump (clump)**	
Influence of Various Media		
m1 (Potato Extract)	107.33	c
m2 (Yam Extract)	101.00	a
m3 (Taro Extract)	101.33	b

Effect of Variety		
v1 (Sidenuk)	91.67	a
v2 (Pajajaran)	104.00	b
v3 (Cakrabuana)	114.00	c

Note: Average numbers marked with the same letter in each column are not significantly different according to Duncan's Multiple Range Test at a 5% significance level.

3.4 Weight 1000 Items

The results of the analysis of variance calculation show that the treatment of various m1 media is significantly different from m3 and m2. The treatment of the v1 variety was significantly different from the treatment of the v2 and v3 varieties. Thus, it shows that the best results were achieved in the treatment of various media m1 (Potato Extract) and the treatment of variety v3 (Cakrabuana) which showed the highest yield of 1000 grain weights.

Table 8. Effect of Various P. polymyxa Media and Varieties on the Weight of 1000 Grains

Treatment	Weight of 1000 Items (g)	
Influence of Various Media		
m1 (Potato Extract)	84.47	c
m2 (Yam Extract)	79.90	b
m3 (Taro Extract)	73.90	a
Effect of Variety		
v1 (Sidenuk)	77.57	a
v2 (Pajajaran)	78.83	b
v3 (Cakrabuana)	81.87	c

Note: The average numbers marked with the same letter in each column are not significantly different according to Duncan's Multiple Range Test at a significance level of 5%5%.

3.5 Weight 1000 Items

The results of the analysis of variance calculation showed that the treatment of various m1 media was significantly different from m3 but not significantly different from the treatment of various m2 media, likewise the treatment of variety v1 was significantly different from the treatment of variety v3 and not significantly different from the treatment of variety v3.

Table 9. Effect of Various P. polymyxa Media and Varieties on Seed Weight Per Clump

Treatment	Seed Weight Per Clump (g)	
Influence of Various Media		
m1 (Potato Extract)	395.70	c
m2 (Yam Extract)	350.23	BC
m3 (Taro Extract)	313.25	a
Effect of Variety		
v1 (Sidenuk)	407.80	c
v2 (Pajajaran)	353.06	BC
v3 (Cakrabuana)	298.32	a

Note: Average numbers marked with the same letter in each column are not significantly different according to Duncan's Multiple Range Test at a significance level of 5%

3.6 Seed Weight per Plot

The results of analysis of variance calculations showed that various P. polymyxa media treatments had a good effect on seed weight per plot.

Table 10. Effect of Various P. polymyxa Media and Varieties on Seed Weight Per Clump

Media	Seed Weight Per Plot (kg)					
	v1(Sidenuk)		v2 (Padjadjaran)		v3(Cakrabuana)	
m1 (Potato Extract)	4.98	a	5.23	b	5.40	c

	C		C		C	
m2 (Yam Extract)	4.57 BC	a	4.78 BC	BC	5,10 BC	c
m3 (Taro Extract)	3.48 A	a	3.63 A	a	3.75 A	b

Note: Average numbers marked with the same letter in each column are not significantly different according to Duncan's Multiple Range Test at a significance level of 5%

4. Conclusion

Cakrabuana rice variety against HDB disease intensity at 28 HST 0.09% and 35 HST 0.09% and obtained a seed weight per plot of 5.4 kg (8.64 Tons ha-1). Treatment of P. Polymyxa antagonist agent media in potato extract affected the intensity of HDB disease attacks, plant height, number of productive tillers, weight of 1000 grains, number of panicles per hill, seed weight per hill and seed weight per plot. The cakrabuana rice variety has an effect on the intensity of HDB disease attacks, the number of productive tillers, the weight of 1000 grains, the number of panicles per hill and the seed weight per plot, while the Sidenuk rice variety is significantly different in terms of plant height and seed weight per hill. Based on the conclusions above, it can be recommended to apply P. Polymyxa, apart from using potato extract media, it can also be used as a sweet potato extract media on the Sidenuk and Cakrabuana varieties on a wide scale to see whether the effectiveness of P. polymyxa can be as effective on a plot scale and it is necessary to socialize the use of the agent. P. polymyxa antagonists in controlling various rice plant diseases for farmers so that the benefits can be felt.

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