

**ANTAGONISTIC POTENCY OF BACTERIA ISOLATED FROM LOCAL
MICROORGANISM OF MAJA IN AGAINTS ON DAMPING OFF DISEASE
(*Rhizoctonia solani* Kuhn.) AND GROWTH OF PADDY**

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ABSTRACT

Damping off disease, caused by *Rhizoctonia solani* Kuhn, is one important diseases on field paddy. The use of antagonistic bacteria as bio-control agents is an alternative control method toward damping off disease which is friendly to environment.

The purpose of research was to examine the abilities of antagonistic bacterial isolate from maja fruit to suppress *R. solani*. The experiments were carried out in the Phytopathology Laboratory and Glasshouse of the Department of Plant Pests and Diseases, Faculty of Agriculture, Universitas Padjadjaran from Juny 2010 to September 2010.

There were two experiments i.e.: test of antagonistic ability of the isolates in dual culture method and test of ability of the bacterial isolate to increase growth of paddy var IR64 in the glasshouse. Those experiments were arranged in the completely randomized design consisted of 9 treatments and 3 replications for in vitro and growth test of paddy.

Eight of bacterial isolates from maja fruit showed antagonistic ability against *R. solani* in vitro. The highest suppression was shown by BM4, BM5 and BM6 isolate, with percentage inhibition 81,6% , 88,6% and 86,9%. All bacterial isolates have ability to increase the growth of paddy.

Keyword : *Rhizoctonia solani*, MOL of maja fruit, paddy, Antagonistic bacteria

INTRODUCTION

Narrow brown leaf spot disease caused by *Cercospora oryzae* Miyake is a major disease on paddy (Agrios, 2004; Koga, 2001). This diseases is important disease on rice in Indonesia (Semangun, 2004). According Soenarjo et al. (1991) that diseases intensity of Narrow brown leaf spot disease in field reach 40%, and spora of *C. oryzae* can survive in straw, and disappear by wind.

Organic plantation system with SRI (*System of Rice Intensification*) using a mixture of natural materials found in the area around rice plantation as the effort to control organisms destructive plant. The material used is the bananas stump, coconut

water, water, rice, maja fruit, bamboo sprout, papaya, bananas, water, sugar cane, squash leaf shoots, golden slug, and vegetables. Material's composition is adjusted to the available source material, and then fermented. Results of fermentation are known as the Local Microorganisms or MOL (Ekamaida, 2008; Hersanti & Djaya, 2008). MOL has been used by rice farmers, especially rice farmers using SRI planting methods (Hersanti & Djaya, 2008). According to Uphoff (2004) organic paddy intensification system does not require chemical fertilizers and other chemicals, but will use the materials available in nature.

Hersanti & Djaya research (2008) has been obtained 19 (Nineteen) isolated bacteria of different types of Mol which are from cebreng leaves' Mol, shoots squash's Mol, maja fruit's MOL, bamboo sprout's MOL, bananas' Mol, banana tuber's MOL. Test results of the *dual culture* of 19 (nineteen) isolated bacteria note 6 isolated bacteria have the antagonistic ability against fungus *Rhizoctonia oryzae* and 4 of isolated bacteria have the antagonistic ability against fungus *Cercospora oryzae*.

Antagonist ability of the bacteria that come from to diseases is not yet known. Therefore, the research of utilizing antagonist isolated bacteria from chayote leaf MOL needs to be done, so it can be used as biocontrol agent in controlling the Narrow brown leaf spot disease on paddy.

RESEARCH METHOD

Research conducted in the Laboratory of Phytopathology and Greenhouse of Department Plant Protection, Faculty of Agriculture, Universitas Padjadjaran. Method used in this research is two stages of research scale which are *in vitro* test and In-vivo (greenhouse) test.

Testing the in-vitro

Testing potential antagonistic isolate bacteria of chayote leaf MOL to prevent the growth of fungi *C. oryzae* is done using the method of *dual culture test* with the Complete Random Design . Isolated bacteria obtained on the chayote leaf MOL are 11, then tested the treatment consisted of 11 treatments with 1 control.

Testing the in-vivo

Tests for antagonist isolated bacteria ability to suppress Narrow brown leaf spot disease on paddy are done using experiment method with the Complete Random Design (RAL). Treatment is based on the number of candidates tested antagonist bacteria, which is as much as 7 isolated antagonist bacteria obtained after the *in vitro* test-scale, and added a treatment of active tebukonazol fungicide, positive control (*C. oryzae* inoculation fungi). Each treatment was repeated three times. Observation data analyzed statistically using the program SPSS version (16.0). Differences between treatments tested using the Duncan Double Distance Test in the 5% significant milestone.

RESULTS AND DISCUSSION

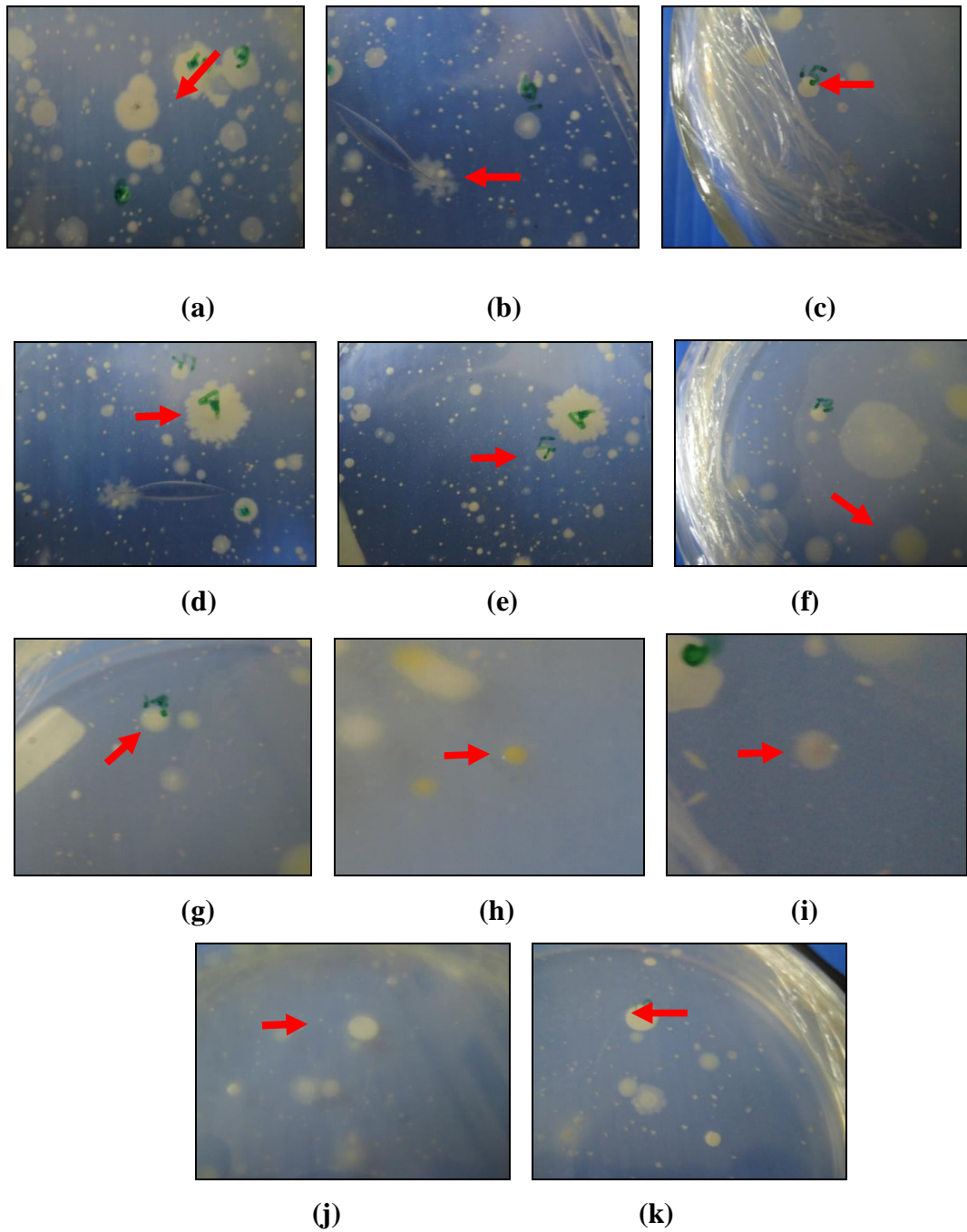
In-vitro test

In the chayote leaf Mol the *in Nutrient Agar* (NA) medium was found as much as 11 isolated bacteria. Isolated bacteria found are differentiated according to the color of the colony morphology, shape, surface, and the colony edge (Leung & Liu, 2002; Johnston, 2007). Characteristic colony morphology of 11 isolated bacteria can be seen in Table 1.

Table 1. Isolated bacterial colonies Morphology of chayote leaf Mol on the *Nutrient Agar* (NA) medium

No	Isolat	Morfologi Koloni			
		Warna	Bentuk	Permukaan	Tepi
1	BDLS1	Cream	Irregular	Flat	Serrate
2	BDLS2	Cream	Filamentous	Flat	Filiform
3	BDLS3	Cream	Irregular	Convex	Undulate
4	BDLS4	White	Irregular	Raised	Undulate
5	BDLS5	White	Irregular	Raised	Filiform
6	BDLS6	Cream	Irregular	Flat	Undulate
7	BDLS7	Cream	Irregular	Flat	Filiform
8	BDLS8	Yellow	Irregular	Convex	Entire
9	BDLS9	Brown	Irregular	Raised	Undulate
10	BDLS10	White	Irregular	Flat	Entire
11	BDLS11	White	Irregular	Convex	Entire

BDL = Bakteri Daun Labu



Picture 1. *Single cell colony* chayote leaf Mol on media of NA (a) BDLS1 (b) BDLS2 (c) BDLS3 (d) BDLS4 (e) BDLS5 (f) BDLS6 (g) BDLS7 (h) BDLS8 (i) BDLS9 (j) BDLS10 (k) BDLS11

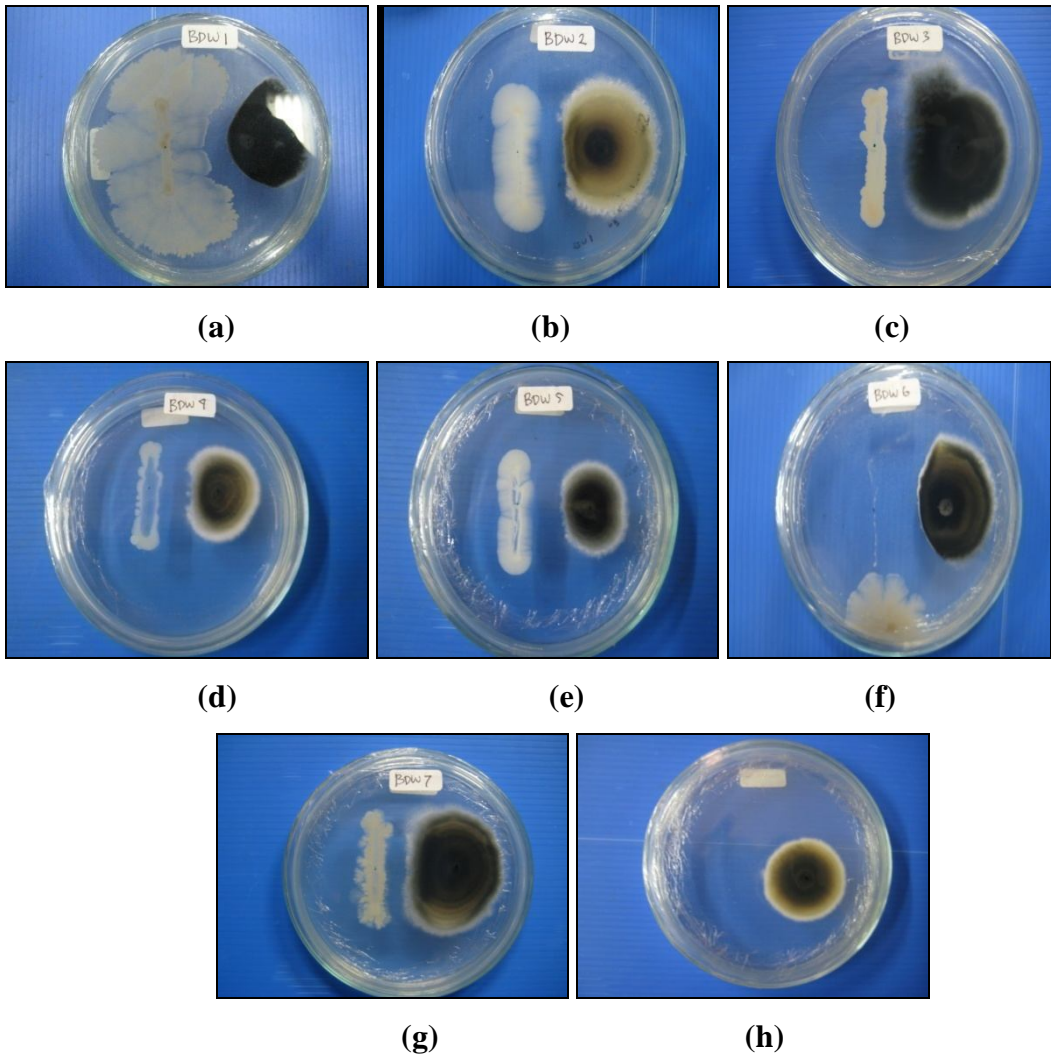
Table 2. Persecution Percentage of 11 isolate bacteria of Chayote leaf against *C. oryzae* dual culture test on 8th day.

No	Perlakuan	Radius of <i>C. Oryzae</i> Colony (cm)	Mean of persecution (%)
1	BDLS1	0,78a	53,7a
2	BDLS2	1,22bcd	28,3bcde
3	BDLS3	1,37de	19,5def
4	BDLS4	1,18bcd	30bcd
5	BDLS5	0,98ab	41,9ab
6	BDLS6	1,07bc	37bc
7	BDLS7	1,3cde	22,9cdef
8	BDLS8	1,53efg	9,9fg
9	BDLS9	1,5efg	12efg
10	BDLS10	1,53efg	9,8fg
11	BDLS11	1,52efg	10,5fg
12	Control	1,7g	0,0g

Description: The average value which followed by the same letter in the same column do not different significantly according to Duncan Double Distance Test in 5% significant milestone



Picture 2. Conidia of *C. oryzae* on OMA media



Picture 2. Percussion of bacteri isolate chayote leaf againts *C. oryzae* on 8th days, show of Isolate BDLS1 (a), BDLS2 (b), BDLS3 (c), BDLS4 (d), BDLS5 (e), BDLS6 (f), BDLS7 (g), dan Control (h).

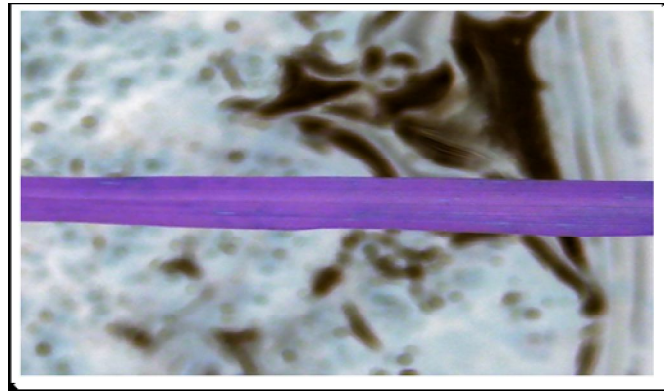
Observation results for activity deceleration are indicated by clear zone between the colony fungus *C. oryzaer* and the isolate bacterial in the medium. Antagonist bacteria produce the antibiotics, siderofor, and other secondary metabolite that does damage to the growth of microorganisms or prevent other activities (Fravel Hasanuddin *in* 1988, 2003). As presented by Howell and Stipanovic (1979) to Hasanuddin (2003), that the antibiotics bacteria *Pseudomonas fluorescens* effectively pressing the growth of *Rhizoctonia solani*, the pathogenic cause of topple shoot disease in the cotton sprout plants and also pyoluteorin antibiotics that can suppress *Pythium ultimum* growth.

Some bacteria have been widely used as bio control agents through the emphasis of antibiotics production to suppress the development of pathogen or disease (Mukerji & Garg, 1988 *in* Yulia et al. 2008). Microbes that produce antibiotics considered most appropriate to use as bio control agents compared with the other antagonism ways such as competition and parasitism (Yulia et al. 2008).

Other mechanism of the bio control agents is the consumption competition of food source or certain elements burly, so that constrain the growth room of other microorganisms (Weller Hasanuddin *in* 1988, 2003; Brock, 1966 *in* Sudadi, 2005).

In-vivo test

On the observation results of known incubation period of infectious Narrow brown leaf spot disease of paddy plants has the different appearance on each bacteria treatment test. The Result of research Suganda et al. (2002) symptom narrow brown leaf spot diseases occur on 4th – 7th after inoculation. And according Suparyono et al. (2003) symptom of Narrow brown leaf spot disease occur on 5th – 6th after inoculation The symptom of this diseases are long narrow spot, brown, parallel with vein.



Picture 3. Symptom of NBLS on leaf paddy 10th after inoculation.

Table 3. Narrow brown leaf spot disease intensity on paddy plants

No	Treatment	Narrow brown leaf spot disease incubation period (days)	Average intensity NBLS disease (%)		
			7 th Day after inoculation	10 th Day after inoculation	14 th Day after inoculation
1	BDLS1	-	0,00a	0,00a	0,00a
2	BDLS2	10	0,00a	1,85a	3,24ab
3	BDLS3	-	0,00a	0,00a	0,00a
4	BDLS4	7	3,7a	3,7a	2,78ab
5	BDLS5	-	0,00a	0,00a	0,00a
6	BDLS6	-	0,00a	0,00a	0,00a
7	BDLS7	10	0,00a	1,85a	2,78ab
8	Fungisida (tebukonazol)	-	0,00a	0,00a	0,00a
9	Kontrol positif	4	4,94b	8,64b	6,47c

Description: The average value which followed by the same letter in the same column do not differ significantly according to Duncan Double Distance Test in 5% significant milestone

Table 6 show that high NBLS disease intensity on occurs on positive control at 10th after inoculation or paddy plant be grown up 27 days. This result appropriate with research of Suganda (2002) that symptom of NBLS occur at paddy be grown up 3 weeks.

CONCLUSION

Among the eleven bacterial isolates tested by dual culture, 7 isolates showed antagonistic ability against *Cercospora oryzae* invitro. The highest suppression was 53,7% shown by BDLS1 isolate. Four bacterial isolates i.e.: BDLS1, BDLS3, BDLS5, and BDLS6 were effective in suppressing narrow brown leaf spot (*C. oryzae*) on paddy var IR64 in the glasshouse.

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