Advances in Social Science, Education and Humanities Research, volume 429
International Conference on Agriculture, Social Sciences, Education, Technology and Health (ICASSETH 2019)

Effect of Corynebacterium Against Xantomonas Campetric Causes of Bacterial Leaf Blight in the Paddy Plant (*Oryza sativa* L.) Varieties Inpari 13

Reni Nurhayatini*, Raden Budiasih, Lia Amalia, Linlin Parlinah, Yanyan Suryana
Agriculture Faculty
Universitas Winaya Mukti
Indramayu, Indonesia
*renimuljadi@gmail.com

***Abstract*—This research aims to determine the influence of biological Agensia Corynebacterium on growth and yield of paddy crops (Oryza sativa L.) The varieties of Inpari 13 were held in Cianjur regency with a height of 500 m above sea level from January to April in 2015. Environmental Design uses random Group draft with 6 treatments and repeated 4 times, Corynebacterium concentration treatment used is A: control (without Corynebacterium); B: 1.5 ml L-1 solution; C: 2.5 ml L-1 solution; D: 35 ml L-1 solution; E: 4.5 ml L-1 solution; F: 5.5 ml L-1 solution. Results showed that the concentration of Cocynebacterium Bioagents was influential for the high plant, the number of saplings, and leaf blight attacks. Corynebacterium concentrations are most effective for controlling Xanthomonas sp bacteria in paddy plants i.e. concentrations of 5.5 ml L-1 water, where potentially lowering the level of leaf blight attacks by 69.4% at 14 DAP, 72.71% at 28 DAP, 62.09% at 42 DAP and 66.89% at 56 DAP and increase the yield weight of 1000 grain by 9.5% and yield per meeting of 48.4%.**

Keywords: paddy Inpari 13, Corynebacterium, Xanthomonas compestris

I. INTRODUCTION

Rice is the most widely needed agricultural plant commodity in Indonesia, in 2018 total rice consumption of 29.57 million tonnes and total rice production of 32.42 Millionaton until [1]. Although the estimate occurred surplus but BPS reported that Indonesia imports rice in 2018 as much as 2,254 million tonnes [2]. The cause of the rice production target is due to pests and diseases. Efforts for production targets are achieved one of them with the use of quality seeds so that they have high production results. The characteristics of farming and the pattern of use of seeds in West Java Ishaq and Ruswandi divide into three areas i.e. formal strata, strata of informal perseverance and the strata of mixed seed, varieties of Sarinah, IR-64 and Inpari 13 Potentially adopted and developed in the Wolayah of SPI [3]. The results of dried grain varieties of Situbagendit range from 8.10 tons ha-1, Ciherang 8.08 ton ha-1, Inpari 13 8.07 ton ha-1, Inpari 7 7.52 ton ha-1, Inpari 10 6.7 ton ha-1 [4], Dianawati and Sujitno added that Inpari 13 had a relatively high production of Inpari 4 [5]. Some research results showing the resilience of some rice varieties that are susceptible to bacterial leaf blight disease, namely Inpari 30, Situbagendit, Cibogo, Luk-Ulo [6], Inpari 3 and Inpago 9 [7]. The bacterial leaf blight resistant varieties Inpari 1, Inpari 10, Limboto, Lekat Tombot lineut, Rommokot, Paki Gajah, Tomboen, BO 100, Sipasie, BO Minyak, Bontok, Sirendeh Semantuk Wayla, Sambei [8], IRBB 27, IR-64, Inpari 16, Ciherang, Inpari 30, Inpari 31 [9]. Mikenggo varieties are most resistant to the than of IR-64, Ciherang, Situbagendit, Sintanur and Cilebes [10]. The variety of Impari 10 has relatively low resistance when the comparative varieties of Ciherang, and Impari 13 [11]. Impari Variety 13 has high production, resistant to bacterial leaf blight and adaptable in swamp land [12].

The chances of success in suppressing the disease development of rice by applying an integrated epidemic [13]. Some bioagents capable of reducing the bacterial leaf blight attack result from Xantomonas campetric PV bacteria. Oryzae is Conynebacterium [14,15], Paenibacillus Polymyca [16-18], Bacillus subtilis [19,20], Streptomyces Roseoflavus [21].

II. RESEARCH METHODS

The research was completed in Kp. Darmaraja, Ds. Neglasari, Kec. Cianjur at an altitude of ± 500 above sea level. Experiments Held in January to April 2015. The experimental materials are used as follows: SP-36 Fertilizer (150 Kg ha^{-1}), Urea (200 Kg ha^{-1}), seed varieties Inpari 13, and Corynobacterium. The design of the environment used is group random design, 6 treatments and repeated 4 times, so that the whole consists of 24 plot size of each plot of 5 x 2 meters, the distance between plots in Deuteronomy 20cm and the interreplay distance of 40cm. The number of plants each plot 160 plants. The number of samples for each of the 8 crop plots, sampling is carried out randomly without the inclusion of fringe cropping. The treatment design consists of A Corynebacterium concentration consisting of: A: Control (without Corynebacterium treatment); B: 1.5 ml L^{-1} water; C: 2.5 ml L^{-1} water; D: 3.5 ml L^{-1} water; E: 4.5 ml L^{-1} water; F: 5.5 ml L^{-1} water. The Data was analysed by a 5% advanced test of Duncan.

III. Results and Discussion

A. High Crop

High observation of plants on the testing influence of biological agents giving Corynebacterium to rice paddy plants (Oryza sativa L.) Varieties of Inpari 13 can be seen from table 1. At the age of 14 DAP awarding of all treatments does not give really different results, but at the age of 28 DAP, 42 DAP and 56 DAP treatment of F (5.5 ml L^{-1} water) give effect to higher plant height compared to other treatments though differ not real to the plant given the treatment B (1.5 ml L^{-1} water), C (2.5 ml L^{-1} water), D (3.5 ml L^{-1} water) and E (4.5 ml L^{-1} water).

TABLE I. AVERAGE HIGH CROP AT AGE 14 DAP, 28 DAP, 42 DAP AND 56 DAP

Treatment	Average age of crops at age to-(cm)			
	14 DAP	***28 DAP***	***42 DAP***	***56 DAP***
A (0 ml l^{-1} air)	23,13 a	43,35 a	53,16 a	80,02 a
B (1,5 ml l^{-1} air)	24,05 a	45,27 ab	53,35 a	82,25 ab
C (2,5 ml l^{-1} air)	24,32 a	44,55 ab	55,89 abc	81,76 ab
D (3,5 ml l^{-1} air)	24,54 a	44,38 ab	54,46 ab	83,36 ab
E (4,5 ml l^{-1} air)	25,38 a	47,14 ab	58,48 bc	81,54 ab
F (5,5 ml l^{-1} air)	26,34 a	49,39 b	59,82 c	83,89 b

Description: The number followed by the same letter of the same match shows different but not real according to the real Duncan test on the real level of 5%.

B. Number of Saplings

Data on the results of the number of saplings in the testing influence of biological agents giving Corynebacterium to the rice paddy plants (Oryza sativa L.) Varieties of Inpari 13 can be seen from table 2, the administration of treatment F (5.5 ml L^{-1} water) provides more and different real numbers of saplings with other treatments at the age of 56 DAP, but different not real with the treatment D (3.5 ml L^{-1} water) at the age of 14 DAP and other treatments at the age of 28 DAP and 42 DAP.

TABLE II. AVERAGE NUMBER OF SAPLINGS AT AGE 14 DAP, 28 DAP, 42 DAP AND 56 DAP

Treatment	Average number of rice saplings at age to-(cm)			
	14 DAP	***28 DAP***	***42 DAP***	***56 DAP***
A (0 ml l^{-1} air)	9,47 cd	23,18 bcd	23,18 a	25,80 b
B (1,5 ml l^{-1} air)	7,57 a	22,30 ab	23,64 ab	24,39 a
C (2,5 ml l^{-1} air)	7,50 a	22,65 abc	24,46 abc	24,65 ab
D (3,5 ml l-1 air)	8,47 b	21,82 a	24,70 bcd	25,60 ab
E (4,5 ml l^{-1} air)	9,16 c	23,58 cd	25,65 cd	26,05 b
F (5,5 ml l^{-1} air)	9,88 d	23,78 d	26,99 d	28,08 c

Description: The number followed by the same letter of the same match shows different but not real according to the real Duncan test on the real level of 5%.

C. BLB Attack Intensity

High observation of crops on testing influence of biological agents giving Corynebacterium to rice paddy plants (Oryza sativa L.) Varieties of Inpari 13 can be seen from table 3. At all age observations the highest BLB attack intensity is shown in A (control) while the intensity of the attack is least indicated on the treatment of F (5.5 ml L^{-1} water) Although the treatment of F differs not apparent with the treatment of B (1.5 ml L^{-1} water), C (2 3.5 ml L^{-1} water), D (3.5 ml L^{-1} water) and E (4.5 ml L^{-1} water).

TABLE III. THE AVERAGE INTENSITY OF THE BLB ATTACK AT AGE 14 DAP, 28 DAP, 42 DAP AND 56 DAP

Treatment	Average intensity of BLB attack at age to-(%)			
	14 DAP	***28 DAP***	***42 DAP***	***56 DAP***
A (0 ml l^{-1} air)	3,85 c	5,35 c	8,31 b	14,95 b
B (1,5 ml l^{-1} air)	1,93 ab	2,73 ab	3,85 a	6,60 a
C (2,5 ml l^{-1} air)	1,93 ab	2,46 ab	4,95 ab	6,60 a
D (3,5 ml l^{-1} air)	2,28 b	3,30 b	5,50 ab	5,50 a
E (4,5 ml l^{-1} air)	1,66 ab	1,65 ab	3,30 a	7,18 a
F (5,5 ml l^{-1} air)	1,18 a	1,46 a	3,15 a	4,95 a

Description: The number followed by the same letter of the same match shows different but not real according to the real Duncan test on the real level of 5%.

D. Grain Weight per 1000 Items and Results per Plot

The observations of grain weights per 1000 grains and results per plot on the testing influence of biological agents giving Corynebacterium on rice paddy plants (Oryza sativa L.) Varieties of Inpari 13 can be seen from table 4. The F-treatment (5.5 ml of L^{-1} water) is distinct from the treatment of D (3.5 ml L^{-1} water) and A (control), but is not apparent in the treatment of E (4.5 ml L^{-1} water), C (2.5 ml L^{-1} water) and B (1.5 ml L^{-1} water). The F treatment provides heavier grain weight than other treatments and shows a distinct condition of the other treatment with a higher perpetlessness.

TABLE IV. GRAIN WEIGHT PER 1000 ITEMS AND RESULTS PER PLOT

Treatment	Grain weight per 1000 item (g)	Results per plot (kg)
A (0 ml l^{-1} air)	23,60 ab	8,59 a
B (1,5 ml l^{-1} air)	25,20 bc	9,50 ab
C (2,5 ml l^{-1} air)	27,70 bc	10,58 bc
D (3,5 ml l^{-1} air)	22,53 a	11,14 c
E (4,5 ml l^{-1} air)	24,80 bc	10,92 c
F (5,5 ml l^{-1} air)	25,85 c	12,75 d

Description: The number followed by the same letter in the same column shows different but not real according to the real Duncan test on the real level of 5%.

Based on the analysis of the data on the height of the plant and the number of rice saplings given the treatment F (5.5 ml L^{-1} water) showed a different condition of real at all treatment especially at the age of 56 DAP. A healthy plant that is located in an environment that corresponds to the moisture for rice crops, at a temperature of 18.70 – 22, 50C, it will not support the disruption of such crops by disease. As presented by Nuryanto that increased soil pH of 1 scale was able to lower the 2.4% assault rate, the increase in temperature of 10C increased the assault by 4.0% and a 1% increase in moisture would increase the attack by 2.3% [22]. This is due to the disease of blight leaf bacteria Its absorption rate is very low due to the population Xanthomonas campentris PV. Oryzae is

restrained by Corynebacterium with a concentration of 5.5 ml L^{-1}, so that the appearance of the rice saplings is not obstructed, in addition to the varieties Inpari 13 is a variety that is resistant to BLB [11] and Inpari 13 also has a rough leaf surface where morphological surface of the leaf that is hairy or slightly hairy correlates positively to the resistance of the bacterial leaf blight [23]. In fact, Zahara reported with 7 ml of L^{-1} affected the number of rice seedlings of Ciherang variety [14]. The intensity of the BLB attack on F treatment (5.5 ml L^{-1} water) was able to lower the assault rate by 69.4% at 14 DAP 72.71% at 28 DAP, 62.09% on 42 DAP and 66.89% at 56 DAP. So that the F-treatment (5.5 ml of L^{-1} water) indicates it can potentially increase the yield of 1000 grain weights by 9.5% and the yield per match of 48.4%.

IV. CONCLUSION

From the research that has been done, it can be concluded as follows: Biological agency concentration affects the plant height at the age of 42 DAP, number of saplings at the age of 14 DAP, 28 DAP, 42 DAP and 56 DAP, the level of BLB attack at age 14 DAP, 28 DAP, 42 DAP and 56 DAP, grain weight of 100 grain and weight per tile. Corynebacterium's concentration of biological agencies is most effective for controlling Xanthomonas sp bacteria in rice paddy plants (Oryza sativa L.) at concentrations of 5.5 ml L-1 water where the potential for lowering bacterial leaf blight attack rate is 69.4 % at 14 DAP 72.71% at 28 DAP, 62.09% at 42 DAP and 66.89% at 56 DAP and increase the yield grain weight of 1000 grains at 9.5% and yield per match amounted to 48.4%.

REFERENCES

[1] S. Suhariyanto, Luas Panen dan Produksi Beras 2018. Jakarta-Indonesia: Badan Pusat Statistik, 2018.

[2] BPS, Impor Beras Menurut Negara Asal Utama, 2000-2018," Badan Pusat Statistik [Online]. Retrieved from: https://www.bps.go.id/statictable/2014/09/08/1043/impor-beras-menurut-negara-asal-utama-2000-2018.html, 2019.

[3] I. Ishaq and A. Ruswandi, "Karakteristik Usahatani Dan Prilaku Penggunaan Benih Padi Bersertifikat Petani Pada Tiga Strata Perbenihan Di Jawa Barat," CR Jounal, vol. 4, no. 1, pp. 1–12, 2018.

[4] W.R. Rohaeni and M.I. Ishaq, "Evaluasi Varietas Padi Sawah Pada Display Varietas Unggul Baru (VUB) Di Kabupaten Karawang, Jawa Barat," Agric, vol. 27, no. 1, pp. 1–7, 2015.

[5] M. Dianawati and E. Sujitno, "Assessment of many new varieties on brown planthopper Nilaparvata lugens attack and wetland rice production of Garut District, West Java," Pros Sem Nas Masy Biodiv Indon, vol. 1, no. 4, pp. 868–873, 2015.

[6] R.H. Aditya, W.S. Wahyuni, and P.A. Mihardjo, "Ketahanan Lapangan Lima Genotipe Padi terhadap Penyakit Hawar Daun Bakteri," J. Fitopatol. Indones., vol. 11, no. 5, pp. 159–165, 2015.

[7] D. Yuliani, J. Amirrullah, and S. Sudir, "Keragaan Penyakit Padi Pada Varietas Unggul Baru Untuk Agroekosistem Rawa Dan Lahan Kering," Agric, vol. 29, no. 1, pp. 21–30, 2017.

[8] W. Hadianto, L. Hakim, and Bakhtiar, "Ketahanan Beberapa Genotipe Padi Terhadap Penyakit Hawar Daun Bakteri (Xanthomonas oryzae pv. oryzae)," J. Hama dan Penyakit Tumbuh. Trop., vol. 15, no. 2, pp. 152–163, 2015.

[9] R. Hanum, B. Bakhtiar, and L. Hakim, "Pertumbuhan, Hasil dan Ketahanan Enam varietas Padi (Oryza sativa L.) Terhadap Penyakit Hawar Daun Bakteri (Xanthomonas oryzae pv oryzae)," J. Ilm. Mhs. Pertan., vol. 1, no. 1, pp. 138–146, 2016.

[10] T. Pinem and Z. Syarif, "Intensitas Serangan Xanthomonas oryzae pv. oryzae pada Beberapa Varietas Padi Sawah dan Dampaknya terhadap Pertumbuhan dan Hasil Panen," JPT J. Prot. Tanam., vol. 2, no. 1, pp. 9–17, 2018.

[11] S. Yanti, M. Marlina, and F. Fikrinda, "Pengendalian Penyakit Hawar Daun Bakteri pada Padi Sawah Menggunakan Fungi Mikoriza," J. Agroecotania, vol. 1, no. 2, pp. 14–21, 2018.

[12] W. Wahyu and S. Suparwoto, "Inpari Sebagai Varietas Padi Alternatif Di Lahan Rawa Lebak Provinsi Sumatera Selatan," J. Ilm. Agroust, vol. 1, no. 1, pp. 91–105, 2017.

[13] B. Nuryanto, "Penyakit Hawar Pelepah (Rhizoctonia solani) pada Padi dan Taktik Pengelolaannya," J. Perlindungan Tanam. Indones., vol. 21, no. 2, pp. 63–71, 2017.

[14] R. Zahara, M. Marlina, and A. Ulim, "Pengaruh Corynebacterium sp. Dalam Menekan Pertumbuhan Penyakit Hawar Daun Bakteri pada Tanaman Padi (Oryza sativa L.)," J. Ilm. Mhs. Pertan., vol. 1, no. 1, pp. 188–194, 2016.

[15] A.D. Serdani, L.Q. Aini, and A.L. Abadi, "Isolasi dan Identifikasi Bakteri Endofit dari Tanaman Padi (oryza sativa) sebagai Pengendali Penyakit Hawar Daun Bakteri Akibat Xanthomonas Oryzae pv. oryzae," Viabel J. Ilm. Ilmu-ilmu Pertan., vol. 12, no. 1, pp. 18–26, 2018.

[16] E. Kantikowati, R. Haris, and S. Anwar, "Aplikasi Agen Hayati (Paenibacillus polymixa) terhadap Penekanan Penyakit Hawar Daun Bekteri Serta Hasil dan Pertumbuhan Padi Hitam (Oryza sativa)Var. Lokal," Paspalum J. iImiah Pertan., vol. 6, no. 2, pp. 143–142, 2018.

[17] M. Syamsiah, "Efektifitas Aplikasi Paenibacillus polymyxa dalam Pengendalian Penyakit Hawar Daun Bakteri pada Tanaman Padi varietas Mekongga," Agroscience, vol. 5, no. 1, pp. 24–28, 2015.

[18] A. Komariah and E.L. Mustika, "Pertumbuhan, Hasil dan Toleransi Genotip Padi terhadap Penyakit Hawar Daun (Bacterial Leaf Blight) pada Aplikasi Dosis Paenibacillus polymixa Berbeda," Paspalum J. iImiah Pertan., vol. 4, no. 1, pp. 1–11, 2016.

[19] W. Wartono, G. Giyanto, and K.H. Mutaqin, "Efektivitas Formulasi Spora Bacillus subtilis b12 Sebagai Agen Pengendali Hayati Penyakit Hawar Daun Bakteri pada Tanaman Padi," J. Penelit. Pertan. Tanam. Pangan, vol. 34, no. 1, pp. 21–28, 2015.

[20] A. Yanuar, S.D. Nurcahyanti, and H.S. Addy, "Potensi Agens Hayati dalam Menekan Perkembangan Penyakit Hawar Daun Bakteri," J. Agroteknologi Trop., vol. 5, no. 2, pp. 70–76, 2016.

[21] N.L.C.A. Nellawati, R. Kawuri, and N.L. Apriwi, "Uji Daya Hambat Streptomyces roseoflavus AL2 terhadap Xanthomonas sp. Penyebab Penyakit Hawar daun Bakteri (HBD) pada Tanaman Padi (Oryza sativa L.)," Metamorf. J. Biol. Sci., vol. 3, no. 1, pp. 1–7, 2016.

[22] B. Nuryanto, A. Priyatmojo, and B. Hadisutrisno, "Pengaruh Tinggi Tempat Dan Tipe Tanaman Padi Terhadap Keparahan Penyakit Hawar Pelepah," J. Penelit. Pertan. Tanam. Pangan, vol. 33, no. 1, pp. 1–8, 2014.

[23] W.R. Rohaeni and D. Yuliani, "Keragaman Morfologi Daun Padi Lokal Indonesia dan Korelasinya dengan Ketahanan Penyakit Hawar Daun Bakteri," J. Ilmu Pertan. Indones., vol. 24, no. 3, pp. 258–266, 2019.