Effect of different methods of application of P*seudomonas fluorescens* against bacterial leaf blight under direct sown rice

C. Jeyalakshmi, K. Madhiazhagan and C. Rettinassababady

ABSTRACT

Effect of different methods of application of *Pseudomonas fluorescens* commercial formulation under direct seeded wet sowing rice against bacterial leaf blight (*Xanthomonas oryzae* pv. *oryzae)* incidence, growth promotion and yield improvement was assessed under field condition. Among the different methods tried, the combination of seed treatment, soil application and foliar spray with *P. fluorescens* recorded the minimum disease incidence of bacterial leaf blight with maximum yield in comparison with the chemical treatment and control.

Key words: *Pseudomonas fluorescens,* methods of application, bacterial leaf blight reduction, crop production

INTRODUCTION

Rice (*Oryza sativa* L.), the ruling crop of Cauvery delta of Tamil Nadu and the adjoining Karaikal district of Union Territory of Pondicherry is now being cultivated as a direct sown crop because of water scarcity. Introduction of modern high yielding cultivars have changed the microclimate and ecology of the crop and hence diseases have assumed major status in all rice ecosystem and eventually result in significant reduction in yield. However, ecofriendly strategies have been developed to suppress the diseases and increase the yield. Accordingly, *Pseudomonas fluorescens* commercial formulation is recommended as seed treatment, soil application and foliar spray to the transplanted rice crop (Crop Production Guide, 1999). But the effectiveness of different methods of application is not tested for the direct sown crop. Hence, the present study was undertaken to find out the efficacy of different methods application of *P. fluorescence* commercial formulation under direct seeded wet sowing rice against diseases incidence, growth promotion and yield improvement under field condition.

MATERIALS AND METHODS

Field trial was conducted to standardize the method of application of *Pseudomonas fluorescens* (commercial formulation) under direct seeded wet sowing rice (ADT 43) in randomized block design with fourteen treatments and three replications. Methods of *P. fluorescence* application includes wet seed treatment (ST) @ 10g per kg of seed; Soil application (SA) @ 2.5 kg ha^{-1} either basal or topdressing on 30DAS along with 50 kg of well-decomposed FYM and Foliar spray (FS) @ 0.2 per cent on 60 and 75 DAS. Treatments include (T1) ST alone; (T2) ST + SA on 30 DAS; (T3) ST + SA on 30 DAS + FS on 60DAS; (T4) ST + SA on 30 DAS + FS on 60 and 75 DAS: (T5) SA alone; (T6) SA + SA on 30 DAS; (T7) SA + SA on 30 DAS + FS on 60DAS; (T8) SA + SA on 30 DAS + FS on 60 and 75 DAS: (T9) SA on 30 DAS alone; (T10) SA on 30 DAS + FS on 60DAS; (T11) SA on 30 DAS + FS on 60 and 75 DAS; (T12) FS alone; (T13) Carbendazim check and (T14) control. Natural incidence of Bacterial Leaf Bight (BLB) was scored 15 days after flowering on randomly selected leaves using 0 – 9 scale of TNAU disease score chart (Grade 0 = No visible symptoms; Grade 1= < 1 % leaf area diseased; Grade 3 = 1 - 10% leaf area diseased; Grade 5 = 11 - 25% leaf area diseased; Grade 7 = 26 - 50% leaf area diseased and Grade 9 = 11 - 25% leaf area diseased) and Per cent Disease Index (PDI) was worked out using the formula suggested by McKinney (1923). The growth parameters including plant height, total of productive tillers and grain yield were recorded.

Statistical analysis

The data on bacterial leaf blight incidence were transformed into arc sine for statistical analysis (Gomez and Gomez, 1984). The data was subjected to statistical scrutiny following the method of Panse and Sukhatme (1989) and Gomez and Gomez (1984) and the means were compared with Least Significant Difference (L.S.D.).

RESULTS AND DISCUSSION

The results presented in Table 1 revealed that treatment combinations recorded an increase in plant height, total number of tillers, productive tillers and yield over the application of *Pseudomonas* alone. Among the fourteen treatments, application of *Pseudomonas* as seed

Table 1. Effect of different methods of application of *Pseudomonas fluorescens* under direct seeded rice

Treatments	Plant height (cm)	Total no. Of tillers	No. of Productive tillers	Bacterial Leaf Blight PDI (%)	Grain yield (t / ha)
PFST alone	66.67^{h}	10.00^{g}	9.67^{d}	34.44^{d}(35.93)	3.2^{d}
PFST + PFSA on 30 DAS	68.00^{f}	12.00^{e}	11.67^{c}	32.1^{d}(34.51)	3.3^{d}
PFST +PF SA on 30 DAS + PFFS on 60 DAS	73.00^{c}	14.66^{b}	14.00^{bc}	3.33^{a}(10.51)	3.9^{b}
PFST + PFSA on 30 DAS + PFFS on 60 DAS and 75 DAS	78.67^{a}	15.00^{a}	15.00^{a}	1.11^{a}(6.05)	4.1^{a}
PFSA alone	65.00^{j}	9.33^{h}	9.00^{d}	39.99^{e}(39.23)	3.3^{d}
PFSA + PFSA on 30 DAS	67.67^{g}	11.33^{f}	11.00^{c}	33.3^{d}(35.26)	3.3^{d}
PFSA + PFSA on 30 DAS + PFFS on 60 DAS	71.00^{d}	14.33^{bc}	14.00^{ab}	3.33^{a}(10.51)	3.9^{b}
PFSA +PFSA on 30 DAS + PFFS on 60 DAS and 75 DAS	77.00^{b}	15.00^{a}	15.00^{a}	2.22^{a}(8.57)	4.0^{ba}
PFSA on 30 DAS	64.33^{i}	9.00^{hi}	8.67^{e}	43.33^{f}(41.17)	3.2^{d}
PFSA on 30 DAS + PFFS on 60 DAS	69.00^{e}	13.00^{d}	12.00^{c}	26.6^{c}(31.09)	3.5^{c}
SA on 30 DAS + FS on 60 DAS and 75 DAS	71.00^{d}	14.00^{c}	13.33^{b}	11.1^{b}(19.47)	3.6^{c}
PFS on 60 DAS and 75 DAS	62.00^{k}	8.66^{i}	7.00^{e}	48.88^{g}(44.36)	2.8^{e}
Carbendazim ST	65.00^{j}	9.00^{hi}	8.00^{de}	58.88^{h}(50.11)	2.0^{f}
Control	60.00^{l}	7.00^{j}	5.00^{f}	60.00^{h}(50.77)	1.2^{g}

Data in parentheses are arc sine transformed values. In a column, means followed by a common letter are not significantly different at 5% level by DMRT; PFST: *Pseudomonas fluorescens* seed treatment @ 10g per kg of seed; PFSA: *Pseudomonas fluorescens* soil application @ 2.5 kg ha^{-1}, PFFS: *Pseudomonas fluorescens* Foliar spray @ 0.2 per cent; Carbendazim ST @ 2 g per kg of seed

treatments followed by soil application on 30 DAS and foliar spray on 60 and 75 DAS was found to be highly effective by recording minimum bacterial leaf bight (1.11 %) and maximum yield (4.1 t ha $^{-}$1) whereas the control plots recorded maximum disease (60.00%) with minimum yield (1.2 t ha $^{-}$1). The combination of soil application either basal or topdressing on 30 DAS and foliar spray on 60 and 75 DAS ranked next in reducing the BLB disease and increasing the yield, which was followed by the soil application on 30 DAS and foliar spray on 60 DAS.

Further, it is interesting to note that plants raised from seed treatment with *Pseudomonas* and soil application on 30 DAS reached 50 per cent flowering a week earlier than other. The results are in agreement with those of Rabindran and Vidhyasekaran (1996), who reported that combination of application of *Pseudomonas* including seed treatments, seedling dip, soil application and foliar spray not only reduced sheath blight disease but also increased the grain yield of cultivar ASD.18 under transplanted condition. Perusal of the literature revealed that *Pseudomonas* application increases growth rate of rice plant (Nayar, 1996). However, chemical seed treatment without any *P. fluorescens* doesn't reduce bacterial leaf bight incidence.

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C. Jeyalakshmi*, K. Madhiazhagan and C. Rettinassababady

Department of Plant Pathology, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal - 609 603, Union Territory of Puducherry, India, *E-mail – csjayal@yahoo.co.in, csjayal@pajancoa.ac.in.

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