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Efficacy of Bio-Control Agents for the Management of (*Pyricularia grisea*) Blast Disease of Finger Millet Under Field Condition of Bastar, Chhattisgarh

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A field experiment was conducted during kharif 2009-10 and 2010-11 to evaluate the efficacy of bioagents spray combination to control blast disease in finger millet caused by *Pyricularia grisea*. Among different spray combinations of bio-agents used as foliar spray, three sprays of *Pseudomonas fluorescens,* was effective for controlling leaf blast severity and finger blast incidence followed by two sprays of *P. fluorescens*. Besides, significantly lowest neck blast incidence was also revealed in three sprays of *P. fluorescens* followed by two sprays of *P. fluorescens*. Significantly higher grain yield was recorded from three sprays of *P. fluorescens*. Cost benefit ratio was higher in, three sprays of *P. fluorescens* and *Trichoderma harzianum*.

Keywords: *In vivo* evaluation, Bioagents, *Pseudomonas fluorescens, Trichoderma viride, Trichoderma harzianum, Pyricularia grisea*.

Finger millet (*Eleusine coracana* (L.) Gaetn.) is commonly known as Ragi is one of the most important and largely grown small millet in India. It is widely consumed as the staple food in the rural community of Southern Karnataka, Tamilnadu, Andhra Pradesh, Bihar, Orissa and Chhattisgarh. It is an important group of rainfed and dry land field crop, also known as 'Nutri-cereals' in human dietary components. Even though, finger millet is known to be one of the hardiest crops, it is affected by good number of diseases such as blast, foot rot, smut, streak and mottling virus (Govindu and Shivanandappa 1967). Among these, blast is caused by *Pyricularia grisea* is the most devastating disease affecting different aerial parts of the plant at all stages of its growth starting from seedling to grain formation and considered as most destructive disease. Yield loss due to blast may be around 28 per cent (Vishwanath *et al*., 1997), but under favorable conditions it may go higher to 80-90 per cent. Sitther and Gananamanickan (1996) reported effectiveness of six strains of *fluorescent pseudomonas* belonging to *P. fluorescens* and *P. Putida* for their ability to inhibit the *Pyricularia grisea* causing blast disease of finger millet.

Sompappa (1999) evaluated six biocontrol agents as seed applicants for the control of leaf blast and found that the per cent disease index at 45 DAS was least and were at par with Carbendazim, neck and finger blast were also controlled by above bio agents. In spite of a great deal of research on the pathogen and on the disease, blast still remains a serious constraint to Ragi production in areas with conducive environments where susceptible cultivars are grown. Since finger millet is predominantly grown as rain fed crop by small

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farmers, the disease management by chemical means is found to be effective. However, reliance on pesticides to manage disease and pest problems has aggravated environment decline and caused serious health effects on agricultural workers and rural communities. Pesticides residues also raise food safety concerns among domestic consumers and pose trade impediments for export crops.

It is in this context that bio control against i.e. *Pseudomonas fluorescence*, *Trichoderma viride /harzianum* have recently become the focus of research and resources in many countries. Scientists worldwide are now exploring sutable and effective bio control agents as among the strategies to achieved improved and sustainable crop production. In many Asian countries bio agent control technologist are now in various stages of development and utilization. Ramappa *et al.,* (2002) obtained good control of finger blast by two sprays of *P. fluorescens* @ 3g/l. A talc powder based formulation of an antagonistic strain of *Pseudomonas fluorescens* (ABPf-1) isolated from the rhizosphere of rice plants in India was tested for its efficacy against *Pyricularia grisea* [*Magnaporthe grisea*]. Effectiveness of *P. fluorescens* as foliar spray in controlling the rice blast in field condition was reported by Hossain and Kulkarni (2001), Krishnamurthy and Gnanamanickam (1998) and Vidhyasekaran, *et al.,* (1997) also reported the effectiveness of *P. fluorescens*. Ramappa, *et al.,* (2002b and 2002c) obtained good control of *Pyricularia grisea* by two sprays of *P. fluorescens* @ 3g/ l causing blast disease of finger millet. For this reason, we evaluated different spray combination of *Pseudomonas fluorescens* and *Trichoderma harzianum* for their effectiveness against finger millet blast disease and their impact on yield under field conditions.

MATERIALS AND METHODS

The field experiments were conducted during the years 2009-10 and 2010-11 at Research Farm of SG College of Agriculture & Research Station, Jagdalpur, Bastar (Chhattisgarh, India). *In vivo* efficacy of bio-control agents i.e. *Pseudomonas* fluorescens @ 0.6% *Trichoderma viride* @ 1.0% and *Trichoderma harzianum* @ 1.0 % was tested for the control of blast disease of finger millet caused by *Pyricularia grisea*. The highly susceptible finger millet variety PR-202 was sown in 3 x 2 m^2 plots followed recommended package of practices. The bio-agents were applied thrice as foliar spray first at the initiation of disease, second at 50% flowering and third spray was given after 10 days of second spray. Spray with water served as check.

Observations were recorded for leaf, neck and finger blast separately. Leaf blast severity was recorded on 0- 5 scale (Mackill and Bonman 1992). Whereas, neck blast and finger blast incidence was recorded by counting the number of infected panicles and fingers from total population (Mackill

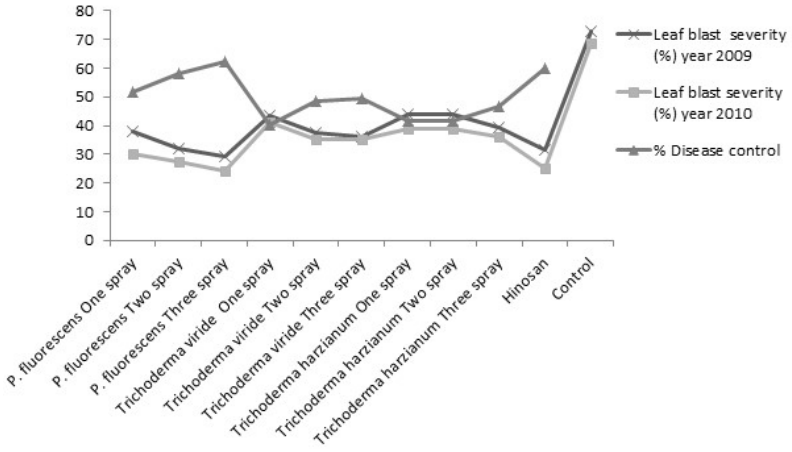

Fig. 1. Efficacy of bio-control agents against leaf blast disease severity of finger millet caused by *Pyricularia grisea*

and Bonman 1992). Disease severity scoring for leaf blast was recorded at seedling and booting stage, whereas for neck blast and finger blast at the physiological maturity and at harvest. Further per cent disease index (PDI) for leaf blast was calculated (Dubey, 1995).The grain yield was recorded after harvesting of crop from individual plots. The per cent disease control was worked out using the formula given by Abbott's (1925).

Percentage reduction = C – T/C x 100, where, C is the population of control and T is the population of treated plots.

RESULTS AND DISCUSSION

Efficacy of bio-control agents i.e. *Pseudomonas fluorescens, Trichoderma viride* and *Trichoderma harzianum* was evaluated *in vivo* for controlling blast disease of finger millet caused by *Pyricularia grisea*. The leaf blast severity was found to be significantly less in all treated plots over check. Among different spray combinations of bio-agents, three sprays of *P. fluorescens* (26.67%) was effective in controlling leaf blast severity followed by two spray of *P. fluorescens* (29.67%) and was at par with Ediphenphos

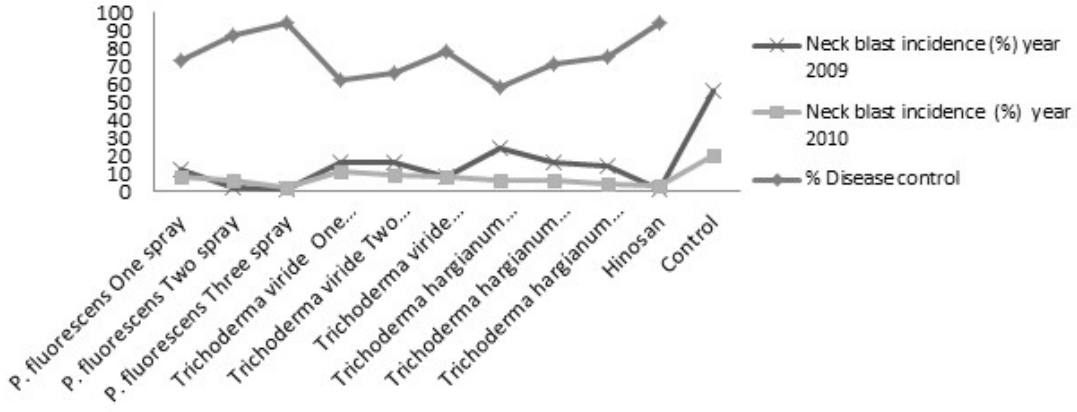

Fig. 2. Efficacy of bio-control agents against neck blast disease incidence of finger millet caused by *Pyricularia grisea*

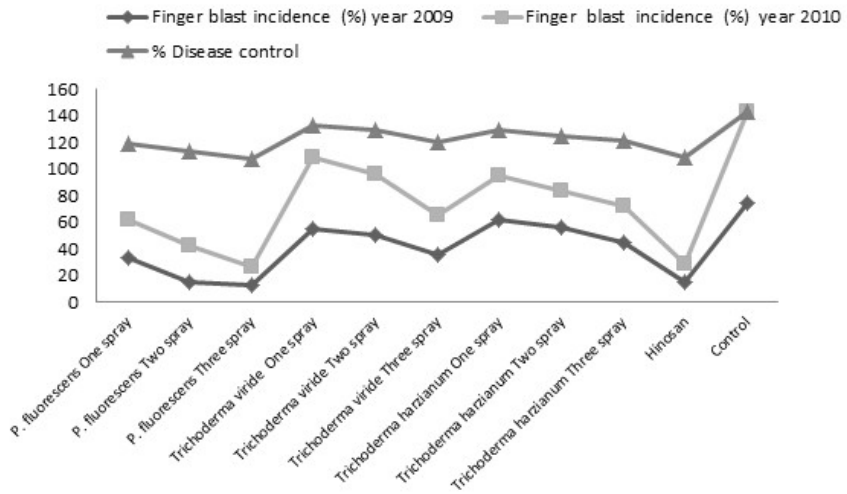

Fig. 3. Efficacy of bio-control agents against finger blast disease incidence of finger millet caused by *Pyricularia grisea*

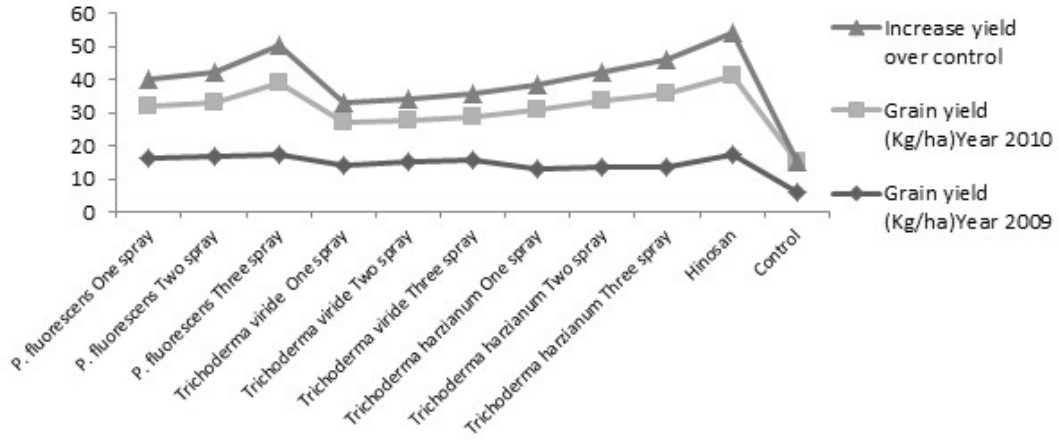

Fig. 4. Effect of bio-control agents on grain yield of finger millet finger

(28.33%). Pooled mean data indicated that the maximum per cent disease control was recorded from three sprays of *P. fluorescens* (fig.1).

Three sprays of *P. fluorescens* (3.85%) was also having significantly lowest neck blast incidence and at par with Ediphenphos (3.85%) followed by two spray of *P. fluorescens* (7.69%) during 2009-10 and 2010-11. Pooled mean data indicated that the maximum per cent disease control was recorded from above treatments (fig. 2).

Similarly lowest finger blast incidence of 21.20 per cent was recorded from three sprays of *P. fluorescens* (23.09%) followed by two spray of *P. fluorescens* (23.10%) during 2009-10. Whereas finger blast incidence was significantly lowest in Ediphenphos (20.91%) and at par with three spray of *P. fluorescens* (21.58 %) during 2010-11. Two years pooled mean data indicated that the maximum of 81.43 per cent disease control was recorded from three sprays of *P. fluorescens* (fig. 3).

Data on grain yield recorded from various treatments indicated that the grain yield was significantly higher in three sprays of *P. fluorescens* (17.5 q/ha) followed by Ediphenphos (17.5 q/ha), three sprays of *Trichoderma viride* (15.56 q/ha) and three sprays of *Trichoderma harzianum* (13.75 q/ha) during 2009-10. Whereas, higher grain yield was recorded in Ediphenphos (23.75 q/ha) at par with three sprays of *Trichoderma harzianum* (22.08 q/ha) and three sprays of *P. fluorescens* (21.39 q/ha) during 2010-11.The cost-benefit ratio was also higher in three spray of *P. fluorescens,* three sprays of *Trichoderma harzianum* and at par with Ediphenphos (fig. 4).

Ramappa *et al.,* (2002) obtained good control by two sprays of *P. fluorescens* against *Pyricularia grisea*. Sitther and Gananamanickan (1996) reported the effectiveness of six strains of *Pseudomonas fluorescens* for their ability to inhibit the blast fungus. The application of bioagents in reducing the blast disease of finger was also reported by Senthil *et al.,* (2012).

Kumar and Kumar (2011) reported that seed treatment with *Pseudomonas fluorescens* (@ 0.6% along with two sprays (@ 0.6% were significantly most effective in reducing blast disease of finger millet. Similar finding was reported by Patro, *et.al.* (2008) and Kumar (2011). Several other workers i.e. Krishnamurthy and Gnanamanickam 1998, Vidhyasekaran *et al.,* 1997, and Ramappa *et al.,* 2002 were also reported the effectives of *P. fluorescens* applied as foliar spray.

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