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Original Article

Optimization of Doses of Talc Based *Fluorescent Pseudomonas* for the Management of Banded Leaf and Sheath Blight of Maize (*Zea Mays* L.)

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Abstract

Several strains of fluorescent pseudomonas were isolated from rhizosphere of different crops. Carrier-based formulations of two of these isolates were made using talc powder. Three doses of carrier-based formulations i.e.2 g, 4 g and 6 g of two isolates viz. ZRP-3 and ZRP-5 were tested as seed treatment, soil treatment and foliar sprays. Higher doses (4 g and 6 g) were found effective in reducing disease severity of banded leaf and sheath blight of maize (18.6%-40.0%) with all three methods of application. Higher doses also enhanced germination (10.5%-25.0%) of maize seeds when used as seed treatment and soil application.

Keywords

Fluorescent pseudomonads; *Rhizoctonia solani*; Carrier-based formulations.

Introduction

Banded leaf and sheath blight of maize (BL & SB) incited by *Rhizoctonia solanil* Kuhn; Exner is one of the major production constraints for maize in India as well as other maize growing countries. It was first reported from Sri Lanka as Sclerotial disease of maize [1]. Since then it has attained worldwide distribution. In India it was first time recorded from *Tarai* region of Uttar Pradesh [2]. The disease results in direct losses exhibiting premature death, stalk breakage and ear rot. Yield losses up to an extent of 97% have been reported.[3] Very few maize cultivars have shown resistance to this disease and chemical control measures provide only partial protection to the crop. Breeding for the resistance which has been very successfull tools for many crops is not able to keep pace with the development of more virulent races of the pathogens. This situation has dully prompted the pathologist to look for an alternative strategy for managing the disease. Bacterial flora has been used successfully for the control of plant disease and yield improvement.[4] Success of biological control largely depend upon the proper application of bio control agent for that proper dose of bio control agent for seed treatment, soil application and foliar spray. Therefore present investigation are carried out to optimize appropriate doses of formulated bio control agent for controlling banded leaf and sheath blight of maize.

Materials and Methods

Experiments were conducted in glass house using randomized complete block design with three replications. Earthen pots of 9 inches size filled with two kg of field soil thoroughly mixed

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with compost manure were used. The soil was then inoculated with free culture *Rhizoctonia solani* grown on sorghum grains. These pots were watered regularly and covered with polythene bags to maintained high relative humidity and kept for one week to allow the fungus for its establishment. Ten healthy seeds of maize cultivar Basilocal were seeds in each pot. Carrier based formulation of ZRP-3 and ZRP-5 was prepared on talk powder and used as per following methods.

Seed Treatment

Seeds of maize were treated with talk based formulation @ 2, 4 and 6 g/kg of seeds just before sowing.

Soil Treatment

Maize seeds were sown in pots containing field soil. After 20 DAS talk based formulations were manually placed in the root zone of plants in doses of 2,4 and 6 g/pot.

Foliar Spray

Talk based formulation was suspended in water separately @ 2,4 and 6 g/liter of water, allowed to settle for some time, filtered through muslin cloth and filtrates were sprayed at the appropriate time.

Data on germination percentage and disease severity were recorded following 1-5 rating scale as suggested by Ahuja and Payak, 1983[5] (where, 1= Healthy and 5= severely infected.

Result and Discussion

Effect of Different Doses of ZRP-3

All three doses of formulated bio control agent@ 2,4 and 6 g/kg of seeds increase the germination of maize plants (Table 1). However, maximum germination (905 and 88%) was recorded when the formulation was used in higher doses ie. 4, 6 g/kg of seeds. Similarly, soil application @ 6g/plote also enhance the germination, where as lower dose was ineffective. Non significant effect ware recorded in germination when the formulation was applied as foliar sprays. All three doses of the formulation reduced doses severity significantly when applied as seed treatment. Seed treatment @ 4g and 6g/K exhibited 30%

Table 1: Effect of different doses of ZRP-3 and ZRP-5 on germination and disease severity

Treatments	Germination (%)		Increase over control (%)		Disease (1-5)		Reduction over control (%)	
Seed Treatment	ZRP-3	ZRP-5	ZRP-3	ZRP-5	ZRP-3	ZRP-5	ZRP-3	ZRP-5
				Seed Treatment				
Control	76(60.6)	68(55.5)	-	-	5.0	5.0	-	-
2g/kg	84(66.4)	72(58.0)	10.5	5.8	4.0	4.0	20.0	20.0
4g/kg	90(71.5)	74(59.3)	15.4	8.6	3.5	3.5	30.0	30.0
6g/kg	88(69.7)	82(64.9)	15.7	20.5	3.5	3.3	30.0	33.4
CD (5%)	5.42	6.42	-	-	0.39	0.36	-	-
				Soil Application				
Control	70(56.7)	74(89.3	-	-	5.0	4.6	-	-
2g/plot	72(58.0)	80(63.4)	2.8	8.1	3.5	3.5	30.0	24.8
4g/plot	74(59.3)	82(64.9)	5.7	10.8	3.3	3.3	33.4	28.5
6g/plot	84(66.4)	88(69.7)	20.0	18.9	3.0	3.0	40.0	35.6
CD (5%)	6.29	8.03	-	-	0.46	0.38	-	-
				Foliar Application				
Control	76(60.6)	76(60.6)	-	-	4.6	5.0	-	-
2g/liter	76(60.6)	74(59.3)	0.0	-	4.3	4.3	7.1	13.4
4g/ liter	80(63.4)	76(60.6)	5.2	0.0	4.0	3.5	14.1	30.4
6g/ liter	74(59.3)	72(58.0)	-	-	3.5	3.3	24.8	33.4
CD (5%)	NS	NS	-	-	0.52	0.37	-	-

reduction in disease as compared to control. Higher doses of soil application showed even better disease reduction (40%). Similarly, foliar sprays of the formulation @ 6g/L resulted in 24.8% reduction in disease severity.

Effect of Different Doses of ZRP-5

The data indicates no significant effect of any dose on seed germination when formulation was used as seed treatment and foliar sprays (Table 1). However, higher doses (4 and 6g/plot) of soil applications enhanced germination (15.6% and 25%) significantly as compared to control, and lower doses (2g/plot). Significant reduction in disease severity was also recorded with higher doses (4g and 6g) of formulation when applied to seeds and in soil. Foliar sprays @ 6g/L also reduced the disease significantly. In general, lower dose (2g) was ineffective in reducing disease severity. Several workers have been able to control foliar diseases using *fluorescent pseudomonas* formulations.[6] Similar results have been reported by Shiv Kumar *et al* [7] who tested the different doses of peat based formulation of *fluorescent pseudomonas* against banded leaf and sheath blight of maize and observed that higher doses of seed treatment, soil application and foliar sprays effectively reduced disease severity as compared to lower doses as reported earlier.[8]

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