Indian Journal of Plant Sciences ISSN: 2319–3824 (Online)
An Open Access, Online International Journal Available at http://www.cibtech.org/jps.htm
2014 Vol. 3 (2) April -June, pp. 163-166/Patro and Madhuri
Research Article

MANAGEMENT OF BANDED BLIGHT OF FINGER MILLET INCITED BY *RHIZOCTONIA SOLANI* (KUHN.)

T.S.S.K. Patro and *J. Madhuri
A.N.G.R Agricultural University, Agricultural Research Station, Vizianagaram – 535001, A.P.
**Author for Correspondence*

ABSTRACT
Field experiment was conducted at the research farm of Agricultural Research Station, Vizianagaram, Andhra Pradesh during the *kharif* season of 2009-10 to test the management of banded blight of finger millet (*Eleisine coracana* (L) Gaertn.) caused by *Rhizoctonia solani*. Three fungicides viz., Carbendazim @ 1g/kg, Hexaconazole @ 2ml/kg, Propiconazole @ 1 ml/kg, One antibiotic Validamycin @ 2gm/kg, two bio-agents viz., *Pseudomonas flurescens* @ 10 g/kg, *Trichoderma harzianum* @ 4 gm/kg and its combination *Pseudomonas flurescens* @ 10 g/kg + *Trichoderma harzianum* @ 4 gm/kg were used as seed treatment on the susceptible variety Champavathi (VR-708). Among all the treatments seed treatment with propiconazole @ 1 ml/kg was found most effective in reducing disease incidence and increasing yield with 12.57 per cent of disease severity and 1435.87 kg/ha yield compared to untreated check with 42.2 per cent disease severity and 1324 kg/ha yields. Hexaconazole @ 2ml/kg was also at par with propiconazole both in reducing the disease severity and increasing yield. Validamycin @ 2 gm/kg, *P.flurescens* @ 10 g/lt + *T.harzianum* @ 4 gm/lt, Carbendazim was also effective in reducing the disease. Next to them are *Pseudomonas flurescens* @ 10 g/kg and *Trichoderma harzianum* @ 4 gm/kg.

Keywords: *Finger Millet, Fungicides, Rhizoctonia Solani, Banded Blight*

INTRODUCTION
Millets are one of the oldest foods known to humans & possibly the first cereal grain to be used for domestic purposes. Finger millet (*Eleusine coracana* (L.) Gaertn.), commonly known as birds foot, Nagli, Mandua and ragi in different parts of India is a major food crops as well as feed and fodder for livestock, especially in tribal belts. It is an indispensable to Indian Agriculture as a source of grain and straw in vast dry land areas. It is a sturdy crop to fluctuating environmental conditions, it can be cultivated in all seasons of the year. This nutritious millet is highly nutritious and even superior to rice and wheat in certain constituents. Seeds are richest source of protein (7.3 g), crude fibre (3.6 g), mineral matter (2.7g), fat (1.3 g),carbohydrates (72g), calcium (344 mg), phosphorus (283 mg), and iron (3.9 mg) per 100 grain. The grains have high dietary fibre and helps in prevention of constipation, lowering of blood cholesterol and slow release of glucose to the blood streams during digestion. Never the less, lower incidence of cardiovascular disease, duodenal ulcer and hyperglycemia (diabetes) are reported among regular millet consumers. In India it has been grown over an area of 16.42 lakh ha with an average production of 19.35 lakh tonnes (Nagaraja *et al*., 2007). It is known to be effected by several diseases viz., blast, Brown spot, banded blight, smut, rust, foot rot and viral diseases.

Banded blight of finger millet incited by *Rhizoctonia solani* (Kuhn.) (Basidial stage: *Thanatephorus cucumeris* (Fr.) Donk) is one of the emerging malady in successful cultivation of finger millet. Lalu Das and Girija (1989) for the first time reported as sheath blight of ragi from Vellayani in kerala, where it occurred in a severe form. Kannaiayan and Prasad (1979) found finger millet to be highly susceptible to rice isolate of *Rhizoctonia solani*. The disease was observed in severe form at the Agricultural Research Station in Vizianagaram, Andhra Pradesh and Berhampur, Orissa during monitoring survey in *kharif* 2000. Again the disease occurred severely at Agricultural Research Station, Vizianagaram in 2009 and 2010. The pathogen was isolated, purified and pathogenicity was established and the sample was deposited at *Herbarium Cryptogamae Indiae Orientalis (HCIO)*, IARI, New Delhi with HCIO number 46,916. The disease is characterized by oval to irregular light grey to dark brown lesions on the lower leaf sheath. The central portion of the lesions subsequently turns white to straw with narrow reddish brown

boarder. Such spots at later stages are distributed irregularly on leaf lamina. A temperature of around 28-30°C and a relative humidity of 70 per cent or above favors the rapid disease development where these lesions enlarge rapidly and coalesce to cover large portions of the sheath and leaf lamina. At this stage, the disease symptom is characterized by a series of copper or brown color bands across the leaves giving a very characteristic banded appearance. The mycelial growth along with white to brown sclerotia can be observed on and around the lesions. Later on, the leaves dry up and plants appear blighted.

MATERIALS AND METHODS

Efficacy of Fungicides, Bio-Agents Against R. Solani. Fungicides, antibiotic and bio-agents tested were Carbendazim, Hexaconazole, Propiconazole, Validamycin, *Pseudomonas flurescens, Trichoderma harzianum* and *P.flurescens + T.harzianum.*

Carbendazim. Chemically it was methyl-2-benzimidazole carbamate (MBC) with empirical formula of $C_9H_9N_3O_2$ and molecular weight of 191.2. It is a whitish grey powder having a faint acrid odour. It is a very stable compound. It is one of the safer fungicides. Carbendazim is systemic with prophylactic and curative action. It has been found to be non-phytotoxic at rates tested. It shows a broad spectrum of fungitoxic activity being effective against deuteromycetes. Besides the disease control, beneficial side effects like stimulation of growth, flowering and yield of plants as well as reduction of mite population on the treated hosts have been reported. It can be used as spray, seedling dip (five to ten minutes), seed dressing, soil drench, or as post-harvest treatment of fruits (dip for 0.5 to 1 minute).

At present, the developed product of carbendazim, Bavistin 50 per cent W.P. having an experimental number of BAS 3460F of the BASF of Federal Republic of Germany was used as seed treatment.

Hexaconazole

'Anvil' is the trade name for this fungicide. Chemically it is (RS)-2-(2, 4-dichlorophenyl)-1-(1H-1, 2, 4-triazol-1-yl) hexan-2-ol. It is a white crystalline solid melting at 111^0C. It is stable for at least nine months. It is available as soluble grain (5 SG having 50 g/kg), suspension concentrate (5 SG having 50 g/litre) and oil missible liquid for use with banana spray oil (5 OL having 50 g per litre) formulations. It is a broad spectrum fungicide. It inhibits the growth of a wide range of fungi both *in vitro* and *in vivo*. It is absorbed and translocated acropetally in xylem. It shows translaminar activity also. It has both protectant and eradicant properties. It is a potent inhibitor of ergosterol biosynthesis in sensitive fungi.

Propiconazole

It is a systemic fungicide. Chemically it is 1-[[2-(2, 4-dichlorophenyl)-4-propyl-1, 3-dioxolan 2yl] mythyl]-H-1,2,4-triazole. Its molecular formula is $C_{15}H_{17}Cl_2N_3O_2$ with molecular weight 342.2. It is pale liquid having boiling point of 180^0 C at 0.1 mm Hg. It is also known under the trade name Tilt. Tilt 250 E (250 g/litre) is used formulations of this fungicide. It is a broad spectrum foliar fungicide with systemic and eradicant properties. It is active on diseases caused by deuteromycetes.

Validamycin

Validamycin is a non-systemic antibiotic with fungicide action. Validamycin is also called Validamycin A. Chemically it is 1,5,6-Trideoxy-3-O-B-D-Glucopyranosyl-5-hydroxymethyl-1-((4,5,6-Trihydroxy-3-Hydroxymethyl)-2-cyclohexen-1-yl)amino) D-chiro-Inositol having molecular weight of 497.5 and melting point of 130-135 degrees C. Trade names include Validacin, Valimon; and Solacol. It is produced from fermentation of streptomyces hygroscopicus variety limoneus. It is most effective against soil borne diseases and is used for the control of Rhizoctonia solani in rice, potatoes, vegetables, and others as well as damping off diseases in vegetable seedlings, cotton, sugar beets, rice and other plants. It is practically non-toxic. Validamycin is found as a soluble concentrate, a dustable powder, and a seed treatment. Validamycin undergoes rapid microbial degradation in soil. Validamycin is a colorless, odorless hygroscopic powder. Validamycin is non-corrosive. Readily soluble in water.

Pseudomonas Fluorescens

Talcum based formulation of *Pseudomonas fluorescens* was used for field experiment. Before applying the talcum based formulation of *Pseudomonas fluorescens* in the field the c.f.u was checked in the laboratory.

c. f. u Count of Pseudomonas Fluorescens Formulation:

One gram powder formulation of *Pseudomonas fluorescens* was weighed and added to 9 ml of sterile distilled water, shaken well and labelled as 10^{-1} (1:10), made dilutions serially up to 10^{8}. From the first dilution 1 ml of the suspension transferred to the dilution blank 10^{2} with sterile pipette diluting the original suspension to 100 times (1/100 or 10^{2}), from the 10^{2} dilution blank transferred 1 ml of suspension to 10^{3}dilution blank with sterile pipette, thus diluting the original sample to 1000 times (1:1000). Repeated this procedure till the original sample has been diluted to 100,000,000 (10^{8}). From the dilution 10^{4} to 10^{8} transferred 1 ml of suspension while in motion, with the pipette, to each sterile Petri plates. Added 15 ml of the king's B molten, cooled medium mixed the contents of each plate by rotating gently. Allowed the plates to solidify and incubated in inverted position for 24 – 48 hours at 25 ± 2^{0}C**.**

c. f. u. = number of colonies / Amount plated x dilution factor.

The c. f. u. was 2×10^{8}/ gram.

Application of Trichoderma Harzianum

Talcum based formulation of *Trichoderma harzianum*, was used for field experiment. Before applying the talcum based formulation of *Trichoderma harzianum* in the field the c.f.u was checked in the laboratory.

c. f. u Count of Trichoderma Harzianum Talcum Based Formulation:

c. f. u. count of *Trichoderma harzianum* was done and the spore load was tested before the application. The following procedure was followed under aseptic condition. One gram *T. harzianum* powder was weighed and the volume was made up to 10 ml with sterilized distilled water and shaken well (1:10). Out of this suspension 1 ml was taken out and transferred to 9 ml of sterilized distilled water in a test tube (1:1000). Serial dilutions were made similarly by transferring 1 ml of each suspension to the subsequent tubes to get 10^{7}dilution. One ml each of 10^{7}suspension was transferred aseptically to sterilized Petri plates. Fifteen ml melted and cooled PDA medium was poured in these plates. The plates were incubated in an inverted position at 25 ± 2^{0}C. After 3 days average numbers of colonies were calculated per plate of *T. harzianum* The number of colony forming units (c. f. u.) present in one gram (or millilitre) of *T. harzianum* powder was calculated by the following formula.

c. f. u. = Number of colonies / Amount plated × dilution factor

The c. f. u. was 2×10^{6}/ one gram.

Field Evaluation of the Treatments. Field evaluations of three fungicides viz., Carbendazim @ 1g/kg, Hexaconazole @ 2ml/kg, Propiconazole @ 1 ml/kg, one antibiotic Validamycin @ 2gm/kg, two bio-agents viz., *Pseudomonas flurescens* @ 10 g/kg, *Trichoderma harzianum* @ 4 gm/kg and its combination *P. flurescens* @ 10 g/kg + *T. harzianum* @ 4 gm/kg were carried out using a susceptible finger millet variety 'Champavathi' during 2009 and 2010 at research farm of Agricultural Research Station, Vizianagaram, Andhra Pradesh. The experiments were laid out in randomized block design consisting of seven treatments each with three replications. Seeds of finger millet were sown in last week of June, 2009 and 2010 at a planting distance of 22.5 × 10 cm in plot size of 2.8 × 1.8 M. Standard agronomic practices of NPK – 50 kg, 40kg, 25kg were followed at the time of crop growth period.

$$\text{Disease severity} = \frac{\text{Area of plant tissue infected}}{\text{Total area}} \times 100$$

Seed treatments with bio-agents and fungicides were done. The disease severity and yield were recorded and analyzed statistically by using ANOVA.

RESULTS AND DISCUSSION

All the treatments were found significantly superior over check in controlling the disease. Among all the treatments seed treatment with propiconazole @ 1 ml/kg was found most effective in reducing disease incidence and increasing yield with 12.57 per cent of disease severity and 1435.87 kg/ha yield compared to untreated check with 42.2 per cent disease severity and 1324 kg/ha yields. Hexaconazole @ 2ml/kg

was also at par with propiconazole both in reducing the disease severity (13.6 per cent) and increasing yield (1433.50 kg/ha). Validamycin @ 2 gm/kg, *P.flurescens* @ 10 g/lt + *T.harzianum* @ 4 gm/lt, Carbendazim was also effective in reducing the disease. Next to them are *Pseudomonas flurescens* @ 10 g/kg and *Trichoderma harzianum* @ 4 gm/kg.

Table 1: Effects of different treatments on disease intensity and yield of finger millet

S.No	Seed treatments	Disease severity (%)*	Yield (kg/ha)*
1	Carbendazim @ 1 g/kg	27.2	1384.90
2	Hexaconazole @ 2 ml/kg	13.6[a]	1433.50 [a]
3	Propiconazole @ 1 ml/kg	12.57[a]	1435.87 [a]
4	Validamycin @ 2 gm/kg	19.97[b]	1426.87
5	*Pseudomonas flurescens* @ 10 g/kg	33.07[c]	1366.30
6	*Trichoderma harzianum* @ 4 gm/kg	37.1[cd]	1341.50
7	*P.flurescens* @ 10 g/lt + *T.harzianum* @ 4 gm/lt	20.37[b]	1402.97
8	Control	42.2[d]	1324
	S.Em	1.94	1.02
	CD (0.05)	5.89	3.08

** Average of three replicates.*

REFERENCES

Anilkumar TB, Mantur SG and Madhukeswara SS (2003). Diseases of finger millet. *Indian Council of Agricultural Research*, UAS, Bangalore, India.

Dubey SC (No Date). Banded blight of finger millet caused by *Thanatephorus cucumeris. Indian Journal of Mycology and Plant Pathology* **25** 315-16.

Kannaiayan S and Prasad NN (1978). Reaction of certain crop plants to sheath blight of rice. *Indian Journal of Mycology and Plant Pathology* **31** 541.

Lalu Das and Girija VK (1989). Sheath blight of ragi. *Current Science* **58** 681-682.

Nagaraja A, Kumar J, Jain AK, Narasimhudu Y, Raghuchander T, Kumar B and Gowda BH (2007). Compendium of small millet diseases. *All India Coordinated Small Millets Improvement Project*, UAS, Bangalore, India.