INTERNATIONAL JOURNAL OF PLANT PROTECTION / VOLUME 6 | ISSUE 1 | APRIL, 2013 | 221-222

IJPP

RESEARCH NOTE

Efficacy of *Pseudomonas fluorescens* in relation to diseases incidence of soft rot of ginger in Uttara Kannada district of Karnataka

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ARITCLE INFO

Received : 09.01.2013
Accepted : 26.04.2013

Key Words :
Ginger soft rot, *Pseudomonas fluorescens, Trichoderma harzianum,* Bordeaux mixture, Copper oxychloride

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ABSTRACT

Ginger (*Zingiber officinale* Roscoe.) an important spice crop is seriously damaged during monsoon by soft rot causing organism, *Pythium aphanidermatum* (Edson.) Fliz. in Uttara Kannada district of Karnataka. Application of *Pseudomonas fluorescens* (@ 1 per cent at 10^8 cfu) as seed treatment and three sprays at 15 days interval from 30 days after planting showed reduced incidence of soft rot disease and improved the vigour and yield of the crop.

How to view point the article : Lokesh, M.S., Patil, S.V., Gurumurthy, S.B., Palakshappa, M.G. and Anandaraj, M. (2013). Efficacy of *Pseudomonas fluorescens* in relation to diseases incidence of soft rot of ginger in Uttara Kannada district of Karnataka. *Internat. J. Plant Protec.*, **6**(1) : 221-222.

Ginger (*Zinger officinale* Roscoe), a herbaceous spice crop is grown in Uttara Kannada district of Karnataka during monsoon. It is used as fresh, dried, pickled preserved in syrup, powdered, crystalloid since time immemorial. It is also used in curry powder, cakes and cookies. It has multiple medicinal properties *viz.*, cures indigestion, relieves seasickness, fights nausea, diarrhoea, lowering cholesterol, reducing arthritis pain and preventing ulcers. India is the largest producer of dry ginger in the world. It is cultivated throughout India stands first in the production. The rhizome under ground is succumbed to infection by soft rot [*Pythium aphenidermatum* (Edson.) Fliz.] ,a soil borne organism, which results in huge losses to the tune of 80 per cent. The disease is more severe during South West monsoon especially under ill drained soil condition. The disease appears as yellowing of lower leaves tip which spreads gradually to leaf blade and leaf sheath along the margin. Later the yellowing spreads from bottom to upwards in all the leaves with drooping, withering and drying. Pseudo stem at collar region shows pale translucent brown colour with water-soaked lesions. The fungal infection spreads to rhizome with rotting symptoms and results in death of plant. The disease aggravates with application of nitrogenous fertilizer within fortnight. Though the disease could be managed by integration of cultural practices and chemical methods, the residue of chemicals in the produce results in poor quality and less price in the international market. There is little information on the efficacy of bioagent *viz., Pseudomonas fluorescens* in combating the disease. Hence, the present investigation was taken up to find out the effectiveness of bioagent on the disease.

The experiment was conducted at Horticulture Research Station, Sirsi, Uttara Kannada, Karnataka during 2011. The centre is situated at an altitude of 516 mts MSL with and average annual rainfall of 2500 mm with 110 rainy days. The temperature ranges from 16 ^{0}C to 36 ^{0}C. The variety used in the experiment was popular local cultivar which was highly susceptible to the disease. The trial was laid out in RBD with 4 replications. There were seven treatments, out of which four

Table 1 : Efficacy of bioagents and fungicides in the management of soft rot of ginger

Treatments	Per cent disease incidence
Mancozeb (@ 0.2 per cent)	27.00
Carbendazim (@ 0.1 per cent)	32.25
Copper oxychloride (@ 0.2 per cent)	18.00
Bordeaux mixture (@ 1 per cent)	16.50
Pseudomonas fluorescens (@ 1 per cent)	13.00
Trichoderma harzianum (@ 1 per cent)	31.00
Control	63.50
S E.±	0.60
C.D. @ 5 %	1.68

treatments with fungicides *viz.,* mancozeb (@ 0.2 per cent), copper oxychloride (@ 0.2 per cent), carbendazim (@ 0.1 per cent) and Bordeaux mixture (@ 1 per cent) and two treatments with bio agents *viz., P. fluorescens* (@1 per cent with 10^8 cfu) and *Trichoderma harzianum* (@ 1 per cent with 10^8 cfu in 100g of neem cake (as soil application). The untreated plants served as control. The treatment was started right from seed treatment for 20 minutes with respective fungicide/bioagents followed by spraying and drenching at 15 days interval for three times after 30 days of planting. The bed size was 2X1 m which was raised and planting was done during on set of monsoon in June,2011. The disease incidence was calculated in per cent based on rotting of the rhizome and symptoms of yellowing, drooping and withering of leaves.

The results from Table 1 indicated that the disease incidence of rhizome rot was least in the bioagents treatment with *P. fluorescence* (13.00 %) followed by fungicide treatment with Bordeaux mixture (16.50 %). However, copper oxychloride was found effective in reduction of disease incidence (18.00 %), where as with carbendazim disease reduction was (32.25 %). It was on par with the *T. harzianum* (31.00 %). Mancozeb was also effective in checking the disease (27.00 %). The untreated plants showed maximum disease incidence (63.50 %).

P. fluorescens suppressed the plant pathogens by producing a range of multiple secondary metabolites *viz.,* pterines, pyroles, indoles, alignate, siderophores, indole-3-acedic acid, lipids/pyco compounds, phenazines, aminoacids, peptides antibiotics (Mondal and Verma, 1988). Under high disease pressure, the level of production in sugarbeet against *Pythium ultimum* and *Aphanomyces cochliodes* by fluorescent Pseudomonas was very much reduced (Willams and Asher, 1996).

Seed treatment gave effective protection against pathogens by inducing defense mechanism much before pathogens attack as transient protection by inducing defense genes for 14-40 days. Along with seed treatment, foliar spray of *P. fluorescens* at 15 days interval helped in long term protection against rice blast (Vidhyasekaran *et al.,* 1997). The finding are in inconformity with the results of the above workers.

The present investigation revealed that *P. fluorescens* is a potential bioagents for the management of rhizome rot of ginger as alone or as a component of integrated disease management strategies.

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