



## **Integrated Management of *Phytophthora* in Black pepper raised on Forest Tree Nurse Crops.**

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### **ABSTRACT**

Black pepper (*Piper nigrum*) is a spice best-adapted to Konkan agro-climatic conditions in Maharashtra. It is cultivated under partial shade of Arecanut and Coconut crops. However, other suitable forest trees as nurse crops can be established at a close spacing (3 x 3 m) and used for growing sole crop of black pepper under adequate irrigation facilities. *Phytophthora* causing foot rot in black pepper is a major problem of this crop. As a part of this experiment, study of integrated management of *Phytophthora* was conducted using combinations of different fungicidal materials. The experiment was laid out in Randomized Block Design with seven replications and three treatments during the year 2007 to 2010 on farmers field at Kelashi, Tal. Dapoli, Dist. Ratnagiri. The treatments were T<sub>1</sub>- Potassium phosphonate @ 0.3% as spray (2 l/vine) + *Trichoderma harzianum* (50 g of inoculum 1 x 10<sup>8</sup> cfu) mixed with one kg of neem cake as soil application, T<sub>2</sub>- Bordeaux mixture 1% as spray (2 l/vine) and Copper oxychloride @ 0.1% as drenching (3 l/vine) and T<sub>3</sub> - Farmers' practice- Copper oxychloride @ 0.1% as spray once served as control. Both T<sub>1</sub> and T<sub>2</sub> were of equal efficacy in reducing foot rot incidence by 70.47 and 56.85 per cent respectively, compared to farmers' practice. Also Maximum dry berry yield (0.916 kg/vine) was recorded in T<sub>1</sub> which was significantly superior to other treatments by 11.44 per cent increase in dry berry yield compared to farmers' practice.

### **Keywords:**

Arecanut, Coconut, *Erythrina*, *Piper nigrum*, *Phytophthora capsici*, *Trichoderma harzianum*

### **INTRODUCTION**

Black pepper (*Piper nigrum* L.) (Family-Piperaceae) is being cultivated in Kerala (96%), Karnataka (3%) and to a lesser extent in Maharashtra, Andhra Pradesh, Tamil Nadu and North Eastern regions. In Konkan region of Maharashtra Black pepper is cultivated under partial shade of Arecanut and Coconut crops. However, other suitable forest trees as nurse crops can be established at a close spacing (3 x 3 m) and

used for growing sole crop *Erythrina indica* under adequate irrigation facilities.

The production of black pepper is hampered by various diseases. Amongst the serious diseases affecting black pepper, *Phytophthora* foot rot caused by *Phytophthora capsici* is very serious (Anandraj et al.1996). Sudden mortality of the vines due to *Phytophthora* foot rot was the major constraint for cultivation of the crop (Sastry 1982,

Dutta 1984 and Sarma et. al. 1994). Survey of diseases of black pepper conducted during the period from 2001-2002 to 2005-06 also revealed the continuous threat posed by this disease to black pepper cultivation in the Konkan region (Anonymous 2006). *Phytophthora* causing foot rot in black pepper is a major problem of this crop. The life cycle of the disease and symptoms is given in Fig. 1. As a part of this experiment, study of integrated management of *Phytophthora* was conducted using combinations of different fungicidal materials.

### MATERIAL AND METHODS

The experiment was laid out in Randomized Block Design during the year 2007-08, 2008-09 and 2009-10 on farmers' field at Kelashi, Tal. Dapoli, Dist. Ratnagiri, with seven replications and three treatments viz.,

- T<sub>1</sub>- Potassium Phosphonate @ 0.3% as spray (2 l/vine) + *Trichoderma harzianum* (50 g of inoculum 1 x 10<sup>8</sup>cfu) mixed with one kg of neem cake as soil application,
- T<sub>2</sub>- Bordeaux mixture 1% as spray (2 l/vine) and Copper oxychloride @ 0.1% as drenching (3 l/vine) and
- T<sub>3</sub>- Farmers' practice- (Copper oxychloride @ 0.1% as spray once served as control). Observations on disease incidence and dry berry yield were recorded.

### RESULTS AND DISCUSSION

The data presented in Table 1 indicated that Potassium phosphonate + *Trichoderma harzianum* and Bordeaux Mixture + Copper oxychloride were of equal efficacy in reducing foot rot incidence by 70.47 and 56.85 per cent respectively, compared to farmers' practice.

Maximum dry berry yield (0.916 kg/vine) was recorded by Potassium phosphonate + *Trichoderma harzianum* treatment which was significantly superior to farmers' practice with 11.44 per cent increase in dry berry yield. Though Bordeaux mixture + COC was significantly superior to farmers' practice in reducing foot rot and leaf blight incidence, increase in yield was only to the tune of 2.55 per cent.

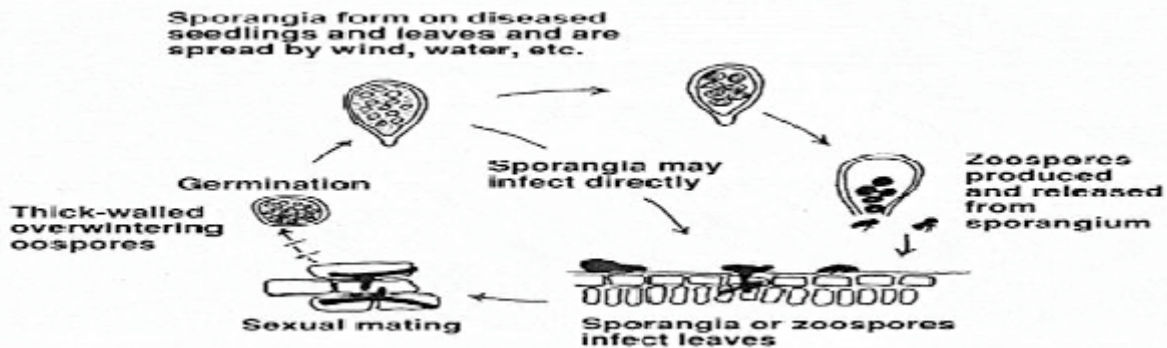
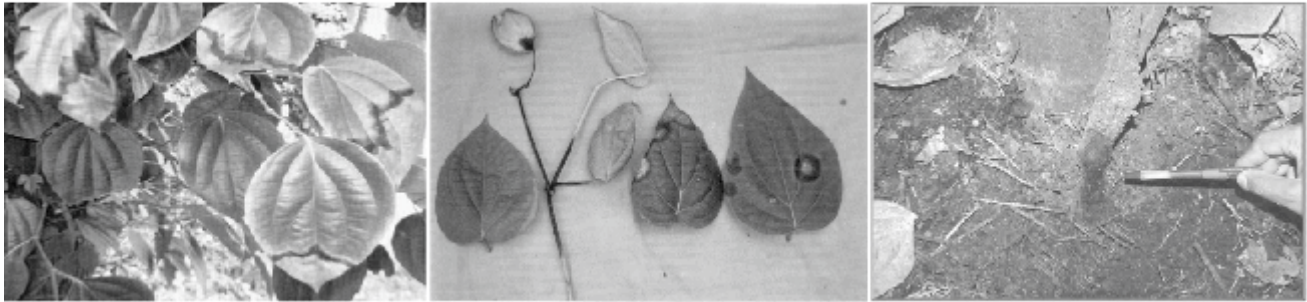
It can be concluded that the assessment of Potassium phosphonate and *Trichoderma harzianum* gives good protection to root system against *Phytophthora capsici* in Black pepper (Rajan and Sarma 1997). The results were in conformity with the findings of Sarma et al 1996 where they reported the compatibility of agrochemical Potassium phosphonate with bio-agent *Trichoderma* spp.in checking *Phytophthora* infection in black pepper. Rajan et al., 2002, confirmed that *Trichoderma harzianum* was able to control the foot rot infection in black pepper more efficiently proliferating in the soil and can remain in the soil for long time as well as gave good protection to the root system against *P. Capsici*.

### RESULTS :

**Table 1.** Integrated management of *Phytophthora* foot rot of black pepper in farmers' field

Sr. No	Treatment	Foot rot (%)			Dry berry yield (kg/vine)				
		2007	2008	2009	Pooled	2007	2008	2009	Pooled
1.	Potassium Phosphonate + <i>T. harzianum</i> (T <sub>1</sub> )	0.00	0.00	4.42 (6.62) <sup>a</sup>	4.42 (6.62) <sup>a</sup>	0.960	0.917 <sup>a</sup>	0.870 <sup>a</sup>	0.916 <sup>a</sup>
2.	Bordeaux Mixture + Copper oxychloride (T <sub>2</sub> )	0.00	0.00	6.46 (9.79) <sup>b</sup>	6.46 (9.79) <sup>a</sup>	0.890	0.830 <sup>b</sup>	0.810 <sup>b</sup>	0.843 <sup>b</sup>
3.	Farmers' practice (Copper oxychloride @ 0.1% as spray once served as control) (T <sub>3</sub> )	0.00	0.00	14.97 (22.75) <sup>b</sup>	14.97 (22.75) <sup>b</sup>	0.870	0.827 <sup>b</sup>	0.770 <sup>b</sup>	0.822 <sup>b</sup>
	S.Em. ±	-	-	4.08	4.08	0.032	0.022	0.015	0.021
	C.D. at 5%	-	-	12.57	12.57	NS	0.067	0.048	0.061

Figures in parentheses indicate arcsine transformation. Means with same letters as subscript are at par.



**Figure 1.** Life cycle of disease and symptoms

#### ACKNOWLEDGEMENTS

One of us (Dr. Rajesh R. Rathod, Asstt Professor of Plant Pathology) is grateful to Shri. U. A. Gadre (Retd. Jr. Pl. Pathologist) for work carried out and also grateful to Dr. P. M. Haldankar (Head, Dept. of Horticulture) and Dr. V. S. Pande (Head, Dept. of Plant Pathology). The help provided by farmers by giving their pepper field for field trials is being acknowledged gratefully.

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