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Colletotrichum blight control in large cardamom (*Amomum subulatum* Roxb.) nursery

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Abstract

Experiments were conducted in large cardamom (*Amomum subulatum* Roxb.) nursery using bioagents and chemicals to produce healthy planting materials free from blight caused by *Colletotrichum gloeosporioides* (Penz.) Sacc. The results indicated that selection of apparently disease free mother plants and treating the rhizome and pseudostem (planting unit) with carbendazim+mancozeb (0.3%) or copper oxychloride (0.3%) would help in reducing the disease incidence in the nursery. Since Sikkim is an organic state, use of copper oxychloride can be recommended.

Keywords: *Amomum subulatum*, bioagents, *Colletotrichum* blight, fungicides, large cardamom, management

In India, large cardamom (*Amomum subulatum* Roxb.) is affected by various fungal diseases among which blight caused by *Colletotrichum gloeosporioides* (Penz.) Sacc. is highly destructive in Sikkim and Darjeeling hills (Pun *et al*. 2006; Saju *et al.* 2010 & 2012). *C. gloeosporioides* causes leaf and pseudostem lesions on large cardamom. Lesions on the pseudostem usually turn necrotic resulting in lodging and death of tillers. Since the disease is widespread in these areas, availability of healthy mother plants for production of healthy planting material is difficult. Apparently, healthy looking plants can also carry the disease to new locations through latent infections. Hence, experiments to produce healthy planting materials in the nursery were conducted by treating the planting units with bioagents and fungicides.

Initial experiment was conducted during 2008 in Dzongu, North Sikkim using cv. Dzongu Golsey in one location and mix of Dzongu Golsey and Ramsey in another location. The rhizome and pseudostem of collected planting units were treated with 0.3% (a.i.) carbendazim + mancozeb (combined formulation, 8 + 64 WP, $4g^{-l}$) for 30 min. The treated suckers were shade dried and planted in trenches. The nurseries were large (400-1200 plants) and for the purpose of observation, three replications with 16 plants each were marked. Number of diseased plants in each treatment and number of diseased and

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healthy tillers in each clump were recorded in March 2010 and disease incidence (%) and severity were calculated. The data were analyzed by *t*-test.

Another experiment using bioagents and fungicides was started in Kabi, North Sikkim during June 2009 and the collected suckers were given the respective treatments for 30 min. The rhizome and pseudostem were immersed in the treatment solution, shade dried and planted in trenches. Experiments were conducted in two plots *viz*., (i) Suckers of cv. Varlangey (diseased) and (ii) Suckers of cv. Sawney (apparently healthy).

The four treatments *viz*., T_1: Control; T_2: Bioagents (*Pseudomonas fluorescens* + *Bacillus subtilis* 3% each); T_3: Carbendazim + Mancozeb (Combined formulation 8 + 64 WP) (0.3%) and T_4: Copper oxychloride (0.3%) were imposed in selected two plots and laid out in a randomized block design with five replications. The treatments were repeated in October 2009 (*i.e.* after six months) and twice during 2010 (April and October) by spraying the solution on to the leaves and pseudostem. Survival percentage and number of healthy and diseased tillers plant^{-1} were recorded in March 2011. Disease incidence (%) and severity were then calculated. The data was analyzed by ANOVA after angular transformation of the percent values.

Treatment of planting units with fungicide

The data showed that there was only 3.1% incidence of *Colletotrichum* blight in the treated plot as compared to 20.8% in the control plot and the difference was significant. Similarly, there was significant difference in the disease severity of treated plot (0.006) and control plot (0.06).

Treatment of planting units with bioagents and fungicides

In planting units collected from infected plants of cv. Varlangey, the disease incidence was significantly less in carbendazim+mancozeb (6.2%) treatment followed by copper oxychloride (16.6%) and bioagents (37.5%) as compared to control (68.7%). Disease severity was also the least when treated with carbendazim + mancozeb (0.02) and it was on par with each other in copper oxychloride (0.12) and bioagent (0.15) treatments as compared to control (0.54). In suckers from apparently healthy Sawney, the disease incidence was significantly less in copper oxychloride (4.1%) and carbendazim + mancozeb (6.2%) treatments which were on par with each other followed by bioagents (10.4%) and control (14.6%). Disease severity was on par with each other in case of carbendazim + mancozeb (0.01) and copper oxychloride (0.05) followed by bioagents (0.07) and control (0.13) (Table 1).

In large cardamom, *C. gloeosporioides* infects leaves and pseudostem and the latter lodges at the point of necrotic lesions in the advanced stage resulting in death. Latent infections on the inner leaf sheath were also noticed during winter season (Saju *et al.* 2013). Usually at the

Table 1. Efficacy of bioagents and fungicides for the control of *Colletotrichum* blight of large cardamom in the nursery

Treatment	Suckers of diseased cv. Varlangey		Suckers of apparently healthy cv. Sawney	
	Blight incidence (%)	Blight severity	Blight incidence (%)	Blight severity
T_1 Control	68.7 (55.98)	0.54	14.6 (22.46)	0.13
T_2 Bioagents	37.5 (37.76)	0.15	10.4 (18.81)	0.07
T_3 Car+Man	6.2 (14.42)	0.02	6.2 (14.42)	0.01
T_4 CoC	16.6 (20.04)	0.12	4.1 (11.68)	0.05
CD (p=0.05)	10.2	0.05	10.5	0.06

Bioagents=*Pseudomonas fluorescens* + *Bacillus subtilis* (3% each); Car=Carbendazim + Man=Mancozeb (0.3%); CoC=Copper Oxychloride (0.3%); Values in parenthesis are angular transformations

field level, planting materials are collected arbitrarily from existing plantations and latent infections of blight go unnoticed. No control measures have been developed so far to get rid of the infections on the pseudostem. At the same time, production of disease free planting material is a pre-requisite for new field planting and area expansion. The first experiment gave an indication about the suitability of pseudostem treatment for blight control. More treatments were evaluated in the second study so that suitable strategies could be followed in situations of organic and inorganic cultivation. It was inferred from the study that selection of apparently disease free mother plants and treating the collected suckers with carbendazim + mancozeb (0.3%) or copper oxy chloride (0.3%) would help in reducing the disease incidence in the nursery. However, since Sikkim is an organic state use of copper oxychloride can be recommended.

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