

Comparative Efficacy Of Fungicides Against Phytophthora Rot Of Small Cardamom

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ABSTRACT

EFFICACY of fourteen different fungicides was evaluated against Phytophthora rot of small cardamom (*Elettaria cardamomum* Maton) in plantations during different years. Aliette 80 WP (Fosetyl-aluminium), a systemic fungicide and Bordeaux mixture gave consistently significant disease control over other fungicides tested. Fungicidal residue studies were carried out with varying concentrations of Aliette under field conditions. Capsules harvested and cured one month after the last application of Aliette were free of Aliette or phosphonic acid residues. The results indicate that both 1% Bordeaux Mixture and 0.3% Aliette are effective in controlling azhukal disease without any residual effect of the latter.

INTRODUCTION

SMALL cardamom (*Elettaria cardamomum* Maton) is highly susceptible to rot disease. Malayalam: 'Azhukal'. Since its first report in 1972 (Menon et al 1972), the disease has been frequently noticed in the high ranges of Kerala and in some parts of Anamalais, in Tamil Nadu. The disease outbreak coincides with the onset of the south-west monsoon and becomes severe during July-Aug. The characteristic disease symptoms are rotting of the capsules, panicles and young leaves followed by shedding of affected capsules. In extreme cases of infection, decay extends to all plant parts and the whole plant perishes. The etiology of the disease was studied by several workers and the pathogenic fungi were reported to be *Phytophthora nicotianae* var. *nicotianae* (Thankamma and Pillai, 1973), *Phytophthora palmivora* (Radha & Joseph, 1974) and *Pythium vexans*, Nambiar & Sarma, 1976). The recent studies conducted by Joseph Thomas et al (1988) have clearly

showed that it is *Phytophthora meadii* Mc Rae of A2 mating type which is responsible for 'azhukal' incidence in Idukki areas.

Attempts have been made by several workers to control the disease by fungicidal applications. Bordeaux mixture and other copper fungicides (Menon et al 1973, Nambiar and Sarma, 1974), organomercurials (Nair, 1979) and dexton or BAY 5072 (Alagianagalingam and Kandaswamy, 1981) were reported to control azhukal disease. However, no fungicide was reported to give consistently good disease control in different years. In the present study, field evaluations were carried out in different years with various fungicides including Aliette, a systemic fungicide which was reported to be specific against oomycete fungi. Attempts were also made for studying the residual levels of Aliette in cured cardamom.

MATERIALS AND METHODS

The fungicidal evaluation was carried out in plantations where 'azhukal' incidence was found

severe. Preliminary field screening was carried out with selected fungicides during 1981-83 period. Further field evaluation was attempted from 1984-86 using selected fungicides which showed satisfactory disease control during the preliminary screening. The experiment was laid out in a RBD with three replications. Each treatment contained 12 plants. The fungicides used were Aliette 80 WP (0.3%), Ridomil 25 WP (0.15%), Fytolan (0.3%), Emulsicop (0.3%), Perecloud dust (25 g/plant), Dithane M-45 (0.3%), Bordeaux mixture (1%), Emisan (0.2%), Kitazin (0.2%), Rovral (0.2%), Bavistin (0.1%), Captaf (0.3%), Difolatan (0.3%) and BAY 5072 (0.3%). Application of fungicides was done three times a year at 30 days intervals starting from the pre-monsoon spray during May. Fungicidal sprays were given after proper phytosanitation such as trashing the plants and removal of mulch from plant base. Three litres of all the fungicides, except Aliette were applied as spray and soil drenching at plant base while Aliette was used as a foliar spray at the rate of one litre per plant. Observations on disease incidence in capsule was recorded and expressed as percentage.

For studying the residue of Aliette, a field experiment was conducted with varying concentrations of Aliette in RBD with 12 plants per plot. Plants were sprayed three times with different dosages of Aliette. For determining the residue levels, the crop was harvested four weeks after the last application of Aliette.

and as the advantages of sprays and economics of the control programme are properly demonstrated to the growers, there is every likelihood that more and more growers would follow such a control approach, and fungicide consumption would increase more than double the quantity in comparison to what has been presently in use.

(VI) Water is another input which is a scarce commodity in the rough terrains of Himachal Pradesh and some of the areas of Jammu and Kashmir. Orchards have been raised under the rain-fed conditions and there is hardly any possibility of irrigation. During the summer, water even for drinking is in short supply. As such there is an urgent need for developing suitable and simple technology for collecting water during the rains and storing it in the reservoirs for spray programme and other orchard operations.

Requirements from industry

(i) Avoiding criticism of other products — The R & D officials as well as the field staff of the chemical industry in order to propagate their own product(s) very often resort to criticism of other products which have found place in recommendations of spray schedule, and this lead to confusion among the growers. Such unhealthy practice needs to be avoided in field and it should be the policy

of a company to project the image of their own product by publicizing its properties in rightful manner.

(ii) Demonstration trials — The demonstration trials which are often carried in the growers field should be organised in cooperation with the local scientists (research worker) and should reflect the performance not only of one product but also of all other recommended brands to provide an opportunity to the grower to evaluate the merits and demerits of the products.

(iii) Technical knowhow — The growers are sore that often the R & D scientists coming from the agro-chemical industry lack the knowledge of apple and apple diseases, and their visit and discourse in the field often lead to a confusion and disappointment among the growers as they hardly receive any proper guidance from them. The agro-chemical industry in India must have proper R & D set up, and must employ scientists/field staff who are well versed with temperate horticulture and in particular the apple scab. Such an approach would help in restoring the reliability of the industry among the growers.

(iv) Authentic scientific literature on the product. — The agro-chemical industry should bring out authentic scientific literature on the products incorporating the findings of the research done in

the country and by the principal abroad. Such literature once in the hand of key growers would create a confidence about the product being in use and enable them to utilize it in best manner.

(v) Publicity campaign — In order to educate the growers and create an awareness among them about the advantages of use of particular product, it is necessary that the R & D officials of the industry should organize the field camps in different apple growing areas, involving the scientists, extension officials and the growers.

(vi) Quality of product — The industry must ensure strict quality control in the production of a fungicide so that the growers do not feel let down while using it. Very often complaints are made by the growers that a particular product in the past used to have a better suspensibility, better retention and effectiveness while it is not so now. No doubt, there is a practice of pre despatch inspection and test as to confirm the ISI standards but it is confined to a random sampling in a batch and as such the industry's role to maintain proper quality control in manufacturing the product remains supreme to avoid such criticism.

It is expected that the partnership between the research scientists, extension workers and fruit growers will help in eradicating the scab effectively from India apple orchards.

Table 1: Preliminary Field Screening of Fungicides against Phytophthora Rot of Cardamom

Sl. No.	Fungicides	Conc. %	% Disease incidence	
			1981	1983
1	Aliette	0.3	5.5 (13.6) †	9.6 (18.1) †
2	Bavistin	0.1	††	22.8 (28.5)
3	BAY-5072	0.3	17.1 (24.4)	††
4	Bordeaux Mixture	1.0	8.2 (16.7)	11.4 (19.7)
5	Captaf	0.3	18.4 (25.4)	††
6	Difolatan	0.3	17.2 (24.5)	††
7	Dithane M45	0.3	15.9 (21.9)	14.4 (22.3)
8	Emisan	0.2	17.2 (24.5)	15.2 (22.9)
9	Emulsicop	0.3	16.3 (23.8)	15.1 (22.8)
10	Fytolan	0.3	18.0 (25.1)	15.7 (23.3)
11	Kitazin	0.3	††	17.8 (25.0)
12	Perecloud dust	25g/plant	21.1 (27.4)	††
13	Ridomil	0.15	8.3 (16.7)	††
14	Rovral	0.2	††	17.7 (22.9)
15	Control	—	26.6 (30.7)	23.6 (29.7)
C.D. at 5%			9.05	2.2
† angular values			†† not tested	

Table 2: Comparative Efficacy of Selected Fungicides on 'Azhukal' (Rot) Disease

Sl. No.	Treatments	Conc. %	% Disease incidence		
			† 1984	1985	1986
1	Aliette	0.3	9.7 (18.1)	12.7 (20.8) ††	1.7 (7.5) ††
2	Bordeaux Mixture	1.0	6.2 (14.4)	19.2 (25.9)	1.6 (7.3)
3	Dithane M45	0.3	7.5 (17.0)	31.2 (33.9)	9.6 (18.0)
4	Control	—	12.6 (20.8)	67.8 (55.4)	33.4 (36.9)
N.S. C.D. at			5%	9.34	8.71

† 1st round spray was given after commencement of monsoon
 †† angular values.

ette. The harvested green cardamom was cured in dark curing chambers at 55-58°C for 36 hrs. and were directly used for analysis. Residue analysis was carried out at Rallis Agrochemical Research Laboratories, Bangalore using the gas chromatographic method described by Cooper et al, (1982).

RESULTS AND DISCUSSION

Results on field screening of various fungicides are presented in Tables 1&2. In the preliminary evaluation with various fungicides during 1981-83, two systemic fungicides viz. Aliette 80 WP and Ridomil 25 WP were found to be equally effective in controlling azhukal as with 1%

Bordeaux mixture application. Since no disease incidence was observed during 1982, possibly due to continued dry weather, no data could be collected. During 1984-86 Aliette was on par with Bordeaux mixture in controlling the rot disease (Table 2). It is seen that no satisfactory disease control was achieved when the commencement of the monsoon as in 1984, (Table 2). During 1985 and 1986 years, incidence of the disease could be greatly reduced when the first round application of fungicides was given prior to onset of monsoon. It is possible that pre-monsoon soil drenching with 1% Bordeaux mixture could have greatly reduced the inoculum levels in soil (Nair 1979). The efficacy of the systemic fungicide Aliette, in controlling Phytophthora rot in many species have been reported in recent years (Ramachandran and Sarma, 1985, Pegg et al 1987 and Davis 1982). Although Bordeaux mixture and Aliette were found to be equally effective in azhukal control, the latter offers protection by triggering the defence mechanism of the host plant (Guest, 1986).

Capsules sprayed two to three times with 0.3% of Aliette (2400 ppm) were free of residues. No detectable level of phosphorous acid was found in samples received three consecutive sprays. The LD50 value for aliette reported in mice is 3700 mg/kg. Therefore a fungicidal schedule of upto three rounds of aliette at 30 days interval can be safely used for managing Phytophthora rot in cardamom. Aliette being systemic in nature would also offer protection to plant parts which have not directly received the fungicidal sprays.

ACKNOWLEDGEMENTS

The authors are thankful to Dr. M S Mithyantha and Mr. H G

Vishwanath, Rallis Agrochemical Research Laboratory, Bangalore for assisting the residue analysis studies.

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