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APSULE ROT DISEASE OF CARDAMOM (*Elettaria CARDAMOMUM* MATON) AND ITS CONTROL

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ABSTRACT

Etiological studies on the 'azhukal' disease of *Elettaria cardamomum* Maton showed that the disease is caused by *Phytophthora meadii* Mc Rae of A2 mating type. *In vitro* and *in vivo* studies on athenogenicity showed that *P. meadii* readily infected all plant parts and produced similar disease symptoms as seen in natural infection.

Fourteen different fungicides of various formulations were evaluated under field conditions against 'azhukal' disease during 1981-86 seasons. Field control trials with different fungicides showed varying degrees of protection. In all the trials, Bordeaux mixture gave consistently good disease control. In addition to Bordeaux mixture, fosetyl aluminium (Aliette) a systemic fungicide was found to be on par with Bordeaux mixture in controlling 'azhukal' disease. Phytosanitary measures such as trashing and removal of diseased plant parts coupled with pre-monsoon application of the fungicide were very effective disease control.

INTRODUCTION

Apsule rot popularly known as 'azhukal' is one of the most serious diseases of small cardamom (*Elettaria cardamomum* Maton). The disease is prevalent in Idukki District of Kerala and in some parts of Anamalai in Tamil Nadu. Disease occurs with the onset of the monsoon and becomes severe during the September months. The disease is characterised by rotting of capsules, panicles and tillers leading to leaf shredding of capsules and the whole plant withers and perishes in extreme cases of infection.

Etiological studies conducted during 1973-74 showed that the pathogenic fungus in Kerala was *Phytophthora* sp. (Menon et al. 1973) and *P. nicotianae* var. *nicotianae* (Thambi and Pillai, 1973) and *P. palmivora* (Thambi and Joseph, 1974). In addition to this, Nambiar and Sarma (1976) reported the involvement of *Pythium vexans* de Bary

as the causal organism. The symptomatology of the disease has been studied in detail by Nair (1979).

Fungicidal control of azhukal has been reported earlier by several workers. Prophylactic spraying with 1% Bordeaux mixture or copper oxychlorides. (Menon et al. 1973; Nambiar and Sarma, 1974; Nair, Zachariah and George, 1982), fenaminosulf or BAY-5072 (Balakrishnan and Joseph 1982; Alagiah-nagalingam and Kandaswami, 1981) and drenching with agalliol (Nair, 1979) were reported to control the disease. However, no fungicide was reported to give consistently good disease control. It has been observed that the intensity and spread of the disease vary considerably during different years. Therefore, evaluation of fungicides for different seasons is necessary to obtain consistently good results which can be transferred to the growers for large scale application.

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Studies undertaken at this Institute on the etiology of the disease as well as its control measures with systemic fungicides in different seasons are reported here.

MATERIALS AND METHODS

For studying the etiology, disease affected plant parts such as panicles, capsules and leaves collected from representative plantations in Idukki Dist. were plated on PDA and carrot agar media. Pathogenicity tests were conducted both *in vitro* and in the field using mycelial culture bits and zoospores of the fungus.

Field evaluation was carried out with eleven fungicides during 1981 and 1982 and nine fungicides during 1983 seasons in disease affected gardens. The trials were laid out in randomised block design with three replications and 12 plants per plot. The fungicides used were fosetyl aluminium (Aliette 0.3%), metalaxyl (Ridomil 0.15%), copper oxychlorides (Fytolan 0.3%; Emulsicop 0.3% and pereicloud dust 25 g/plant) mancozeb (Dithane M 45, 0.3%), methoxy-ethyl mercuric chloride (Emisan 0.3%), dexton (BAY 5072 0.3%) Bordeaux mixture (1%) carbendazim (Bavistin 0.15%), Kitazin 0.3% and Rovral 0.2%. Fungicides were applied to the plants three times a year at 30 days interval starting from the month of June just before the onset of monsoon. Phytosanitary measures such as trashing and removal of mulch materials from the plant base were done prior to fungicidal application. All the fungicides were applied as spraying cum drenching at the plant base using hand compression pumps at the rate of three litres of fungicidal solution per clump while Aliette was applied as a foliar spray (1 lit/clump).

During 1984, 85 and 86 seasons, field trials were carried out at Myladumpara using the fungicides viz., Aliette, Bordeaux mixture and Dithane M 45 which were

proved to be effective during the pre-monsoon seasons. Observations on the number of healthy and diseased capsules were recorded in any five affected panicles per plot in each treatment and the percentage of disease incidence was calculated. The pooled data was statistically analysed and the percentage disease incidence was calculated.

RESULTS AND DISCUSSION

Studies on the causal organism showed that *Phytophthora meadii* Mc Rae of A2 mating type is the pathogenic fungus causing azhukal disease. The identity of the fungus was confirmed by CMI, Kew, England. Field evaluation studies on different plantations showed that *P. meadii* readily infected all plant parts tested and produced characteristic disease symptoms within 4 to 7 days of inoculation. The fungus produced large, aseptate sporangia measuring 4.8 μ m in breadth and 11.5 μ m in length and 41.5 μ m x 11.5 μ m (average).

The results on the field trials are presented in Tables I, II and III. In the field trials conducted during 1981, two systemic fungicides viz. Aliette and Ridomil were found to be on par with Bordeaux mixture in controlling the disease (Table I). Among the nine fungicides tested during 1983, only two fungicides viz., Aliette and Bordeaux mixture were found to be effective in controlling the disease. Field trials conducted during 1984 and 1986 seasons also these two fungicides were found to be on par (Table II) and other fungicides showed varying degrees of protection (Table III) during different years. Disease incidence and severity often varied on the rainfall pattern, such differences were expected in field control trials (S. Nambiar and Brahma 1979). The systemic fungicide Aliette gave the best disease control but was on par with Bordeaux mixture and Dithane M 45 which were

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I. Comparative incidence of 'azhukal' under different fungicidal treatments during 1981 and 1983

Fungicides	Conc. %	% disease incidence	
		1981	1983
Aliette	0.3	4.4 *(12.10)	9.5 *(18.08)
Bordeaux mixture	0.15	** —	16.8 (24.29)
Dithane M 45	0.3	15.4 (23.12)	— —
Ridomil	1.0	9.5 (15.11)	13.6 (21.65)
Bordeaux mixture	0.3	14.4 (22.31)	— —
Dithane M 45	0.3	16.3 (23.85)	— —
Ridomil	0.3	15.0 (22.80)	14.4 (22.31)
Bordeaux mixture	0.3	13.9 (21.90)	18.8 (25.69)
Dithane M 45	0.3	15.1 (21.69)	21.8 (27.31)
Ridomil	0.3	14.5 (22.4)	18.5 (25.47)
Bordeaux mixture	0.3	— —	22.2 (27.94)
Dithane M 45	25 g/pl	16.4 (23.92)	— —
Ridomil 25 WP	0.15	9.4 (17.80)	— —
Dithane M 45	5 g/pl	14.5 (22.4)	— —
Ridomil	0.2	— —	17.1 (24.39)
Bordeaux mixture	—	27.2 (31.46)	22.2 (27.43)
C.D. at 5%		7.34	5.76

Angular values ** not tested

II. Incidence of 'azhukal' in field trials with selected fungicides 1984, 85 and 86 seasons

Fungicides	Conc %	% disease incidence		
		1984*	1985	1986
Aliette	0.3	16.9 (23.76)**	19.3 (20.1)	2.2 (10.2)
Bordeaux mixture	1.0	14.5 (22.12)	21.5 (27.62)	1.0 (5.7)
Dithane M 45	0.3	17.10 (23.92)	40.1 (39.27)	9.6 (18.07)
Ridomil	—	28.9 (32.52)	61.1 (51.43)	26.8 (31.8)
C.D. at 5%		N.S.	11.8	8.3

* spray was given after the onset of monsoon ** Figures in parenthesis are angular values

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Table III. Comparative efficacy of selected fungicides in 'azhukal' control during different years

Fungicides	% disease control		
	1981	1983	1985
Aliette	80.80	57.25	68.4
Bordeaux mixture	65.10	43.77	64.80
Dithane M 45	44.80	35.93	34.40
Ridomil	65.40	*	°

* not tested

azhukal disease, has earlier been discussed (Menon et al. 1973; Nambiar and Sarma 1974 and Balakrishnan and Joseph 1982). It was observed that satisfactory disease control was effected only when the first application was given before the onset of monsoon. Application of fungicides after the appearance of the 'azhukal' was not effective in controlling the disease. The systemic fungicide Aliette when applied as foliar sprays at one litre (2.4 gm/plant) could equally protect the plants as three litres of Bordeaux mixture spraying and drenching. It is quite possible that the consistent disease control with Bordeaux mixture could be due to its suppressive action of the soil inoculum. (Nair, 1979). Although, a number of systemic fungicides were reported to be very effective against many fungi, only a few chemicals were found to be useful against pythiaceus fungi (Papavizas et al. 1979 and Schwinn, Staub and Urech, 1977). Systemic activity of Aluminium tris (3-ethyl phosphonate) or Aliette against *Phytophthora* disease has recently been reported (Frossard, 1978 and Benson, 1980). Aliette has been shown to be very effective in controlling *Phytophthora* disease of several crop plants (Olivera, Santos and Silva, 1981; Davis, 1982). Disease management involving plant sanitation and timely application of fungicides only would ensure protection from disease.

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