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EVALUATION OF CERTAIN FUNGICIDES AGAINST THE DIE-BACK DISEASE OF *ARECA* INFLORESCENCE*

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ABSTRACT

Button shedding preceded by die-back of inflorescence is a severe problem in the areca plantations. Out of 13 fungicides tested *in vitro*, benomyl (0·1%), captan (0·25%), thiram (0·25%), and a phenyl mercury urea formulation (0·1%) were highly fungicidal to the mycelial growth of *Colletotrichum gloeosporioides*, the casual agent of the disease. Field trials carried out with seven fungicides showed that DMOC (0·1%), heptaene antibiotic (50 ppm) + $CuSO_4$ (50 ppm), and Zineb (0·4%) in that order, were effective in controlling the malady.

INTRODUCTION

ARECA (*Areca catechu* L.) is one of the important perennial cash crops grown in several states of India. The die-back disease of areca inflorescence caused by *Colletotrichum gloeosporioides* Penz. [*Glomerella cingulata* (Stonem) Spauld and Schrenk] is one of its severe diseases (Anonymous, 1973). The fungus causes drying of rachis and shedding of buttons from the inflorescence. The disease is prevalent throughout the year, but becomes acute during February to May.

Earlier, field trials to control the disease with different copper fungicides like shell copper + endrex (Anonymous, 1960), coppessan (Anonymous, 1961), Bordeaux mixture alone or in combination with endrex (Anonymous, 1963) met with little success. Nambiar and Radhakrishnan Nair (1971) suggested after preliminary trials that Dithane Z-78 and Aureofungin sol were effective in reducing button shedding. Since the earlier results were inconclusive, the present investigation was undertaken to evaluate the efficacy of some common fungicides on the *in vitro* growth of *C. gloeosporioides* as well as to test the more promising chemicals in field to control the disease.

MATERIALS AND METHODS

The comparative toxicity of fungicides on the growth of the fungus *in vitro* was evaluated by a little modified method as described by McCallan (1947). The fungicides used were (1) Bordeaux mixture, (2) Copper oxychloride formulation 50%, (3) Thiram 75%, (4) Zineb 75%, (5) Maneb 78%, (6) Methoxy ethyl mercuric chloride formulation, (7) a Phenyl mercury urea formulation, (8) Captan 83%, (9) Difolatan, (10) O-ethyl S, S-diphenyl-dithio phosphate, (11) Benomyl 50%, (12) DMOC 75%, and (13) Heptaene antibiotic. The fungicides dissolved in sterile distilled water were added aseptically to sterilized oats-agar medium in required concentrations and poured into petri dishes. The medium without any fungicides in petri dishes served as control. The plates were then inoculated with 5 mm discs of seven-day-old monospore isolate of the fungus growing on oats-agar plates and incubated at room temperature (28±2° C) for 10 days. Four plates were maintained for each treatment. Radial growth of the mycelium in each plate was recorded as the average of two diameters measured at right angles to one another and the data were statistically analysed.

The field fungicidal trial was conducted in the institute's garden during November–December 1974 and February–March 1975. The fungicides used were: (1) Captan 83%, (2) Zineb 75%, (3) Thiram 75%, (4) Benomyl 50%, (5) DMOC 75%, (6) Heptaene antibiotic, and (7) Heptaene antibiotic + copper sulphate. All the fungicides were used in the first trial while Zineb (0·3%), Benomyl, and Heptaene antibiotic (0·1%) were deleted from the second

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trial. For each treatment, eight palms were selected having inflorescences where female flowers had not yet opened. Five hundred ml of fungicidal solution was sprayed twice on each of the inflorescence. The first spray was given just before opening of the female flowers and the second 20 days after the opening. The controls received sterile distilled water. The number of female flowers per inflorescence was recorded before first spraying and 45 days after the second spraying. The percentage of buttons retained on the inflorescence was calculated and the data statistically analysed. The infection of the rachis in various treatments was also recorded.

Results and Discussion

The effect of fungicides on the growth of the fungus is presented in Table I. Thiram, phenyl mercury urea, captan, and benomyl completely inhibited growth of the fungus. Saikia and Roy (1974) observed that benomyl, ceresan wet, and maneb were fungicidal *in vitro* to *C. gloeosporioides* of chillies.

The influence of fungicides on retention of buttons is given in Table II. In the first trial, the maximum percentage retention of buttons with no disease symptoms on the rachis was observed in palms sprayed with DMOC, zineb (0·4%), and captan. In the second trial, DMOC and heptaene + $CuSO_4$ followed by zineb (0·4%) helped to retain the maximum number of buttons as well as reduced the symptoms on rachis. DMOC, which was less effective *in vitro*, has proved to be superior in the field experiments. At the same time, thiram and benomyl exhibited the reverse activity. Such a type of differential activity of fungicides has been observed earlier also (Domsch, 1964).

TABLE I

Effect of fungicides on growth of Colletotrichum gloeosporioides

Sl. No.	Treatment	Fungicide concentration (%)	Mean colony diameter (mm)†	Mean log transformations
1.	Bordeaux mixture	1·0	19·8	1·3265
2.	Copper oxychloride 50%	0·25	63·5	1·8107
3.	Thiram 75%	0·25	00·0	0·1761
4.	Zineb 75%	0·2	64·1	1·8037
5.	Maneb 78%	0·2	70·0	1·8541
6.	Methoxy ethyl mercuric chloride	0·1	20·1	1·3315
7.	Phenyl mercury urea	0·1	00·0	0·1761
8.	Captan 83%	0·25	00·0	0·1761
9.	Difolatan 80%	0·1	43·9	1·6464
10.	Hinosan 50%	0·1	24·9	1·4155
11.	Benomyl 50%	0·1	00·0	0·1761
12.	DMOC 75%	0·1	35·3	1·5482
13.	Heptaene antibiotic	0·01	29·6	1·4871
14.	Control	..	73·5	1·8696

S.E. ± = 0·0624
F. value = 496·2564**
C.D. (P = 0·05) = 0·0883

† Measured 10 days after inoculation
** Significant at 0·001%

TABLE II

Influence of fungicides in the field on the retention of buttons

Sl. No.	Treatment	Fungicide concentration (%)	Mean percent buttons retained		Mean Log transformation		Mean‡ of first and second trials
			First trial	Second trial	First trial	Second trial	
1.	Captan 83%	0·25	50·96	39·19	1·7098	1·5627	1·6362
2.	Zineb 75%	0·30	44·98	..	1·6731	..	..
3.	Zineb 75%	0·40	60·88	42·50	1·7309	1·6140	1·6724
4.	Thiram 75%	0·25	33·21	32·81	1·4845	1·5010	1·4927
5.	Benomyl 50%	0·10	33·23	..	1·4935	..	..
6.	DMOC 75%	0·10	72·91	51·80	1·8252	1·7090	1·7671
7.	Heptaene antibiotic + $CuSO_4$†	50 ppm 50 ppm+	36·91	48·79	1·5560	1·6699	1·6129
8.	Control	..	25·34	34·01	1·4700	1·5151	1·4925
	S.E. ±				0·1536	0·1363	0·13841
	F. value				7·56056**	3·0268*	2·16544 (N.S)
	C.D. (P = 0·05)				0·1536	0·1376	..

† In the first trial heptaene at 1000 ppm conc. without $CuSO_4$ was used.
‡ After Log transformations.
* Significant at 5% level.
** Significant at 1% level.
N.S. Not significant.

The trials thus show that DMOC, heptaene antibiotic + $CuSO_4$, and zineb in that order can be effectively used in controlling die-back disease in the field. However, more than two sprayings may become necessary if the disease appears in severe form.

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