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Microbial Control of *Coccidohystrix insolita* (Green) on Pigeonpea*

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ABSTRACT

Microbial control of *Coccidohystrix insolita* (Green) infesting pigeonpea was studied in laboratory and field conditions at Junagadh. The entomogenous fungus, *cladosporium cladosporioides* tested at 3.6 x 10^6 and 2.7 x 10^6 spores/ml gave above 70 per cent mortality of *C. insolita*, whereas, *Fusarium pallidoroseum* at 6.1 x 10^5 spores/ml and *Alternaria alternata* at 5.6 x 10^4 spores/ml recorded above 60 per cent mortality in laboratory condition. Under field condition, *C. cladosporioides* at 3.6 x 10^6 spores/ml gave above 67 per cent mortality. Similarly, *F. pallidoroseum* at 6.1 x 10^5 spores/ml and *A. alternata* at 5.6 x 10^4 spores/ml gave more than 32 per cent mortality of *C. insolita*.

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INTRODUCTION

Pigeonpea *Cajanus cajan* (L.) Millsp. is an important legume crop and various insect-pests reduced the yield by 33.47 per cent in Saurashtra region of Gujarat State (Bhalani and Parsana, 1991). Among the 200 insect-pests (Lateef and Reed, 1990), the mealybug, *Coccidohystrix insolita* (Green) has been observed recently infesting pigeonpea in South Gujarat and Saurashtra regions (Patel *et al.*, 1985; Bhalani, 1990). Considering the importance of the pest, though *Fusarium* and *Alternaria* are the prudent pathogen for pigeonpea, but the species isolated in the present study worked as pest control agent rather than to cause disease in pigeonpea.

MATERIALS AND METHODS

Collection of the pathogen sample

The body of the mealybugs infected with fungi was dilated with pinkish colour and was mummified. The cadavar remained attached to the lower surface of the pigeonpea leaves by rhizoides under humid condition and turned brownish to blackish in colour. Such naturally diseased mealybug was collected and examined under compound binocular microscope for presence of pathogen. The isolation was carried out in potato dextrose agar medium and purified by single spore technique as described by Dhingra and Sinclair (1986). These cultures were got identified as *Alternaria alternata* (Fr.) Kessler agg, *Cladosporium cladosporioides* (Fres.) de

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Vries and *Fusarium pallidoroseum* (Cooke) Sacc. at International Mycological Institute, England.

Pathogenicity test of fungi

The pathogenicity test all three entomogenous fungi were carried out as described by Nayak and Srivastava (1978) and mortality was corrected by Abbott's formula before statistical analysis (Abbott, 1925).

Laboratory application

An isolated condial suspension of *A. alternata* at a spore strength of 5.6×10^4, 4.2×10^4 and 2.7×10^4; *C. cladosporioides* at 3.6×10^6, 2.7×10^6 and 1.8×10^6 and *F. pallidoroseum* at 6.1×10^5, 4.6×10^5 and 3.1×10^5 spores/ml was made by serial dilution method from the 15 days old culture grown in Richard's medium. Twenty-one days old potted pigoenpea plants were selected and tagged for the study. Before spraying, 25 third instar nymphs were released on each selected plants. The concentrated spore suspension of each entomogenous fungi was sprayed @ 3 ml per potted pigeonpea plant using atomizer. Each treatment replicated three times. In case of control only water was sprayed. Then, each plant was covered with glass chimney and top covered with muslin cloth. The mortality counts of mealybugs were recorded at 2, 3, 5, 7 and 10 days of treatments.

TABLE 1

Effect of different entomogenous fungi at different concentration against *C. insolita*, 7 days after spore application *in vitro*.

Sr. No.	Entomogenous fungi	Concentration (spore/ml)	Per cent mortality of mealybugs	
			Transformed	Retransformed
1.	*A. alternata*	5.6×10^4	50.91	60.24
2.	*A. alternata*	4.2×10^4	46.11	51.94
3.	*A. alternata*	2.8×10^4	42.26	45.23
4.	*C. cladosporioides*	3.6×10^6	73.70	92.12
5.	*C. cladosporioides*	2.7×10^6	57.69	71.43
6.	*C. cladosporioides*	1.8×10^6	49.33	57.53
7.	*F. pallidoroseum*	6.1×10^5	52.60	63.11
8.	*F. pallidoroseum*	4.6×10^5	46.90	53.31
9.	*F. pallidoroseum*	3.1×10^5	43.80	47.91
	S. Em. ±		2.12	
	C. D. at 5%		6.31	
	C. V. %		7.12	

Field application

The entomogenous fungi, *A. alternanta*, *C. cladosporioides* and F. pallidoroseum were tested against mealybug with spore concentration of 5.6 x 10^4, 3.6 x 10^6 and 6.1 x 10^5 spores per ml, respectively during the year 1991-92 and 1992-93 with six replication in a randomized block design. Twenty-four mealybugs infested pigeonpea (BDN 2) plants were selected. The suspension of respective entomogenous fungi applied in evening on tagged plants to the extent of slight run off. Water spray served as control. Subsequent spraying was done on 10th day of first application. The mealybug mortality was recorded before and after application at 2, 5, 7 and 10 days on five branches selected randomly from each plant of six randomly selected plants per replication. Three leaves (top, middle and basal) were selected randomly and tagged from each branch of the plant. Observation on mealybugs mortality due to infection by these fungi were recorded before and after application at 2, 5, 7 and 10 days. The data obtained were analysed after arcsin transformation.

RESULTS AND DISCUSSION

Pathogenicity test of fungi

The inoculated mealybugs were successfully infected by the entomogenous fungi, whereas in check they remained healthy. Infected mealybugs were inactive and sluggish, crawled slowly, ragging their legs and finally ceased to feed. The infected mealybugs turned orange to pink in colour within 2 days and died in 3 to 7 days after inoculation. The cadavar turned dry, shrunken, shapeless and lost holding with the leaves in field, the body colour of the infected mealybugs changed to pinkish and mummified. The cadavar remained attached to the lower surface by rhizoids and under humid condition, the colour turned brownish to blackish. Such mummified mealybugs were blown off when dry climate prevailed. On the basis of radial growth, dry mycelial weight and sporulation of all three fungi viz., *A. alternata, C. cladosporioides* and *F. pallidoroseum* tested in 10 different media, Richard's medium was found to be the best for mass multiplication.

Laboratory application

All the entomogenous fungi at higher doses proved to be highly effective against *C. insolita* giving more than 60 per cent mortality 7 days after treatments (Table 1). However, *C. cladosporioides* with 3.6 x 10^6 spores per ml recorded significantly higher mortality (92.12%) than the rest of the fungi *in vitro*. *C. cladosporioides* at lower dose of 2.7 x 10^6 spores/ml gave more than 70 per cent mortality and it was followed by *F. pallidoroseum* at 6.1 x 10^5 spores/ml (63.11%) and *A. alternata* at 5.6 x 10^4 spores/ml (60.24%). In Kerala, Hareendranath *et al.*, (1987) have observed cent per cent mortality of *Aphis craccivora* Koch. with the application of *F. pallidoroseum*.

Field application

Pooled data on mortality of mealybugs population (Table 2) revealed that per cent mortality of *C. insolita* was highest with the application of *C. cladosporioides* (3.1 x 10^6 spores/ml) giving more than 67 per cent mortality 10 days after second spray in both the years. The application of remaining fungi viz., *F. pallidoroseum* (6.1 x 10^5 spores/ml) and *A. alternata* (5.6 x 10^4 spores/ml)

TABLE 2

Effect of different entomogenous fungi spray against *C. insolita* after 10 days of application in field.

Sr. No.	Treatment	Concentration (Spores/ml)	Mean no. of *C. insolita* per leaf before application			Per cent mortality of *C. insolita*					
						First Spray			Second Spray		
			1991-92	1992-93	Pooled	1991-92	1992-93	Pooled	1991-92	1992-93	Pooled
1.	*A. alternata*	5.6×10^4	6.38+ (40.70)	6.54+ (42.77)	6.46+ (41.73)	25.67+ (18.77)	23.42+ (15.80)	24.55+ (17.26)	36.42+ (35.25)	34.49+ (32.07)	35.47+ (33.66)
2.	*C. cladosporioides*	3.6×10^6	6.25 (39.06)	7.01 (49.14)	6.63 (43.96)	36.00 (34.55)	31.89 (27.91)	33.95 (31.19)	56.14 (68.96)	55.20 (67.43)	55.67 (68.20)
3.	*F. pallidoroseum*	6.1×10^5	6.76 (45.70)	6.92 (47.89)	6.84 (46.79)	29.11 (23.67)	25.25 (18.20)	27.18 (20.87)	43..05 (46.60)	39.14 (39.84)	41.09 (43.20)
4.	*Control (water spray)*	—	6.86 (47.06)	7.11 (50.55)	6.98 (48.72)	10.05 (03.05)	10.73 (03.47)	10.39 (03.25)	12.04 (04.35)	13.88 (05.75)	12.96 (05.03)
	S. Em. ±	—	0.40	0.50	0.31	1.20	1.54	0.99	2.38	1.48	1.39
	C. D. at 5%	—	N.S.	N.S.	N.S.	3.62	4.65	2.85	7.18	4.47	4.00
	C. V. %	—	14.99	17.90	16.59	11.69	16.55	14.10	15.80	10.18	13.39

*transformed values. + Arcs in transformed values. Figures in parentheses are retransformed values.

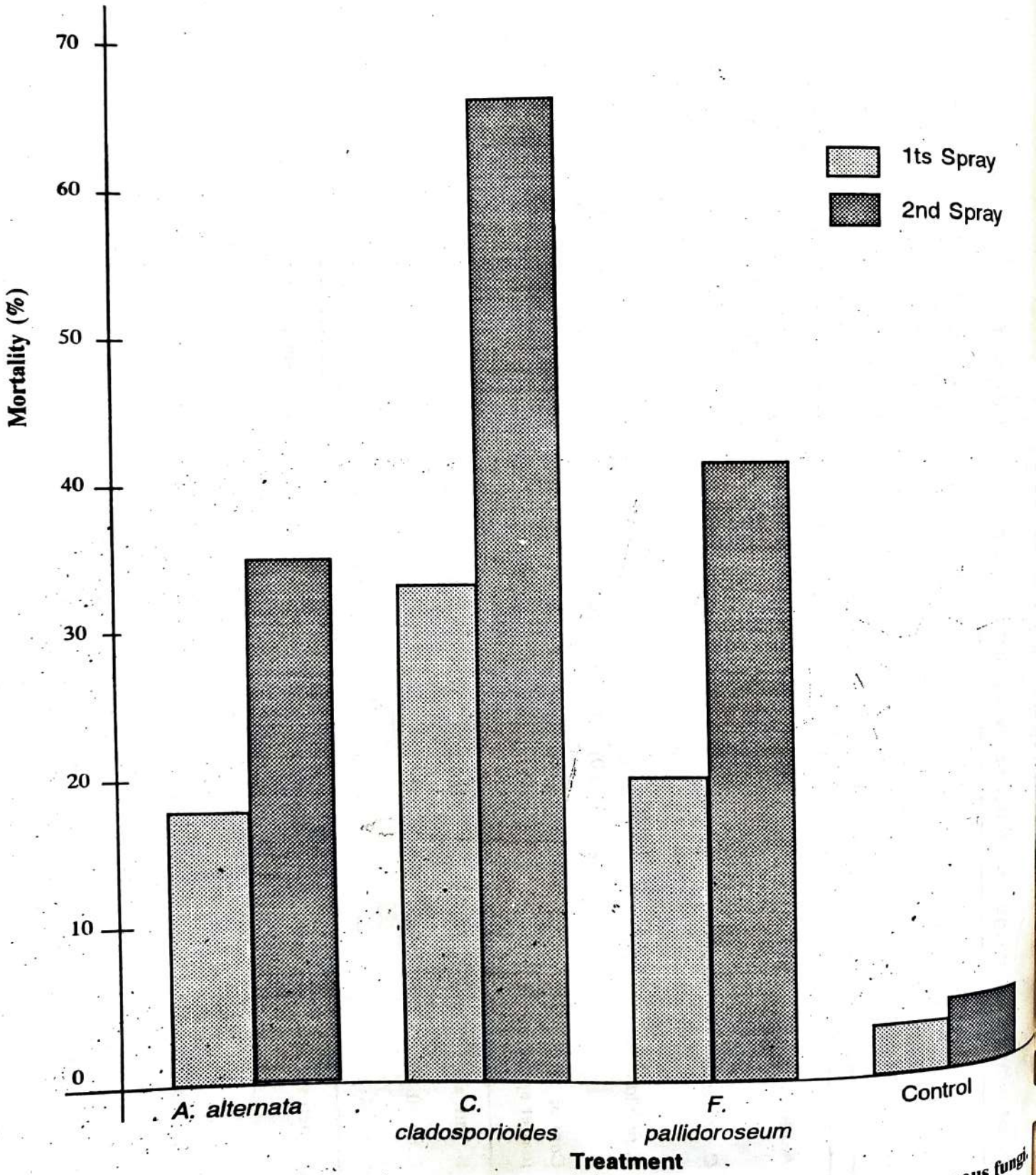

Fig. 1 : Pooled mean per cent mortality of *C. insolita* with field application of entomogenous fungi.

registered more than 32 per cent mortality 10 days after second sprays (Fig. 1). According to Samways and Grech (1986), the field application of *Cladosporeum oxysporum* had resulted 82.8 per cent reduction of *Toxoptera citricidus* (Kirk.) in South Africa.

Thus, it can be concluded that entomogenous fungi, *C. cladosporioides* play an important role in minimizing the population of *C. insolita* in pigeonpea followed by *F. pallidoroseum* and *A. alternata*.

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