



Research Note

Record of *Fusarium pallidoroseum* (Cooke) Sacc. on cotton mealybug, *Phenacoccus solenopsis* Tinsley

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ABSTRACT: Cadavers of *Phenacoccus solenopsis* Tinsley were collected from locations in Haryana and Punjab during 2007-2010. The entomofungal pathogen, *Fusarium pallidoroseum* (Cooke) Sacc., was consistently isolated from all locations during three seasons. The recovery of the entomopathogen varied among locations and seasons. Koch's postulates were proved by reisolating the same fungus from infected mealybugs. In the laboratory, *F. pallidoroseum* caused 80-95% mortality of *P. solenopsis*.

KEY WORDS: *Phenacoccus solenopsis*, cotton, *Fusarium pallidoroseum*

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INTRODUCTION

The solenopsis mealybug (*Phenacoccus solenopsis* Tinsley) appeared in Punjab during 2007 (Monga *et al.*, 2009) in severe form. In subsequent years (2008 and 2009) also the mealybug was observed on cotton crop in the zone but due to widespread awareness and available management strategies, the incidence was well contained and did not cause any economic loss. Another reason for lower mealybug incidence during 2008 and 2009 was high rate of natural parasitism by *Aenasius bambawalei* Hayat. A mean of 57.2% parasitism was observed in the field, while in the laboratory it was 60.6% (Kumar *et al.*, 2009). Mealybugs are also subjected to infection by microorganisms such as fungi and such microorganisms may be exploited for biological control of mealybugs.

In order to look for alternate management sources as tools of integrated pest management, it was considered appropriate to look for entomopathogens associated with *P. solenopsis* and accordingly a study for three seasons (2007 to 2009) was conducted.

Surveys were conducted for three years (2007 to 2009) in December every year for the collection of mealybug cadavers from cotton stalks in Haryana and Punjab wherein seven hot spots were selected on the basis of mealybug infestation by interacting with agricultural officials and farmers in concerned locality [(Fatta Maluka

(Distt. Mansa); Pipli (Distt. Sirsa); Dabwali (Distt. Sirsa); Govindgarh (Distt. Ferozpur); Doda and Malout (Distt. Muktasar); Deon (Distt. Bathinda)]. The sample size was 50, 30 and 100 mealybugs per location during 2007-2008, 2008-2009 and 2009-2010, respectively, depending upon the availability of cadavers. Cadavers were kept in glass vials and stored under refrigeration at 4°C. For isolation of microorganisms, potato dextrose agar (PDA) and nutrient agar (NA) media were used. Cadavers were thoroughly washed with sterile distilled water and then dipped in mercuric chloride solution (0.01%) for 30 seconds. They were then rinsed twice with sterilized water and placed in 90 mm Petri plates containing solidified PDA / NA separately and incubated at 26±2°C. Observations on fungi or bacteria that appeared in the Petri-plates were recorded after one week. On the basis of colony colour, growth pattern and conidia, the microorganisms were tentatively identified and the identities were later confirmed from Indian Type Culture Collection, Division of Mycology and Plant Pathology, IARI, New Delhi, India.

The fungus was multiplied on potato dextrose broth medium. For this, 50 ml medium was taken in 150 ml capacity conical flasks and autoclaved followed by inoculation. Inoculated flasks were kept in a incubator for 10 days at 26±2°C. Mycelial mat was harvested and 2.5% (w/v) spray solution was made and sprayed on 10

Table 1. Presence of *Fusarium pallidoroseum* in mealybug cadavers

Location	Per cent cadavers infected with <i>F. pallidoroseum</i> *			
	2007–08	2008–09	2009–10	Mean of 3 years
Fatta Maluka (Distt. Mansa)	78.00 (62.03)	0.00 (0.00)	93.00 (75.93)	45.99
Pipli (Distt. Sirsa)	72.00 (58.13)	63.33 (52.83)	78.00 (62.07)	57.68
Dabwali (Distt. Sirsa)	84.00 (66.67)	0.00 (0.00)	83.00 (65.73)	44.13
Malout (Distt. Muktasar)	94.00 (78.50)	93.33 (75.47)	69.00 (56.17)	70.04
Govindgarh (Distt. Ferozpur)	96.00 (80.70)	86.67 (69.53)	90.00 (71.70)	73.98
Doda (Distt. Muktasar)	84.67 (67.13)	88.89 (71.33)	95.00 (77.53)	72.00
Deon (Distt. Bathinda)	98.00 (83.74)	0.00 (0.00)	89.00 (70.67)	51.38
Mean	86.67 (68.6)	47.46 (43.6)	85.29 (67.5)	
CD (5%) A=4.67, B=3.05, A x B=8.09 CV % A=2.30, B=1.51, A x B=3.99 SE(m) A=1.63, B=1.06, A x B=2.82 A = Locations; B = Years				

*Mean of three replications, Figures in brackets are angular transformed values

days old crawlers already present on potato sprouts with the help of a small sprayer. After 3, 7 and 10 days, dead mealybugs were collected separately to prove Koch's postulates. An untreated control was maintained separately. To prove Koch's postulates, ten dead mealybugs were thoroughly washed with sterile distilled water and then dipped in mercuric chloride solution (0.01%) for 30 seconds. They were then rinsed twice with sterilized water and plated into 90 mm Petri plates containing solidified PDA and incubated at $26 \pm 2^\circ\text{C}$ temperature for one week. The fungus was reisolated from dead mealybugs for confirmation.

Collection of mealybug cadavers was made from all seven locations in both Haryana and Punjab states during 2007-08 and 2009-10 from the heaps of cotton stalks which were kept on field boundaries of farmers' fields, while during 2008-09 cadavers were collected from only four locations because of low infestation and less availability and cadavers from Fatta Maluka, Dabwali and Bathinda could not be collected.

From all the seven samples collected in 2007, *Fusarium pallidoroseum* (Cooke) Sacc. (identification number – 6974-08 to 6976-08) was isolated. During 2008-09 and 2009-10, the same fungus was again isolated from all the samples predominantly. Per cent recovery of *F. pallidoroseum* varied from location to location and also in different years (Table 1). Maximum recovery of this entomopathogen from mealybug cadavers during 2007-08 was observed in samples from village Deon (Bhatinda) followed by Govindgarh (Ferozpur) and Malout (Muktsar),

which were on par. Minimum and significantly less recovery was noted from Pipli in Sirsa district. In 2008-09, maximum recovery was made from cadavers collected from Malout in Muktsar district followed by Doda and Govindgarh. Village Doda showed highest entomopathogen recovery during 2009-10 followed by Fatta Maluka and Govindgarh. In general, percentage of cadavers infected with *F. pallidoroseum* was higher in villages of Punjab as compared to that from Haryana (Table 1). Hareendranath (1987) reported *F. pallidoroseum* as a fungal pathogen of aphid, *Aphis craccivora* Koch. Similarly, *F. pallidoroseum* was also isolated from rice brown planthopper, *Nilaparvata lugens* (Stål) from Godavari zone of Andhra Pradesh by Mallikharjuna Rao *et al.* (2008).

In the present investigations, *F. pallidoroseum* appears to have contributed to population reduction of *P. solenopsis*. Since the mealybug survives during the off season along with the cadavers, chances of its infection from these cadavers is high, thus helping in reduction of its carry over.

Pathogenicity tests indicated that *F. pallidoroseum* caused 80-95% mortality of mealybugs under laboratory conditions. Koch's postulates were proved under laboratory conditions as fungal cultures obtained from all the dead cadavers were confirmed as *F. pallidoroseum*.

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