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Distribution of Milky Disease and Green Muscardine Disease of White Grub in Central Gujarat

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ABSTRACT

***Bacillus popilliae* var *holotrichiae* and *Metarhizium anisopliae* var *anisopliae* were found well distributed in three districts of Central Gujarat (23°N, 73°S) causing milky disease and green muscardine disease respectively, in *Holotrichia consanguinea* populations. The incidence of milky disease varied from 2.0 to 36.0 per cent and green muscardine disease 1.9 to 15.3 per cent in different villages during 1985-87. A few grubs were also found simultaneously infected by both the pathogens.**

KEY WORDS : *Holotrichia consanguinea, Bacillus popilliae* var *holotrichiae, Metarhizium anisopliae,* natural distribution

Holotrichia consanguinea Blanchard (Coleoptera : Scarabaedae) is one of the the major white grub species of India. In Gujarat; it causes serious damage to groundnut, sugarcane, sesamum, pearl-millet, sorghum and maize (Desai and Patel, 1965). Heavy infestation of *H. consanguinea* in these crops have been reported from Kapadwanj Tahsil of Central Gujarat. Surveys were conducted to find out the naturally occurring pathogens associated with the pest and also to know their distribution in Kapadwanj Tahsil and adjoining districts of Central Gujarat during 1985-87.

MATERIALS AND METHODS

Grubs of *H. consanguinea* were collected from groundnut, sorghum, sesamum and maize fields showing heavy damage due to grub infestation. They were collected, by digging the field to a depth of 10-20 cm, especially near the roots of damaged plants. The grubs were reared on clean bajra roots individually in plastic tubes (4 cm x 8 cm) containing sterile soil and observed every alternate day for disease development.

The grubs showing clear milky symptoms were reared separately till their death and the dead grubs were examined for the presence of *B. popilliae* in the haemolymph. The grubs showing brown spots of melanization were considered to be infected with fungal pathogen. After death, the hard cadavers were surface sterilized and kept in petri dish lined with moist filter paper. They were incubated for the fungal growth and sporulation. Microscopic observations were made by preparing wet mounts or tissue smears (Poinar and Thomas, 1982). Number of grubs infected with milky disease organism, fungal pathogen and mixed infection with both the organisms were recorded and percentage natural infection was determined.

RESULTS AND DISCUSSION

In the preliminary surveys during 1984, two pathogens, a milky disease bacterium and a green muscardine fungus were found to occur naturally in the white grub population. The milky disease bacterium was identified as *Bacillus popilliae* var *holotrichiae* (Vyas *et al.*, 1986). The same bacterium has also been

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Table 1. Natural incidence of *B.popilliae* and *M. anisopliae* in *H.consanguinea* during 1985

Locality	No. of grubs collected	% diseased		
		B. popilliae	*M. anisopliae*	Mixed
Torna	74	23.0	10.7	1.3
Hirapura	24	15.4	0.0	0.0
Mohamadpura	50	16.0	2.0	0.0
Pratapnagar	12	16.6	8.23	0.0
Udapura	38	34.2	0.0	0.0
Dasalwada	50	10.0	6.0	2.0
Fadiabad	50	14.0	10.0	0.0
Bhatera	50	22.0	2.0	0.0
Antroli	53	15.2	1.9	0.0
Paria	50	6.0	8.0	0.0
Ram Talawdi	24	0.0	0.0	0.0
Antroli Road	13	7.6	15.3	0.0

reported on *Holotrichia diomphalia* from China (Ju *et al.*, 1983). The fungus was identified as *Metarhizium* (Metsch) Sorokin var *anisopliae* (Patel *et al.*, 1986). According to Tulloch (1976), variety *anisopliae* is more common on the lepidopterous insects while the variety *major* is commonly found with soil insects especially Coleopteran insects. Mohan and Pillai (1982) and Sundara Babu *et al.* (1983) have worked with *M. anisopliae* var *major* for the control of the coconut rhinoceros beetle, *Oryctes rhinoceros* (L.) in India.

Interestingly, a few fungus-infected grubs were also found to be infected by milky disease bacterium under natural conditions suggesting coexistence of both the organisms in the same host. No other pathogen was found to occur during subsequent surveys.

In the year 1985, mortality due to mycosis varied from 1.9 to 15.3%. The mortality due to milky disease varied from 6.0 to 36.0%. The percentage of grubs showing mixed infection varied from 1.3 to 2.0% (Table 1). The percentage of grubs infected with fungus varied

Table 2. Natural incidence of *B.popilliae* and *M.anisopliae* in *H.consanguinea* during 1986

Locality	No. of grubs collected	% diseased		
		B. popilliae	*M. anisopliae*	Mixed
Hirapura	23	13.0	4.3	0.0
Mohamadpura	32	25.0	6.2	3.0
Udapura	39	28.2	7.6	0.0
Dasalwada	60	33.3	3.3	0.0
Bhatera	25	36.0	4.0	0.0
Antroli	64	12.5	0.0	0.0
Ram Talawdi	30	6.6	0.0	0.0
Narshipura	69	21.8	3.1	0.0
Kabhai Muwada	11	18.1	0.0	0.0
Ganagapura	20	10.0	0.0	0.0
Kevadia	45	4.4	2.2	0.0

Table 3. Natural incidence of *B.popilliae* and *M.anisopliae* in *H.consanguinea* grub population in different localities of Central Gujarat during 1987

Locality	No. of grubs collected	% diseased		
		B. popilliae	*M. anisopliae*	Mixed
Anand	22	27.3	9.0	4.54
Bhaner	50	2.0	2.0	0.0
Vatrak	16	12.5	6.2	0.0
Talod	24	16.6	0.0	0.0
Vijapur	31	22.6	6.4	3.2
Ladol	20	25.0	0.0	0.0
Anjol	84	35.7	0.0	0.0
Mansa	13	30.8	0.0	0.0
Unava	17	35.5	5.8	0.0

from 2.2 to 7.6% during 1986. The percentage of grubs infected by the bacterium varied from 6.0 to 34.2, while percentage mixed infection varied from 0.0 to 3.0 (Table 2).

In 1987, surveys were extended in area surrounding Kapadwanj Tahsil of the Central Gujarat. It was found that 2.0 to 9.0% and 2.0 to 35.7% grubs were infected with the fungus and the bacterium, respectively. Mixed infection varied from 3.2 to 4.54% (Table 3). This survey also indicated that both the pathogens occurred in many localities of the surrounding two districts namely, Sabarkantha and Mehsana where white grub infestation was noticed.

It is clear from these results that both the pathogens are well distributed in Central Gujarat and cause considerable disease in the grub population indicating their high virulence against the pest under natural conditions. *B. popilliae* var *holotrichiae* was reported to be effective causing 72.2% mortality in the grubs of *H. consanguinea* under field conditions when applied @ 5 billion spores/m^2 (Vyas *et al.*, 1991) in the same area where the present studies were carried out. Insectivorous birds were found to help in the dispersal of *B. popilliae* over large areas (Vyas *et al.*, 1988). The inoculative application of muscardine fungi has resulted in natural epizootics of the disease under favourable conditions in the soil grubs (Ferron, 1978).

In view of this, it would be worthwhile attempting inoculative application of *B. popilliae* var *holotrichiae* and *M. anisopliae* in the area where the natural incidence is low or not known to occur, so as to induce natural epizootics of the pathogens.

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