CONTROL OF BLACK BEETLE BY MICROBES

BY

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Various methods have been advocated to control the destructive insect pest of coconut, the rhinoceros beetle, *Oryctes rhinoceros* L. They include mechanical, chemical and biological methods. Even though pesticides have immediate effect and the pest can be controlled by them to a great extent, they have certain limitations such as toxicity to plants, insect resistance to insecticides, toxicity to man and chemical pollution of the environment. Mechanical means of control are too costly and can be done only with the help of a skilled worker.

The use of biological control by means of other predatory insects and by microbes is of more recent origin and appears to have high potentialities. Microbial control is part of biological control and is concerned with the employment of micro-organisms and their products by man for pest control. The success lies in the fact that once the pathogen or parasite is established, it continues to be effective by virtue of its further spread by contact through air, water etc. Thus the use of micro-organism in the control of insect pest is of great importance.

A large number of pests attack the coconut palm. Among these, the black beetle is found to be injurious and has wide distribution all over the coconut growing regions and is subject to a number of diseases due to fungus, bacteria and virus.

Two strains of the "Green muscardine" fungus and two species of bacteria were isolated at this Station from third instar dead grubs collected from different regions. The fungus *Metarrhizium x anisopliae*, commonly known as "Green muscardine" causes maximum destruction to the pest. It was first

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discovered on rhinoceros grubs in Samoa (1913). Two strains of this fungus isolated from local collection and from Laccadives revealed certain differences in colour as well as in the pattern of growth of colony on potato dextrose agar. The growth of the isolate from Laccadives was comparatively faster than that of the local strain. Colour of the local isolate was bronze green and that of the other olive green. But there was no significant difference in pathogenicity.

In spraying trials cent per cent mortality was obtained within 13 days after treatment under laboratory condition. But in the field condition the mortality rate is varying according to environmental and predisposing factors. Favourable weather factors for the fungus (low temperature and high humidity) and higher quantity of inoculum potential have great influence in increasing the activity of the fungus.

The results of the experiment conducted at Central Palantation Crops Research Institute indicate the possibility of building up the population of this fungus in Oryctes infested gardens under favourable weather factors as a measure of biological control on the immature stages of the pest at its breeding places and thus break a connecting link in the life cycle of the pest. Fungus infected material has been collected from cowdung pits during South-West monsoon from various places surveyed.

Symptom of the disease after death is that the normal colour changes into opaque creamy white. Two or three days after death a white growth appears on the surface and it turns to greenish appearance all over the body except head capsule and joints of legs. All stages of the beetle except eggs are susceptible to this fungus. The mortality rate is greater between seventh and eleventh day after inoculation. Disease appears from fifth day onwards.

The fungus is harmless to man, animals and plants. Host range of this fungus exceeds fifty species of insects. In general it may be hoped that this disease, once established under favourable conditions, may maintain itself year after year. Thus it is considered to be a valuable method for the successful control of the pest.

Besides the fungus, two bacteria have been isolated from dead grubs collected locally. They are identified as *Serratia* sp. and *Pseudomonas* sp. which were found to be effective against *Oryctes* grubs. *Serratia* sp. have been isolated several times from dead third instar grubs (reddish pink) collected locally. Besides the local isolate, *Pseudomonas* sp. had been isolated from the collections of dead grubs (3rd instar) from Laccadives and Mysore State. Forty to sixty per cent mortality was obtained by spraying the inoculum on the surface of the grubs and feeding medium.

Flaccid nature and change in the normal colour to reddish pink is the symptom of the bacteria, *Seriatia* infected specimen. Third instar stage of the pest is comparatively more infected by this microbe. The abdomen becomes turbid and the body-fluid which is dark red will ooze out when slightly pricked. Mortality begins from three to five days after inoculation. The colour of *Pseudemonas* infected specimen is pinkish blue and it becomes flaccid. A number of other bacteria was found to be effective against *Oryctes* only by injection to the body cavity.

A virus, *Rhabdionvirus oryctes* mostly infecting third instar larvae of *Oryctes* has been described from Germany. This is otherwise called "Malaya disease" because it was first detected in Malaya. It is easily transmissible to third instar by contaminated food as well as by intrahalmocoelic inoculation. The signs and symptoms of the disease are turbidity and glassy appearance of the abdomen accompanying diarrhea. Frequently the turgor is increased and the hind gut is completely extraverted.

Even if the insect pathogen cannot ultimately replace the use of chemical insecticides with our growing knowledge of the side effects of chemical pesticides and after the decided development of resistance to chemicals in some important pests, it is obvious that these microbial agents have a role to play. Safety of use is one of the mainstays of the proposal for microbial control.