Organic management of corm borer *Haplosonyx chalybaeus* (Hope) - A serious insect pest of Colocasia in north eastern India

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Abstract

The Corm borer *Haplosonyx chalybaeus (*Hope*)* (Coleoptera: Chrysomelidae) is a major insect pest of colocasia (*Colocasia esculenta*) in North Eastern Region of India. *H. chalybaeus* adults cause 50-70% damage to foliage and 70-90% to corms. Adult beetles hide in the leaf sheath during night and 6-7 beetles were recorded per plant. Tribal farmers in the region control the insect by hand-picking the adults. *Beauveria bassiana* found to infect *H. chalybaeus* at a dose of $1x10^9$ spores/ml and result in mortality of both adults and grubs upto 95.4 and 81.2% respectively *in vitro* and 72.6 and 50.0% in field conditions.Adults of *H. chalybaeus* were infected by entomopathogenic nematode *Heterorhabditis indica* and *Steinernema carpocapsae*, death occurs on 5th day after inoculation and emergence of nematodes after 7 days. *H. indica* is more effective than *S. carpocapsae* in killing the grubs of corm borer. *S. carpocapsae* killed 50% of the grubs within 72 hr whereas, *H. indica* produced a mortality rate of 95% within the same duration and the harvest rate from the dead cadavers was also more. The lethal doses of *H. indica* for the corm borer was 25 *Ijs* (Infective juveniles) for the second instar, 40 for the 3rd, 400 for the 4th and 5th instar grubs. The restricted movement of the grubs of *H. chalybaeus* in taro corms and the moist protected environment within corm suggest that these conditions might be conducive to the use of *S. carpocapsae* and *H. indica* for the management of *H. chalybaeus*.

Keywords: Colocasia esculenta, Corm borer, Haplosonyx chalybaeus, Beauveria bassiana, Heterorhabditis indica and Steinernema carpocapsae.

Introduction

Colocasia (*Colocasia esculenta*) is grown extensively in the North Eastern Hill (NEH) Region of India in plains and hill slopes as a rainfed crop during April to September. Many insect pests infest colocasia, while the corm borer *Haplosonyx chalybaeus* (Coleoptera: Chrysomelidae) is a regular and endemic pest causing 50-70% 50-70% damage to foliage and 70-90% to corms, which ultimately result in serious economic losses to the farmers of the region. *H. chalybaeus* is a new record from the NEH region and was not reported from other parts of India.

Organic farming was introduced in several states of NEH region by the respective state governments in the region. In view of these policy changes in the agriculture sector, a need has arisen to manage the insect pests in organic manner so as to prevent the accumulation of pesticide residues and production of clean and synthetic pesticide residues and production of clean and safe corms or any other agricultural produce. Hence, a study was undertaken to understand the biology of the *H. chalybaeus* on colocasia and the management of the borer with the use of entomopathogenic fungus *Beauveria bassiana* and entomopathogenic nematodes (EPN) *Heterorhabditis indica* and *Steinernema carpocapsae*.

Materials and methods

The adults and grubs of *H. chalybaeus* infected by *B. bassiana* were collected from field and incubated for the isolation of indigenous strains of the fungus. Both these stages were bioassayed to test the efficiency of *B. bassiana*, which was mass multiplied on cowpea grains (Sharma et al., 1999). Different doses of the *B. bassiana* were used to test the mortality of the *H. chalybaeus* viz. 1×10^5, 1×10^6, 1×10^7, 1×10^8 and 1×10^9 spores ml^{-1} and for each dose 5 replications and 30 insects were used.

A mixed culture of EPNs isolated from other insect pests like rice leaf folder *Cnaphalocrocis medinalis* and maize cob borer *Steinachroia elongella* were used for the study. These EPNs were cultured on wax moth, *Galleria mellonella*, which was further, reared on artificial diet. Different cultures of the EPNs *S. carpocapsae* and *H. indica* were also tested for their efficacy on the mortality of the adult and grubs of the corm borer. Petridish assay was used for the bio-efficacy. Whatman No. 1 filter paper was kept in the lid of a 10 cm petri-dish. The infective juveniles (*ijs*) spread evenly over the filter paper in 1 ml of distilled water. One grub or adult was added and covered with inverted petri-dish lid and kept in a plastic bag to conserve moisture and incubated at 22^{0}C. The mortality was recorded at 24 h intervals.

Results and discussion

Haplosonyx is a genus earlier known as *Aplosonyx*. The adults of *H. chalybaeus* are bright metallic with blue and pink colour (Fig 1). The two colours were found both in male and female beetles. The head and thorax of *H. chalybaeus* are orange coloured and the abdomen is in blue to deep pink to purple in colour. However, the ventral side is yellowish to orange in colour. Sexual dimorphism is present. The *H. chalybaeus* infest both the leaf sheath and the corm. The adult beetles feed on the leaves by making cicular holes of different sizes generally half to one-inch size. Similar damage pattern was reported in *Aplosonyx amorphophallus* a pest on amorphophallus in Indonesia (Mohammedsaid, 2008). The holes are more on the edges of the leaf lamina than inside. The damaged plants wither, wilt and become yellow and emit foul smell. A maximum of 70-80 grubs were found per plant. The beetles during night efficiently hide and survive in the leaf sheaths at ground level. 2-3 beetles were found in each leaf sheath and 6-7 beetles/plant. The water present in the leaf sheath was also part of the nutritional source for these beetles. The local farmers collect the beetles and destroy them mechanically is one of the important management strategy for *H. chalybaeus*.

Figure 1. Adult *Haplosonyx chalybaeus* feeding colocasia leaf

H. chalybeaus was found to be highly susceptible to *B. bassiana*. The fungus at a dose of 1x10^{9} spores ml^{-1} was found to infect and result in mortality of both adults and grubs upto 95.4 and 81.2% respectively in vitro and 72.6 and 50.0% in field conditions. The beetles that were fed with taro leaves sprayed with *B. bassiana* died within 8-10 days and the grubs were killed within 3-4 days. In both the cases, about 90% mortality of the pest was recorded.

All the adult beeltes of *H. chalybaeus* were infected by the two strains of EPN *Heterorhabditis indica* and *Steinernema carpocapsae*, death occurs on 5th DAI and immergence of nematodes after 7 days. The entomopathogenic nematode *H. indica* is more effective than *S. carpocapsae* in killing the grubs of taro corm borer. *S. carpocapsae* killed 50% of the grubs within 72 hr whereas the *H. indica* produced a mortality rate of 95% within the same duration and the harvest rate from the dead cadavers was also more. The lethal doses of *H. indica* for the corm borer was 25 *Ijs* (Infective juveniles) for the second instars, 40 for the 3rd, 400 for the 4th and 5th instar grubs. These rhabditoid nematodes, found typically in soil, have been utilized successfully as microbial insecticides in control programmes for a variety of cryptic pests including the possibility to use against sweet potato weevil *C. formicarius*. The restricted movement of the grubs of *H. chalybaeus* in taro corms and the moist protected environment within corm suggest that these conditions might be conducive to the use of *S. carpocapsae* and *H. indica* for the management of the taro corm borer.

The predictable climatic conditions, the availability of high moisture with low temperatures during the cultivation of colocasia in the NEH region are suggested to be suitable for effective use of *B. bassiana* and *H. indica* together with the resistant or tolerant varieties could successfully manage the *H. chalybaeus*.

References

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