



## Management of cashew stem and root borer, *Plocaederus ferrugineus* L. by microbial and plant products

K. R. Sahu\* and D. Sharma

### ABSTRACT

The cashew (*Anacardium occidentale* L.) is an export oriented plantation crop. Among the various factors responsible for low yields in cashew, the insect-pests are major one. The cashew stems and root borer (CSRB) *Plocaederus ferrugineus* L. is one of the serious pests in cashew. The tiny grub of CSRB bores into the fresh tissue and feeds on the phloem and xylem tissues of the trunk and root with making irregular tunnels. Due to extensive tunneling the vascular tissues were damaged and plant sap movements were arrested and ultimately trees died. For management of the CSRB, an experiment was conducted using different bio-control measures including two plant products (neem oil @ 5% and neem cake) and two microbial pesticides such as *Metarhizium anisopliae* (Metsch) Sorkin (Deuteromycotina: Moniliales) and *Beauveria bassiana* (Bals.) Vuill in different time intervals and in different combinations. All the treatments were effective and superior over control in minimizing the CSRB infestation. Application of *M. anisopliae* spawn 250g/tree along with neem cake 500g (T<sub>4</sub>) was most effective treatment with least infested trees (7.40%) followed by application of *B. bassiana* spawn 250g/tree along with neem cake 500g (T<sub>5</sub>) with 11.11% infested trees.

Key words: Cashew insects, *Plocaederus ferrugineus*, *Metarhizium anisopliae* and *Beauveria bassiana*

### INTRODUCTION

The cashew (*Anacardium occidentale* L) is an important commercial plantation crop with tremendous potential for foreign currencies. Cashew cultivation in India during 2004-05 concerned on area of 820 thousand hectares of land and produced 500 thousand tones of raw nuts (Directorate of Cashew and Cocoa Development REPORTS, 2005-06). Among the several factors contributing to yield reduction in cashew, infestations by insect pests are of major components. The cashews stem and root borer (CSRB), *Plocaederus ferrugineus* L. is one of the serious pests of cashew. The extent of attack assessed in different cashew plantations of Forest (David and Ananthakrishnan, 2004). Reports reveals that Departments of Kerala and Tamilnadu was found be 7-20 per cent and 30-35 per cent loss, respectively (Misra and Basu Choudhary, 1985). In Guntur and Prakasam districts of Andhra Pradesh, the infestation was recorded up to 40 per cent (Arjuna Rao, 1978; Ayyanna and Rama Devi, 1986). Haldankar *et al.* (2004) highlighted the strategies and constraints for cashew production in Maharashtra.

The tiny grub of CSRB bores into the fresh tissue and feeds on the phloem and xylem tissues of the trunk and root with making irregular tunnels, resulting in exudation of gum (gummosis) and extrusion of fibrous frass from damaged portion (Sathiamma, 1977). Due to extensive

feeding damage caused by the grubs, the flow of sap is arrested and the leaves become yellow and are shed prematurely. The cash trees succumb to attack within a period of one to three years depending on pest load, bark circumferences damaged and age of the trees (Misra and Basu Choudhary, 1985). Synthetic pesticides like carbaryl and sevidol (Mohapatra, 2004) and entomopathogenic fungi such as *Beauveria bassiana*, *Beauveria brongniartii* and *Metarhizium anisopliae* (Saminathan *et al.*, 2004) were proposed for controlling this pest. The farmers seldom take control measures against this pest, which are rarely visible and whose damage is sporadic in nature. Insecticidal controls have so far not come out with suitable control of this pest. Two entomopathogenic fungi *Metarhizium anisopliae* (Metsch) Sorkin (Deuteromycotina: Moniliales) and *Beauveria bassiana* (Bals.) Vuill, have been successfully utilized against many insect pests (Gupta *et al.*, 2003; Bhattacharyya *et al.*, 2008). Therefore it was thought desirable to explore the possibilities of using these fungal pathogens for the management of cashews stem and root borer at Baster region of Chhattisgarh.

### MATERIALS AND METHODS

The experiment was conducted at S.G. College of Agriculture and Research Station, Jagdalpur, during 2005-

06 with different plant products and bio-control measures along with control. Each treatment provided to randomly selected trees in all 54 trees in CSRFB infested area and all the cashew trees had managed with similar horticultural practices. For management of CSRFB, two plant products (neem oil and neem cake) and two microbial pesticide (*M.anisopliae* and *B.bassiana*) were used at different time intervals and in different combinations. The details of treatments were T<sub>1</sub> (Swabbing neem oil 5% (200ml per tree) during October-November); T<sub>2</sub> (Swabbing neem oil - 5% @ 200ml per tree) during October to November, January to February), T<sub>3</sub> (Swabbing neem oil -5% @ 200ml per tree) during October to November, January to February and April to May), T<sub>4</sub> (Application of *M. anisopliae* spawn 250g/tree + 500g neem Cake during October to November), T<sub>5</sub> (Application of *B. bassiana* spawn 250g/tree + 500g neem Cake during October to November) and T<sub>6</sub> (Untreated check). The mother culture of microbial pathogens were purchased from PDBC (Project Directorate of Biological Control), Bangalore (Karnataka) and multiplied in sterilised sorghum grains and used for experimental purposes. The trees were observed at fortnightly interval and counted the number of damaged and undamaged trees. The total number of days free from pest infestation was taken and averaged. The analysis was done as for the method given by Steel and Torrie (1981).

## RESULTS

The effect of different treatments in this experiment for management of CSRFB was shown in Table 1. All the treatments were effective and superior to the control in

minimizing the CSRFB infestation. Among all the treatments the application of entomopathogenic fungus *M. anisopliae* spawn at 250g/tree in combination with 500g neem cake during October-November (T<sub>4</sub>) was most effective with least infested trees (7.40%) but on par with application of *B. bassiana* spawn 250g/tree in combination with 500g neem Cake October-November (T<sub>5</sub>) with 11.10% infestation. The Mean duration free from CSRFB attack was maximum up to 120 days in the treatment where application of *M. anisopliae* along with 500g neem cake was done during October-November followed by up to 105 days in treatment in which application of *B.bassiana* spawn 250g/tree in combination with 500g neem cake was done during the same period. Per cent reduction of CSRFB infestation over control was maximum (63.63%) in T<sub>4</sub> followed by T<sub>5</sub> with 45.45% reduction over control.

## DISCUSSION

The treatment T<sub>4</sub> was found most effective as the treated trees were free from pest attack up to 120 days. It may be due to longer persistence of fungal colony around the tree base which causes highest mortality of CSRFB grubs as compared to other treatments. Similar findings were reported by Ambethgar *et al.* (1999) that the green muscardine fungus, *M.anisopliae* cause 19-26 and 100 per cent mortality of the grubs in field and laboratory conditions, respectively. The treatment T<sub>5</sub> was the second best management practice for CSRFB as it made the cashew tree free from CSRFB attack up to 105 days. This finding was in agreement with Sundaraju (2002) who reported that mycopathogens like *M. anisopliae* and *B. bassiana* known to cause mycosis of grubs of CSRFB. The spores of *M.*

Table 1. Infestation levels of CSRFB in different prophylactic treatments

Treatments	No. of trees treated	No. of trees infested	Infestation (in %)	Mean duration free from pest attack (in days)
T <sub>1</sub>	54	8	14.80(16.91)*	45
T <sub>2</sub>	54	7	12.96(15.76)	60
T <sub>3</sub>	54	7	12.96(15.76)	75
T <sub>4</sub>	54	4	7.40(11.68)	120
T <sub>5</sub>	54	6	11.10(14.29)	105
T <sub>6</sub>	54	11	20.35(20.08)	30
CD at 5%			(2.698)	

T<sub>1</sub> (Swabbing neem oil 5% (200ml per tree, during October-November); T<sub>2</sub> (Swabbing neem oil - 5% @ 200ml per tree, during October to November, January to February), T<sub>3</sub> (Swabbing neem oil -5% @ 200ml per tree, during October to November, January to February and April to May), T<sub>4</sub> (*M. anisopliae* spawn 250g/tree + 500g neem cake during October to November), T<sub>5</sub> (*B. bassiana* spawn 250g/tree + 500g neem cake during October to November) and T<sub>6</sub> (Untreated check); Figures in parenthesis are Arc Sin transformed Values

*anisopliae* survive for three months under field condition. Mixing the spawn with organic matters like FYM, neem cake and cashew apple can increase the spore load in the field condition. Similarly Bakthavatsalam and Bhat (1991-92) also reported that entomofungal pathogen *B. bassiana* tested under laboratory condition against CSRB. Three methods of applications were tried, among these methods, direct spraying recorded maximum mortality up to 60 per cent. Whereas the mortality was 10-20 per cent in soaking of the bark piece in spore suspension and allowing the grubs to feed and mixing the fungal suspension in saw dust and allowing the grubs to feed.

#### REFERENCES

- Ambethgar, V., Lakshman V., Dinakaran, D. and Selvaragan M. 1999. Mycosis of cashews stem and root borer (CSRB)-*Plocaederus ferrugineus* L. (Coleoptera : Cerambycidae ) by *Metarhizium anisopliae* (Metsch) Sorkin (Deuteromycotina: Moniliales) from Tamil Nadu (India). *Journal of Entomological Research*, **23** (1): 81-93.
- Arjuna Rao, P. 1978. Pest complex of cashew (*Anacardium occidentale*) in Guntur and Prakasm district of Andhra Pradesh. *Cashew Bulletin*, **15** (11): 7-11.
- Ayyanna, T. and Rama Devi. 1986. A study of the distribution and status of stem and root borer (*Plocaederus ferrugineus*) dreadful pest on cashew in the coastal districts of Andhra Pradesh and its control. *Cashew Cause*, **8** (1):6-8.
- Bakthavatsalam, N. and Bhat, P.S. 1991-92. Developing integrated pest management package against cashew stem and root borer. *Annual Report*, 1991-92. National Research Centre for Cashew (NRCC), Puttur, Karnataka, India. 34-35 **PP**.
- Bhattacharyya, B., Baruah, A.A.L.H., Purnima Das and Bhuyan, U. 2008. Field efficacy of *Beauveria bassiana* (Bals.) Vuill and *Metarhizium anisopliae* (Metsch) Sorkin (Deuteromycotina: Moniliales) against white grubs in Assam. *Journal of Biological Control*, **22** (1): 81 – 64.
- David, B. V. and Ananthkrishnan, T.N. 2004. General and applied entomology. Tata McGraw-Hill Publishing company Ltd., New Delhi. 1184 **PP**.
- Gupta, R.B.L., Sharma, S. and Yadav, C.P.S. 2003. Effect of moisture regimes on efficacy of *Metarhizium anisopliae* against white grub. *Indian Journal of Entomology*, **65**: 38 – 42.
- Haldankar, P. M., Chavan, V. G., Sapkal, B. B., Deshpande, S. B. and Patil, B. P. 2004. Strategies and constraints for cashew production in Maharashtra. *Cashew*, **18** (2): 13-15.
- Misra, M.P. and Basu Choudhary, J.C. 1985. Control of *Plocaederus ferrugineus* Linnaeus (Coleoptera: Cerambycidae) through field hygiene. *India Journal of Agriculture Sciences*, **55**: 290-293.
- Sathiamma, B. 1977. Nature and extent of damage by *Helopeltis antonii* S., the tea mosquito on cashew. *Journal of Plantation Crops*, **5**: 58-62.
- Mohapatra, L. N. 2004. Management of cashew stem and root borer *Plocaederus ferrugineus* L. *Indian Journal of Plant Protection*, **32** (1): 149-150.
- Saminathan, V. R., Mahalingam, C. A. and Ambethgar, V. 2004. Virulence of entomopathogenic fungi to cashew stem and root borer, *Plocaederus ferrugineus* Linnaeus (Coleoptera: Cerambycidae) under laboratory conditions. *Journal of Biological Control*, **18** (2): 215-218.
- Steel, Robbert G.D. and Torrie James, H. 1981. Principles and Procedures of Statistics- A biometrical approach. McGraw-Hill International Book Company.
- Sundaraju. D. 2002. Pest and disease management of cashew in India. *The Cashew*, October - December 2002, 32-38 **PP**.

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#### K. R. Sahu\* and D. Sharma

S.G. College of Agriculture and Research Station, Indira Gandhi Agriculture University, Jagdalpur, Central Gujarat, India; \*Corresponding Address- Research Scholar, Dept. of Entomology, College of Agriculture, Raipur – 494005, Central Gujarat, India, E-mail : koobi\_ento@yahoo.co.in