ISSN 2319-6432 (Print)
ISSN 2349-6433 (Online)

J Krishi Vigyan 2024, 12(4) : 981-985

DOI : 10.5958/2349-4433.2024.00168.2

Short Communication

Management Module for Banana Pseudostem Weevil *Odoiporus longicollis* Oliver

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ABSTRACT

Banana crop is affected by the pseudostem weevil (*Odoiporus longicollis*), which damages the pseudostem and causes the plant to collapse. This weevil causes yield losses of between 10% and 90%. The study was conducted on the evaluation of various management modules for pseudo stem weevil in banana (var. Red Banana) in farmer's fields with four treatments and seven replications in an RBD design. Treatments were imposed on 5th ,6th and 7th month after planting which includes spraying of cassava leaf based biopesticides (Nanma) in the pseudostem, filling the leaf axil with Heterorhabditis (EPN), spraying of Chlorpyriphos 20EC in the pseudo stem. Percentage of plants affected and extent of pseudostem borer infestation, individual bunch weight were measured. In plants treated with the biopesticide based on cassava leaves (Nanma), crop damage was found to be 2.0%; in contrast, EPN showed 13.0% damage, Chlorophyriphos showed 15.2% damage, and untreated control plants showed 35.5% damage. The Weevil infestation was 2.4 % in cassava leaf based biopesticides (Nanma) treatment followed by 8.60% in EPN treatment and 14.60 per cent in Chlorophyriphos treatment and 36.60 per cent in untreated control. The average increase in bunch weight was 26.16 percent for plants treated with the cassava leaf-based biopesticides (Nanma), 21.52 percent for EPN, and 18.60 percent for Chlorophyriphos when compared to untreated control plants. The study revealed that the spraying of cassava leaf based biopesticides reduced the incidence of pseudostem weevil with higher yield.

Key Words: Banana, Pseudostem Weevil, Cassava leaf based biopesticide, Nanma, Entomo pathogenic nematode, *Heterorhabditis*

INTRODUCTION

Banana (*Musa* sp.) is the second most important fruit crop in India and contributes 29.19% of the world's 145 million tons (Mt) of banana production (Ploetz, 2015). Numerous pests and non-pests have been associated to Musa spp., that significantly damage fruit, leaves, pseudostems, and rhizomes. It has been found that banana cultivars are infested by 19 different species of insects (Padmanaban *et al*, 2001). According to Padmanaban *et al* (2020a, b) *Odoiporus longicollis* and *Cosmopolites sordidus* are the two weevil pests that primarily impede banana production. In the Asia Pacific banana-growing region, pseudostem weevil *Odoiporus longicollis*, causes severe assault and production loss (Justin *et al*, 2008). The grub nibbles from the collar region near the rhizome till peduncle, which reduces nutrition intake and weakens the stem. (Padmanaban and Sathiamoorthy, 2001). Pseudostem weevil infestations cause severe damage, which decreased bunch weight and yield. Bunch size decreases significantly as the infection progresses and the infected pseudostem that supports the bunch break off and topples due to wind. Depending on the banana cultivar's growth stage and the effectiveness of management, the pseudostem weevil could result in a yield loss of 10–90% (Padmanaban *et al,* 2020a). Farmers use very toxic synthetic insecticides for spray or

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Grade	Symptom
0	Plants with no symptoms
1	Plants with 1 to 5 bore holes on the pseudostem
2	Plants with 6 to 10 bore holes on the pseudostem
3	Plants with more than 10 bore holes on the pseudostem
4	Plants with pseudo stem about to break or already broken

pseudo stem injection, despite there is no satisfactory control which triggers high levels of pesticide pollution and residue problem in the fruits. Globally there is a drive to shift from synthetic insecticides to eco-friendly formulations in pest management strategies.

The most prevalent way for managing banana stem weevil in India is to use synthetic chemical insecticides (Tippaiah *et al,* 2011). Safer methods of management are needed as bananas serve as a food crop. Biological management with entomopathogenic fungi (EPF) is a safe and effective alternative since these fungi can naturally develop in soil and infect a variety of insects (Sharmila and Mohan, 2015). *O. longicollis* is controlled by the use of entomopathogenic fungi (Velavan *et al*, 2021). When treated early in the crop cycle, endophytic isolates of *B. bassiana* are effective for *O. longicollis*. (Alagesan *et al*, 2019). Padmanaban *et al,* (2019) isolated of endophytic Entomopathogenic fungi (EPF) from cultivars of Musa germplasm that provided protection against pests of banana. The effect of EPN *Heterorhabditis indica* against banana stem weevil under *in vitro* was studied by Padamanaban *et al* (2002). A biopesticide based on cassava leaf extract effectively controls the pseudostem weevil in banana plants (Pushparaj and Shinoj, 2022).The purpose of the field study was to document the effectiveness of several management modules in controlling the banana pseudostem weevil.

MATERIALS AND METHODS

The experimental trial was conducted at Muthalakurichi of Thuckalay block, Kanyakumari during the *Kharif* season. The texture of the soil was sandy loam, with a moderate capacity to hold water. It had a low to medium level of organic carbon (0.31-0.63%), low levels of available nitrogen (175-273 kg/ha), phosphorus (5.4-9.9 kg/ha), and potassium (76-154 kg/ha), as well as a slightly acidic to neutral pH (6.0-6.7). . For all treatments, the typical integrated nutrient management schedule of 150:90:300 g NPK per plant/year was adhered with, along with the use of 20 g of *Azospirillum* and *Phosphobacteria* per plant. The crop with 2.1 x 2.1 m spacing was planted. The management of pseudo stem weevil in the banana variety Red banana involved the application of the following four treatments with seven replications in an RBD design.

T1: Spraying of cassava leaf based biopesticides (Nanma) in the pseudostem @ 5 ml on 5^{th} ,6^{th} and 7^{th} month after planting

T2: Filling the leaf axil with Heterorhabditis, (EPN) @ four cadavers per plant on 5^{th} ,6^{th} and 7^{th} month after planting

T3: Spraying of Chlorpyriphos 20EC @ 0. 25% in the pseudo stem at monthly interval on 5^{th} , 6^{th} and 7^{th} month after planting

T4: Untreated control

During the crucial stages of the crop, fields were irrigated; the crop was harvested, and the yield was recorded. The symptoms, which included tiny pinhead-sized holes, fibrous extrusions, sticky substance exudation, and adult weevil presence, were observed. Percentage of plants affected and extent of pseudostem borer infestation were determined. The weevil infestation was calculated using the damage grade index described by Thippiah *et al* (2010). The number of plants that fell as a result of a pest attack was divided by the total number of plants to determine the extent of crop damage. Individual bunch weight was determined by randomly selecting harvested bunches.

STATISTICAL ANALYSIS

All the experiments were analyzed independently. The OP STAT software was used to analyze the data statistically. The treatment means were compared by Duncan's Multiple Range-Test

Table 1. Effect of different management modules on Pseudostem weevil incidence, yield, economics in Banana.

Treatment	Crop Damage (%)	Infestation percentage of Pseudostem weevil (%)	Bunch weight (Kg)	Yield (q/ha)	BCR
T1	2.0 (8.11)	2.40 (8.91)	21.55	474.0	2.33
T2	13.0 (21.13)	8.60 (17.07)	20.27	446.0	2.06
T3	15.2 (22.95)	14.60 (22.48)	19.55	408.0	2.09
T4	35.5 (36.57)	25.30 (30.21)	15.91	250.0	1.57
SED	0.085	0.361	4.0	175.0	
CD(P=0.05)	0.33	0.68	2.25	14.86	

Figures in parentheses are arc sine transformed values

(DMRT) (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

The effect of different management modules against pseudostem weevil is presented in Table 1. Treatment of plants based on cassava leaves (Nanma) biopesticide) recorded crop damage of 2.0%, in contrast, EPN (13.0%), Chlorophyriphos (15.2%), and untreated control plants recorded 35.5% damage. The Weevil infestation was 2.4 % in cassava leaf based biopesticides (Nanma) treatment followed by 8.60% in EPN treatment and 14.60 per cent in Chlorophyriphos treatment and 36.60 per cent in untreated control. The outcomes align with the research conducted by Jithu *et al* (2017) and Pushparaj and Shinoj (2022), which demonstrated the effectiveness of cassava leaf extract based biopesticide against banana stem weevil. The application of a cassava leaf extract based biopesticide formulation effectively suppressed banana weevil (Hali, 2016). Kannan *et al* (2021) reported that Nimbicidine and cassava based Nanma significantly reduced the infestation of Banana Stem Weevil similar to positive control chlorpyriphos.

On comparing treated vs untreated control plants, the average increase in bunch weight was 26.16 percent for plants treated with the cassava leaf-based biopesticides (Nanma), 21.52 percent for EPN, and 18.60 percent for Chlorophyriphos. The yield of banana is 474.0q/ha with BCR of 2.33 in plants treated with the cassava leaf based biopesticides (Nanma) followed by 446.0q/ha with BCR of 2.06 in plants treated with EPN and plants treated with Chlorophyriphos recorded yield of 408q/ha with BCR of 2.09. The untreated control recorded yield of 250q/ha with BCR of 2.06. The decrease in crop damage was the reason of the increased banana output. Earlier studies by Pushparaj and Shinoj (2022) and Irulandi *et al* (2012) have reported similar results. In conclusion, results of this study revealed that the spraying of cassava leaf based biopesticides reduced the incidence of pseudostem weevil with higher yield. Cassava leaf extract contains secondary metabolites such cyanogenic glycosides, flavonoid glycosides, and hydroxycoumarins that function as chemical defenses and insecticidal qualities, and functions as a natural insecticide by altering the physiology of insects and causing behavioral changes (Joseph *et al,* 2021). Ethyl acetate extract of Cassava leaf extract is a possible grain protector against *Sitophilus oryzae* adult (Mity and Tom 2015). Cyanogens, the primary active ingredients in cassava that effectively combats key stored grain pests like *Rhyzopertha dominica* and *Tribolium castaneum* (Ajesh *et al*, 2018).

CONCLUSION

Using botanical ingredients as pesticides will help crops from pest infestation. In addition to being inexpensive, they pose no insecticidal risks to the environment. The results of the current studies provide compelling evidence for the application and investigation of botanicals in pest management techniques. This formulation's popularity will result in a cleaner environment and more revenue for farmers. The implementation

Integrated pest control techniques could significantly lower the occurrence of pests incidence, boost revenue, and enhance the standard of living for the agricultural community when combined with other enhanced production techniques in the banana

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Received on 6/8/2024 Accepted on 7/10/2024