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Management of Cashew Apple and Nut Borer (*Nephopteryx* sp.) by using Newer Insecticides

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A B S T R A C T

Cashew is influenced by many of the pest out of which cashew apple and nut borer is one of the most important pest which causes economic losses, by considering the importance of this pest a field experiment was conducted at Agriculture and Horticulture research station Ullala, Mangalore during the year 2021-22 to find out the best insecticides for the management of apple and nut borer in cashew, the study recorded that the treatment Chlorantraniliprole @ 0.3 ml/L found one of the best and effective insecticide against cashew apple and nut borer and second best insecticide was Flubendiamide @ 0.3 ml/L at 7 and 14 days after spray. Treatments like *Beauveria bassiana* @ 5g/L, *Metarhizium anisopliae* @ 5g/L and Azadirachtin 1 E.C (10,000 ppm) were on par each other and control recorded highest infestation in the present study. The response of these insecticides was also observed on the yield, with the highest nut yield of 24.48 q/ha and the cost-benefit ratio of 1:3.26 was recorded in Chlorantraniliprole @ 0.3 ml/L.

Introduction

In India, the potential of cashew (*Anacardium occidentale*) was first recognized by Portuguese, then they introduced it to Goa, from there it was spread rapidly along the west coast of India. At earlier it was introduced to manage soil erosion, now it is widely grown as a commercial crop in tropical climates and it is very well adapted to the Indian conditions (Anonymous, 2012). India is the country with the highest production of cashew nuts and contributes more than one-third of the world's total production. Even though in India Maharashtra leads in cashew production, due to the emergence of pests which is affecting the production of cashew (Anonymous, 2012). These insect pests are harmful to the cashew crop, which causes yield loss up to 70% and also contaminate the produces with toxic chemicals that could be harmful to humans. Previously, the cashew apple and nut borer was

considered as a minor pest, so there is very little information are available, previous researchers are made less research on this particular topic. This is due to climate change and deforestation, which are leading to an increase in the pests that feed on cashew crops.

Presently, *Thylocoptila panrosema* meyrick, *Hyalospila leuconeurella* Ragonot, *Anarsia epotias* meyrick, and *Nephopteryx* sp. of apple and nut borer are reported infesting on cashew in India. *T. panrosema* larvae bores in to tender apple and nuts; similarly, *H. leuconeurella* adults lays eggs in the grooves near the junction of apple and nut after emerging this caterpillars feeds on that particular cashew apple and nuts(Godase *et al*., 2004). The scientist reported that *Nephopteryx* sp. was the first reported species in India and the scientist suggested that it likely spread from Goa to Andhra Pradesh. 10% yield loss due to *Thylocoptia panrosema* sp. during severe infestations, so the management of this pest is critical (Maruthadurai *et al*., 2012). Therefore, it is important to carry out a broad survey to understand the current population of the cashew apple and nut borer, in order to effectively manage this pest. The pest population may reduce by collection and devastation of infested apple and nuts from the plantation. By considering the significance of apple and nut borer, the current experimentation was conducted on management of apple and nut borer in cashew.

Materials and Methods

A field experiment was carried out for management of apple and nut borer at Agriculture and Horticulture research station Ullala, Mangalore during the year 2021-22. The experiment was laid out in Randomized Block Design with nine treatments and replicated thrice. Insecticides were applied as per the treatment, when the infested nut observed in the field. The treatment details are given in Table 1.

To evaluate the efficacy of different insecticide, five infested nuts were randomly selected from each treatment and labeled individually. The observation on per cent mortality of larvae on the selected nuts were recorded at seven days and fourteen days after spraying of different insecticides by slightly opening of frass material and it was further converted to percent mortality and statistically analyzed.

Statistical Analysis

After the transformation of percent incidence of apple and nut borer data were statistically analyzed by standard analysis of variance method.

Results and Discussion

The data presented in the table 2 showed that the pre count of cashew apple and nut borer infestation was non-significant. There was significant difference between the treatments after days of spray was observed visually.

At 7 days after spray amongst all the treatments, Chlorantraniliprole (T_7) @ 0.3 ml/L found first best treatments with lowest infestation against cashew apple and nut borer was 4(2.12) and the second best treatment was Flubendiamide (T_4) @ 0.3 ml/L with lowest infestation was 6(2.55, which was followed by Cypermethrin + Profenophos (T_3) @ 1ml/L with lowest infestation was 9(3.08). The treatments (T_1) Lambda cyhalothrin 5 EC @ 0.6ml/L and (T_2) Profenophos 50 EC @ 1ml/L with lowest infestation 11(3.39) respectively was on par each other, and remaining treatments like *Beauveria bassiana* @ 5g/L, *Metarhizium anisopliae* @ 5g/L and Azadirachtin 1 E.C (10,000 ppm) were on par each other. The control recorded very lowest percent of larval mortality. At 14 days after spray, almost similar results were observed on larval mortality percentage.

These results were supported by the findings of Manoj Kumar *et al*., (2020) who reported that lowest percent fruit and shoot infestation on brinjal had been observed when chemical insecticides like chlorpyrifos, imidacloprid and flubendiamide were used.

Table.1 Details of the treatments used in the present study

Treatment No.	Treatment details	Dosage
T_1	Lambda cyhalothrin 5 EC	0.6ml/L
T_2	Profenophos 50 EC	1ml/L
T_3	Cypermethrin + Profenophos	1 ml/L
T_4	Flubendiamide	0.3 ml/L
T_5	Beauveria bassiana	5g/L
T_6	Metarhizium anisopliae	5g/L
T_7	Chlorantraniliprole	0.3 ml/L
T_8	Azadirachtin 1 EC(10,000 ppm)	2ml/L
T_9	Control	-

Table.2 Efficacy of insecticides against Cashew apple and nut borer

Treatment No.	Treatment details	Pre count	7 DAS	14 DAS
T_1	Lambda cyhalothrin 5 EC	52 (7.25^{a})	11(3.39^{b})	17(4.18^{c})
T_2	Profenophos 50 EC	50 (7.11^{a})	11 (3.39^{b})	17(4.18^{c})
T_3	Cypermethrin + Profenophos	51(7.18^{a})	9 (3.08^{ab})	15 (3.94^{bc})
T_4	Flubendiamide	52 (7.25^{a})	6 (2.55^{ab})	11 (3.39^{ab})
T_5	*Beauveria bassiana*	52 (7.25^{a})	19 (4.42^{c})	22 (4.74^{cd})
T_6	*Metarhizium anisopliae*	50 (7.11^{a})	19 (4.42^{c})	21 (4.64^{cd})
T_7	Chlorantraniliprole	51 (7.18^{a})	4 (2.12^{a})	10 (3.24^{a})
T_8	Azadirachtin 1 EC(10,000 ppm)	52 (7.25^{a})	14 (3.81^{bc})	15 (3.94^{bc})
T_9	Control	53 (7.31^{b})	43 (6.60^{d})	44 (6.67^{d})
	S.Em ±	0.10	0.18	0.32
	CD at 5%	0.31	0.55	0.97
	CV	4.45	13.45	21.20

Table.3 Effect of insecticides on cashew nut yield and BC ratio

Treatment No.	Treatment details	Nut yield (q/ha)	B:C ratio
T_1	Lambda cyhalothrin 5 EC	24.48^{a}	3.26
T_2	Profenophos 50 EC	21.63^{b}	2.88
T_3	Cypermethrin + Profenophos	23.28^{ab}	3.10
T_4	Flubendiamide	18.17^{cd}	2.42
T_5	*Beauveria bassiana*	21.93^{b}	2.92
T_6	*Metarhizium anisopliae*	17.27^{d}	2.30
T_7	Chlorantraniliprole	19.52^{c}	2.60
T_8	Azadirachtin 1 EC(10,000 ppm)	14.87^{e}	1.98
T_9	Control	0.14	-
	S.Em ±	0.42	-
	CD at 5%	7.24	-
	CV (%)		

Fig.1 External indication of cashew apple and nut borer symptoms

According to Tayde *et al.*, (2022) who found that the best and most economical treatment was Chlorantraniliprole which was par with Spinosad followed by Flubendiamid. Patel *et al.*, (2018) and Tokare *et al.*, (2006) reported that at 7 and 15 days after application, the treatments lambda cyhalothrin and Quinalphos were observed to be equally effective and significantly superior to profenofos and endosulfan. Jena (1990) also reported the efficacy of cypermethrin and profenophos in cashew borer management. The cashew apple and nut borer was earlier considered a minor pest, and thus former researchers paid little attention, despite the pest's recent creation of a problem in cashew.

Nut yield

For all the treatments cashew nut yield was recorded. The treatment, Chlorantraniliprole (T_7) @ 0.3 ml/L recorded the highest cashew nut yield of 24.48 q/ha followed by Flubendiamide (T_4) @ 0.3 ml/L (23.28 q/ha). Nut yield of the treatments like Profenophos 50 EC @ 1ml/L (21.63 q/ha), Cypermethrin + Profenophos @ 1ml/L (19.52 q/ha), *Metarhizium anisopliae* @5g/L respectively. The lowest cashew nut yield of 14.87 q/ha was recorded in Azadirachtin 1 E.C (10,000 ppm) and control recorded 0.14 q/ha nut yield.

Cost-benefit ratio

After incidence of cashew apple and nut borer, the cost-benefit ratio was calculated for all the treatments and presented in Table 3. The treatment Chlorantraniliprole (T_7) @ 0.3 ml/L recorded the highest costbenefit ratio of 1:3.26 followed by Flubendiamide (T_4) @ 0.3 ml/L. The least cost-benefit ratio of 1:1.98 was recorded in Azadirachtin 1 E.C (10,000 ppm).

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