



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(9): 286-288
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www.thepharmajournal.com
Received: 13-07-2023
Accepted: 24-08-2023

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Management of red pumpkin beetle, *Aulacophora foveicollis* L. in Bottle gourd (*Lagenaria siceraria* M.) crop

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Abstract

The present investigation was studied in *Zaid* season 2022 at the student's instructional farm, A.N.D. University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.). In the course of the research, the various treatments evaluated for the management of red pumpkin beetle (*A. foveicollis*), T₁- [Fipronil (Soil application) + Spinosad (Foliar Spray 30 g *a.i.* + 60 g *a.i./ha*) was observed most effective which caused the maximum mean reduction and gave highest yield 245.60 q/ha followed by T₂ - [Fipronil (Soil application)+ Spinosad (Foliar Spray) 30 g *a.i.*+30g *a.i./ha*] treated plots with 240.50 q/ha. The highest cost-benefit ratio is 22.76:1 obtained from T₅- [Fipronil (Soil application) + Neem Seed Kernel Extract (Foliar Spray 30g *a.i.*+10%/ha) and followed by T₃-[Fipronil (Soil application) + Parthenium leaf extract (Foliar Spray) 30g *a.i.* + 10%/ha] 16.68:1. The efficacy of remaining treatments in order of superiority were T₆- [Fipronil (Soil application) + Neem Seed Kernel Extract (Foliar Spray 30g *a.i.*+10%/ha), T₇- [Fipronil (Soil application) + Lantana Leaf Extract (Foliar Spray 30g *a.i.* + 5%/ha) T₄-[Fipronil (Soil application)+ Parthenium leaf extract (Foliar Spray) 30g *a.i.*+5%/ha]. The least effective treatment was recorded T₈-[Fipronil (Soil application) +Lantana Leaf Extract (Foliar Spray) 30g *a.i.* + 10%/ha] and T₉ - [500 liters water spray], respectively.

Keywords: Lantana leaf extract, fipronil, cost-benefit ratio, neem seed kernel extract and parthenium leaf extract

Introduction

Bottle gourd, *Lagenaria siceraria* (Molina) Stand., belongs to the Cucurbitaceae family and is one of the most significant vegetable crops farmed in India. It has numerous regional names, including Lauki and Ghia. It is cultivated in tropical and subtropical climates around the world. Bottle gourd helps to avoid sodium loss and weariness, especially in the heat. It is a low-calorie diet that is beneficial to those with diabetes and jaundice. The fruits are utilized as aphrodisiac, cardiogenic, hepatoprotective, analgesic, anti-inflammatory, expectorant, diuretic, and antioxidant agents. They are endemic to most of the world countries, particularly the tropics, where they are grown in every country, state, and province. In India, the total area covered by Bottle Gourd was 187 ha, with a production of 3165 Mt. (DES Report, 2021) [3]. Many significant food plants belong to the Cucurbitaceae family, including melon, pumpkin, squash and cucumber (Ajuru and Nmom, 2017) [1]. The cotyledons are damaged by both grubs and adults of the red pumpkin beetle at an early stage. Adults do more damage by eating both flowers and leaves, while grubs eat roots. *Aulacophora foveicollis* L. is a common and major pest of a wide range of cucurbits, especially sweet gourd, bottle gourd, bitter gourd, white gourd, water melon and musk melon. It is polyphagous in nature and larval, adult stages are injurious to the crop and cause severe damage to almost all cucurbits at seedlings, young and tender leaves and flowers (Rahaman and Prophan, 2007; Rahman *et al.*, 2008) [6, 7]. The adult beetles feed on the leaves making irregular holes and also attack the flowers and flower buds but the larvae feed on root tissue and cause direct damage to the newly developed seedlings (Narayanan and Batra, 1960) [4]. Chemical insecticides have been used exclusively to control the red pumpkin beetle. In addition to damaging the ecosystem, their regular usage has made insects resistant to them. Furthermore, insecticides are employed in an indiscriminate manner, resulting in pesticide waste and posing a risk to consumers and non-target creatures. Bio-efficacy of newer insecticides and botanicals was included in the current study to batter the red pumpkin beetle infestation on bottle gourd. With the aforementioned information in mind, the

current research was conducted to design a management strategy for the red pumpkin beetle.

Materials and Methods

The present research conducted at student Instructional Farm, A. N. D. U. A. & T., Kumarganj, Ayodhya (U.P.) during Zaid, 2022. Used the variety Rashmi, replication 03, treatment 09 and used the design RBD. The required quantity of volume

of spray solution was diluted by mixing of 600 liter of water per hectare for spraying with the help of sprayer. The red pumpkin population reach up to ETL, treatments were applied. The population of red pumpkin beetle were recorded one day before spray and 3, 7 and 10 days after spray in each plot. The incidence of red pumpkin beetle was recorded on five randomly selected plants from each plot. The yield also be recorded each plot to determine the efficacy of treatments.

Table 1: Treatment details and doses

Treatment	Name of Insecticide	Dose/ha
T ₁	Fipronil (Soil application)+ Spinosad (Foliar Spray)	30g a.i.+60g a.i.
T ₂	Fipronil (Soil application)+ Spinosad (Foliar Spray)	30g a.i.+30g a.i.
T ₃	Fipronil (Soil application)+ Parthenium leaf extract (Foliar Spray)	30g a.i.+10%
T ₄	Fipronil (Soil application) +Parthenium leaf extract (Foliar Spray)	30 g a.i.+5%
T ₅	Fipronil (Soil application)+ Neem Seed Kernel Extract(Foliar Spray)	30 g a.i.+10%
T ₆	Fipronil (Soil application)+ Neem Seed Kernel Extract(Foliar Spray)	30g a.i+ 5%
T ₇	Fipronil (Soil application)+Lantana Leaf Extract (Foliar Spray)	30g a.i+ 5%
T ₈	Fipronil (Soil application)+Lantana Leaf Extract (Foliar Spray)	30g a.i.+10%
T ₉	Control (water spray)	500 liters

Table 2: Efficacy of certain insecticides against red pumpkin beetle on bottle gourd during Zaid, 2022

Treatments	Dosage (gm a.i./ha)	No. of Beetles/5 plants									
		DBS	First Spray				DBS	Second Spray			
			3DAS	7DAS	10DAS	Mean		3DAS	7DAS	10DAS	Mean
Fipronil (Soil application) + Spinosad (Foliar Spray)	30g a.i.+60g a.i.	10.00 (3.24)	6.33 (2.61)	2.00 (1.58)	2.67 (1.78)	3.67 (2.04)	9.50 (3.16)	5.33 (2.42)	1.50 (1.41)	2.00 (1.58)	2.94 (1.86)
Fipronil (Soil application) + Spinosad (Foliar Spray)	30g a.i.+30g a.i.	10.50 (3.32)	7.33 (2.80)	3.00 (1.87)	4.50 (2.24)	4.94 (2.33)	10.17 (3.27)	6.23 (2.59)	2.63 (1.77)	3.52 (2.00)	4.13 (2.15)
Fipronil (Soil application) + Parthenium leaf extract (Foliar Spray)	30g a.i.+10%	10.33 (3.29)	4.67 (2.27)	5.83 (2.52)	9.83 (3.21)	6.78 (2.70)	9.67 (3.19)	3.70 (2.05)	5.00 (2.15)	8.65 (3.02)	5.78 (2.51)
Fipronil (Soil application) +Parthenium leaf extract (Foliar Spray)	30 g a.i.+5%	11.33 (3.44)	6.00 (2.55)	6.67 (2.68)	10.83 (3.37)	7.83 (2.89)	10.00 (3.24)	4.90 (2.32)	5.67 (2.48)	9.75 (3.20)	6.77 (2.70)
Control (water spray)	500	12.17 (3.56)	13.33 (3.72)	14.17 (3.83)	15.00 (3.94)	14.17 (3.83)	10.83 (3.17)	11.92 (3.52)	13.37 (3.72)	13.67 (3.76)	12.98 (3.67)
S.Em±		NS	(0.06)	(0.07)	(0.08)	(0.22)	-	(0.07)	(0.09)	(0.09)	(0.23)
CD at 5%		NS	(0.18)	(0.21)	(0.23)	(0.66)	(NS)	(0.22)	(0.26)	(0.26)	(0.69)

Results and Discussion

First spray

One day after spray T₁ (Fipronil (Soil application) + Spinosad (Foliar Spray) 30 g a.i. + 60 g a.i./ha) was observed most effective which caused the maximum mean reduction followed by T₂ (Fipronil (Soil application)+ Spinosad (Foliar Spray) 30 g a.i.+30 g a.i./ha) and T₅ (Fipronil (Soil application)+ Neem Seed Kernel Extract (Foliar Spray) 30g a.i.+10%/ha). The lowest efficacy treatments were recorded in the case of T₈ (Fipronil (Soil application) + Lantana Leaf Extract (Foliar Spray) 30g a.i. + 10%/ha) and T₉ (500 liters water spray) respectively. The findings supported by Dangi *et al.* (2006) [2] the spinosad is significantly effective against *Aulacophora torticollis* on ridge gourd. The botanicals viz., NSE (5.0 %) followed by neem oil (1.0 %) and azadirachtin (5.0 ml/ l) proved to be least effective against red pumpkin beetle on bottle gourd. Similarly, findings by Rathod *et al.* (2009) [8] conducted an experiment and recorded maximum mortality in neem-based commercial formulation gronim (49.89) and neem-azal-F (44.86%) against red pumpkin beetle.

Second spray

One day after spray T₁ -(Fipronil (Soil application)+ Spinosad (Foliar Spray) 30 g a.i.+60g a.i./ha) was observed most effective which caused the maximum mean reduction followed by T₂ [Fipronil (Soil application)+ Spinosad (Foliar

Spray) 30 g a.i.+30 g a.i./ha], T₅-[Fipronil (Soil application)+ Neem Seed Kernel Extract -(Foliar Spray 30g a.i.+10%/ha)], while the Among rest of the treatments T₈ (Fipronil (Soil application) +Lantana Leaf Extract (Foliar Spray) 30g a.i. + 10%/ha) and T₉ (500 liters water spray) respectively was found least effective treatment. The findings supported by Dangi *et al.*, (2006) [2] examined that spinosad is significantly effective against *Aulacophora foveicollis* on ridge gourd. Similarly findings by Rathod *et al.*, (2009) [8] maximum mortality in neem-based commercial formulation gronim (49.89) and neem-azal-F (44.86%) against red pumpkin beetle. Partially supported by Neupane *et al.* (2016) [5] 5 ml/l concentration of multi-neem formulation gave the highest reduction of beetle population (100%) in pumpkin followed by 4 ml/l (91.5%), 3 ml/l (63%) and 2 ml/l (37.9%).

Fruit yield

Among all the treatments with the highest fruit yield of bottle gourd yield (245.60 q/ha) Had recorded in a treatment sprayed with T₁ .Fipronil (Soil application) + Spinosad (Foliar Spray) (30ga.i.+60g a.i.) the succeeding best treatment was T₂ Fipronil (Soil application) + Spinosad (Foliar Spray) (30g a.i.+30g a.i.) while the lowest recorded T₈. Fipronil (Soil application)+Lantana Leaf Extract (Foliar Spray) (30g a.i.+10%) and gave yield(192.34 q/ha) and T₉ control recorded the lowest yield of (179.67 q/hac). Present findings supported that the findings of Shivaleela and Chowdary

(2020) [9] recorded the second most effective against sucking insect/pests Fipronil 5 percent SC @ 40 g a.i. /ha.

Conclusion

Among the most effective treatments against the red pumpkin beetle population was found in [Fipronil (Soil application) + Spinosad (Foliar Spray) 30 g a.i.+60g a.i./ha] and the least effective was found [Fipronil (Soil application)+Lantana Leaf Extract (Foliar Spray)30g a.i. + 10%/ha]. The highest fruit yield of bottle gourd yield (245.60 q/ha) Had recorded in a treatment sprayed with T₁ - Fipronil (Soil application) + Spinosad (Foliar Spray) (30g a.i.+60g a.i.) and the lowest yield recorded at T₈ [Fipronil (Soil application)+Lantana Leaf Extract (Foliar Spray 30g a.i.+10%)] and gave yield (192.34 q/ha).

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