The Pharma Innovation Journal 2022; 11(11): 1520-1524

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(11): 1520-1524

www.thepharmajournal.com
Received: 15-08-2022
Accepted: 18-09-2022

Munj SS
M.Sc. Scholar, Department of Agricultural Entomology, College of Agriculture, Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

Gurav SS
Associate Professor (CAS), Department of Agricultural Entomology, College of Horticulture, Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

Munj AY
Junior Entomologist, Regional Fruit Research Station, Vengurle, Sindhudurg, Maharashtra, India

Mule RS
Assistant Professor, Department of Agricultural Entomology, College of Agriculture, Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

Malshe KV
Agronomist, Regional Coconut Research Station, Bhatye, Ratnagiri, Maharashtra, India

Thakur MV
M.Sc. Scholar, Department of Entomology, Post Graduate College of Agriculture, Dr. RPCAU, Pusa, Bihar, India

Corresponding Author:
Munj SS
M.Sc. Scholar, Department of Agricultural Entomology, College of Agriculture, Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

Management of banana skipper, *Erionota torus* (Evans.) (Hesperiidae: Lepidoptera) infesting banana under field conditions

Munj SS, Gurav SS, Munj AY, Mule RS, Malshe KV and Thakur MV

Abstract
A field experiment on the management of banana skipper, *Erionota torus* (Evans.) was conducted at the research farm of Department of Entomology, College of Horticulture, Mulde, Dist. Sindhudurg, during the year 2021. Various treatments like chlorantraniliprole, quinalphos, cypermethrin, lambda cyhalothrin, deltamethrin and azadirachtin were tested. The overall per cent reduction over control after two sprays revealed that the treatment chlorantraniliprole 18.5 SC @ 0.005 per cent was most effective treatment which recorded (74.33%) reduction of larvae. The next best treatment was quinalphos 25 EC @ 0.05 per cent with (63.88%) reduction. It was followed by cypermethrin 25 EC @ 0.07 (61.26%), lambda cyhalothrin @ 5 EC (57.33%), deltamethrin @ 2.8 EC (53.99%) and T_6 – azadirachtin @10000 ppm (50.82%). However, all the treatments were significantly superior over control.

Keywords: Banana, banana skipper, *Erionota torus*, *Musa*, insecticides, management and reduction

1. Introduction
Banana (*Musa* sp.) belongs to family Musaceae and which is one of the most important fruit crop in India, commonly known as “Kalpataru” as well as “Tree of Paradise”. It is a native of tropical region of South-East Asian and Western Pacific Regions (Robinson and Sauce, 2010) [9]. In India, banana is grown in Tamil Nadu, Kerala, Maharashtra, Gujarat, Andhra Pradesh and Karnataka which accounts for 2.81 per cent of agricultural GDP (Bora *et al.*, 2017) [2]. Tamil Nadu ranks first in area while Maharashtra ranks first in productivity and second in area among all states of India. In Maharashtra, cultivated area of banana is 82,000 ha with annual production of 4,303 thousand MT and having productivity of 52.5 MT /ha **(**Nanaware, 2017) [6].
Among many other fruits, banana is highly nutritious and easily digested. It is rich in phenolic compounds and flavonoids, which possess antioxidant properties (Mohapatra, 2010) [5]. A medium sized banana gives near about 105 calories. Banana is also attacked by many insect pests. Out of 470 species of insects and mites damaging the banana plant, only 250 species feeds on foliage (Ostmark, 1974) [8].
The banana skipper, *Erionota torus* (Evans.) (Lepidoptera: Hesperiidae) also referred as banana leaf roller which is one of the major defoliator pest in banana. After hatching of eggs, the young larvae move towards the outer margin of leaf where they cut the leaves and construct leaf rolls before undergoing into pupa and then emerge as a moth (Guru *et al*., 2018) [3]. The feeding and rolling devastate the banana leaves and can causes remarkable reduction in photosynthetic efficiency of plants which ultimately leads to decrease in bunch size, weight of fruit and cause considerable impact on fruit production (Irulandi *et al*., 2018) [4]. Based on its severe leaves damaged, the present investigation was undertaken to evaluate insecticides against *E. torus* infesting banana.

2. Materials and methods
2.1 Location
The study on the management of banana skipper, *Erionota torus* (Evans.) was conducted at the research farm of Department of Entomology, College of Horticulture, Mulde, Dist. Sindhudurg, in field conditions during the year 2021.

2.2 Experimental Details
A field experiment was laid out in Randomized Block Design (RBD) with seven treatments and three replications during *Kharif* season of 2021-22 to study the management of banana

skipper, *E. torus* infesting banana using different insecticides. Six different insecticides *viz.*, Chlorantraniliprole 18.5 SC, Lambda Cyhalothrin 5 EC, Deltamethrin 2.8 EC, Quinalphos 25 EC, Cypermethrin 25 EC and Azadirachtin 10000 ppm along with untreated control were evaluated. Banana (Konkan safed velchi) cultivar was used for management trial.

2.3 Method and period of insecticide application
The quantity of spray suspension required for each treatment was calibrated by spraying water over the untreated controlled plot prior to application of insecticides. The spray suspension of desired strength of each insecticide was prepared and applied using manually operated knapsack sprayer. The spraying of insecticides was done twice. First spray of each insecticide was applied in August 2021 when the peak incidence of pest was noticed, while second spray was taken at an interval of 30 days after first spray in the month of September 2021.

2.4 Method of recording observations
Pre-treatment count of larvae were taken before 24 hrs of spraying and post-treatment count of larvae were recorded at 1st, 3rd, 7th, 10th, 14th and 30th days after spraying (DAS) from five randomly selected banana plants. The observations at 30th day after first spray were considered as pre-count observations for second spray. The per cent reduction over control was calculated for the experiment.
The per cent reduction over control was calculated by following the Abbott's formula (Abbott, 1925),

$$\text{Per cent reduction over control} = \frac{C - T}{C} \times 100$$

Where,
C = Per cent reduction in control
T = Per cent reduction in treatment

2.5 Statistical methods
The data obtained were subjected to square root transformation ($\sqrt{x+0.5}$) and statistically analyzed.

3. Results and Discussion
The efficacy of various tested insecticides against *E. torus* showed the significant reduction in the larval population and the detailed results were presented below,

3.1 First spray
The results on mean of all observations in first spray (Table 1.) revealed that significant differences were found among the different treatments. All the treatments recorded significantly least population of larvae than untreated control. The mean population of *E. torus* larvae were ranged from 3.47 to 10.30 per plant. The minimum mean population of *E. torus* larvae was observed in T_1- chlorantraniliprole 18.5 SC @ 0.005 per cent (3.47 larvae/plant) which was found to be statistically superior over rest of the other treatments. The next best treatment in order of merit was T_4- quinalphos 25 EC @ 0.05 per cent (4.68 larvae/plant) which was at par with T_5- cypermethrin 25 EC @ 0.07 per cent and T_2- lambda cyhalothrin 5 EC @ 0.005 per cent which recorded 4.98 and 5.42 larvae per plant, respectively. It was followed by T_3- deltamethrin 2.8 EC @ 0.056 per cent (5.75 larvae/plant) and T_6 - azadirachtin 10000 ppm @ 0.02 per cent (6.09 larvae/plant). The maximum mean population was observed in T_8- untreated control (10.30 larvae/plant).
The data revealed that the highest per cent reduction in larval population over untreated control was observed in treatment T_1- chlorantraniliprole 18.5 SC (66.34%) followed by T_4- quinalphos 25 EC (54.58%), T_5- cypermethrin 25 EC @ 0.07 (51.67%), T_2- lambda cyhalothrin 5 EC (47.36%), T_3- deltamethrin 2.8 EC (44.22%) and T_6 - azadirachtin 10000 ppm (40.89%).

3.2 Second spray
The results on mean of all observations in second spray (Table 2.) revealed that significant differences were noticed among the different treatments. All the treatments recorded significantly least population of larvae than untreated control. The mean population of the larvae were ranged from 2.88 to 16.28 larvae per plant. The lowest mean population of larvae were observed in T_1- chlorantraniliprole 18.5 SC @ 0.005 per cent (2.88 larvae/plant) which was found to be statistically superior over rest of the treatments. The next best treatment was T_4- quinalphos 25 EC @ 0.05 per cent (4.37 larvae/plant), which was statistically at par with T_5- cypermethrin 25 EC @ 0.07 per cent (4.75 larvae/plant). The next effective treatments were T_2- lambda cyhalothrin 5 EC @ 0.005 per cent (5.32 larvae/plant) and it was at par with treatment T_3- deltamethrin 2.8 EC @ 0.056 (5.90 larvae/plant). The next treatment was T_6 - azadirachtin 10000 ppm @ 0.02 per cent which recorded 6.44 larvae/plant. The maximum mean population was observed in T_8- untreated control (16.28 larvae/plant).

Table 1: Efficacy of different insecticides against *Erionota torus* (Evans.) infesting banana after first spray in the year 2021

Sr. No.	Treatment	Mean number of larvae per plant								Reduction over control (%)
		Pre-count	1 DAS**	3 DAS	7 DAS	10 DAS	14 DAS	30 DAS	Mean	
1	Chlorantraniliprole 18.5 SC (0.3 ml/lit)	8.73 (3.04) *	4.80 (2.30)	2.00 (1.58)	1.47 (1.40)	0.53 (1.01)	2.67 (1.77)	9.33 (3.13)	3.47 (1.87)	66.34
2	Lambda Cyhalothrin 5 EC (1 ml/lit)	8.87 (3.06)	5.93 (2.54)	4.20 (2.17)	2.53 (1.74)	2.40 (1.70)	5.20 (2.39)	12.27 (3.57)	5.42 (2.35)	47.36
3	Deltamethrin 2.8 EC (2 ml/lit)	9.73 (3.20)	6.27 (2.60)	4.73 (2.29)	2.60 (1.76)	2.47 (1.72)	5.47 (2.44)	12.93 (3.66)	5.75 (2.41)	44.22
4	Quinalphos 25 EC (2 ml/lit)	9.13 (3.10)	5.80 (2.51)	2.93 (1.85)	2.20 (1.64)	2.07 (1.60)	4.27 (2.18)	10.80 (3.36)	4.68 (2.19)	54.58
5	Cypermethrin 25 EC (0.3 ml/lit)	9.40 (3.14)	5.87 (2.52)	3.87 (2.09)	2.27 (1.66)	2.13 (1.62)	4.60 (2.26)	11.13 (3.41)	4.98 (2.26)	51.67
6	Azadirachtin 10000 ppm (2 ml/lit)	9.67 (3.19)	6.73 (2.69)	4.87 (2.31)	3.00 (1.87)	2.93 (1.85)	5.73 (2.50)	13.27 (3.71)	6.09 (2.49)	40.89
7	Untreated Control	8.93 (3.07)	8.87 (3.06)	9.07 (3.09)	9.13 (3.10)	9.20 (3.11)	9.80 (3.21)	15.73 (4.03)	10.30 (3.27)	-
S.E (m±)		NS	0.02	0.08	0.03	0.04	0.07	0.07	0.05	-
CD at 5%		NS	0.07	0.25	0.10	0.11	0.21	0.22	0.16	-

* Figures in parentheses are square root $\sqrt{(x+0.5)}$ transformed values ** DAS: Days After Spraying

The data revealed that the highest per cent reduction of larval population over untreated control was observed in T_1-chlorantraniliprole 18.5 SC (82.32%) followed by T_4-quinalphos 25 EC (73.18%), T_5- cypermethrin 25 EC @ 0.07 (70.85%), T_2- lambda cyhalothrin 5 EC (67.30%), T_3-deltamethrin 2.8 EC (63.75%) and T_6 - azadirachtin 10000 ppm (60.74%).

3.3 Overall spray

The results pertaining to overall mean of two sprays against *E. torus* (Table 3.) revealed that the T_1- chlorantraniliprole 18.5 SC @ 0.005 per cent was most effective treatment which recorded least population of *E. torus* (3.18 larvae/plant) and it was significantly superior over all other treatments. The next effective treatment was T_4- quinalphos 25 EC @ 0.05 per cent (4.53 larvae/plant) and was at par with T_5- cypermethrin 25 EC @ 0.07 per cent (4.87 larvae/plant) and T_2- lambda cyhalothrin 5 EC @ 0.005 per cent (5.37 larvae/plant). It was followed by T_3-deltamethrin 2.8 EC @ 0.056 per cent (5.83 larvae/plant) and T_6 - azadirachtin 10000 ppm @ 0.02 per cent (6.27 larvae/plant). All the above treatments were found to be superior over untreated control which recorded maximum *E. torus* population (13.29 larvae/plant).

The results on average reduction of larval population of *E. torus* over untreated control revealed that highest per cent reduction of larvae were observed in the treatment T_1-chlorantraniliprole 18.5 SC @ 0.005 per cent (74.33%), followed by T_4- quinalphos 25 EC @ 0.05 per cent (63.88%), T_5- cypermethrin 25 EC @ 0.07 (61.26%), T_2- lambda cyhalothrin 5 EC (57.33%), T_3- deltamethrin 2.8 EC (53.99%) and T_6 - azadirachtin 10000 ppm (50.82%).

The results revealed that the application of insecticides had played a significant role in reducing the larval population of *E. torus*. The results of present study are similar with the findings of the following workers.

Table 2: Efficacy of different insecticides against *Erionota torus* (Evans.) infesting banana after second spray in the year 2021

Sr. No.	Treatment	Mean number of larvae per plant								Reduction over control (%)
		Pre-count	1 DAS**	3 DAS	7 DAS	10 DAS	14 DAS	30 DAS	Mean	
1	Chlorantraniliprole 18.5 SC (0.3 ml/lit)	9.33 (3.13) *	3.47 (1.99)	2.53 (1.74)	1.73 (1.49)	0.60 (1.05)	2.27 (1.66)	6.67 (2.67)	2.88 (1.77)	82.32
2	Lambda Cyhalothrin 5 EC (1 ml/lit)	12.27 (3.57)	6.80 (2.70)	4.93 (2.33)	2.67 (1.78)	2.27 (1.66)	5.33 (2.41)	9.93 (3.23)	5.32 (2.35)	67.30
3	Deltamethrin 2.8 EC (2 ml/lit)	12.93 (3.66)	7.73 (2.87)	5.80 (2.51)	3.07 (1.89)	2.67 (1.78)	5.73 (2.50)	10.40 (3.30)	5.90 (2.48)	63.75
4	Quinalphos 25 EC (2 ml/lit)	10.80 (3.36)	5.93 (2.54)	2.93 (1.85)	2.20 (1.64)	1.93 (1.56)	4.87 (2.32)	8.33 (2.97)	4.37 (2.15)	73.18
5	Cypermethrin 25 EC (0.3 ml/lit)	11.13 (3.41)	6.40 (2.62)	3.27 (1.94)	2.33 (1.68)	2.13 (1.62)	5.07 (2.36)	9.27 (3.12)	4.75 (2.22)	70.85
6	Azadirachtin 10000 ppm (2 ml/lit)	13.27 (3.71)	8.47 (2.99)	6.33 (2.61)	3.87 (2.09)	2.87 (1.83)	6.00 (2.55)	11.07 (3.40)	6.44 (2.58)	60.74
7	Untreated Control	15.73 (4.03)	16.13 (4.08)	16.80 (4.16)	17.93 (4.29)	17.40 (4.23)	16.27 (4.09)	13.13 (3.69)	16.28 (4.09)	-
S.E (m±)		NS	0.07	0.03	0.04	0.07	0.05	0.08	0.06	-
CD at 5%		NS	0.22	0.09	0.14	0.20	0.16	0.26	0.18	-

* Figures in parentheses are square root √(x+0.5) transformed values ** DAS: Days After Spraying

Table 3: Overall efficacy of different insecticides against *Erionota torus* (Evans.) infesting banana (Average of two sprays) in the year 2021

Sr. No.	Treatment	First Spray		Second Spray		Average	
		Mean population of *E. torus* per plant	Reduction over control (%)	Mean population of *E. torus* per plant	Reduction over control (%)	Population of *E. torus* per plant	Reduction over control (%)
1	Chlorantraniliprole 18.5 SC (0.3 ml/lit)	3.47 (1.87) *	66.34	2.88 (1.77)	82.32	3.18 (1.82)	74.33
2	Lambda Cyhalothrin 5 EC (1 ml/lit)	5.42 (2.35)	47.36	5.32 (2.35)	67.30	5.37 (2.35)	57.33
3	Deltamethrin 2.8 EC (2 ml/lit)	5.75 (2.41)	44.22	5.90 (2.48)	63.75	5.83 (2.45)	53.99
4	Quinalphos 25 EC (2 ml/lit)	4.68 (2.19)	54.58	4.37 (2.15)	73.18	4.53 (2.17)	63.88
5	Cypermethrin 25 EC (0.3 ml/lit)	4.98 (2.26)	51.67	4.75 (2.22)	70.85	4.87 (2.24)	61.26
6	Azadirachtin 10000 ppm (2 ml/lit)	6.09 (2.49)	40.89	6.44 (2.58)	60.74	6.27 (2.54)	50.82
7	Untreated Control	10.30 (3.27)	-	16.28 (4.09)	-	13.29 (3.68)	-
SE (m±)		0.05	-	0.06	-	0.05	-
CD at 5%		0.16	-	0.18	-	0.17	-

* Figures in parentheses are square root (√x+0.5) transformed values

Guru *et al.* (2018) [3] also investigated the effectiveness of different insecticides for the control of *E. torus* and found that among the treatments, lambda cyhalothrin + dichlorvos (65.41%) was more effective in reducing *E. torus* population and it was followed by a combination of quinolphos + dichlorvos (54.01%).

Okolle *et al.* (2011) [7] observed that among the insecticides evaluated against *E. thrax* of banana, capture 605® (Cypermethrin) caused 100 per cent mortality in mature instar larvae after 12 hrs in laboratory, while 90% mortality after 6 hrs in field after treatment, respectively.

Soumya *et al.* (2013) [11] stated that application of botanical insecticides such as azadirachtin and neem oil was suggested by Department of Agriculture, Kerala to control the caterpillars of *E. thrax.*

The findings of Bora *et al.* (2017) [2] indicated that spraying of

chemicals such as chloropyriphos 20 EC @ 2ml, quinolphos 25 EC @ 2ml, imidacloprid 17.8 Sl @ 0.5 ml and dimethoate 20 EC @ 1.7 ml was most effective to control the banana skipper.

The effect of azadirachtin was also found in the results. The obtained results were supported by Irulandi *et al.* (2018) [4], who found that azadirachtin 10000 ppm @ 2 ml/lit was effective against larvae of *E. torus* which recorded 70.30 per cent reduction of infestation.

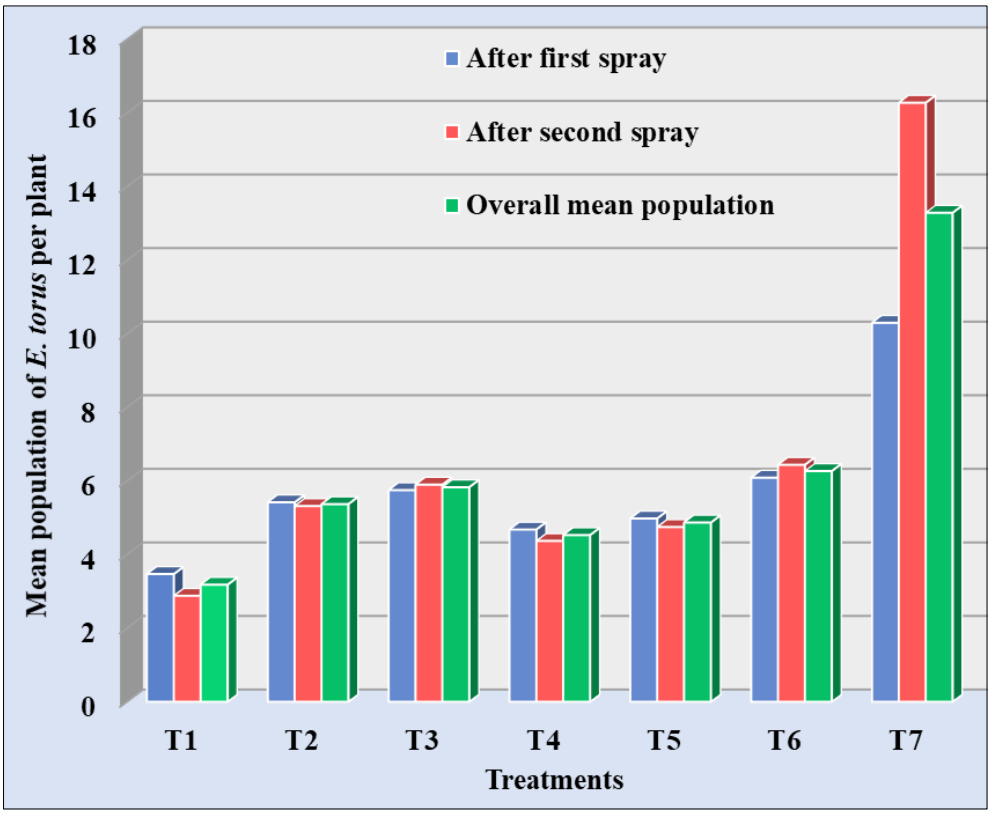

Fig 1: Efficacy of insecticides against *Erionota torus* (Evans.) infesting banana

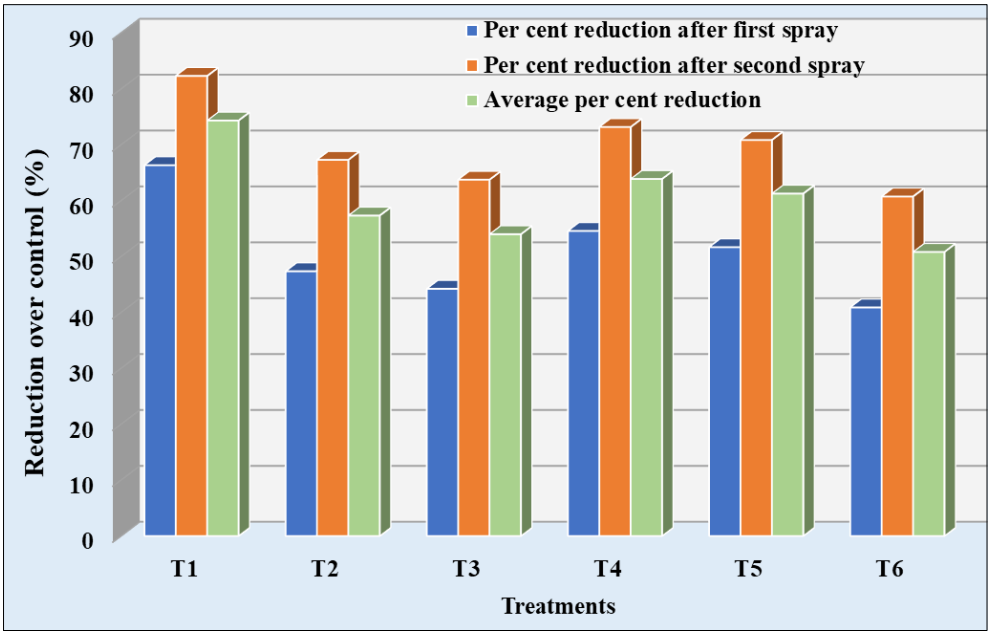

Fig 2: Average per cent larval reduction of *Erionota torus* (Evans.) due to different insecticidal treatments

4. Conclusion

The overall results revealed that, even though *E. torus* is a new introduced pest of banana, it can be managed very effectively by following spray schedule as experienced in the present findings. The insecticide chlorantraniliprole 18.5 SC was found to be the best insecticide in reducing the larval population of banana skipper. Quinalphos 25 EC and Cypermethrin 25 EC were also proved promising. The present

investigation results are based on one season and one location data. Therefore, in order to arrive a sound conclusion, it is necessary to continue the studies with long duration trail including improved pest management practices based on IPM techniques to keep the pest infestation at low level and to get higher returns of yield.

5. Acknowledgement

Authors are thankful to Department of Agricultural Entomology, College of Agriculture, Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli-415712, Ratnagiri-dist, Maharashtra (India), to provide necessary facility and valuable suggestion during investigation.

6. References

1. AICRP-Fruits. All India Coordinated Research Project on Fruits, Indian Institute of Horticultural Research, Banglore; c2019.
2. Bora L, Kundu M, Srivastava RM, Chander S. Banana skipper: An emerging threat to banana leaf industry. Popular Kheti. 2017;5(3):58-61.
3. Guru PN, Patil R, Patil RK, Chatter S. Bioefficacy of insecticides and biopesticides on banana leaf roller, *Erionata torus* (Evans.) J Entomol. Zool. Stud. 2018;6(1):1343-1346.
4. Irulandi S, Manivannan MI, Kumar AR. Bio-ecology and management of the banana skipper, *Erionota thrax* (L.) (Hesperiidae: Lepidoptera). J Entomol. Zool. Stud. 2018;6(2):262-265.
5. Mohapatra. Banana and its by-product utilisation: an overview. J Sci Ind Res. 2010;69:323-329.
6. Nanaware S. A study on banana production technology by the farmers in Kolhapur district, Maharashtra. M. Sc. thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra; c2017. p. i-03.
7. Okolle JN, Abu Hassan A, Mashhor M. Evaluation of selected insecticides for managing larvae of *Erionota thrax* and effects on its parasitoid (*Brachymeria albotibialis*). Pest technology. 2011;5(1):39-43.
8. Ostmark HE. Economic insect pests of bananas. Annu. Rev. Entomol. 1974;19(1):161-176.
9. Robinson JC, Sauce VG. Bananas and Plantains. 2nd Ed. CAB International; c2010. p. 312.
10. Sharanabasappa. Biorational insecticides for the management of *Erionota torus* (Evans.) (Lepidptera: Hesperiidae) on banana. Pesticide Research Journal. 2017;29(1):93-97.
11. Soumya KC, Sajeev TV, Maneetha TK, Vijayan K, Mathew G. Incidence of *Erionota thrax* (Hubner) (Lepidoptera: Hesperiidae) as a pest of banana in Kerala. Entomon. 2013;38(1):53-57.