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Seasonal Incidence and Biorational Management of Mango hopper, *Amritodus atkinsoni* Leth."

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Abstract: *The incidence of the mango hopper started gradually increasing from 2nd week of September to 4th week of September corresponding to 37 to 39 M.W. The incidence was (18.22 hopper/5 panicles) in 39th meteorological week, when the temperature and relative humidity was 33.3^{0}c and 93 per cent, respectively. The peak incidence of mango hopper was found to be in 44th M.W i.e 45.76 hoppers/5 panicles when the temperature and relative humidity was 31.2^{0}c and 88 per cent, respectively. The result indicated that temperature was positively correlated (r=0.302) with the incidence of mango hopper and rainfall (r=-0.062) and relative humidity (-0.383) was negatively correlated with the incidence of mango hopper.*

The studies carried out for evaluation of newer insecticides for control of mango hopper revealed that imidacloprid 17.8 SL @ 0.004% was found to be most effective in reducing mango hopper which was on par with thiomethoxam 25 WG @ 0.01% and lambda cyhalothrin 5 EC @ 0.004%. The significant differences did not existed among the rest of the treatment indicating that they are equally effective in reducing the survival population of mango hopper. Among the biopesticides, M. anisoplae 1x10^8 cfu/ml @ 0.004%, V. lecanii 1x10^8 cfu/ml @ 0.004 %, B. bassiana 1x10^8 cfu/ml @ 0.004% and NSKE 5% @ 1500 ml/ha, were found to be equally effective in reducing the survival population of mango hopper and significant differences did not exist among them.

Key words- *Mango hopper, Amritodus atkinsoni , newer insecticides, Metarhizium anisoplae, Beauveria bassiana* ***Verticillium lecanii.***

I. Introduction

Mango orchards are subjected to the attack of more than 300 insect pests, among them hopper infestation is major yield limiting factor which affect the productivity and quality of mango fruits(Adnan *et al.* 2014*)*. For the management of hopper incidence on mango farmers mainly reli on insecticides (Pena *et al*. 1998), several insecticides have been recommended for hoppers. Mango hopper is a ponderable menace now a days for mango cultivation. This pest is causing irreparable loss to mango plant sick, yellow, weak and fruitless. The hopper cause a loss of 20 to 100 per cent of inflorescence (Borad and Rathod, 2013). The seasonal incidence of mango hoppers will be foundation for undertaking management practices. The inorganic and organic pesticides *viz*., imidacloprid, quinolphos, thiamethoxam, lambda-cyhalothrin, spinosad, NSKE, *Verticillium lecanii*, *Metarhizium anisoplae*, *Beauveria bassiana* has a eco-friendly nature and value in IPM of mango crop.

II. Materials And Methods

The observations on seasonal incidence of M*a*ngo hopper, *Amritodus atkinsoni* Leth., were recorded on the basis of intensity of infestation on 5 inflorescences at weekly interval throughout the season from the month of Sep., 2014 to Jan., 2015.The seasonal incidence was correlated with meteorological data. When mango trees were at flowering stage and pest population was high, evaluation of various insecticides was done against mango hopper for their management.

The experiment was laid out in Randomised Blok Design and each treatment was replicated thrice. Ten trees were considerd as one replication. A total number of 30 trees of mango of 15 years old age and having uniform shapes were selected for the experiment. Two round of application of insecticides was done with the help of gatour sprayer. The population of adults was recorded as per the method suggested by Girish kumar and Giraddi (2001) and Borad and Rathod (2013) from 5 inflorescences one day before as pre-treatment and post-treatment observations on survival population were recorded 3, 7 and 14 days after spray application. Mean results (pre-treatment to post-treatment observations) of each spray were recorded. The data was subjected to analysis of variance.

III. Results And Discussion

Seasonal incidence

The meteorological data revealed that incidence of the mango hopper was noticed from 1st week of Sept corresponding to 36 M. W, the population was 7.57 hoppers /5 panicles and started gradually increasing

from 37 to 39 M.W. The incidence was (18.22 hopper/5 panicles) in 39th meteorological week, when the temperature and relative humidity was 33.3^{0}c and 93 per cent, respectively. The peak incidence of mango hopper was found to be in the 44th M.W i.e 45.76 hoppers/5 panicles when the temperature and relative humidity was 31.2^{0}c and 88 per cent, respectively. The temperature was positively correlated (r= 0.302) with the incidence of mango hopper. these result were in conformity with results of Debnath *et al*. (2013) However rainfall (r=-0.062) and relative humidity (r=-0.383) was negatively correlated with incidence of mango hopper.

Efficacy of newer insecticide- first spray.

The treatment with imidacloprid 17.8 SL @ 0.004%. was recorded minimum mean survival population of mango hopper however, which was found to be on par with thiamethoxam 25 WG @ 0.01% and lambda cyhalothrin 5 EC @ 0.004%, the treatment with quinolphos 25 EC @ 0.05%, spinosad 45 SC @ 0.02 %. Among the biopesticides the treatment with *M. anisoplae* 10^8 cfu @ 0.004%, *V. lecanii* 1x10^8 cfu/ml @ 0.004 %, *B. bassiana* 1x10^8 cfu/ml @ 0.004% and NSKE 5% @ 1500 ml/ha, were found to be equally effective in reducing the survival population of mango hopper and significant differences did not exist among them.

Second spray-

The treatment with imidacloprid 17.8 SL @ 0.004% was recorded minimum population of mango hopper however, which was found to be on par with thiamethoxam 25 WG @ 0.01% and lambda cyhalothrin 5 EC @ 0.004%, Among the biopesticides, *M. anisoplae* 1x10^8 cfu/ml @ 0.004%, *V. lecanii* 1x10^8 cfu/ml @ 0.004 %, *B. bassiana* 1x10^8 cfu/ml @ 0.004% and NSKE 5% @1500ml/ha, were found to be equally effective in reducing the survival population of mango hopper similar results were also reported by Kumar *et al*. (1983) and significant differences did not exist among them.

Hence, these result were in conformity with results of Girishkumar and Giraddi (2001) reported that imidacloprid, lambda cyhalothrin, profenophos and cypermethrin were found to be the most effective treatment recording zero or significantly negligible leaf hoppers population and comparable to standard check. The effectiveness of imidacloprid was also reported by Patil *et al* (2003) , Godase and Bhole (2002) and Rameshbabu and Singh (2014).Monocrotophos, thiamethoxam, difenthiuron and acephate were the next best to follow and were moderate in reducing mango hoppers.

Whereas, Venkatesan *et al.* (2003) who reported that spraying of thiamethoxam 25 WG @ 50 and 100 g a.i/ha two times, once at the pre blooming stage and second at post blooming stage reduced the hopper population from 7 to 1 per inflorescence.

Table 1. Correlation between mango hopper, *A. atkinsoni* Leth incidence with weather parameters.

Sr. No	Meteorological Parameters				
	Max. Temp.	Min. Temp.	Relative Humidity	Rainfall	Hopper Incidence
	Correlation coefficient values				
1	0.302*	-0.322**	-0.383**	-0.062**	1.000*

*= Significant at 5 per cent level
**= Significant at1 per cent level

Table 2 Efficacy of newer insecticide treatments against mango hopper after first spray.

Sr No.	Treatment	Conc (%)	Mean population of Mango hoppers / 5 panicles				Mean
			First Spray				
			Pre count	**3 DAS	**7 DAS	**14 DAS	
1	Imidacloprid 17.8 SL	0.004	8.33 *(2.97)	1.00 (1.22)	2.33 (1.97)	2.53 (1.74)	1.95 (1.64)
2	Thiamethoxam 25 WG	0.01	7.18 (2.77)	1.60 (1.45)	2.53 (1.74)	4.73 (2.29)	2.95 (1.82)
3	Lambda cyhalothrin 5 EC	0.004	6.09 (2.56)	1.93 (1.56)	2.80 (1.82)	4.93 (2.33)	3.22 (1.90)
4	Quinolphos 25 EC	0.05	5.90 (2.52)	3.26 (1.93)	5.39 (2.42)	5.78 (2.50)	4.81 (2.28)
5	Spinosad 45 SC	0.02	6.60 (2.66)	3.36 (1.96)	5.90 (2.52)	5.73 (2.50)	4.99 (2.32)

6	*Verticillium lecanii* 1x10^8 cfu/ml	0.004	7.20 (2.77)	3.46 (1.98)	5.97 (2.54)	6.00 (2.54)	5.14 (2.35)
7	*Metarhizium anisoplae* 1x10^8 cfu/ml	0.004	7.50 (2.82)	3.20 (1.92)	5.56 (2.46)	6.00 (2.54)	4.92 (2.30)
8	*Beauveria bassiana* 1x10^8 cfu/ml	0.004	8.13 (2.93)	3.46 (1.98)	5.66 (2.48)	6.40 (2.62)	5.17 (2.36)
9	NSKE 5%	1500 ml/ ha	7.88 (2.89)	3.52 (2.00)	6.10 (2.56)	7.00 (2.73)	5.54 (2.43)
10	Untreated control	-	8.90 (3.06)	6.72 (2.68)	8.18 (2.94)	8.00 (2.91)	7.63 (2.84)
	SE $\pm$		NS	0.18	0.12	0.26	
	CD at 5%		NS	0.54	0.38	0.78	

DAS- Days after spraying, *Figures in parenthesis are
x + 0.5 transformed values. ** Average of 3 replication

Table. 3 Efficacy of newer insecticide treatments against mango hopper after Second spray.

Sr No.	Treatment	Conc (%)	Mean population of mango hoppers / 5 panicles			Mean
			Second Spray			
			**3 DAS	**7 DAS	**14 DAS	
1	Imidacloprid 17.8 SL	0.004	2.60 *(1.76)	2.20 (1.64)	2.60 (1.76)	2.46 (1.72)
2	Thiamethoxam 25 WG	0.01	3.00 (1.87)	2.53 (1.74)	2.66 (1.78)	2.73 (1.79)
3	Lambda cyhalothrin 5 EC	0.004	3.53 (2.01)	2.80 (1.82)	3.06 (1.89)	3.13 (1.90)
4	Quinolphos 25 EC	0.05	6.64 (2.67)	6.20 (2.58)	7.66 (2.85)	6.83 (2.70)
5	Spinosad 45 SC	0.02	6.13 (2.57)	6.38 (2.62)	6.08 (2.56)	6.19 (2.58)
6	*Verticillium lecanii* 1x10^8 cfu/ml	0.004	6.90 (2.72)	6.40 (2.62)	6.55 (2.70)	6.61 (2.68)
7	*Metarhizium anisoplae* 1x10^8 cfu/ml	0.004	6.02 (2.55)	6.31 (2.60)	6.37 (2.65)	6.23 (2.61)
8	*Beauveria bassiana* 1x10^8 cfu/ml	0.004	6.86 (2.71)	6.90 (2.72)	6.80 (2.62)	6.85 (2.71)
9	NSKE 5%	1500ml/ha	6.66 (2.67)	6.95 (2.73)	7.19 (2.77)	6.93 (2.72)
10	Untreated control	-	8.58 (3.01)	9.10 (3.09)	9.63 (3.18)	9.10 (3.09)
	SE $\pm$		0.26	0.23	0.25	
	CD at 5%		0.79	0.69	0.75	

DAS- Days after spraying. *Figures in parenthesis are x + 0.5
** Average of 3 replication

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