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Evaluation of Insecticides against Tobacco Mealy Bug, *Phenacoccus solenopsis* Tinsley and its Parasitoid, *Aenasius bambawalei* Hayat under Laboratory Conditions

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A B S T R A C T

An investigation was carried out for three years at entomology laboratory, Bidi Tobacco Research Station, Anand Agricultural University, Anand in completely randomized design with six treatments and three repetitions to investigate insecticidal toxicity against tobacco mealybug *Phenacoccus solenopsis* Tinsley and its parasitoid, *Aenasius bambawalei* Hayat. The insecticides *viz*., triazophos 40 EC @ 0.06 %, imidacloprid 17.8 SL @ 0.004 %, thiamethoxam 25 WG @ 0.005 %, buprofezin 25 SC @ 0.005 % and azadirachtin 1 EC @ 0.003 % effectively control mealybug *P. solenopsis* while it has deleterious impact on its parasitoid, *A. bambawalei* in laboratory.

Introduction

In India, principle states producing tobacco are Andhra Pradesh, Karnataka, Gujarat, Bihar, West Bengal and Tamil Nadu. Among these states bidi tobacco (*Nicotiana tabacum* L.) and chewing tobacco (*Nicotiana rustica* L.) are largely cultivated in middle Gujarat agro climatic zone. Tobacco being a long duration crop, it passes through various biotic stresses like insect pests causing quantitative and qualitative damage. In recent past, tobacco has been found to attacked by mealy bug, *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae); a major species occurring on cotton in middle Gujarat (Jhala *et al.*, 2008). Bhatt *et al.*, (2009) reported, presence of hymenopterans parasitoid, *Aenasius bambawalei* Hayat (Chaeidodea: Aphelinidae) on *P. solenopsis.*

The parasitism was ranged from 6.25-29.94% (Average 13.8%). With view to above, present experiment was proposed with following objective includes, to evaluate the toxicity of recommended insecticides against parasitoid

of mealy bug. And also to evaluate the toxicity of recommended insecticides against mealy bug.

Materials and Methods

The experiment was carried out for three years, 2014-15, 2015-16, 2016-17 at entomology laboratory, Bidi Tobacco Research Station, AAU, Anand in completely randomized design with six treatment including five insecticides and water spray as control (Table 1) with three repetitions.

Methodology followed for laboratory experiment

For mealybug

Tobacco was grown as per recommended agronomical practice. When sufficient population of mealybug built up in the crop, different treatments were imposed to the plants in the morning.

Three leaves from each treatment were plucked and brought into the laboratory after 2 hrs. of insecticidal application. Bases of the leaves were wrapped with moisten cotton swab to maintain turgidity and kept in the glass chimney for further observations. Each leaf was considered as one repetition and mortality of mealy bug was recorded.

For parasitoid

To evaluate toxicity of insecticides against parasitoid (*A. bambawalei*) of mealybugs, mummified mealybugs with presence of parasitoids were identified and collected from the treated plots, these mummified mealybugs were brought to the laboratory and kept in the Petri dish for further observations. Observations on number of parasitoids, *A. bambawalei* emerged out were recorded daily up to 10 days.

Results and Discussion

Evaluation of the insecticides against mealy bug and its natural enemy was carried out in laboratory conditions. The data on mortality of mealy bug *P. solenopsis* and its parasitoid in Table 2 revealed that all the tested insecticides were highly toxic to mealy bug, *P. solenopsis* and its parasitoid, *A. bambawalei*. Under laboratory conditions cent percent mortality was registered hence the statistical analysis using ANOVA was not performed but mean value was worked out and placed in the Table 2. In contrast to the insecticidal treatment, a control (water spray) was found safe to the parasitoid, *A. bambawalei* under controlled conditions. All most all the mealy bug and its parasitoids were found live in a treatment without insecticidal application (Table 2).

Table.1 Treatment details

Treatments	g a. i./ha	Concentration (%)	Formulation (ml or g / 10 l water)
Triazophos 40 EC	600	0.06	15
Azadirachtin 1 EC	90	0.003	30
Imidacloprid 17.8 SL	20	0.004	2.2
Thiamethoxam 25 WG	25	0.005	2.0
Buprofezin 25 SC	250	0.05	20
Water spray	-	-	-

Table.2 Evaluation of insecticides for their toxicity on mealybug and its parasitoid (Pooled of 2014-15, 2015-16 and 2016-17)

Evaluation of insecticides for their toxicity against mealybug								
Treatments	**No. of live mealybug (**Before spray)				**No. of live mealybug (**After spray)			
	2014-15	**2015-16**	**2016-17**	**Av**	**2014-15**	**2015-16**	**2016-17**	**Av**
Triazophos 40 EC	35	10	30	25	0	0	0	0
Azadirachtin 1 EC	35	10	30	25	0	0	0	0
Imidacloprid 17.8 SL	35	10	30	25	0	0	0	0
Thiamethoxam 25 WG	35	10	30	25	0	0	0	0
Buprofezin 25 SC	35	10	30	25	0	0	0	0
Water spray	35	10	30	25	35	10	28	24
Evaluation of insecticides for their toxicity against parasitoid								
Treatments	**Parasitized mealybug**				**Live parasitoids emerged from mummified mealybug 10 DAT**			
	2014-15	**2015-16**	**2016-17**	**Av**	**2014-15**	**2015-16**	**2016-17**	**Av**
Triazophos 40 EC	10	10	20	13	0	0	0	0
Azadirachtin 1 EC	10	10	20	13	2	2	3	2*
Imidacloprid 17.8 SL	10	10	20	13	0	0	0	0
Thiamethoxam 25 WG	10	10	20	13	0	0	0	0
Buprofezin 25 SC	10	10	20	13	0	0	0	0
Water spray	10	10	20	13	9	9	17	9
*** Emerged parasitoids were abnormal and could not survived**								

The data presented in Table 2 indicated that, insecticides *viz*., triazophos 40 EC**,** azadirachtin 1 EC**,** imidacloprid 17.8 SL, thiamethoxam 25 WG and buprofezin 25 SC tested against mealybug and its parasitoids under laboratory conditions were found highly toxic to both.

The findings of Sangle *et al.,* (2011), Nalini and Manickavasagam (2011), Suroshe *et al.*, (2014), Minu and Pala ram (2014), Badshah *et al.,* (2015), Nagrare *et al.,* (2016), Badshah *et al.*, (2017), are in conformity with our results.

In conclusion, the evaluated insecticides *viz*., triazophos 40 EC @ 0.06%, imidacloprid 17.8 SL @ 0.004%, thiamethoxam 25 WG @ 0.005 %, buprofezin 25 SC @ 0.005 % and azadirachtin 1 EC @ 0.003 % were highly toxic to mealybug, *Phenacoccus solenopsis* Tinsley and its parasitoid, *Aenasius bambawalei* Hayat in laboratory.

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