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Bio-efficacy of some new molecules against whitefly, *Bemisia tabaci* (*Gennadius*), thrips, *Scirtothrips dorsalis* (Hood) and red spider mite, *Tetranychus* sp. on cotton under Gangetic basin of West Bengal

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ABSTRACT

Field experiment was conducted to determine the comparative efficacy of some new molecules against 3 major pests of cotton viz. whitefly, thrips and red spider mite. Three applications of diafenthiuron 40.5% + acetamiprid 3.9% WP at three different doses viz. 400g, 500g and 600 g ha-1 each along with diafenthiuron 50 WP @ 600 g ha-1, acetamiprid 20 SP @ 100 g ha-1 and imidacloprid 17.8 SL @ 125 ml ha-1 were made at 15 days interval. Diafenthiuron 40.5% + acetamiprid 3.9% WP @ 600 g ha^{-1} showed the best efficacy for controlling all thethree sucking pests of cotton. Second best result was obtained from acetamiprid 20 SP @ 100 g ha^{-1} when white fly is concerned but in case of thrips and mite, it was diafenthiuron 40.5% + acetamiprid 3.9% WP @ 400 g ha^{-1} and diafenthiuron 50 WP @ 600 g ha^{-1}, respectively. Maximum yield (23.24 q ha^{-1} was recorded in diafenthiuron 40.5% + acetamiprid 3.9% WP @ 600 g ha^{-1}.

***Keywords*:** Acetamiprid, cotton, diafenthiuron, mite, sucking pests.

In India, cotton is grown in an area of 89.60 lakh hectares with a production of 232 lakh bales and productivity of 440 kg lint ha^{-1} as against world average productivity of 682 kg lint ha^{-1} (Anon., 2005). It is an important raw material for the Indian textile industry and plays a key role in the national economy. But, successful cultivation of cotton is hampered due to severe damaged by pests. Main losses in cotton production are due to its susceptibility to about 162 species of insect pests and a number of diseases (Manjunath, 2004). Among the important key pests of cotton the sucking pests *viz.*, whitefly, *(B. tabaci)*, thrips, *(S. dorsalis)*, mite, *(Tetranychus* sp.), leaf hopper, (*Amrasca biguttula biguttula)*, and aphid, *(Aphis gossypii)* cause severe damage and serious threat to the crop for successful cultivation, crop stand and yield of cotton. The mealy bug, *Phenacoccus solenopsis* has also reported as one important burning sucking insect pest of cotton (Patel *et al*., 2011). Another burning pest problem in cotton Heavy infestation reduces the crop yield to the extent of 21.2 per cent (Patil, 1998 and Dhawan and Sidhu, 1986). They also act as vectors for a number of viral diseases in large number of plants (Serdar *et al.*, 1999). Therefore, chemical control is still necessary to keep the population of sucking pests below ETL. In the present study, some new molecules have been used to test their efficacy against the three major sucking pests namely whitefly, thrips and red spider mite.

The experiment was conducted at 'D' Block Farm of BCKV, West Bengal on summer cotton maintaining standard agronomical practices during 2014-15. The field was laid out with three replications for each of seven treatment schedules including untreated control. The seven treatments were as follows: T_1 = Diafenthiuron 40.5% + Acetamiprid 3.9% WP @ 400 g ha^{-1}, T_2 = Diafenthiuron 40.5% + Acetamiprid 3.9% WP @ 500 g ha^{-1}, T_3 = Diafenthiuron 40.5% + Acetamiprid 3.9% WP @ 600 g ha^{-1}, T_4 = Diafenthiuron 50 WP @ 600 g ha^{-1}, T_5 = Acetamiprid 20 SP @ 100 g ha^{-1}, T_6 = Imidacloprid 17.8 SL @ 125 ml ha^{-1} and T_7 = Untreated control. The first round high volume spray was initiated on 13.03.15 and subsequent another two sprays were done at 15 days interval. The data of target pests were recorded from randomly selected five plants in each plot. Observations on thrips and mite were recorded from five top young leaves of each selected plant. In case of white fly, number of nymphal population was recorded from lower surface of top five leaves per selected plant. First count was taken one day before first spray and post treatment counts were recorded on 5, 10 and 15 days after each spray. The yield (q ha^{-1}) of unginned cotton lint from each plot was recorded and analyzed statistically. The average pooled data of three round sprays against targeted pests were subjected to analysis after making necessary transformation and expressed on the basis of percent reduction of their population.

The pooled data (after three round sprays) of the results for different treatments against whitefly, thrips, mites and crop yield have been presented in the table 1.

Efficacy against whitefly (*B. tabaci*)

The highest mortality (83.1%) of whitefly population was noticed in Diafenthiuron 40.5% + Acetamiprid 3.9%

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Table-1: Efficacy of insecticide against whitefly, thrips, mites and yield of cotton during summer season of 2014-15.

Treatment	Dosage (g a.i ha^{-1})	Dosage in formulation (g or ml ha^{-1})	Pre treatment population plant^{-1}	Mean mortality of whitefly after pooling of three round sprays (%)			Mean mortality of thrips after pooling of three round sprays (%)			Mean mortality of mites after pooling of three round sprays (%)			Yield (q ha^{-1})
				5 DAS	10 DAS	15 DAS	5 DAS	10 DAS	15 DAS	5 DAS	10 DAS	15 DAS	
T_1= Diafenthiuron 40.5%	81 + 3.12	400	15.33	74.3	70.2	55.5	81.4	68.8	62.7	82.0	68.9	61.7	
+ Acetamiprid 3.9% WP				(59.9)^{b}	(57.2)^{b}	(48.5)^{bc}	(64.8)^{b}	(56.4)^{ab}	(52.7)^{ab}	(65.3)^{b}	(56.6)^{b}	(52.1)^{b}	20.93^{b}
T_2= Diafenthiuron 40.5%	101.25 + 3.90	500	15.93	81.8	76.0	67.4	86.6	73.8	66.8	89.3	80.7	74.6	
+ Acetamiprid 3.9% WP				(65.2)^{a}	(61.0)^{ab}	(55.5)^{a}	(69.0)^{ab}	(59.5)^{ab}	(55.1)^{a}	(71.5)^{ab}	(64.4)^{a}	(60.1)^{a}	22.96^{a}
T_3= Diafenthiuron 40.5%	121.50 + 4.68	600	16.67	83.1	77.9	69.7	89.2	77.3	71.6	91.2	83.1	79.1	23.24^{a}
+ Acetamiprid 3.9% WP				(66.1)^{a}	(62.3)^{a}	(56.9)^{a}	(71.3)^{a}	(61.9)^{a}	(58.1)^{a}	(73.3)^{a}	(66.2)^{a}	(63.2)^{a}	
T_4= Diafenthiuron 50 WP	300	600	17.67	71.1	62.2	50.4	70.9	59.0	47.8	85.2	77.0	71.2	20.69^{b}
				(57.8)^{b}	(52.2)^{c}	(45.5)^{c}	(57.7)^{c}	(50.5)^{bc}	(44.1)^{bc}	(67.7)^{b}	(61.7)^{ab}	(57.9)^{ab}	
T_5= Acetamiprid 20 SP	20	100	16.93	73.7	71.3	60.5	78.1	65.4	65.4	79.7	67.6	49.8	19.33^{c}
				(59.5)^{b}	(57.9)^{b}	(51.4)^{b}	(62.4)^{b}	(54.3)^{b}	(49.3)^{b}	(63.7)^{b}	(55.9)^{b}	(44.6)^{c}	
T_6= Imidacloprid 17.8 SL	22.25	150	16.73	65.4	57.4	44.2	69.9	54.7	40.9	56.8	48.0	38.5	18.02^{d}
				(54.3)^{c}	(49.6)^{c}	(42.0)^{c}	(57.1)^{c}	(48.0)^{c}	(40.0)^{c}	(49.2)^{c}	(44.1)^{c}	(38.6)^{c}	
T_7= Untreated control	—	…..	15.87	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.0	0.0	15.53^{e}
				(4.1)^{d}	(4.1)^{d}	(4.1)^{d}	(4.1)^{d}	(4.1)^{d}	(4.1)^{d}	(4.1)^{d}	(4.1)^{d}	(4.1)^{d}	
S Em(±)				**1.3**	**1.4**	**1.2**	**1.4**	**2.0**	**1.8**	**1.4**	**1.7**	**2.1**	**0.24**
LSD (0.05)				**3.9**	**4.2**	**3.7**	**4.5**	**6.0**	**5.4**	**4.3**	**5.3**	**6.4**	**0.76**
CV (%)				**0.6**	**0.7**	**0.7**	**0.6**	**1.0**	**1.0**	**0.5**	**0.8**	**1.1**	**0.30**

Similar alphabets represents the homogeneous means group due to Duncan's Multiple Range Test

* Values in the parentheses are angular transformed, DAS: Days after spray

WP @ 600 g ha^{-1} which was statistically at par with 81.8 per cent mortality in same combined insecticide @ 500 g ha^{-1} after 5 days of spraying. No statistical variation was observed on mortality percentage up to 15 days of spraying when these two treatments are concerned. The next best treatment was again the same product @ 400 g ha^{-1} followed by Acetamiprid @ 100 g ha^{-1}. The present findings with diafenthiuron 50 WP is in more or less accordance with the report from Sathyan *et al*. (2016) who reported reduced incidence of white fly in cotton by 64 per cent compared to untreated control. Afzal *et al.* (2002) reported best efficacy by Acetamiprid 20 SP @ 100 g ha^{-1} against whitefly. Similar types of results were also provided by Anuradha and Rao (2005) and Singh and Kumar (2006).

Efficacy against thrips (*S.dorsalis*)

Significant reduction of thrips population was noticed in all the treatments over untreated control. After 5 days of spraying, Diafenthiuron 40.5% + Acetamiprid 3.9% WP @ 600 g ha^{-1} recorded the highest percent (89.2%) of mortality which was statistically at par with Diafenthiuron 40.5% + Acetamiprid 3.9% WP @ 500 g ha^{-1} (86.6%). The same treatment @ 400 g ha^{-1} showed the next best mortality by 80.91 per cent. After 10 days, it was respectively by 77.3 and 73.8 per cent. Here, the lowest percentage of mortality (54.7%) was observed in plots treated with Imidacloprid 17.8 SL @ 150 ml ha^{-1} followed by 59.0 per cent mortality in Diafenthiuron 50 WP @ 600 g ha^{-1}. A minor decrease in the efficacy of these insecticides was observed at 15 days after treatment as compared to 5 and 10 days. The significant efficacy of acetamiprid @10 g a.i ha^{-1} and Diafenthiuron 50 WP @ 0.05% against thrips of cotton was already reported respectively by Yasa *et al.* (2010) and Bharpoda *et al.* (2014). These findings indirectly support the results of the present study with combined insecticide containing Diafenthiuron + Acetamiprid.

Efficacy against mite (*Tetranychus sp.*)

The significantly at par mortality of red mites respectively by 91.2 and 89.3 per cent were observed at 5 days after spray in the same treatment Diafenthiuron 40.5% + Acetamiprid 3.9% WP @ 600 g ha^{-1} and 500 g ha^{-1}. Whereas, lowest percentage of mortality (56.8%) was registered in Imidacloprid 17.8 SL @ 150 ml ha^{-1}. After 10 days of spraying, again both dose (600 and 500 g $ha^{-1)}$ of Diafenthiuron 40.5% + Acetamiprid 3.9% WP were superior as compared to other three statistically at par treatments like T_4, T_1 and T_5. The similar trend for the different treatment schedules was also observed at 15 days after spray. Akatov (1997) reported 57-85 per cent reduction of red spider mite by diafenthiuron. Chakrabarti and Sarkar (2014) also reported that Diafenthiuron 50 WP @ 300 g a.i. ha^{-1} gave best result in controlling *P. latus.*

Crop yield

The highest taken dose (600 g ha^{-1}) of Diafenthiuron 40.5% + Acetamiprid 3.9% WP resulted maximum yield of 23.24 q ha^{-1} followed by statistically at par 22.96 q ha^{-1} with next dose (500 g ha^{-1}). The treatments Diafenthiuron 40.5% + Acetamiprid 3.9% WP @ 400 g ha^{-1} (20.93 q g ha^{-1}) and Diafenthurion @ 600 g ha^{-1} (20.69 q ha^{-1}) were the next respective best options. The lowest yield (18.02 q ha^{-1}) was obtained in Imidacloprid 17.8 SL @ 150 ml ha^{-1}.

REFERENCES

Afzal, M., Ahmad, T. and Bashir, M.H. 2002. Relative toxicity of different insecticides against whitefly, *Bemisia tabaci* (Genn.) and black thrips, *Caliothrips indicus* on NM-92 mungbean, *Vigna radiate* L. *Pak. J. Agri. Sci*., **39(3):** 224-25.

Akhatov, A. K. 1997. Use of Pegasus in the protection of green house crops. *Zashchipa-i-Karantin-Rasteni*, 10-21.

Anonymous, 2005. All India co-ordinated cotton improvement project. *Annual Report*, 2004-05. CICR Nagpur, pp.1-2.

Anuuradha, M. and Arjuna Rao, P. 2005. Comparative efficacy of selective insecticides against whiteflies on Brinjal. *Andhra Agric. J.*, **52**: 173-80.

Bharpoda, T. M., Patel, N. B., Thumar, R. K., Bhatt, N. A., Ghetiya, L. V. and Patel, H. C. 2014. Evaluation of insecticides against sucking insect pests infesting *Bt* cotton BG- II. *Bioscan*, **9 (3):** 977-80.

Chakrabarti, S. and Sarkar, P. K. 2014. Studies on efficacy of some acaricidal molecules for the management of *Polyphagotarsonemus latus* (Banks) (Acari: Tasonemidae) infesting chilli (*Capsicum annuum* L.) in West Bengal. *Curr. Biotica*, **7(4):** 299-305.

Dhawan, A. K. and Sidhu, A. S. 1986. Assessment of losses due to attack of cotton jassid on hirsutum cotton. *Indian J. Pl. Prot.*, **14**: 45-50.

Manjunath, T. M. 2004. *Bt* cotton in India: The technology wins as the controversy wanes. *http://www.Monsanto.co.uk/news/ukshowlib.html?wid = 8478.*

Patel, L. C., Mandal, C. K. and Pramanik, A. 2011. Survey on mealy bug, *Phaenacoccus solenopsis* Tinsley - an emerging threat to cotton based agroecosystem in coastal region of West Bengal. *J. Crop Weed*, **7(2):** 254-56

Patil. 1998. Developing IPM schedule. *Proc. Seminar on IPM*. Special issue. ICPA, Mumbai. pp.101-10.

Sathyan, T., Murugesan, N., Elanchezhyan, K., Arockia Stephen Raj, J. and Ravi, G. 2016. Efficacy of Synthetic Insecticides against sucking insect pests in cotton, *Gossypium hirsutum* L. *Int. J. Ento. Res.* **1(1):** 16-21

Serdar, S., Ulrich, K. and Nedim, U. 1999. Development and fecundity of *Aphis gossypii* Glover (Homoptera: Aphididae) on three malvaceae hosts. *Tr. J. Agric.*, **23**: 637-43.

Singh, S. and Kumar, A. 2006. Bio effectiveness of combination product of acetamiprid with cypermethrin, quinalphos and chlorpyriphos against insect pests of cotton. *Indian J. Appl. Ento*., **20**: 91-92.

Yasa, V., Ranga Rao, G. V. and Dharma Reddy, K. 2010. Bioefficacy of neonicotinoid insecticides against Thrips, *Scirtothrips dorsalis* and Leaf hoppers, *Empoasca Kerri* in ground nut. *Indian J. Pl. Prot.*, **38 (2):** 134-38.