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COMPARATIVE BIOEFFICACY OF SOME NEW MOLECULES AGAINST JASSIDS AND WHITEFLY IN COTTON

R. K. KALYAN*, D. P. SAINI, URMILA, P. P. JAMBHULKAR AND ABHISHEK PAREEK
Agricultural Research Station (MPUAT, Udaipur),
Borwat Farm, Banswara - 327 001 (Rajasthan)
e-mail: rkkalyan@rediffmail.com

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***Corresponding author**

ABSTRACT

Field studies were conducted during 2009 and 2010 to evaluate the bio-efficacy of some new molecules against jassids, *Amrasca biguttula biguttula* (Ishida) and whiteflies, *Bemisia tabaci* (Genn.) of cotton at Agricultural Research Station- Banswara (Rajasthan). Six molecules i.e. acephate 75 SP @ 500 a.i./ha, triazophos 40 EC @ 600 a.i./ha, fipronil 5 SC @ 40 a.i./ha, imidacloprid 70 WG @ 50 a.i./ha, spinosad 45 SC @ 75 a.i./ha and dimethoate 30 EC @ 300 a.i./ha were evaluated. Spinosad, imidacloprid, acephate and fipronil effectively control the population of jassids and whiteflies and gave significantly higher seed cotton yield over to untreated check and standard check. The highest avoidable losses (52.65%) were recorded in spinosad followed by imidacloprid (42.38%), acephate (31.47%), fipronil (28.23%) and dimethoate (28.12%).

INTRODUCTION

Cotton, the "White gold" is one of the most important natural fibre crop and plays a vital role in trade, economy, industry, employment and foreign exchange earnings. It is considered as "King of fibers" and being important cash crop of the country. In India, cotton is cultivated in an area of 12.19 million hectare which is the largest in the world, with production of 37.10 million bales ranking second next to China. The average productivity of cotton in India is the lowest among cotton growing nations of the world (AICCIP, 2011-12). Major losses in cotton production are due to its susceptibility to about 162 species of insect pests and number of diseases (Manjunath, 2004). Among the sucking pests, jassids, *Amrasca biguttula biguttula* (Ishida); thrips, *Thrips tabaci* (Linn.); aphids, *Aphis gossypii* (Glover); and whiteflies, *Bemisia tabaci* (Genn.) are the important from seedling stage and cause heavy losses in tune of 21.20 to 22.86 per cent (Kulkarani *et al.*, 2003; Satpute *et al.,* 1990 and Dhawan *et al.,* 1988) and also vectors for a number of viral diseases (Serader *et al.,* 1999). Cotton growers depend on synthetic insecticides to combat sucking pests. At least 3-4 sprays are directed against sucking pests. Continuous and indiscriminate use of synthetic insecticides resulted in resistance development to these insecticides which reflected on the reliability of efficacy of these insecticides. To overcome this problem testing of new molecules are needed for obtaining effective control of these pests. Hence, the present study was conducted to evaluate the efficacy of some new insecticides for effective control of these insects.

MATERIALS AND METHODS

A field experiment was conducted at Agricultural Research Station-Borwat Farm, Banswara (Rajasthan) during *kharif*-2009 and 2010 to evaluate the efficacy of some new molecules against jassids and whiteflies of cotton. The trial was laid out in randomized block design (RBD) with three replications. Cotton hybrid H-8 was dibbled at 90×45cm spacing. The plot size was kept 6.0×5.4cm. All recommended package and practices was followed to raise the crop, except plant protection measures. There were seven treatments namely acephate 75 SP @ 500 a.i./ha, triazophos 40 EC @ 600 a.i./ha, fipronil 5 SC @ 40 a.i./ha, imidacloprid 70 WG @ 50 a.i./ha, spinosad 45 SC @ 75 a.i./ha and dimethoate 30 EC @ 300 a.i./ha were evaluated. All the treatments had two sprays except check. First spray was done at economic threshold level (ETL) and subsequent spray was given at fortnight interval. Observations on pest incidence were recorded from five fixed plants/plot which were tagged after selecting randomly for this purpose. The number of sucking pests namely jassids, *Amrasca biguttula biguttula* (Ishida) and whitefly *Bemisia tabaci* (Genn.) were recorded from three leaves per plant, before spraying, 3rd and 7th days after spray. The seed cotton yield was recorded plot wise at harvest and calculated as kg/ha.

RESULTS AND DISCUSSION

Advance newer molecules are available in the market which is having wider range and applicability to manage various pests. Accordingly sucking pests such as jassids, aphids, whitefly and thrips are the major threat for the crop and subsequently got resistant to age old agrochemicals which are in the vague. Thus in this trial we have applied newer molecules for the management of these sucking pests of cotton.

Table 1: Efficacy of some new molecules against jassids (2009-2010)

S. No.	Treatments	Dose/ha	Jassids/3 leaves 2009			2010		
			BS	3 DAS	7 DAS	BS	3 DAS	7 DAS
1	Acephate 75 SP	500 a.i.	13.87 (3.85)*	4.20 (2.28)	1.80 (1.34)	18.60 (4.31)	5.00 (2.23)	2.87 (1.69)
2	Triazophos 40 EC	600 a.i.	12.40 (3.66)	5.73 (2.59)	4.20 (2.05)	19.00 (4.35)	7.63 (3.18)	4.40 (2.10)
3	Fipronil 5 SC	40 a.i.	13.47 (3.80)	5.47 (2.54)	2.60 (1.61)	18.40 (4.29)	5.60 (2.37)	2.80 (1.67)
4	Imidacloprid 70 WG	50 a.i.	12.80 (3.71)	3.20 (2.04)	1.60 (1.26)	17.60 (4.19)	4.40 (2.09)	2.60 (1.61)
5	Spinosad 45 SC	75 a.i.	12.53 (3.67)	2.87 (1.96)	1.30 (1.14)	18.60 (4.31)	3.20 (1.78)	2.00 (1.41)
6	Dimethoate 30 EC	300 a.i.	11.80 (3.57)	4.60 (2.36)	2.00 (1.41)	18.10 (4.25)	5.20 (2.27)	2.93 (1.71)
7	Control	-	11.40 (3.52)	14.47 (3.93)	16.20 (4.07)	17.80 (4.21)	20.60 (5.43)	22.40 (4.73)
	F test		NS	S	S	NS	S	S
	CD at 5%		-	0.23	0.19	-	0.34	0.23
	CV %		-	4.26	5.53	-	7.50	6.08

BS = before spray, DAS = days after spray, NS – non significant, S- significant, * Figures in parenthesis are square root transformations.

In this process, the pretreatment population of jassids *Amrasca biguttula biguttula* was uniform and non-significant with the range of 11.40 to 13.87 per three leaves during 2009 and in 2010 experiment the population was 17.60 to 19.00 per three leaves well above Economic Threshold Limit (ETL). Among all the tested chemicals, treatment with spinosad 45 SC recorded the lowest jassids population in both the years which has reduced jassids population to 1.30 and 2.00 per three leaves at 7th days after spray in 2009 and 2010 experiment respectively. Next best treatment was spray with imidacloprid 70WG (1.60 and 2.60 per three leaves at 7th days after spray). Both treatments were significantly at par with each other. All the tested molecules significantly reduce the jassid population compared to untreated check and standard check at 3rd and 7th days after sprays (Table 1). Similarly Shinde *et al*. (2011) reported that imidacloprid 0.004% was most effective for the management of jassids and aphids while Kalawate and Dethe (2012) reported spinosad to be moderately effective against jassids, whitefly and aphids. Acephate 75 SP was also found effective in controlling jassid population and at par with dimethoate 30 EC (standard check) followed by fipronil 5 SC and triazophos 40 EC. Similar trend was also followed at 7 days after spray. The outcome of the experiments are in confirmity with the results of Razaq *et al.,* (2005) who reported that new chemistry insecticides like diafenthiuron, acetamiprid, imidacloprid and thiamethoxam proved effective in reducing jassid population below ETL at 7th days post application.

White fly population in untreated plots was in the range of 32.80 to 34.67 in 2009 and 28.20 to 34.47 per three leaves in 2010 experiments. Treatments with all the chemicals significantly reduced the whitefly population at 3rd and 7th days after sprays (Table 2). Spray with spinosad 45 SC reduced whitefly population to 2.40 and 2.20 per three leaves at 7th days after spray in 2009 and 2010 experiments respectively and at par with imidacloprid 70 WG, acephate 75 SP, dimethoate 30 EC and fipronil 5 SC at 3 days after spray and with fipronil, imadacloprid and acephate at 7th day after spray. Abbas *et al.,* 2012 also reported that treatment with imidacloprid, thiamethoxam and acetamiprid significantly reduced the whitefly population to the safe limit at 7 days post treatment. Present study agrees with the results of Ulaganathan and Gupta (2004) and Mohan and Katiyar (2000) who reported that imidacloprid was most effective in suppressing

Table 3: Mean seed cotton yield and avoidable losses in different treatments (2009 and 2010)

Treatments	Dose/ha	Seed Cotton Yield (kg/ha) 2009	2010	Mean	Avoidable losses (%)
Acephate 75 SP	500 a.i.	991	1068	1029.5	31.47
Triazophos 40 EC	600 a.i.	824	874	849.0	16.90
Fipronil 5 SC	40 a.i.	927	1039	983.0	28.23
Imidacloprid 70 WG	50 a.i.	1204	1245	1225.0	42.38
Spinosad 45 SC	75 a.i.	1478	1502	1490.0	52.65
Dimethoate 30 EC	300 a.i.	965	998	982.0	28.12
Contol	-	670	741	705.5	-
F test		S	S		
CD at 5%		241	247.52		
CV		13.46	13.05		

Table 2: Efficacy of some new molecules against white flies (2009-2010)

S. No.	Treatments	Dose/ha	Whiteflies/3 leaves 2009			2010		
			BS	3 DAS	7 DAS	BS	3 DAS	7 DAS
1	Acephate 75 SP	500 a.i.	30.13 (3.58)*	4.80 (2.40)	3.20 (1.79)	27.40 (5.22)	5.40 (2.29)	3.00 (1.73)
2	Triazophos 40 EC	600 a.i.	31.40 (5.69)	5.80 (2.61)	4.20 (2.05)	28.00 (5.29)	7.20 (2.67)	5.20 (2.28)
3	Fipronil 5 SC	40 a.i.	33.07 (5.85)	5.40 (2.53)	2.60 (1.60)	26.60 (5.15)	6.60 (2.57)	2.20 (1.48)
4	Imidacloprid 70 WG	50 a.i.	28.27 (5.41)	4.20 (2.27)	2.60 (1.61)	26.97 (5.19)	5.00 (2.24)	2.47 (1.57)
5	Spinosad 45 SC	75 a.i.	32.27 (5.77)	3.80 (2.17)	2.40 (1.55)	27.80 (5.27)	3.20 (1.77)	2.20 (1.48)
6	Dimethoate 30 EC	300 a.i.	33.00 (5.53)	5.20 (2.48)	3.60 (1.89)	28.40 (5.32)	6.00 (2.44)	3.20 (1.79)
7	Control	-	32.80 (5.81)	33.20 (5.85)	34.67 (5.89)	28.20 (5.31)	32.60 (5.71)	34.47 (5.87)
	F test		NS	S	S	NS	S	S
	CD at 5%		-	0.40	0.27	-	0.43	0.20
	CV %		-	13.46	6.53	-	8.64	4.91

BS = before spray, DAS = days after spray, NS – non significant, S- significant, * Figures in parenthesis are square root transformations.

the whitefly population and its continuous use may increase whitefly population due to development of resistance thus in our finding we come out with a more better chemical in the form of spinosad which reduce the whitefly population very effectively. The present findings are in conformity with findings of AICCIP Report 2007-08 which states that spinosad 45 SC at 187.5 mL/ha were effective against sucking pests of cotton and give 48.5% higher yield over check. Simultaneously spinosad and imidacloprid significantly increased mean seed cotton yield to 1490.0kg/ha and 1225.0kg/ha respectively over the control (705.5kg/ha) and standard check (988.0kg/ha).

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