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RESEARCH ARTICLE

Evaluation of effective period of seed treatment insecticides against cotton jassids [*Amrasca biguttula biguttula* (Ishida)]

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ABSTRACT

The present study was conducted during *Kharif,* 2010-11 at the Experimental Farm of Cotton Improvement Project, Mahatma Phule Krishi Vidyapeeth, Rahuri to test the efficacy of imidacloprid 600 FS, thiamethoxam 350 FS and carbosulfan 25 DS as seed dressing insecticides against cotton jassid, *Amrasca biguttula biguttula* (Ishida). The results revealed that carbosulfan 25 DS @ 50 g kg^{-1} seed was found to be effective in checking jassid population upto 42 DAE. The next promising treatment was carbosulfan 25 DS @ 40 g kg^{-1} of seed, thiamethoxam 350 FS @ 4 ml $kg^{-1}$of seed. However, it was with thiamethoxam 350 FS @ 4 ml $kg^{-1}$of seed and phorate 10G @ 1 kg a.i. per hectare. Both seed treatment of carbosulfan, thiamethoxam and phorate proved most effective than imidacloprid in protecting the crop from jassids below economic threshold level in early growth period. These treatments appeared to be the most economical and recorded maximum seed cotton yield. Imidacloprid was observed to be less effective than carbosulfan and thiamethoxam and phorate against cotton jassids, might be due to continuous selection pressure of imidacloprid ultimately resulted into development of resistance in jassids.

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INTRODUCTION

Cotton is an important cash crop extensively cultivated in several states of the country, however, it suffers due to various insect pests causing heavy losses in yield. Among the vast array of insect pests, the problem of sap sucking pests has become more serious from seedling stage thereby resulting in considerable reduction in yield. A reduction of 22.85 per cent seed cotton yield due to sucking pests has been reported by Satpute *et al*. (1990). Of the various sucking pests jassid, *Amrasca biguttula biguttula* (Ishida) is the most destructive insect pest of cotton, which causes on an average 11.6 per cent reduction in seed cotton yield (Dhawan and Simwat; 1997).

A project on "Awareness-cum-Surveillance Programme for Management of Major Pests in Cotton-Soybean Based Cropping System in Maharashtra (2009-10)" has been initiated from June 2009 under the Head, Department of Entomology, MPKV, Rahuri. The project deals with survey and surveillance of major insect pests of cotton and soybean in all districts of Western Maharashtra. Pest monitors and Pest scouts appointed by the Department of Agriculture M.S., Pune in different districts had recorded the observations on insect pests of cotton and the same was communicated through internet to the NCIPM, New Delhi, where data was analyzed and interpreted and sent to the university for final advisory for the management of insect pests. The overall observation data indicated that the per cent red leaves caused by jassids was continuously increased in Bt cotton treated with imidacloprid as seed treatment and foliar application since 21DAE. It indicated that repeatedly use of imidacloprid for seed treatment and foliar application resulted in problems like pest resistance and increased cost of production (Nemade *et al*., 2007; Dahival and Arora, 2001).

With a view to confirm the pest resistance problem in jassid to imidacloprid the present investigation was carried

out to study the effective period of seed treatment insecticide 'imidacloprid' alongwith thiamethoxam and carbosulfan against cotton jassid and compared with phorate.

MATERIALS AND METHODS

The experiment was conducted during the *Kharif*, 2010-11 at Experimental farm of Cottton Imrpovement Project, Mahatma Phule Krishi Vidyapeeth, Rahuri in Randomized Block Design with four replications comprising seven treatments including untreated control in homogenous block with respect to soil fertility status. The cotton genotype RCH 118 Bt was sown in plot size of 7.2 x 4.5 sq. meter at the spacing of 90 x 90 m. The details of insecticides used are as follows:

T_1 - Imidacloprid 600 FS (Gaucho) seed treatment @ 9ml kg^{-1}.

T_2 -Thiamethoxam 350 FS(Cruiser) seed treatment @ 4 ml kg^{-1}.

T_3 -Carbosulfan 25 DS (Marshal) seed treatment @ 40 g kg^{-1}.

T_4-Carbosulfan 25 DS (Marshal) seed treatment @ 50 g kg^{-1}.

T_5-Application of phorate 10 G @ 1 kg a.i. ha^{-1}.

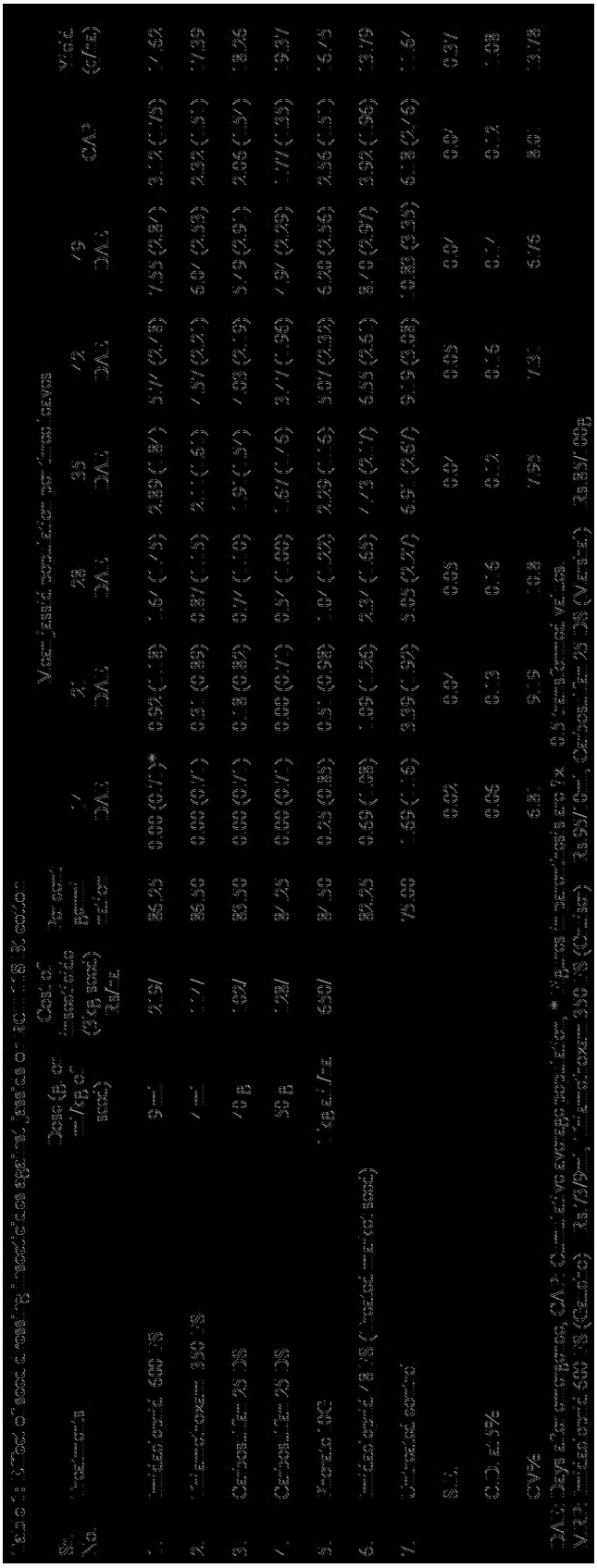
T_6-Market seed of RCH 118 Bt cotton treated with imidacloprid 48% FS.

T_7-Untreated control.

All the recommended agronomical package of practices were adopted for raising the crop. The insecticide imidacloprid 600 FS, thiamethoxam 350 FS and carbosulfan 25 DS at recommended dose of seed treatment were evaluated as seed dressing insecticide in comparison with phorate 10G (soil application). The treated cotton seed of RCH 118 Bt with respective seed dressing insecticide alongwith untreated seed were sown in field. The phorate 10G @ 1 kg a.i. ha^{-1} was applied at the time of sowing in the treatments where seed dressing was not done. No foliar sprays with insecticide were given upto 63DAE of crop. However, based on ETL, two round of blanket spray of 0.05 per cent triazophos 40EC and 0.04 per cent oxydemeton methyl 25EC were imposed in all treatments at 65 and 85 DAE of crop for control of sucking pests. For recording observations, five plants from each plot were selected randomly and were tagged carefully. Observations on the number of jassids (nymphs) were recorded from three leaves (top, middle and bottom canopy of plant) per plant at 7 days interval starting from 14 to 63 days after emergence. The data thus obtained was analysed after necessary transformation (Snedecor and Cochran, 1956).

RESULTS AND DISCUSSION

The data on the effect of various seed dressing insecticides on the incidence of jassids presented in Table 1



revealed significant effectiveness of all seed dressing insecticides in comparison to standard check, phorate 10 G (soil application) @ 1 kg a.i. per hectare and untreated control at weekly interval starting from 14 DAE to 49 DAE of crop (Table 1). The population of jassids was found above ETL in all the treatments at 49 to 63 DAE of crop, including untreated control.

Significantly lowest population of jassid (1.77 Nos./3 leaves and 2.06 Nos./3leaves) were recorded in the plots treated with carbosulfan 25 DS @ 50 and 40 g per kg of seed, respectively. It was followed by thiamethoxam 350 FS @ 4 ml per kg of seed (2.32 Nos./3leaves). Both the treatments were at par with each other. The treatment with imidacloprid, thiamethoxam and phorate showed incidence of jassids from 21DAE, while it was observed from 14DAE in imidacloprid 48 FS market treated seed plot. None of the treatments crossed the jassid ETL upto 35 DAE except untreated control treatment.

Imidacloprid 48 FS market treated seed and imidacloprid 600 FS @ 9 ml per kg of seed recorded significantly higher population of jassids (above ETL *i.e*. 2 Nos./leaves) than carbosulfan 25 DS @ 50 g per kg of seed and thiamethoxam 350 FS @ 4 ml per kg of seed at 42 DAE of crop. It indicated that the crop protection efficiency of imidacloprid as seed dressing insecticide against jassid did not last upto 42 DAE of crop due to continuous selection pressure of imidacloprid (neonicotinoids) which might have resulted into development of resistance in jassids.

Furthermore, it could be seen from the data that the seed cotton yield varied from 13.79 to 19.37 q/ha in treated plots as against 11.64 q/ha in untreated control plot. The maximum seed cotton yield (19.37q/ha) was obtained in treatments with carbosulfan 25DS @ 50g per kg of seed, followed by carbosulfan 25DS @ 40g per kg of seed (18.26), thiamethoxam 350 FS @ 4 ml per kg of seed (17.39), imidacloprid 600 FS @ 9 ml per kg of seed (14.62), phorate10G@ 1kg a.i.per hectare (16.45) and imidacloprid 48 FS treated market seed (13.79). Further, the yield obtained from all the treatments were superior over untreated control. The treatments carbosulfan 25DS and thiamethoxam 350FS appeared to be the most economical and recorded maximum seed cotton yield 19.37 and 17.39 q/ha, respectively.

Overall, it was observed that imidacloprid treated seed plot showed higher jassid population alongwith phorate and untreated control in early growth period; where as carbosulfan and thiamethoxam showed their effectivity upto 42 DAE. Thus, imidacloprid was observed less effective than carbosulfan and thiamethoxam against cotton jassids in initial growth stage. The present findings of development of resistance in jassid to imidacloprid is in conformity with Sone *et al.* (1995), Zewen Liu *et al.* (2004) and Wang *et al.* (2009) who have reported that continuous selection with imidacloprid developed resistance in the population of brown plant hopper, *Nilaparvatha lugens*, a major pest of rice. Further, they reported that imidacloprid could increase the resistance level even more than has already been developed. Moreover, the result of present study of effectiveness of carbosulpfan, thiamethoxam and imidacloprid as seed dressing insecticide against jassids of cotton is also in consonance with Mote *et al.* (1995), Gill *et al*. (1996), Ragunathan (2000), Mohapatra and Sahu (2005).

Based on the present studies, it can be inferred that the carbosulfan 25 DS @ 50 g per kg seed and thiamethoxam 350 FS @ 4 ml per kg of seed can be an effective alternative seed dresser to imidacloprid against jassid for the cotton farmers.

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