



Effectiveness of buprofezin against mealybug (*Phenacoccus solenopsis*) and predatory complex in *Bt* cotton*

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In last few years, a new sucking pest, mealybug [*Phenacoccus solenopsis* (Tinsley)] has emerged as a serious pest on cotton crop in India. *P. solenopsis*, which was hitherto not reported to occur in India is an exotic species originated from the USA, now appeared to be widespread on cotton in almost all cotton growing states of the country (Nagrare *et al.* 2009). In Punjab, it appeared in few pockets of Bathinda, Ferozepur and Muktsar districts during 2006, but in 2007, it also spread to other cotton growing areas of Punjab and emerged in a serious proportion causing 30 to 40% losses in the yield of cotton (Dhawan *et al.* 2007). The integrated strategy has been recommended involving prevention of carry-over of pest, eradication of weeds, regular monitoring and need based application of insecticides belonging to two major groups, viz organophosphates (profenophos, acephate, chlorpyrifos and quinalphos) and carbamates (thiodicarb and carbaryl) for its management (Anonymous 2011). However, it is imperative to explore the possibility of some effective as well as eco-friendly alternatives to highly toxic insecticides which can fit ideally in IPM programme. A new approach towards this step is use of insect growth regulators (IGR's) in the management of insect pests. The present study, therefore, was conducted to evaluate the efficacy of IGR buprofezin against *P. solenopsis* on *Bt* cotton and its impact on predatory complex under field conditions.

Efficacy of buprofezin 25 SC (Applaud) @ 187.5, 250 and 312.5 g a.i./ha was tested for the control of mealybug, *P.*

solenopsis on cotton in 13 different experiments during 2007 and 2008 at farmers' field in Bathinda, Mansa, Muktsar, Faridkot, Ludhiana and Ferozepur districts along with profenophos 50 EC @ 625 g and thiodicarb @ 468.75 g a.i./ha as standard checks and untreated control. The insecticides were applied, when the population of mealybug appeared on cotton. The crop was sprayed once with manually operated knapsack sprayer using 250–300 litres of water/ha. All the treatments were in randomized block design replicated four times in a plot size of 100–150 m² in different locations. The observations were recorded on adult and nymph population of mealybug from 10 cm portion of the central shoot 3, 7 and 10 days after spray (DAS) and per cent reduction in mealybug population over untreated control was worked out. The population of generalist predators in cotton ecosystem, viz. *Coccinella* spp, *Chrysoperla* spp, *Zelus* spp *Geocoris* spp and spiders was also recorded. The data were subjected to statistical analysis of variance (ANOVA) after Arcsine transformation. The means were compared by Duncan's multiple range test (DMRT) at 5% probability level.

The pre-treatment population of mealybug varied from 27.3 to 30.8/10 cm of central shoot during both the years and it did not differ significantly among different treatments. During 2007 (Table 1), the per cent reduction in population of mealybug over untreated control was significantly higher in profenophos (85.28%), followed by thiodicarb (79.45%). The reduction in different buprofezin dosages varied from 49.01 to 64.17%. However, it was significantly inferior to standard checks, 3 DAS. At 7 DAS also, significantly higher reduction in mealybug population was recorded in profenophos (96.29%), followed by buprofezin @ 312.5 g a.i./ha (92.20%) which was at par with standard check thiodicarb (90.34%). After 10 days of spray, buprofezin applied @ 312.5 g a.i./ha (98.26%) was at par with profenophos (99.64%) and thiodicarb (97.19%) in reducing the mealybug population. Lower dosages of buprofezin (187.5 and 250 g a.i./ha) were significantly inferior as compared to standard checks 3, 7 and 10 DAS. During 2008 also,

*Short note

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Table 1 Efficacy of buprofezin against mealybug on cotton during 2007 and 2008

Treatment	Dose (g a.i./ha)	Percent reduction over control*								
		2007			2008			Pooled mean		
		3 DAS	7 DAS	10 DAS	3 DAS	7 DAS	10 DAS	3 DAS	7 DAS	10 DAS
Buprofezin 25 SC	187.5	49.01 ^e	73.49 ^c	81.30 ^c	59.72 ^e	69.75 ^d	77.37 ^d	55.60 ^e	71.19 ^c	78.88 ^d
Buprofezin 25 SC	250.0	57.11 ^d	76.10 ^c	86.48 ^c	65.12 ^d	76.03 ^c	84.17 ^c	62.04 ^d	76.05 ^c	85.06 ^c
Buprofezin 25 SC	312.5	64.17 ^c	92.20 ^b	98.26 ^{ab}	72.40 ^c	87.74 ^b	95.82 ^b	69.24 ^c	89.45 ^b	96.76 ^b
Profenophos 50 EC (Standard Check)	625.0	85.28 ^a	96.29 ^a	99.64 ^a	86.06 ^a	93.35 ^a	98.84 ^a	85.75 ^a	94.48 ^a	99.15 ^a
Thiodicarb 75 WP (Standard Check)	468.75	79.45 ^b	90.34 ^b	97.19 ^b	80.58 ^b	89.07 ^b	95.78 ^b	80.15 ^b	89.56 ^b	96.32 ^b

* Mean of 13 experiments during 2007 and 8 experiments during 2008; DAS, Days after spray; Figures were transformed by arcsine transformation and original values are given; Means within columns followed by common superscript letter(s) do not differ statistically at $P=0.05$ as per DMRT

significantly higher reduction after three days of spray was recorded in profenophos (86.06 %), followed by thiodicarb (80.58 %) and buprofezin at all dosages was significantly inferior (Table 1). However, buprofezin @ 312.5 g a.i./ha was at par with thiodicarb in reducing the population of mealybug at 7 DAS (87.74 %) and 10 DAS (95.82 %). Profenophos was significantly superior in which reduction of mealybug population was 93.35 and 98.84% at 7 and 10 DAS respectively.

Based on the pooled mean of two years (Table 1), all the three buprofezin dosages were significantly inferior in reducing mealybug population as compared to profenophos (85.75 %) and thiodicarb (80.15 %) at 3 DAS. However, buprofezin (312.5 g a.i./ha) was found to be at par with standard check thiodicarb 7 and 10 DAS but was inferior than profenophos. Muthukrishnan *et al.* (2005) also reported that buprofezin dosages (1 125 ml and 1 500 ml/ha) did not significantly reduce grape mealybug *Maconellicoccus hirsutus* population three days after treatment as compared to knock down effects of conventional insecticides. However

at 7 and 15 days after treatment, it significantly mitigated the mealybug colonies. Our results also corroborates with the findings of Patel *et al.* (2010) with respect to superiority of this IGR against *P. solenopsis* who reported that buprofezin tested at different dosages (312.5 and 625 g a.i./ha) significantly reduced mealybug population.

The reduction in population of predatory complex over control in different buprofezin dosages, viz. 187.5, 250 and 312.5 g a.i./ha varied from 20.55 to 27.04, 26.94 to 33.50 and 31.48 to 38.09% at 3, 7 and 10 DAS, respectively (Fig 1). However, it was significantly less as compared to 66.92 to 76.88 and 78.82 to 82.57% in standard checks, i.e. thiodicarb and profenophos, respectively.

SUMMARY

IGR Buprofezin 25 SC (Applaud) was tested at three dosages, viz 187.5, 250 and 312.5 g a.i./ha against mealybug, *P. solenopsis* on *Bt* cotton in 13 different experiments during 2007 and 2008 at farmers' field in Bathinda, Mansa, Muktsar, Faridkot, Ludhiana and Ferozepur districts along with profenophos and thiodicarb as standard checks and untreated control. Buprofezin (312.5 g a.i./ha) was found to be at par with thiodicarb 7 and 10 DAS but inferior than profenophos. However, all the three tested buprofezin dosages were significantly inferior as compared to profenophos and thiodicarb 3 DAS. Buprofezin was found to be safe to predatory complex when compared to profenophos and thiodicarb. Therefore, when the insecticides are needed for management of mealybug, buprofezin may be preferred to other available conventional insecticides as first spray as insecticide selectivity is crucial to conserve natural enemies.

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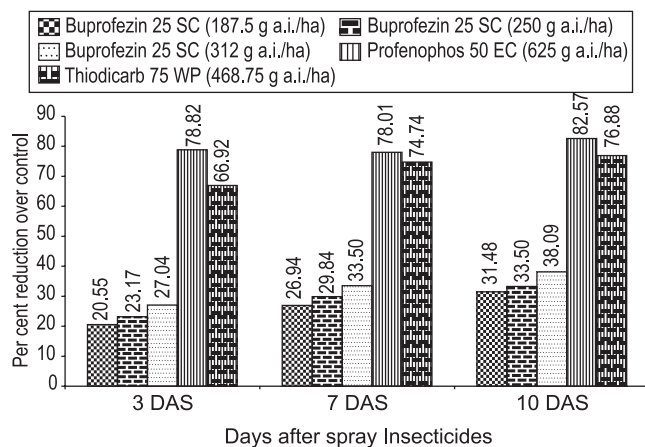


Fig 1 Effect of buprofezin on predator population on cotton (pooled mean of two years)

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