

Field performance of Bt cotton hybrids as IPM component against bollworm complex damage at harvest under rainfed condition

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A field experiment was conducted at Cotton Research Unit, Dr. PDKV, Akola during 2004-05 under rainfed condition in randomized block design with four replications. Three Bt Cotton hybrids viz, MECH-12 Bt, MECH-162 Bt and MECH-184 Bt and two check hybrids viz, PKV-Hy-2 and NHH-44 were grown at 90 x 60 cm as IPM component. The plant protection packages recommended under IPM module which was developed by Dr. PDKV, Akola during 2003-04 were adopted on all the cotton hybrids. From the present study it was observed that are the three Bt cotton hybrids were found promising in recording significantly less open boll and loculi damage at harvest as compared to check hybrids in spite of no sprays for bollworm control on Bt cotton hybrids whereas three sprays for bollworm control on check hybrids.

Key words : Coton, IPM, Azadirachtin, Spinosad 45 SC, Beta - cyfluthrin 2.5EC.

INTRODUCTION

Cotton is a leading commercial crop grown for its valuable fibre. India ranks number one in the world accounting nearly 9 million hectares area under cotton cultivation. However, even with highest area under cotton India ranks only third position with only 13 percent in production India's average yield is only 319 kg ha⁻¹ lint's compared to world average of 603 kg ha⁻¹. (<http://envfor.nic.in>) Amongst the various reasons for low productivity in the country a loss due to insect pest is one of them. Chemical insecticides are being used extensively for control of these insect pests in India. It is estimated that insecticides worth about Rs. 30 billion is used in India agriculture out of which Rs. 16 billion are spent for the control of cotton pests and of this Rs. 12 billion against bollworms alone (Manjunath, 2004). This indicates the economic importance of bollworms. Despite such huge efforts bollworm control has not been generally satisfactory, this mainly because of the fact that the bollworms developed resistance to most of the currently recommended insecticides, further these chemical insecticides bears the stigma of ecological hazards. (Kranthi *et al* 2002).

Taking in to consideration the above problems growing of Bt cotton hybrids can reduce the chemical insecticidal sprays required for bollworms control and there by reduction in plant protection cost. In such situation Bt cotton hybrids can be fitted in IPM programme as one of the component of IPM. Hence present study on field performance of Bt cotton hybrids as IPM component against bollworm complex at harvest under rainfed condition was planned and undertaken.

MATERIAL AND METHODS

A field experiment was conducted at Cotton Research Unit, of Dr. PDKV, Akola, Maharashtra, India during kharif season of 2004-05 under rainfed condition. The design of the experiment was randomized block design with four replications. The plot size was 9.00 x 6.00 m². The three Bt cotton hybrids viz. MECH-12 Bt, MECH-162 Bt and MECH-184 Bt and two check hybrids viz.. PKV-Hy-2 and NHH-44 were grown at 90 x 60 cm in IPM module which, is developed and recommended by Dr. PDKV, Akola

The details of plant protection packages recommended under IPM module are -

- 1) Thiamethoxam 70 WS seed treatment @ 4.28 g.kg⁻¹ of seed.
- 2) Spraying of Acetamiprid 20 SP @ 0.003 per cent for sucking

pests based on ETL.

- 3) *Two releases of T. Chilonis egg parasitoid @ 1-5 lakh.ha⁻¹ at 45-50 and 55-60 DAG.*
- 4) Spraying of Azadirachtin 300 ppm @ 5 ml lit⁻¹ of water for bollworms based on ETL.
- 5) Spraying of Spinosad 45 SC @ 0.01 per cent for bollworms based on ETL.
- 6) Spraying of Beta - cyfluthrin 2.5EC @ 0.0025 per cent for bollworms based on ETL.

The impositions of treatments were based on economic threshold level of a particular pest. Where as, seed treatment and parasitoid releases were undertaken at specific time and interval. Weekly observations were recorded to ascertain the pest load for imposition of ETL based treatments.

Five per cent damage in green fruiting bodies (squares, flowers and green bolls) on plant was considered as ET level for bollworms for imposition of various treatments for bollworm control.

Details of treatments actually under taken in various cotton hybrid

1] MECH-12 Bt :

- Seed treatment with Thiamethoxam 70 WS @ 4.28 g kg⁻¹ of seed.
- Five sprays of Acetamiprid 20 SP @ 0.003 per cent based on ETL
- *Two releases of T. Chilonis @ 1.5 lakh ha⁻¹ at 49 and 59 DAG.*

2] MECH-162 Bt and MECH-184 Bt :

- Seed treatment with Thiamethoxam 70WS @ 4.28 g kg⁻¹ of seed.
- Three sprays of Acetamiprid 20 SP @ 0.003 per cent based on ETL.
- *Two releases of T. Chilonis @ 1.5 lakh ha⁻¹ at 49 and 59 DAG.*

3] PKV-Hy-2 and NHH-44 :

- Seed treatment with Thiamethoxam 70 WS @ 4.28 g kg⁻¹ of seed
- Three sprays of Acetamiprid 20 SP @ 0.003 per cent based on ETL.
- *Two releases of T. Chilonis @ 1.5 lakh ha⁻¹ at 49 and 59 DAG.*
- One spray of Azadirachtin 300 ppm @ 5 ml lit⁻¹ of water based on ETL.
- Two sprays of Spinosad 45 SC @ 0.01 per cent based on ETL.

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Infestation of bollworm in open bolls and loculi at harvest were recorded at each picking, for this 15 open bolls were collected in brown bags from randomly selected five plants from each net plot and these bolls were brought in the laboratory and observed bollworm complex infestation in open bolls and loculi, to see the performance of Bt cotton hybrids against bollworm complex damage at harvest under rainfed situation.

RESULTS AND DISCUSSION

A] Pickingwise open boll damage at harvest (Table -1)

First picking :

Damage was not observed in MECH-162 Bt and minimum damage was noticed in MECH-184 Bt (3.33%) which was at par with MECH-162 Bt (Nil) and MECH-12 (6.66%). Maximum open boll damage was observed in NHH-44 (56.66%) which was at par with PKV-Hy-2 (51.66%).

was at par with MECH-162 Bt (4.99%) and MECH-12 Bt (15.23%). Maximum damage was observed in PKV-Hy-2 (81.66%) which was at par with NHH-44 (78.33%).

B] Picking wise loculi damage at harvest (Table 2) :

1st picking :

Damage was not observed in MECH-162 Bt which was at par with MECH-184 Bt (2.31%) and MECH-12 Bt (2.34%). Maximum damage was noticed in NHH-44 (24.11%) which was at par with PKV-Hy-2 (14.41%)

2nd picking :

Damage was not observed in MECH-162 Bt and MECH-184 Bt and these were at par with MECH-12 Bt (1.55%). Maximum damage was recorded in NHH-44 (10.72%) which was at par with PKV-Hy-2 (9.92%).

Table 1 : Picking wise open boll damage due to bollworm complex at harvest in various cotton hybrids.

Sr. No.	Cotton Hybrids	Av. % open boll damage due to BWC at			
		1 st picking	2 nd picking	3 rd picking	4 th picking
1	MECH-12 Bt	6.66 (10.38)	4.99 (9.09)	4.99 (9.09)	15.23 (19.26)
2	MECH-162 Bt	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	4.99 (9.09)
3	MECH-184 Bt	3.33 (7.47)	0.00 (0.00)	1.66 (3.73)	3.33 (7.47)
4	PKV-Hy-2	51.66 (46.07)	33.32 (34.66)	56.66 (49.04)	81.66 (65.11)
5	NHH-44	56.66 (48.83)	36.66 (36.96)	69.99 (56.96)	78.33 (62.54)
	SE (m) \pm	3.35	4.39	4.44	4.81
	CD at 5%	10.30	13.53	13.70	14.81

Figure in parentheses are arcsine values.

Second picking :

Damage was not observed in MECH-162Bt and MECH-184. Minimum damage was noticed in MECH-12 Bt (4.99%) and was at par with MECH-162 Bt and MECH-184 Bt. Maximum damage was recorded in NHH-44 (36.66%) and it was at par with PKV-Hy-2 (33.32%).

3rd picking :

Damage was not observed in MECH-162 Bt and this was at par with MECH-184 (0.39%) and MECH-12 Bt (2.74%). Maximum loculi damage due to bollworm complex was recorded in NHH-44 (28.62%) at it was at par with PKV-Hy-2 (19.46%).

Table 2 : Picking wise loculi damage due to bollworm complex at harvest in various cotton hybrids.

Sr. No.	Cotton Hybrids	Av. % loculi damage due to BWC at			
		1 st picking	2 nd picking	3 rd picking	4 th picking
1	MECH-12 Bt	2.34 (5.85)	1.55 (4.92)	2.74 (6.62)	8.88 (14.84)
2	MECH-162 Bt	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	1.65 (5.05)
3	MECH-184 Bt	2.13 (5.52)	0.00 (0.00)	0.39 (1.79)	0.78 (2.54)
4	PKV-Hy-2	14.41 (21.72)	9.92 (17.74)	19.46 (25.86)	39.35 (38.79)
5	NHH-44	24.11 (29.34)	10.72 (18.86)	28.62 (32.27)	33.35 (35.23)
	SE (m) \pm	2.43	2.25	2.61	3.38
	CD at 5%	7.49	6.92	8.06	10.41

Figure in parentheses are arcsine values.

Third picking :

Damage was not observed in MECH-162 Bt and this was at par with MECH-12 Bt (4.99%) and MECH-184 Bt (1.66%). Maximum damage was recorded in NHH-44 (69.99%) which was at par with PKV-Hy-2 (56.66%).

4th picking :

Minimum damage was recorded in MECH-184 Bt (0.78%) and it was at par with MECH-162 Bt (1.65%) which was at par with MECH-12 Bt (8.88%). Maximum loculi damage was recorded in PKV-Hy-2 (39.35%) which was at par with NHH-44 (33.35%).

Fourth picking :

Minimum damage was recorded in MECH-184 Bt (3.33%) and

As regards the open boll and loculi damage due to boll worm complex at harvest the present findings are corroborate with the findings of Anonymous (2001 a), Anonymous (2001 b),

Anonymous (2002 a), Anonymous (2002 b), Anonymous (2003) and Bagade (2003) who also reported significantly less open boll and loculi damage due to bollworm complex at harvest in Bt cotton hybrids as compare to non Bt and check hybrids.

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