REPORT ON POLLEN FLOW TRIAL FOR Cry1Ac Event-1
Kharif-2003

Objective

The purpose of this trial was

1. To see the travel-distance of the pollen from last row of the transgenic crop to all the sides surrounding in North, South, East and West of the plot.
2. To see whether the transgenic pollen flows out and cross-pollinate with compatible crops cultivated in the adjacent area

As per the guidelines given by RCGM the pollen flow trial was conducted. The cotton kapas of non-transgenic cotton were collected as shown in the layout at specific distances of all directions. These kapas were ginned and the seeds were collected. The confirmation of gene flow from transgenic cotton to non-transgenic cotton for outflow distance and percentage of contamination was done by PCR and Lateral floe strip ELISA methods

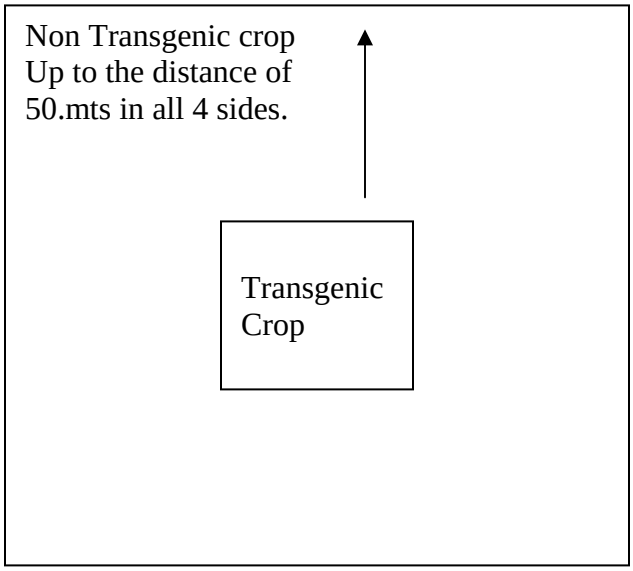
Trial Details

The trial for pollen Flow study using transgenic versus non-transgenic cotton crop was conducted at Ravallkole, R.R. District, A.P.

- Sowing Date: 15th July, 2003
- Spacing: 1.2mt × 0.9mt
- Row length: 6mt
- No of Row: 4
- No of Hills / Row: 6
- Net Plot area of Transgenic Cotton: 30Sq mt
- Total gross area (incl TG and non TG cotton): 11,130 Sq.Mt (2.783 acres)
- Plant Stand of TG Cotton: 24
- Plant Stand of non TG Cotton: 8345
- The kapas picking was conducted on 6th December 2003.

In this trial the transgenic seeds were sown in the center for 30 Sq. Mts area and surrounded by non-transgenic cotton variety in all four sides as refugee crop up to the distance of 50mt from the last row of the transgenic crop.

Experimental field design



Agronomic operations under taken :

(i) Sowing method : Ridges and furrows

(ii) Number of irrigations : 6,

a.) at the time of sowing the seed - 15th July 2003
b.) at 20 days age of the crop - 4th August 2003
c.) at the time of 1st top dressing – 16th August 2003
d.) at 60 days age / flowering / 2nd top dressing – 13th September 2003
e.) at 85 days age of the crop - 8th October 2003
f.) at 125 days age of the crop – 15th November 2003

(iii) Fertilizer dosage :

Nitrogen : Phosphorus : Potash @ 120kg: 80kg: 60kg per hectare.

a.) Basal dosage : 1. FYM - 8 tractor loads
2. Zinc sulphate – 25 kg
3. DAP - 4.5 bags
4. Urea – 10 kgs
5. Murate of potash – 33 kg

b.) Top dressing – 1 :
Urea - 86 kg, Murate of potash – 33 kg

c.) Top dressing - 2 :
Urea - 86 kg, Murate of potash – 34 kg

(iv) Chemical spray schedule :

1.) On transgenic crop (JKCH – 555 Bt) – 3 sprays
    a.) Rogor on 10th August 2003, b.) Metasystox on 12th September 2003, c.)Metasystox on 2nd November 2003
2.) On non – transgenic crop : 6 sparays
    a.) Rogor on 10th August 2003, b.)Metasystox on 12th September 2003, c.) Endosulfan on 22nd September 2003, d.) Chloropyriphos on 10th October 2003, e.) Metasystox on 2nd November 2003, f.) Quinolphos on 16th November 2003.

Trial Observations :

1. The days to 50% flowering was 55 days in both non transgenic and transgenic cotton hybrid namely JK-Varun

2. The average boll number in JK-Varun Bt was 82 bolls / plant, where as in non – transgenic cotton it ranged from 28 to 55 bolls per plant.

The total non - transgenic population surrounding transgenic was 8345 plants. Looking into the large sample population, a random sampling approach has been followed to confirm the gene flow distance and percentage.

The kapas of non - transgenic crops from this trial plot was collected separately by row wise from the periphery of Bt rows at the distances of 1mt, 2mts, 3mts, 4mts, 5mts, 10mts, 15mts, 20mts, 30mts, 40mts, 50mts and the direction wise such as North, South, East and West. The collected kapas were ginned and from the ginned seed sample, 700 seeds were randomly collected from the total bulked population of each row/direction and subjected to germination. Single leaf sample from each germinated seedling DNA were analyzed by PCR technique to screen the presence of Cry1Ac gene.

In another set of experiment the same size of sample was taken for making into seed powder which was resuspended in buffer to extract the total protein. This total protein was subjected to test with Lateral flow ELISA to see the CRY1Ac protein presence. Up to the distance of 10mts, the sample size of 700 seeds was taken as one replication, subsequently, two replication for up to 30mts and three replication for up to the 50mts distance was taken. After conducting the experiments, the refugee population was completely destroyed.

RESULTS AND CONCLUSIONS:

Total of 52 sampling were analyzed by PCR and 72 sampling by Lateral Flow Strip test. The PCR and strip tests were confirmed the pollen flow up to the distance of 1 mt (East and North direction) and 2mt (only west direction) and more than this distances

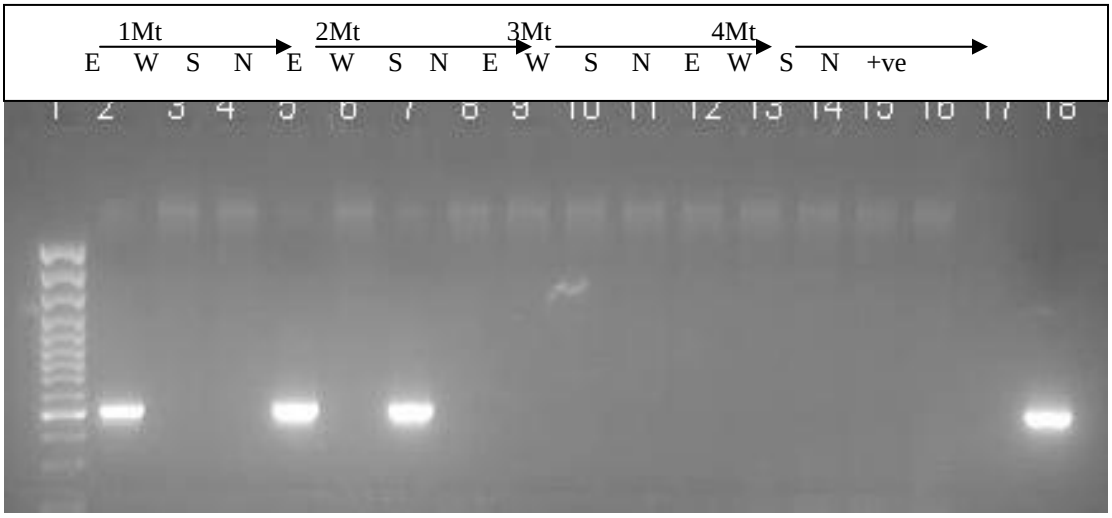
were not contaminated with transgenic pollen. This clearly indicates that the maximum pollen flow in the trial field is up to two meters only. The experimental results are presented in **Fig 3 to 11** It is confirmed that beyond 2mt distance no plants were contaminated with transgenic pollen. This clearly indicates that the maximum pollen flow in the trial field is up to two meters only. Also the results of PCR technique confirmed the gene presence (**Results - See Fig- 3 to 8)** from the same distance where the lateral flow Elisa confirmed the expressed protein. While looking into the percentage of gene transfer, there was 1% of non-transgenic seeds were cross-pollinated with transgenic pollen.

ANNEXURE FIG-3

RESULTS OF POLLEN FLOW STUDY

PCR ANALYSIS

Used non-transgenic seeds for the distance of 1,2,3and 4 mts from all directions of JK-Bt cotton hybrid.



1	:	100 bp MARKER
2 to 4	:	1 Mt distance
6 to 9	:	2 Mt distance
10 to 13	:	3 Mt **distance**
14 to 17	:	4 Mt distance
18	:	Cry1Ac plasmid control

Note: E- East, W- West, S – South, N- North

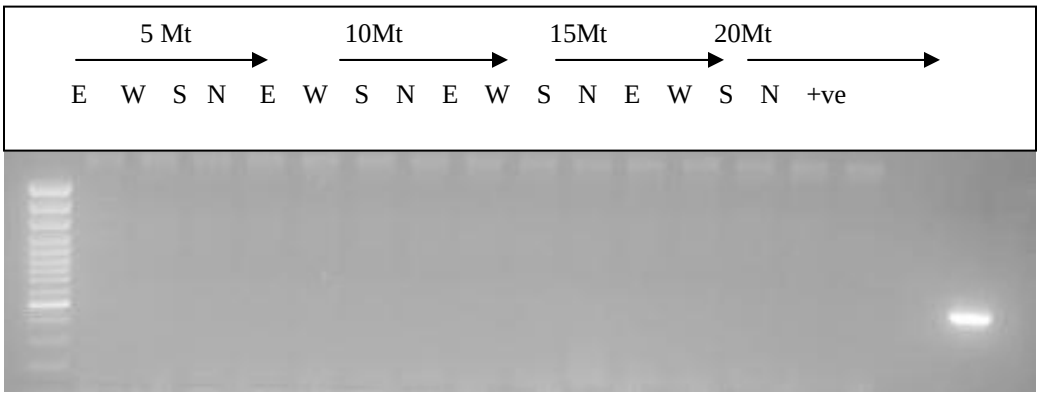
Results

Around 500 bp of internal sequence of Cry1Ac was amplified in East and North direction of 1 Mt and West of 2 Mt.

ANNEXURE FIG-4

RESULTS OF POLLEN FLOW STUDY
PCR ANALYSIS

Used non-transgenic seeds for the distance of 5,10,15and 20 mts from all directions of JK-Bt cotton hybrid.



1	:	100 bp MARKER
2 to 4	:	5 Mt distance
6 to 9	:	10 Mt distance
10 to 13	:	15 Mt distance
14 to 17	:	20 Mt distance
18	:	Cry1Ac plasmid control

Note : E- East , W- West , S – South , N- North

Results :

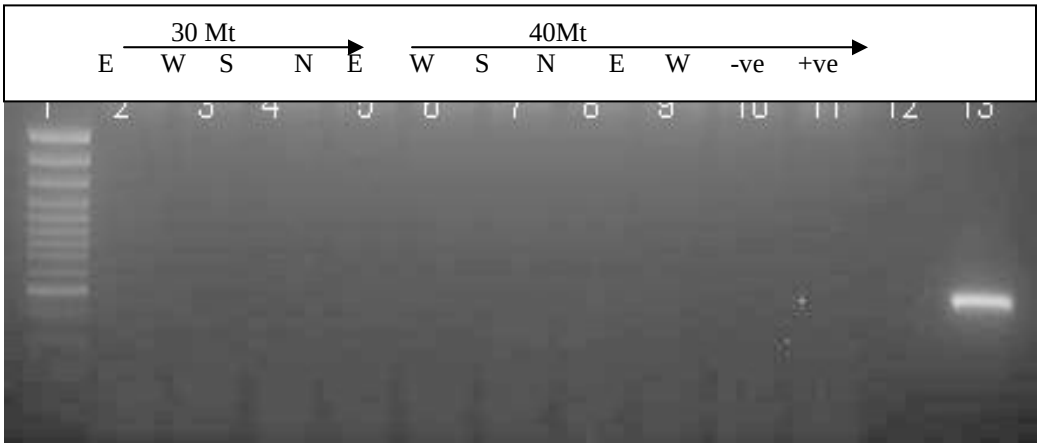
No amplification was observed from 5,10,15 and 20 Mts in all directions

ANNEXURE FIG-5

RESULTS OF POLLEN FLOW STUDY

PCR ANALYSIS

Used non-transgenic seeds for the distance of 30 and 40 mts from all directions of JK-Bt cotton hybrid.



1	:	100 bp MARKER
2 to 3	:	30 Mt distance
4 to 11	:	40 Mt distance
12	:	Water Negative control
13	:	Cry1Ac plasmid control

Note : E- East , W- West , S – South , N- North

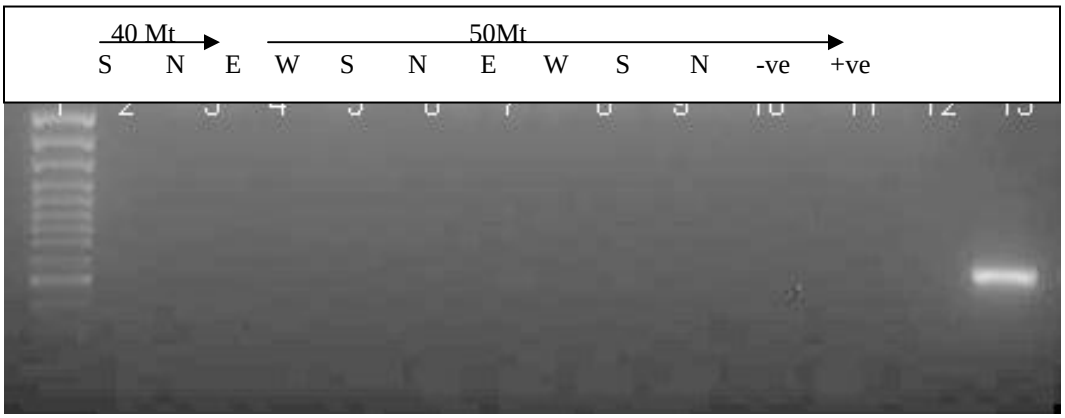
Results :

No amplification was observed from 30 and 40 Mts in all directions

ANNEXURE FIG –6

RESULTS OF POLLEN FLOW STUDY
PCR ANALYSIS

Used non-transgenic seeds for the distance of 40 and 50 mts from all directions of JK-Bt cotton hybrid.



1	:	100 bp MARKER
2 to 3	:	40 Mt distance
4 to 11	:	50 Mt distance
12	:	Water Negative control
13	:	Cry1Ac plasmid control

Note : E- East , W- West , S – South , N- North

Results :

No amplification was observed from 40 and 50 Mts in all directions

ANNEXURE FIG –7 to 11

RESULTS OF POLLEN FLOW STUDY
LATERAL FLOW ELISA (STRIP) TEST

Used non-transgenic seeds for the distance of 1,2,3, 4,5,10,15,20,30,40, and 50 mts from all directions of JK-Bt cotton hybrid.

FIG – 7

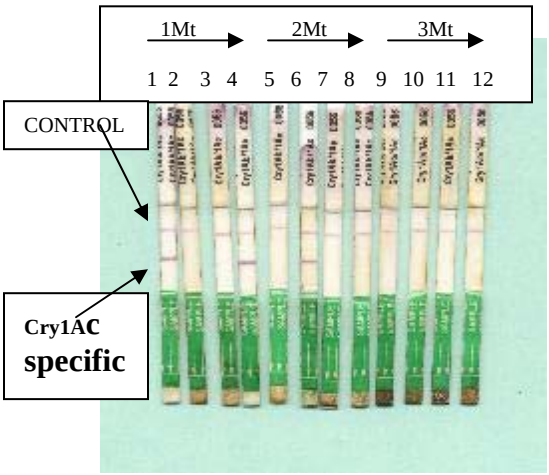


FIG -8

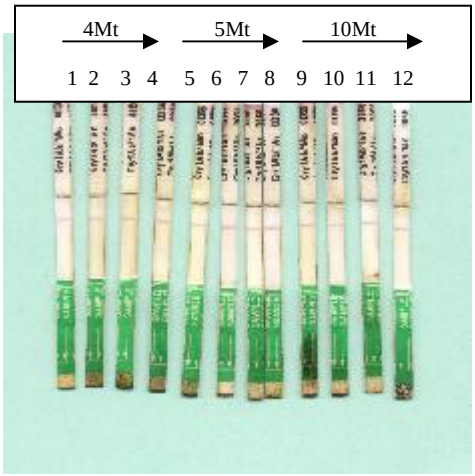


FIG – 9

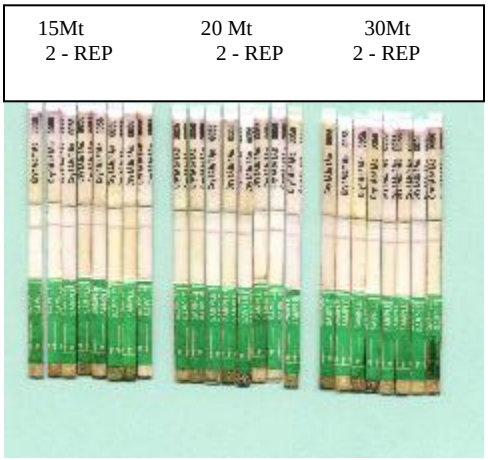


FIG - 10

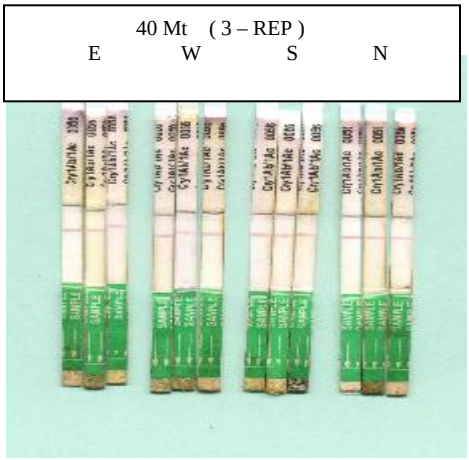
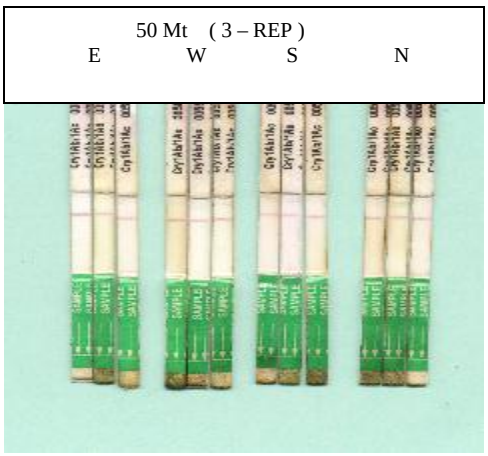


FIG - 11



RESULTS

- Eastern and Northern direction of 1 Mt and Western direction of 2 Mt showed specific band for Cry1Ac protein as indicated with arrow mark
- All other distances showed negative results.

Beneficial Insects:

Observation on effect of JKAL Bt Cotton plants on the beneficial insects such as Chrysopa, Coccinellids, Syrphids, and Spider populations were recorded at the regular intervals. The populations of these insects were not different among Bt and Non-Bt hybrids in the North Zone. This indicates that there is no effect of Cry 1 Ac (Bt) protein on beneficial insect population in the Bt Cotton field.

Data presented in File 1, File 2, File 3 and File 4

Tabe:

Periodical observations on sucking pests **(10plants/plot/obsn)** Location: Nellore (A.P.)

Sr No	Entries	Aphids				Jassids				Thrips				Whitefly			
		30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.
1	JKCH VARUN Bt	8	29	11	16.0	8	15	19	14.0	16	28	32	25.3	0	12	20	10.6
2	JKCH VARUN	11	32	14	19.0	10	18	24	17.3	19	40	36	31.6	0	14	22	12.0
3	JKCH DURGA Bt	10	28	10	16.0	6	13	19	12.3	11	43	38	30.6	6	20	35	20.3
4	JKCH DURGA	13	30	12	18.3	9	17	22	16.0	14	47	42	34.3	9	22	39	23.3
5	JKCH 666 Bt	9	27	12	16.0	3	10	13	8.6	9	39	34	27.3	5	18	32	18.3
6	JKCH 666	12	30	13	18.3	5	11	17	11.0	14	42	38	31.3	7	22	38	22.3
7	JKCH-99 Bt	9	27	11	15.6	9	16	23	16.0	6	45	34	28.3	5	20	25	16.6
8	JKCH-99	11	30	13	18.0	12	19	27	19.3	10	45	36	30.3	9	23	33	21.6
9	MECH 162 Bt	11	31	17	19.6	9	17	24	16.6	13	46	44	34.3	12	22	38	24.0
10	NHH 44(CC)	12	35	18	21.6	8	14	22	14.6	12	42	36	30.0	10	24	38	24.0
11	LOCAL (Bunny)	13	33	20	22.0	11	15	25	17.0	13	50	39	34.0	11	26	42	26.3
12	LOCAL (Savita)	13	33	18	21.3	13	20	25	19.3	14	48	48	36.6	13	29	40	27.3

Table:

Population count of beneficial insects (10 plants/plot/Obsn) Location: Nellore (A.P.)

Sr No	Entries	Coccinellids				Chrysopa				Syrphids				Spiders			
		30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.
1	JKCH VARUN Bt	4	11	4	6.3	4	13	6	7.6	2	5	2	3.0	8	13	7	9.3
2	JKCH VARUN	3	12	2	5.6	5	12	2	6.3	2	6	2	3.3	8	13	8	9.6
3	JKCH DURGA Bt	5	9	4	6.0	6	9	3	6.0	3	3	2	2.6	10	11	7	9.3
4	JKCH DURGA	4	10	2	5.3	6	11	3	6.6	3	4	2	3.0	7	8	7	7.3
5	JKCH 666 Bt	4	12	3	6.3	2	13	3	6.0	3	5	2	3.3	11	12	9	10.6
6	JKCH 666	3	9	3	5.0	4	11	4	6.3	2	4	1	2.3	7	8	10	8.3
7	JKCH-99 Bt	5	8	2	5.0	7	10	4	7.0	3	4	3	3.3	10	12	10	10.6
8	JKCH-99	4	7	3	4.6	6	12	3	7.0	3	5	2	3.3	9	11	8	9.3
9	MECH 162 Bt	4	8	2	4.6	5	11	3	6.3	3	4	2	3.0	6	14	8	9.3
10	NHH 44(CC)	3	9	1	4.3	4	13	3	6.6	2	5	2	3.0	8	11	8	9.0
11	LOCAL (Bunny)	2	7	3	4.0	3	12	3	6.0	2	5	2	3.0	6	12	9	9.0
12	LOCAL (Savita)	2	7	2	3.6	7	13	5	8.3	2	5	3	3.3	7	12	9	9.3

TABLE- Percent Damage caused by bollworm complex pests on JK Bt cotton hybrids, non bt hybrids and check hybrids - Location:Nellore (A.P.)

Sr no	Entries	Open boll damage			Locule damage		
		No of bolls	Damaged bolls	% Of damaged bolls	No of locules	Damaged locules	% Of damaged locules
1	JKCH Varun Bt	421	0	0	1700	0	0
2	JKCH Varun	417	106	25.41	1688	125	7.40
3	JKCH Durga Bt	415	0	0	1679	0	0
4	JKCH Durga	413	122	29.53	1671	142	8.49
5	JKCH 666 Bt	414	0	0	1671	0	0
6	JKCH 666	412	135	32.76	1667	153	9.17
7	JKCH 99 Bt	419	0	0	1701	0	0
8	JKCH 99	414	143	34.54	1671	164	9.81
9	Mech 162 Bt	410	47	11.46	1660	60	3.61
10	NHH44 (cc)	408	153	37.5	1645	169	10.27
11	Local (Bunny)	409	110	26.89	1649	132	8.0
12	Local (Savita)	408	96	23.52	1650	115	6.96

TABLE- Larval counts of bollworm complex pests Location:Nellore (A.P.)
No of larvae/10 plants - mean of 13 weeks.

Sr no	Entries	Spotted bollworm	American bollworm	Pink bollworm
1	JKCH Varun Bt	0	0	0
2	JKCH Varun	16	40	8
3	JKCH Durga Bt	0	0	0
4	JKCH Durga	19	36	9
5	JKCH 666 Bt	0	0	0
6	JKCH 666	17	38	9
7	JKCH 99 Bt	0	0	0
8	JKCH 99	16	40	9
9	Mech 162 Bt	6	17	8
10	NHH44 (cc)	14	41	10
11	Local (Bunny)	17	38	10
12	Local (Savita)	17	32	7

Table:

Periodical observations on sucking pests (10plants/plot/obsn) Location: Prakasham (A.P.)

Sr No	Entries	Aphids				Jassids				Thrips				Whitefly			
		30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.
1	JKCH VARUN Bt	8	27	9	14.6	8	15	18	13.6	14	39	30	27.6	0	14	20	11.3
2	JKCH VARUN	11	30	11	17.3	10	18	22	16.6	17	44	34	31.6	0	17	22	13.0
3	JKCH DURGA Bt	10	30	10	16.6	6	14	17	12.3	10	40	35	28.3	7	21	37	21.3
4	JKCH DURGA	14	33	14	20.3	8	17	21	15.3	13	46	40	33.0	10	24	40	24.6
5	JKCH 666 Bt	10	26	10	15.3	3	7	14	8.0	10	42	32	28.0	6	20	33	19.6
6	JKCH 666	13	30	13	18.6	6	10	17	11.0	14	46	35	31.6	8	23	38	23.0
7	JKCH-99 Bt	11	29	12	17.3	7	15	21	14.3	9	43	29	27.0	6	22	22	16.6
8	JKCH-99	14	34	15	21.0	10	18	25	17.6	10	49	35	31.3	9	26	27	20.0
9	MECH 162 Bt	12	34	16	20.6	9	16	21	15.3	14	48	39	33.6	13	26	37	25.3
10	NHH 44(CC)	13	34	17	21.3	8	14	20	14.0	11	49	38	32.6	12	26	35	24.3
11	LOCAL (Bunny)	14	36	18	22.6	9	17	23	16.3	15	45	41	33.6	15	25	40	26.6
12	LOCAL (savita)	13	36	20	23.0	10	19	24	17.6	16	52	43	37.0	14	28	40	27.3

Table:

Population count of beneficial insects (10 plants/plot/Obsn) Location: Prakasham (A. P.)

Sr No	Entries	Coccinellids				Chrysopa				Syrphids				Spiders			
		30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.
1	JKCH VARUN Bt	4	12	2	6.0	3	10	5	6.0	2	4	2	2.6	11	11	8	10
2	JKCH VARUN	4	10	4	6.0	4	10	3	5.6	2	3	2	2.3	8	12	9	9.6
3	JKCH DURGA Bt	4	8	3	5.0	3	8	2	4.3	2	2	2	2.0	9	9	9	9.0
4	JKCH DURGA	1	8	4	4.3	3	9	3	5.0	2	3	1	2.0	10	7	7	8.0
5	JKCH 666 Bt	4	9	2	5.0	4	11	4	6.3	2	3	3	2.6	9	10	11	10.0
6	JKCH 666	3	9	2	4.6	5	9	4	6.0	2	4	3	3.0	7	10	9	8.6
7	JKCH-99 Bt	6	7	4	5.6	5	7	2	4.6	2	2	2	2.0	12	13	9	11.3
8	JKCH-99	5	8	3	5.3	6	7	2	5.0	3	3	2	2.6	9	10	9	9.3
9	MECH 162 Bt	4	6	3	4.3	8	11	2	7.0	2	3	2	2.3	9	10	9	9.3
10	NHH 44(CC)	4	7	3	4.6	6	11	3	6.6	2	3	1	2.0	8	9	9	8.6
11	LOCAL (Bunny)	4	6	4	4.6	4	9	1	4.6	2	2	2	2.0	7	10	7	8.0
12	LOCAL (Savita)	4	7	2	4.3	6	9	2	5.6	2	4	1	2.3	8	10	9	9.0

TABLE- Percent Damage caused by bollworm complex pests on JK Bt cotton hybrids, non bt hybrids and check hybrids Location: Prakasham(A.P.)

Sr no	Entries	Open boll damage			Locule damage		
		No of bolls	Damaged bolls	% Of damaged bolls	No of locules	Damaged locules	% Of damaged locules
1	JKCH Varun Bt	414	0	0	1677	0	0
2	JKCH Varun	409	115	28.11	1656	133	8.03
3	JKCH Durga Bt	414	0	0	1676	0	0
4	JKCH Durga	409	104	25.42	1658	123	7.41
5	JKCH 666 Bt	412	0	0	1660	0	0
6	JKCH 666	408	119	29.16	1644	140	8.51
7	JKCH 99 Bt	411	0	0	1663	0	0
8	JKCH 99	408	114	27.94	1649	133	8.06
9	Mech 162 Bt	412	41	9.95	1665	54	3.24
10	NHH44 (cc)	409	137	33.49	1650	152	9.21
11	Local(Bunny)	408	101	24.75	1646	121	7.35
12	Local(savita)	407	87	21.37	1640	108	6.58

TABLE- Larval counts of bollworm complex pests Location: Prakasham((A.P.)
No of larvae/10 plants - mean of 13 weeks

Sr no	Entries	Spotted bollworm	American bollworm	Pink bollworm
1	JKCH Varun Bt	0	0	0
2	JKCH Varun	14	43	9
3	JKCH Durga Bt	0	0	0
4	JKCH Durga	16	30	11
5	JKCH 666 Bt	0	0	0
6	JKCH 666	19	33	12
7	JKCH 99 Bt	0	0	0
8	JKCH 99	18	34	9
9	Mech 162 Bt	13	13	9
10	NHH44 (cc)	17	37	10
11	Local(Bunny)	18	33	12
12	Local(savita)	11	26	8

Table:

Periodical observations on sucking pests (10plants/plot/obsn) **Location: Haveri(Kar'ka)**

Sr No	Entries	Aphids				Jassids				Thrips				Whitefly			
		30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.
1	JKCH VARUN Bt	21	42	29	30.66	16	22	14	17.33	38	70	50	52.66	26	35	28	29.66
2	JKCH VARUN	26	48	34	36.0	19	23	17	19.66	42	72	48	54.0	28	38	29	31.66
3	JKCH DURGA Bt	24	38	32	31.33	13	17	15	15.0	41	65	38	48.0	29	42	37	36.0
4	JKCH DURGA	24	45	30	33.0	17	19	16	17.33	43	70	42	51.66	33	40	35	36.0
5	JKCH 666 Bt	22	35	35	30.66	10	14	16	13.33	44	62	72	59.33	25	38	27	30.0
6	JKCH 666	26	39	40	35.0	10	16	18	14.66	45	68	75	62.66	28	42	29	33.0
7	JKCH-99 Bt	29	48	38	38.33	15	18	20	17.66	50	65	58	57.66	24	36	25	28.33
8	JKCH-99	35	50	40	41.66	20	19	22	20.33	52	68	62	60.66	26	38	28	30.66
9	MECH 162 Bt	30	48	39	39.0	14	20	18	17.33	48	65	50	54.33	30	40	28	32.66
10	NHH 44	28	45	42	38.33	16	22	17	18.33	45	68	55	56.0	32	38	25	31.66
11	LOCAL Bunny	26	40	34	33.33	14	15	15	14.66	43	58	42	47.66	30	36	24	30.0
12	LOCAL DHH11	24	39	28	30.33	14	16	16	15.33	40	55	48	47.66	25	37	25	29.0

Table:

Population count of beneficial insects (10 plants/plot/Obsn) Location: Haveri(Kar"Ka)

Sr No	Entries	Coccinellids				Chrysopa				Syrphids				Spiders			
		30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.
1	JKCH VARUN Bt	14	22	8	14.66	6	16	5	9.0	8	22	8	12.66	17	22	12	17.0
2	JKCH VARUN	17	26	7	16.66	5	18	4	9.0	10	25	11	15.33	19	23	13	18.33
3	JKCH DURGA Bt	15	22	10	15.66	7	17	5	9.66	7	20	12	13.0	18	21	14	17.66
4	JKCH DURGA	19	22	12	17.66	9	19	6	11.33	10	24	15	16.33	22	24	18	21.33
5	JKCH 666 Bt	14	24	10	16.0	8	18	5	10.33	6	24	9	13.0	15	20	17	17.33
6	JKCH 666	16	23	15	18.0	7	17	6	10.0	8	28	12	16.0	19	25	15	16.33
7	JKCH-99 Bt	15	25	10	16.66	9	19	5	11.33	7	18	9	11.33	14	19	14	15.66
8	JKCH-99	17	27	12	18.66	8	18	8	11.33	9	22	13	14.66	18	24	14	18.66
9	MECH 162 Bt	18	24	7	16.33	6	18	5	9.66	8	20	7	11.66	14	20	15	16.33
10	NHH 44	19	22	8	16.33	9	21	8	12.66	10	24	12	15.33	16	21	15	17.33
11	LOCAL Bunny	15	20	7	14.0	8	20	8	12.0	9	20	10	13.0	18	22	17	19.0
12	LOCAL DHH11	16	21	9	15.33	10	21	8	13.0	9	24	12	15.0	18	23	18	19.66

TABLE- Percent Damage caused by bollworm complex pests on JK Bt cotton hybrids, non bt hybrids and check hybrids Location: Haveri(KA)

Sr no	Entries	Open boll damage			Locule damage		
		No of bolls	Damaged bolls	% Of damaged bolls	No of locules	Damaged locules	% Of damaged locules
1	JKCH Varun Bt	414	0	0	1676	0	0
2	JKCH Varun	409	106	25.91	1658	126	7.59
3	JKCH Durga Bt	413	0	0	1670	0	0
4	JKCH Durga	408	119	29.16	1649	141	8.55
5	JKCH 666 Bt	410	0	0	1656	0	0
6	JKCH 666	407	133	32.67	1640	154	9.39
7	JKCH 99 Bt	412	0	0	1665	0	0
8	JKCH 99	409	128	31.29	1654	151	9.12
9	Mech 162 Bt	415	63	15.18	1681	73	4.34
10	NHH44 (cc)	408	115	37.99	1647	176	10.68
11	Local Bunny	408	145	35.53	1653	162	9.80
12	Local DHH11	409	131	32.02	1648	153	9.28

TABLE- Larval counts of bollworm complex pests Location: Haveri(KA)
No of larvae/10 plants - mean of 13 weeks

Sr no	Entries	Spotted bollworm	American bollworm	Pink bollworm
1	JKCH Varun Bt	0	0	0
2	JKCH Varun	20	32	11
3	JKCH Durga Bt	0	0	0
4	JKCH Durga	19	37	10
5	JKCH 666 Bt	0	0	0
6	JKCH 666	17	41	11
7	JKCH 99 Bt	0	0	0
8	JKCH 99	17	39	10
9	Mech 162 Bt	16	19	9
10	NHH44 (cc)	18	35	14
11	Local Bunny	21	45	15
12	Local DHH11	24	40	11

Table:

Periodical observations on sucking pests (10plants/plot/obsn) Location: Belgaum(Kar'ka)

Sr No	Entries	Aphids				Jassids				Thrips				Whitefly			
		30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.
1	JKCH VARUN Bt	38	57	35	43.3	18	27	16	20.3	47	79	55	60.3	33	42	35	36.6
2	JKCH VARUN	42	63	40	48.3	20	28	18	22.0	48	80	48	58.6	32	45	38	38.3
3	JKCH DURGA Bt	36	54	38	42.6	16	24	13	17.6	41	68	45	51.3	39	48	37	41.3
4	JKCH DURGA	39	58	38	45.0	19	26	15	20.0	41	69	49	53.0	41	49	39	43.0
5	JKCH 666 Bt	33	55	39	42.3	12	20	17	16.3	49	72	57	59.3	33	52	38	41.0
6	JKCH 666	38	58	37	44.3	14	22	20	18.6	52	75	62	63.0	40	54	38	44.0
7	JKCH-99 Bt	39	60	45	48.0	15	26	17	19.3	39	80	59	59.3	31	43	37	37.0
8	JKCH-99	44	61	46	50.3	18	27	19	21.3	44	82	59	61.6	33	45	39	39.0
9	MECH 162 Bt	41	48	38	42.3	18	27	18	21.0	40	69	43	50.6	38	47	35	40.0
10	NHH44	32	48	32	37.3	15	25	20	20.0	45	65	41	50.3	37	49	42	42.6
11	LOCAL Bunny	35	45	39	39.6	14	25	18	19.0	50	75	42	55.6	42	47	33	40.6
12	LOCAL DHH11	38	43	37	39.3	12	26	14	17.3	45	66	40	50.3	35	55	35	41.6

Table:

Population count of beneficial insects (10 plants/plot/Obsn) Location: Belgaum (Karnataka)

Sr No	Entries	Coccinellids				Chrysopa				Syrphids				Spiders			
		30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.
1	JKCH VARUN Bt	16	25	12	17.6	7	20	8	11.6	9	26	10	15.0	15	24	15	18.0
2	JKCH VARUN	17	26	14	19.0	6	23	10	13.0	7	26	11	14.6	14	25	17	18.6
3	JKCH DURGA Bt	18	23	10	17.0	5	20	9	11.3	6	25	12	14.3	15	26	12	17.6
4	JKCH DURGA	19	26	13	19.3	6	21	10	12.3	7	21	15	14.3	14	25	14	17.6
5	JKCH 666 Bt	16	27	9	17.3	8	22	7	12.3	6	26	14	15.3	16	23	10	16.3
6	JKCH 666	18	26	10	18.0	7	20	9	12.0	7	24	12	14.3	14	21	11	15.3
7	JKCH-99 Bt	14	24	8	15.3	5	19	10	11.3	6	23	10	13.0	17	24	9	16.6
8	JKCH-99	15	23	10	16.0	7	18	12	12.3	8	24	12	14.6	16	25	10	17.0
9	MECH 162 Bt	17	25	10	17.3	6	18	9	11.0	7	21	8	12.0	14	28	12	18.0
10	NHH 44	19	29	8	18.6	8	21	9	12.6	9	23	10	14.0	16	28	12	18.6
11	LOCAL bunny	18	31	7	18.6	7	22	8	12.3	8	26	11	15.0	17	26	10	176
12	LOCAL DHH11	17	29	9	18.3	7	21	10	12.6	9	24	9	14.0	18	26	12	18.6

TABLE- Percent Damage caused by bollworm complex pests on JK Bt cotton hybrids, non bt hybrids and check hybrids Location:Belgaum (KA)

Sr no	Entries	Open boll damage			Locule damage		
		No of bolls	Damaged bolls	% Of damaged bolls	No of locules	Damaged locules	% Of damaged locules
1	JKCH Varun Bt	422	0	0	1708	0	0
2	JKCH Varun	412	116	28.15	1651	132	7.99
3	JKCH Durga Bt	416	0	0	1673	0	0
4	JKCH Durga	411	128	31.14	1650	141	8.54
5	JKCH 666 Bt	419	0	0	1690	0	0
6	JKCH 666	411	152	36.98	1656	160	9.66
7	JKCH 99 Bt	420	0	0	1689	0	0
8	JKCH 99	413	147	35.59	1659	159	9.58
9	Mech 162 Bt	410	61	14.87	1648	76	4.61
10	NHH44 (cc)	380	163	42.89	1526	171	11.20
11	Local(Bunny)	408	133	32.59	1639	152	9.27
12	Local(DHH11)	390	116	29.74	1577	136	8.62

TABLE- Larval counts of bollworm complex pests Location: Belgaum (KA)
No of larvae/10 plants - mean of 13 weeks

Sr no	Entries	Spotted bollworm	American bollworm	Pink bollworm
1	JKCH Varun Bt	0	0	0
2	JKCH Varun	9	46	10
3	JKCH Durga Bt	0	0	0
4	JKCH Durga	10	54	11
5	JKCH 666 Bt	0	0	0
6	JKCH 666	12	61	10
7	JKCH 99 Bt	0	0	0
8	JKCH 99	7	49	8
9	Mech 162 Bt	7	25	6
10	NHH44 (cc)	12	56	11
11	Local(Bunny)	8	52	12
12	Local(DHH11)	8	45	10

Table:

Periodical observations on sucking pests (10plants/plot/obsn) **Location: Salem (TN)**

Sr No	Entries	Aphids				Jassids				Thrips				Whitefly			
		30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.
1	JKCH VARUN Bt	25	58	20	34.33	15	22	17	18.0	52	82	58	64.0	13	28	19	20.0
2	JKCH VARUN	25	60	24	36.3	19	23	18	20.0	55	85	61	67.0	16	30	22	22.6
3	JKCH DURGA Bt	28	55	22	35.0	13	18	14	15.0	40	78	50	56.0	18	48	25	30.3
4	JKCH DURGA	33	57	25	38.3	14	20	14	16.0	45	80	50	58.3	19	50	29	32.6
5	JKCH 666 Bt	30	52	27	36.3	8	13	10	10.3	38	69	48	51.6	23	52	31	35.3
6	JKCH 666	34	54	29	39.0	9	15	10	11.3	39	72	46	52.3	28	56	35	39.6
7	JKCH-99 Bt	29	60	25	38.0	14	18	13	15.0	36	70	48	51.3	16	31	25	24.0
8	JKCH-99	35	64	28	42.3	17	21	16	18.0	40	72	55	55.6	19	34	29	27.3
9	MECH 162 Bt	34	54	28	38.6	14	17	16	15.6	42	75	50	55.6	20	48	27	31.6
10	NHH 44(CC)	26	52	28	35.3	12	18	19	16.3	37	65	44	48.6	17	50	25	30.6
11	LOCAL (Bunny)	28	51	25	34.6	12	16	18	15.3	36	69	48	51.0	19	42	28	29.6
12	LOCAL (Savita)	33	48	26	32.3	10	15	13	12.6	32	65	42	46.3	16	40	24	26.6

Table:

Population count of beneficial insects (10 plants/plot/Obsn) Location: Salem (TN)

Sr No	Entries	Coccinellids				Chrysopa				Syrphids				Spiders			
		30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.
1	JKCH VARUN Bt	13	26	10	16.3	8	16	7	10.3	6	20	9	11.6	13	22	14	16.3
2	JKCH VARUN	14	28	8	16.6	6	15	9	10.0	7	21	11	13.0	15	24	15	18.0
3	JKCH DURGA Bt	16	27	10	17.6	5	18	8	10.3	7	21	8	11.6	16	23	12	17.0
4	JKCH DURGA	19	26	11	18.6	5	19	6	10.0	8	22	12	14.0	19	23	12	18.0
5	JKCH 666 Bt	16	28	7	17.0	9	17	6	10.6	4	18	10	10.6	14	20	12	15.3
6	JKCH 666	18	23	8	16.3	8	17	8	11.0	6	17	8	10.3	14	19	11	14.6
7	JKCH-99 Bt	17	29	9	18.3	7	19	7	11.0	6	15	7	9.3	18	24	10	17.3
8	JKCH-99	19	30	8	19.0	8	18	6	10.6	8	18	6	10.6	16	23	9	16.0
9	MECH 162 Bt	18	25	9	17.3	6	15	7	9.3	5	16	8	9.6	15	25	10	16.6
10	NHH 44(CC)	14	24	8	15.3	8	14	9	10.3	4	15	7	8.6	14	24	12	16.6
11	LOCAL (Bunny)	15	25	7	15.6	8	16	6	10.0	4	14	6	8.0	16	22	11	16.3
12	LOCAL (Savita)	15	23	8	15.3	9	14	6	9.6	5	16	7	9.3	15	23	12	16.6

TABLE- Percent Damage caused by bollworm complex pests on JK Bt cotton hybrids, non bt hybrids and check hybrids Location: Salem (T.N.)

Sr no	Entries	Open boll damage			Locule damage		
		No of bolls	Damaged bolls	% Of damaged bolls	No of locules	Damaged locules	% Of damaged locules
1	JKCH Varun Bt	422	0	0	1706	0	0
2	JKCH Varun	420	116	27.61	1700	134	7.88
3	JKCH Durga Bt	417	0	0	1680	0	0
4	JKCH Durga	416	136	32.69	1680	149	8.86
5	JKCH 666 Bt	418	0	0	1688	0	0
6	JKCH 666	416	144	34.61	1686	156	9.25
7	JKCH 99 Bt	417	0	0	1685	0	0
8	JKCH 99	418	153	36.60	1687	166	9.83
9	Mech 162 Bt	415	50	12.04	1674	64	3.82
10	NHH44 (cc)	415	166	40.0	1677	176	10.55
11	Local (Bunny)	413	116	28.08	1668	135	8.09
12	Local (Savita)	409	107	26.16	1650	124	7.51

TABLE- Larval counts of bollworm complex pests Location: Salem (A.P.)
No of larvae/10 plants - mean of 13 weeks

Sr no	Entries	Spotted bollworm	American bollworm	Pink bollworm
1	JKCH Varun Bt	0	0	0
2	JKCH Varun	14	40	8
3	JKCH Durga Bt	0	0	0
4	JKCH Durga	16	42	7
5	JKCH 666 Bt	0	0	0
6	JKCH 666	17	47	6
7	JKCH 99 Bt	0	0	0
8	JKCH 99	16	50	8
9	Mech 162 Bt	10	22	7
10	NHH44 (cc)	18	52	10
11	Local (Bunny)	20	42	8
12	Local (Savita)	17	39	9

Table:

Periodical observations on sucking pests (10plants/plot/obsn)

Location: Villipuram (TN)

Sr No	Entries	Aphids				Jassids				Thrips				Whitefly			
		30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.
1	JKCH VARUN Bt	40	48	25	37.6	22	25	15	20.6	75	88	45	69.3	22	25	19	22.0
2	JKCH VARUN	45	50	28	41.0	24	28	17	23.0	70	90	45	68.3	27	29	25	27.0
3	JKCH DURGA Bt	41	42	22	35.0	17	18	12	15.6	68	75	42	61.6	42	48	35	41.6
4	JKCH DURGA	44	46	28	39.3	21	20	15	18.6	72	80	45	65.6	45	50	40	45.0
5	JKCH 666 Bt	40	45	24	36.3	19	18	13	16.6	70	77	48	65.0	39	42	40	40.3
6	JKCH 666	47	50	30	42.3	18	19	18	12.3	68	79	50	65.6	42	46	44	44.0
7	JKCH-99 Bt	40	43	26	36.3	21	22	16	19.6	65	80	50	65.0	23	28	21	24.0
8	JKCH-99	44	49	29	40.6	21	27	20	22.6	69	82	58	69.6	25	30	28	27.6
9	MECH 162 Bt	48	45	33	42.0	20	24	20	21.3	68	75	50	64.3	42	50	38	43.3
10	NHH 44(CC)	50	48	30	42.6	16	16	11	14.3	70	77	48	65.0	48	52	40	46.6
11	LOCAL (Bunny)	35	40	30	35.0	15	16	15	15.3	71	75	45	63.6	42	48	38	42.6
12	LOCAL (savita)	36	41	32	36.3	16	15	13	14.6	68	72	50	63.3	39	45	25	39.6

Table:

Population count of beneficial insects (10 plants/plot/Obsn) Location: Villipuram (TN)

Sr No	Entries	Coccinellids				Chrysopa				Syrphids				Spiders			
		30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.	30th day	45th day	60th day	Avg.
1	JKCH VARUN Bt	19	24	7	16.6	9	15	8	10.6	6	13	8	9.0	14	20	14	16.0
2	JKCH VARUN	18	26	8	17.3	10	16	9	11.6	5	14	7	8.6	16	21	15	17.3
3	JKCH DURGA Bt	18	22	8	16.0	10	14	7	10.3	7	15	6	9.3	15	22	12	16.3
4	JKCH DURGA	20	23	9	17.3	11	14	8	11.0	8	16	5	9.6	17	23	13	17.6
5	JKCH 666 Bt	20	24	7	17.0	8	12	10	10.0	6	15	6	9.0	14	21	14	16.3
6	JKCH 666	22	26	6	18.0	12	10	9	10.3	7	14	7	9.3	12	22	13	15.6
7	JKCH-99 Bt	20	25	8	17.6	10	13	8	10.3	4	15	8	9.0	13	20	12	15.0
8	JKCH-99	22	26	9	19.0	10	14	7	10.3	5	17	7	9.6	14	22	9	15.0
9	MECH 162 Bt	20	23	7	16.6	8	13	7	9.3	5	14	7	8.6	15	18	10	14.3
10	NHH 44(CC)	19	24	8	17.0	7	12	6	8.3	4	13	6	7.6	14	20	11	15.0
11	LOCAL (Bunny)	18	28	8	18.0	9	10	6	8.3	6	14	8	9.3	15	21	11	15.6
12	LOCAL (Savita)	19	27	7	17.6	10	11	8	9.6	5	14	8	9.0	14	20	12	15.3

TABLE- Percent Damage caused by bollworm complex pests on JK Bt cotton hybrids, non bt hybrids and check hybrids Location: Villipuram (T.N.)

Sr no	Entries	Open boll damage			Locule damage		
		No of bolls	Damaged bolls	% Of damaged bolls	No of locules	Damaged locules	% Of damaged locules
1	JKCH Varun Bt	427	0	0	1720	0	0
2	JKCH Varun	416	112	26.92	1680	128	7.61
3	JKCH Durga Bt	419	0	0	1691	0	0
4	JKCH Durga	412	125	30.33	1664	141	8.47
5	JKCH 666 Bt	422	0	0	1700	0	0
6	JKCH 666	418	136	32.53	1689	152	8.99
7	JKCH 99 Bt	423	0	0	1709	0	0
8	JKCH 99	415	139	33.49	1681	154	9.16
9	Mech 162 Bt	418	48	11.48	1688	59	3.49
10	NHH44 (cc)	416	160	38.46	1679	180	10.72
11	Local bunny	417	114	27.33	1682	133	7.90
12	Local Savita	416	109	26.20	1677	125	7.45

TABLE- Larval counts of bollworm complex pests Location: : Villipuram (T.N.)
No of larvae/10 plants - mean of 13 weeks

Sr no	Entries	Spotted bollworm	American bollworm	Pink bollworm
1	JKCH Varun Bt	0	0	0
2	JKCH Varun	16	40	8
3	JKCH Durga Bt	0	0	0
4	JKCH Durga	19	42	9
5	JKCH 666 Bt	0	0	0
6	JKCH 666	15	36	9
7	JKCH 99 Bt	0	0	0
8	JKCH 99	18	45	9
9	Mech 162 Bt	12	21	8
10	NHH44 (cc)	19	47	10
11	Local bunny	21	41	9
12	Local Savita	20	38	9