TMC MM 1.4: Development and promotion of Bt transgenic cotton for bollworm resistance

INTRODUCTION

This project has started with three major activities. Transfer of *crylAc* from BN Bt event to elite cotton varieties and parents of hybrids, genetic transformation of cotton with new genes and zone wise testing of released Bt cotton hybrids under single platform are the three activities.

Seven, thirteen and twelve genotypes of *G.hirsutum* are in BC_4, BC_3 and BC_2 generations of backcrossing, respectively at Dharwad. Similarly 20, 5, 15 and 16 genotypes are in BC_4, BC_3, BC_2, BC_1 generations of backcrossing, respectively at CICR, Nagpur.

Kanamycin resistant T1 Surabhi *(G.hirsutum)* plants for *cry 1F* and DLSa 17 (G. *arboreum)* T1 plants for *cry2Aa* have been recorded at Dharwad. Putative transgenic TO plants of PA225 and PA 402 of arboreum cotton have been recorded at Nagpur.

Bt hybrids MRC 6029 Bt, RCH 314 Bt, NCS 138Bt for north zone; PRCH 31 Bt, AKKa Bt, RCH 138 Bt for irrigated conditions; ACH-11 BGII, MRC 7347Bt, MRC 7301 Bt, for rainfed condition in central zone and MRC 7201 BGII, Tulsi 1 IBt, PCH 205Bt, Tulsi 4, Tulsi 9 Bt for south zone have been found promising based on yield trials conducted during the years 2007-08 and 2008-09.

OBJECTIVES

- Development of Bt Cotton through back cross breeding using approved Bt gene event belonging to public institute.
- Genetic transformation of new Bt genes.
- Promotion of promising Bt varieties / hybrids

SALIENT FINDINGS

1.Development of Bt Cotton through back cross breeding using approved Bt gene event belonging to public institute.

The list of genotypes under back crossing for transfer of BN Bt event at Dharwad & Nagpur is given below.

Genotypes under backcrossing at UAS, Dharwad and CICR, Nagpur

UAS, Dharwad

BC4S 1 Genotypes: Sahana, Surabhi, MCU5 ,CPD423, DS 28, CPD 621, CPD420

BC3 Genotypes: AK 32, CAK-023 A, AKA-8828 ,PH-1009, PH-93, Vikram, SVPR2, F-2164,LH-2076, F-2226, NISD 3,AKA053B, JK4

BC2 Genotypes:PVK Rajat, AK-23 B, NH-615, Khandwa 3, MCU 13, Sumangala, PD-1056, HAG-1055, SRT19, JK 119, CCHL 76, ADL903

CICR, Nagpur

Bc4 Genotypes: F1861 ,H1242,CSH 198(Female),CSH 198(male), CSH238(female), CSH238(male) of north zone; KH 138,Surat dwarf of central zone and CPD 731 ,CPD 758,SCS

9,LRA5166,SCS1 01 ,Surabhi,Abadhita,RAH30,PSS 2,TCH 1002,CCH51 04, SCS 37 of south zone

BC3 Genotypes: RK4145 of north zone and DS28, MSx 72-1358, CPD 787, L 761 of south zone

BC2 Genotypes: Pusa 56-1, Pusa 56-2, Pusa 56-4,Pusa56-6,RS810, RS875, NH4520f north zone;

Rajat,PKV 081 ,AK 32,AKH 8828, GMS Line LRA5166, KH 2, B59-1684, G 67 of central zone and MCU 12 of south zone

New back crosses BC1: H 324,H1117, HHH 287(m), HD 123,F 2236,F 2036,F2086,F 2188, LH2076,F2164 of north zone; PH93,NH 152 CICR, NH 615, PH 1009 of central zone and Narsimha of south zone

Adaptability studies of few advance generations lines in sub centres

Around each 100 BC_4seeds (non homozygous) of Sahana, DS28, MCU5, Surabhi, and BN were supplied to sub centres of North, Central and South zones for adaptability studies. They were raised under unprotected condition for bollworms in all the locations. With the help of ELISA test, positive plants were selected. Results are presented in the following tables. Since seed supplied to these centres was BC_4S1, it is expected to present both positive and negative plants. In positive plants, presence of both homozygous and hemizygous plants is expected. Positive plants will be used this year to select homozygous plants.

Table 1.4.1 : Adaptability studies of advance generations lines.

Genotypes	North Zone				South Zone					
	Sirsa			Sriganganagar	Guntur			Coimbatore		
BC,S1	No. Of Plants Established	No. Of Plants tested	No. Of Positive Plants	NO.Of Plants Established	No. Of Plants Established	NO.Of Plants Tested	No. Of Positive Plants	NO.of Plants Established	NO.of Plants Positive	NO.of plants Tested
DS-28Bt	37	37	37	20	20	20	2	53	53	18
MCU-5Bt	30	30	30	16	20	20	4	53	53	18
Surabhi Bt	26	26	17	25	20	20	3	73	73	27
Sahana Bt	12	12	9	13	20	20	3	82	82	23
BNBt	32	32	32	20	20	20	5	-	-	-

Central Zone

Genotypes	Surat			Khandwa				Akola	
	No.of Plants Established	No.of plants Tested	No.of Positive Plants	No.of Plants Established	No.of plants Testedplants	No.of Positive Established	No.of plants Testedplants	No.of plants	No.of Positive
DS -28 Bt	59	59	11	59	59	11	20	20	2
MCU-5 Bt	61	61	16	61	61	16	20	20	4
SurabhiBt	65	65	26	65	65	26	20	20	3
SaharaBt	55	55	22	55	55	22	20	20	3
BNBt	62	62	20	62	62	20	20	20	5

2. Genetic transformation of new Bt genes.

The genotypes of *G.hirsutum* selected for genetic transformation studies at UAS, Dharwad and CICR, Nagpur is given below.

Centers	Genotypes	Genes
UAS, Dharwad	Sahana Surabhi, DLSA-17,	*cry 2Aa,cry1F* *cry* 1Ac (Enhancer)
CICR, Nagpur	PA-255PA-402	*cry* 1Aa 3, *cry* 1 *F, crylAc* (Enhancer).

At UAS, Dharwad, the screening of Sahana T1 seeds was completed. None of the positive events were recorded. The screening of Surabhi transformed with *cry 1 F* and DLSa 17 transformed with *cry2Aa* is under progress.

Screening of TI plants

Genotype	No of TO Plants Established	Gene of Interest T 1 Plants	Kanamycin Positive
Sahana	50	*cry2Aa*	0
Surabhi	150	*cry I F*	*03*
DLSA-17	25	*cry2Aa*	*16/130* seeds screened

In *G.arboreum,* genetic transformation studies were carried out at CICR, Nagpur in PA 225 and PA 402 using *cry I F.* Seven and eight putative tranformants in PA 225 and PA402 have been recovered, respectively.

New primary putative transformation events of *G.arboreum* for *cry* 1 *F*

Genotypes	No. of Explants	No. of putative Transformants	PCR positive	Transformation frequency (%)
PA255	1280	07	-	0.54
PA402	932	08	-	0.92


T0 Surbhi Plants