



D.O.No.Biyane-1705/10412/CR-170/1-A  
Agriculture, Animal Husbandry, Dairy  
Development & Fisheries Department,  
Mantralaya Annexe, Mumbai 400 032

Date :- 30 th April, 2005

J.S.Saharia  
Prin. Secretary (Agri. & Hort.)

**Subject :-** Renewal of GEAC permission for commercialization of three Bt. Cotton hybrids viz. MECH-12 Bt., MECH-162Bt. and MECH-184 Bt. containing with Cry 1 Ac gene developed by M/s. Mahyco in Central and South zones

**Ref :-** Your D.O.letter No.10/4/2005-CS/GEAC, dated 20.4.2005.

Dear Sir,

With reference to your above letter, I am directed to communicate the following views of the State Government :-

a) Whether the Bt. technology introduced in cotton crop has been beneficial to the farmers in your State :-

Yes, Bt. technology introduced in cotton crop has been beneficial to the farmers in this State. However, the cost benefits of Bt. cotton are more in irrigated areas than in non irrigated areas.

b) Whether the overall productivity of cotton crop in general has increased over the period 2002 to 2005 in your State :-

The overall productivity of cotton crop has gradually increased during the period 2002-2005. The area under Bt.cotton grew from about 0.44% in 2002 to 5.23% in 2005 ( total area approximately 30 lakh ha.).

1-a/3



c) Any other findings specific to an area :-

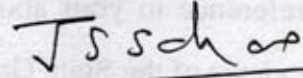
i) There is urgent need to transfer Bt. in the popular cotton varieties. It seems that the seed industry is not very interested in these varieties. The Government of India may think of some strategy in this direction.

ii) Prices of Bt. cotton seeds must be brought down to reasonable levels so that the farmers could get the advantage of the inherent capacities to produce higher yields.

iii) Instances of para-wilting have been observed in Mahyco Bt. varieties especially MECH-184 leading to losses especially in the districts of Aurangabad, Amravati, Nanded and Yeotmal . As per the report of C.I.C.R., Nagpur it is a physiological disorder which normally occurs when Bt. cotton hybrids in the field are exposed to prolong dryspell followed by heavy showers.

**With regards,**

Yours sincerely,

  
( J. S. Saharia ) 30/4/05

✓ **Shri. Suresh Chandra,**  
**Special Secretary,**  
**Government of India,**  
**Ministry of Environment and Forest,**  
**New Delhi.**

No.QCC/Seed/1425/64/ <sup>855</sup>QC-7/8  
Commissionerate of Agriculture'  
Maharashtra State,  
Pune - 411 001., Date 20.05.2005

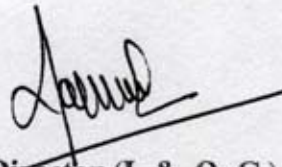
To,

**Additional Director  
Govt. of India  
Ministry of Environment and Forests  
Paryavaran Bhavan, CGO Complex,  
Lodi Road, New Delhi - 110 003**

**Subject :- Performance of Bt.cotton in Maharashtra during 2004-05**

*gdr.w.*  
*896214*  
*315*  
Please find enclosed herewith a copy of the report on "Performance of Bt.cotton in Maharashtra 2004-05" for your information and further needful action please.

*Encl. :- As above*

  
**Director (I. & Q. C.)  
Commissionerate of Agriculture,  
Maharashtra State, Pune-1**

Copy submitted to **Secretary, (Agril.) M.S.Mantralya Mumbai** for favour of information.

B.T.Note Commissioner



## **A Brief Note on Performance of Mahyco Bt. Cotton varieties in the State of Maharashtra**

### **Executive summary**

The average area under cotton crop in India is 8 to 9 million ha. which is highest in world. Although India ranks first with respect to area under cotton cultivation, ranks third in cotton production after USA and China. India accounts for approximately 25 percent of world's total cotton area and 16 percent of world's cotton production. The per hectare yield of cotton in India is lowest with 300 kgs per hectare against world average of 580 kgs per hectare. Pest and disease attack is one of the most important factor affecting yield levels significantly. Approximately 21500 M.T. insecticides in terms of active ingredients are used on cotton which contributes 55 percent of the total pesticides utilized in the country. In cotton the three most damaging lepidopteran species affecting the crop in India are American bollworm (*Helicoverpa armigera*), Pink Bollworm (*Pectinophora gossypiella*), and Spotted Bollworm (*Earias vittella*). Indian cotton farmers has to spray their cotton crop 6 to 15 times per growing season for controlling insects with an average cost of Rs. 5500-6000 per hectare.

### **Bt.cotton in Maharashtra**

Maharashtra has highest area under cotton cultivation in India. Average area under cotton cultivation in Maharashtra is 2.8 million ha. On an average Maharashtra share 35% of the area and only 18% of the cotton production at national level. The productivity of cotton is 182 kg. per ha. which is low compared with productivity of other States. In Maharashtra during Kharif 2004-05, 265200 packets (450gm.-Bt.cotton & 120gm.-Non Bt.cotton) of Mahyco Bt.cotton varieties are distributed in 19 districts. MECH-12 Bt.-148900, MECH-162 Bt. :- 56000 and MECH-184 Bt.- 60300 packets were distributed. The area covered under Mahyco Bt.cotton varieties is 1060850 hectares.

In Maharashtra for evaluation of Bt.cotton performance the detail guidelines for monitoring were issued. Proforma designed by CICR, Nagpur is used for recording observations. The performance of Bt.cotton variety is compared with its non Bt. counterpart and standard check i.e. best performing hybrid of the area. The following characters were studied.

1. Plant Height      2. No. of Squares      3. No. of flowers      4. No. of Green bolls
5. Jassids damage      6. Aphids damage      7. White fly damage
8. No. of Spudoptera larvae      9. No. of Helicoverpa larvae
10. No. of Pink Bollworm larvae      11. No. of Spotted Bollworm larvae.

There is no significant difference with respect to height of plants. Bt.cotton plants bears more No. of squares, No. of flowers, No. of Bolls etc. than non Bt.cotton hybrids. However No significant difference was observed with respect to No. of squares, No. of flowers, No. of Bolls etc. During Kharif 2004-05 moderate to heavy infestation of sucking pests was noticed and it crosses ETL level at many places on Bt. and Non-Bt. cotton hybrids. The % infestation in non Bt. hybrids is between 7 to 10% and in Bt.hybrids 12 to 15%. The attack of pests including boll worm was reported but it does not cross ETL level in Bt. hybrids. In Yeotmal, Nanded, Aurangabad and Amravati parawilting was reported on Bt.hybrids. On an average 5 to 6 sprayings were given to non Bt. hybrids where as 2 to 3 sprayings were given to Bt. hybrids for the control of pests. There was difference in bollworm infestation. It ranges between 10 to 15% in non Bt.hybrids and 3 to 5% in non-Bt. hybrids.

The Cost of the Bt. Cotton seed is also a major point of consideration. The Cost fixed by mahyco is Rs. 1600/- packet which cannot be a justifiable Cost



## **Purpose of Survey**

Govt. of India Ministry of Environment and Forests constituted a committee to institute a monitoring and verification mechanism to assess the performance of Bt.cotton vide their office memorandum No. 10/1/2002-CS, dt. 5th May, 2003. The purpose of the study is to assess the performance of Bt.cotton varieties.

## **Objectives of Survey**

To assess the performance of Bt.cotton varieties in terms of

- a. Yield
- b. Boll worm resistance
- c. Reduction in No. of sprays for boll worm control

## **Materials and Methods**

For evaluation Divisional level committees under the chairmanship of Divisional Joint Directors of Agriculture, District level committees under the chairmanship of District Superintending Agriculture Officers and Sub-division level committees under the chairmanship of Sub-divisional Agriculture officers are formulated. The committees are instructed to take six field visits for evaluation. From every district villages have been selected. 10% of the farmers cultivating Bt.cotton are selected randomly. From each plot 10 plants were selected randomly and were tagged. The observations are recorded on these selected plants.

## **Cotton Scenario in Maharashtra**

Maharashtra is the largest cotton growing State in the country. It covers about 35% of total cotton area and contributes 18% of the production. Maharashtra produces approximately 30 lakh bales per year (2003-04). Main features of cotton cultivation in Maharashtra are as below.

1. The Cotton is grown in Kharif in entire State except Konkan and eastern Maharashtra and sowing is generally done with the onset of Monsoon.
2. About 97% of the cotton crop is cultivated under rainfed condition.
3. The Cotton is mostly grown on black cotton soil. The Black colour of the soil is due to presence of titanium oxide.
4. In Maharashtra mostly intrahirsutum hybrids are grown along with two species of cotton viz G.hirsutum and G.arboreum are cultivated. The hybrid cotton covers about 73%, improved hirsutum varieties covers about 11% and arboreum cultivars covers 16% area of total area under cotton.
5. Most of the cotton varieties and hybrids possess medium and medium long fiber. However, the cotton growing area of Maharashtra is divided into four major regions.
  - i) Vidarbha region :- Yeotmal, Amravati, Akola, Buldhana, Washim, Wardha & Nagpur districts
  - ii) Marathwada region :- Nanded, Hingoli, Parbhani, Aurangabad, Jalna & Beed districts.
  - iii) Khandesh region :- Jalgaon, Dhule & Nandurbar districts
  - iv) Deccan canal region :- A.nagar & Satara districts

The average productivity of cotton in the State is 190 kg. lint per ha.(2003-04) as against 357 kg. per ha. in Andhra Pradesh, 452 kg. per ha. in Punjab, 399 kg. per ha. in Haryana and 274 kg. per ha. in Karnataka.



## Bt. cotton cultivation and its evaluation.

The information about district wise Bt.cotton seed packets distributed and area covered is as under.

Sr. No.	Name of district	No. of packets distributed							
		MECH-12	Area covered	MECH-162	Area Covered	MECH-184	Area Covered	Total	Area Covered
1	Nasik	3000	1200.00	1000	400.00	1000	400.00	5000.00	2000.00
2	Dhule	18000	7200.00	2000	800.00	400	160.00	20400.00	8160.00
3	Jalgaon	22000	8800.00	32000	12800.00	4000	1600.00	58000.00	23200.00
4	Na. bar	18000	7200.00	3000	1200.00	300	120.00	21300.00	8520.00
<b>Total Nasik Div.</b>		<b>61000</b>	<b>24400</b>	<b>38000</b>	<b>15200</b>	<b>5700</b>	<b>2280</b>	<b>104700.00</b>	<b>41880</b>
5	A.nagar	500	200.00	500	200.00	500	200.00	1500.00	600.00
<b>Total Pune Div.</b>		<b>500</b>	<b>200</b>	<b>500</b>	<b>200</b>	<b>500</b>	<b>200</b>	<b>1500.00</b>	<b>600</b>
6	Satara	0	0.00	0	0.00	0	0.00	0.00	0.00
<b>Total Kolhapur Div.</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.00</b>	<b>0</b>
7	A.bad	30000	12000.00	200	80.00	14000	5600.00	44200.00	17680.00
8	Jalna	28000	10400.00	300	120.00	5000	2000.00	31300.00	12520.00
9	Beed	3000	1200.00	2000	800.00	5000	2000.00	10000.00	4000.00
<b>Total Aurangabad Div.</b>		<b>59000</b>	<b>23600</b>	<b>2500</b>	<b>1000</b>	<b>24000</b>	<b>9600</b>	<b>85500.00</b>	<b>34200</b>
10	Latur	0	0.00	0	0.00	0	0.00	0.00	0.00
11	Parbhani	3000	1200.00	200	80.00	5000	2000.00	8200.00	3280.00
12	Nanded	1000	400.00	200	80.00	8000	3200.00	9200.00	3680.00
<b>Total Latur Div.</b>		<b>4000</b>	<b>1600</b>	<b>400</b>	<b>160</b>	<b>13000</b>	<b>5200</b>	<b>17400.00</b>	<b>6960</b>
13	Akola	2000	800.00	5500	2200.00	4000	1600.00	11500.00	4600.00
14	Amravati	500	200.00	1000	400.00	3000	1200.00	4500.00	1800.00
15	Washim	0	0.00	0	0.00	0	0.00	0.00	0.00
16	Buldhana	5000	2000.00	6000	2400.00	3000	1200.00	14000.00	5600.00
17	Yotmal	15000	6000.00	1000	400.00	2000	800.00	18000.00	7200.00
<b>Total Amravati Div.</b>		<b>22500</b>	<b>9000</b>	<b>13500</b>	<b>5400</b>	<b>12000</b>	<b>4800</b>	<b>48000.00</b>	<b>19200</b>
18	Wardha	400	160.00	300	120.00	1500	600.00	2200.00	880.00
19	Nagpur	500	200.00	600	240.00	3000	1200.00	4100.00	1640.00
20	Ch.pur	1000	400.00	200	80.00	600	240.00	1800.00	720.00
<b>Total Nagpur Div.</b>		<b>1900</b>	<b>760</b>	<b>1100</b>	<b>440</b>	<b>5100</b>	<b>2040</b>	<b>8100.00</b>	<b>3240</b>
<b>Total Maharashtra</b>		<b>148900</b>	<b>59560</b>	<b>56000</b>	<b>22400</b>	<b>60300</b>	<b>24120</b>	<b>265200.00</b>	<b>106080</b>

As such 265200 packets of Bt.Cotton were sown on 106080 ha. area in Maharashtra. Commissionerate of Agriculture has conducted field evaluation report of the standing crop on different characters to study usefulness of the technology. The highlights of the report are as below.

**1. Physical characters :-** There is no difference in the height of the plants both Bt. and non Bt. cotton plants are comperately of same height. Bt.cotton plants bears more No. of squares, No. of flowers, No. of Bolls etc. than non Bt.cotton hybrids. However No significant differecnes was observed with respect to No. of squares, No. of flowers, No. of Bolls etc.

**2. Disease and Pest incidence :-** During Kharif 2004-05 moderate to heavy infestation was noticed and it crosses ETL level at many places on Non-Bt. cotton hybrids. No such incidence was reported on Bt.cotton hybrids. The attack of pests including boll worm was reported but it does not cross ETL level in Bt. hybrids. At some places the attack of wilt was reported on Bt.hybrids.

**a. Sucking Pests :-** The attack of sucking pests was reported on both Bt. & Non Bt.Cotton varieties.

i) Aphids, Jassids & Thrips :- The % infestation in non Bt. hybrids is between 7 to 10% and in Bt.hybrids 12 to 15%.

ii) White fly :- On an average 2 to 3 % infestation was reported on both Bt. & Non Bt.Cotton varieties.

**b. Bollworm :-**

i) During, 2004-05 moderate to heavey infestation was reported on non Bt.hybrids which crosses ETL level and farmers has to spray the crop for control. The infestation of bollworm was also reported on Bt.cotton hybrids but it was below ETL level.



**3. Yield :-** The picking-wise yield observations recorded on Bt. Cotton, its non Bt. counter part and standard check are as below :-

Sr.	Name of Division	1st Picking			2nd Picking			3rd Picking		
No.		Bt. cotton	Non Bt cotton	Standard Check	Bt. cotton	Non Bt cotton	Standard Check	Bt. cotton	Non Bt cotton	Standard Check
1	Nasik	225	180	160	560	525	540	725	670	625
2	Aurangabad	244	127.5	220	520	204.6	290.17	326	366.93	469.6
3	Latur	483	419	410	599	522	508	443	374	360
4	Amravati	582	422	490	690	532	672	815	590	525
5	Nagpur	310	176	275	450	230	350	575	315	472
Total		1844	1324.5	1555	2819	2013.6	2360.17	2884	2315.93	2451.6
Average		368.8	264.9	311	563.8	402.72	472.034	576.8	463.186	490.32

Sr.	Name of Division	4th Picking			Total		
No.		Bt. cotton	Non Bt cotton	Standard Check	Bt. cotton	Non Bt cotton	Standard Check
1	Nasik	0	0	0	1510	1375	1325
2	Aurangabad	596	263.13	329.77	1686	962.16	1309.54
3	Latur	328	291	273	1853	1606	1551
4	Amravati	362	270	292	2449	1814	1979
5	Nagpur	1163	866	622	2498	1587	1719
Total		2449	1690.13	1516.77	9996	7344.16	7883.54
Average		489.8	338.026	303.354	1999.2	1468.832	1576.708

From the above observations it is clear that the yield of Bt.cotton hybrids is more than yield of its non Bt. counter part and standard check in every picking. The yield of Bt. cotton hybrids ranges between 1510 kg per ha. (Nasik division), 2498 kg per ha.(Nagpur division). The yield of Non Bt. counter part ranges between 962.16 kg per ha. (Aurangabad division), 1814 kg per ha.(Amravati division). The yield of standard check ranges between 1309.54 kg per ha. (Aurangabad division), 1979 kg per ha.(Amravati division).

As such the average yield increase of Bt.cotton over its non Bt. counter part during last three years is 29.54% and over its standard check during last two years is 15.79%. It means that there is increase in the production of Bt.cotton crop.

The fed back received from most of the farmers of the state is as follows :-

(1) The Bt. Cotton hybrids show more susceptibility to wilting under heavy rains compared to other popular hybrids. Complaints regarding wilting were received from Yeotmal, Nanded, Amravati and Aurangabad districts.

(2) There should also be a mechanism to control the cost of Bt Cotton Seeds. In this particular year the cost of only 450 gms. packet of B.T.Cotton seeds of Mahyco is Rs. 1600/- which is not justifiable in any case. Atleast in initial years the Govt should control the cost of the seeds. In the year 1984 Government of Maharashtra with the prior concurrence of Central Government has fixed the cost of H-4 cotton seeds @ of 150/kg. The copy of the notification is enclosed.

(3) There is urgent need to transfer Bt. in the popular cotton varieties and make it available with affordable cost to resource poor farmers. So that the farmers can use the seeds of the produce from these varieties atleast for few years. It seems that the seed industry is not very interested in these varieties. The Govt. of India may think of some strategy in this direction.



### **Issues related to use of Bt**

The use of genetic engineering and the G.M. plants comes under Environment Protection Act and the rules and orders made there under. Under Seeds Act, 1966, seeds Rules 1968 and Seeds Control order 1983 the use of Genetically modified crop varieties is not considered. To monitor this in the State :-

1. The Central Government should notify the minimum standards and also the methods of testing the seeds in notified laboratories.
2. The inspectors should be appointed and the duties and powers should be specified.
3. The strict provisions should be made against the sellers of spurious or fake seeds and F2 seeds of G.M. crops.
4. Atleast in initial years the Govt should control the cost of the seeds.

### **Specific views of the Department regarding use of Bt.cotton**

The Bt.technology introduced in the cotton crop has been beneficial to the farmers in the State. However, the cost benefits of Bt.cotton are more in irrigated areas than in non irrigated areas.

The cotton is mostly cultivated as rainfed crop in the State of Maharashtra. The area under rainfed cotton is 97%. The rainfed farmers are resource poor farmers and cannot afford costly Bt.cotton seeds. In rainfed cotton the recommended row to row and plant to plant spacing is reduced and it requires more seeds per ha.

In Maharashtra the area under organically grown cotton is increasing at a faster rate. The farmers in the Nasik and Amravati division (Nasik, Dhule, Nandurbar, Jalgaon, Yeotmal, Akola, Buldhana, Washim, Amravati districts) are practising organic farming for growing cotton crop. They are not using Bt.cotton varieties but successful in getting higher yields than Bt.cotton.

The another cotton cultivation technology which is growing fast in Maharashtra is IMP cotton. By using different Integrated Pest Management practices farmers in Maharashtra particularly in Amravati Division (Yeotmal, Akola, Buldhana, Washim, Amravati districts) are managing disease and pest problems successfully even by reducing use of chemical pesticides. The produce received from organically grown/IPM cotton is having more demand and fetches better prices at indigeneous and foreign markets.

By using Bt.technology in cotton crop the resistance to a group of insects belonging to class of lepidoptera specially bollworm is introduced in it. It means by using Bt.cotton varieties farmers can safeguard their cotton crops only against bollworm. It cannot protect the crop from other pest and diseases attack. The organic farming technology, IPM technology and Bt.technology all these technologies are useful to the farmers. The State Department of Agriculture, Government of Maharashtra is promoting all these technologies and farmers will have the choice of selection of technology.

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