

Brief record of the 26th meeting of the Genetic Engineering Approval Committee (GEAC) held on 19th June, 2001.

The 26th meeting of the Genetic Engineering Approval Committee (GEAC) was held on 19th June, 2001 at 10.00 a.m. under the chairmanship of Shri A.M. Gokhale, Additional Secretary, Ministry of Environment & Forests. Shri R.C.A. Jain, Additional Secretary and Shri A. Govindan Nair, Joint Secretary, from Deptt. of Agriculture & Cooperation, and Dr. Mangla Rai, Deputy Director General and Dr. K.C. Jain, Astd. Director General, from ICAR/DARE participated in this meeting as special invitees. The list of participants is annexed.

2. At the outset, the Chairman in his opening remarks, welcoming the members and the special invitees referred to the importance of the meeting that was to consider MAHYCO's proposal for release of Bt cotton hybrids into the environment. In this context, he informed the meeting about the open dialogue organized on 18.6.2001 between Greenpeace and MAHYCO, wherein some experts, and farmers' associations also participated. Considering that MAHYCO's proposal on Bt cotton is the first proposal that has come up before GEAC for commercial cultivation, the Chairman urged the members to develop a well-defined procedure especially with respect to ICAR/DARE's requirement for new varieties and the procedures as per Seed Act. In this background, the Chairman requested the Committee to consider MAHYCO's proposal carefully.

3. The Chairman referred to the minutes of the twenty-fifty meeting of GEAC held on 27.3.2001, which were circulated to all the members. As there were no comments from the members, the minutes were confirmed. Thereafter, the agenda items were taken up for discussion.

Agenda item 3.1: Application for environmental clearance for large scale cultivation of transgenic Bt cotton hybrids by MAHYCO, Mumbai.

4. The Chairman invited the views of the participants on the proposal.

5. Dr. P.K. Ghosh elaborated at length on the procedures and the protocols developed by RCGM for evaluating various environmental risks of Bt cotton. These interalia include studies on pollen flow, food safety evaluation on cow, buffaloes, chicken and fish. Dr. Ghosh also informed about the studies carried out to evaluate the impact on soil microorganisms. Based on all these studies, the RCGM concluded that the Bt cotton hybrids are eligible for release into environment, and they are safe from environment and food safety angles. Dr. Ghosh mentioned that the Bt cotton pollen had travelled upto a maximum of 15 metres in a field design where trapper rows were not planted all around the

borders of transgenic cotton. When the Bt cotton plants were surrounded by non-transgenic trapper lines, the transgenic pollen did not travel beyond 5 metres. Regarding AAD gene, Dr. Ghosh has mentioned that the chances of vertical transmission of promoter and the antibiotic resistance marker genes are very rare. Even if such homologous recombination takes place and microorganisms resistant to streptomycin are developed, there are more potent antibiotics for virulent microbes that have acquired resistance to streptomycin. Dr. Ghosh further mentioned that while the Bt cotton hybrids are safe from environmental angle, there is a need to have a mechanism for long term monitoring to watch the performance of the hybrids.

6. Dr. Sushil Kumar, specifically referring to the issued raised by Dr. B.S. Dhillon and Dr. R.S. Paroda in their comments regarding delayed sowing stated that RCGM has opined that late sowing may not have made any difference. Dr. Sushil Kumar further observed that non Bt cotton when sprayed should have given the same yield as the Bt cotton, but the data shows that its yield was lower.

7. Dr. A.K. Bhatnagar stated that there is a need for developing an appropriate insect management strategy so as to get optimum benefit from the Bt gene. In this connection, he referred to the strategy adopted in the United States, where Bt gene was introduced simultaneously in cotton, corn and other such crops which are attacked by bollworm. Dr. Bhatnagar also raised the issues of gene flow, weediness potential and legal implications arising from unintended contamination through pollen flow, which need to be addressed before commercial cultivation of transgenic crops is approved.

8. Dr. Mangla Rai stated that the pollen flow is dependent on the distance that the pollinating insects traverse. Hence, pollen transfer may take place beyond 15 mt. also. The trapper row barriers are more suited for seed production rather than acting as barriers for pollen flow. He further informed that in India hybrid cotton is grown only in about 35-40% of the total area under cotton cultivation. The bollworm pest *Helicoverpa armigera* is polyphagous in nature and could therefore attack other crops as well. This aspect also needs to be looked into through integrated pest management strategy.

9. Dr. R.P. Sharma stated that Cry1Ac gene is not the only gene which has proved to be resistant to bollworm. Resistance development is a natural phenomenon and will certainly take place. But parallel efforts are being made for biological control through integrated pest management strategy. He further observed that resistance development in India is a much slower process because of small land holdings where different crops are grown unlike the U.S., where agriculture is practiced in large scale monocultures. The most important

environmental benefit of Bt cotton will be the reduction in the number of insecticidal sprays and the concomitant reduction in pollution levels. The economical benefit of Bt cotton is because of less number of sprays and accrued saved labour. As regards antibiotic resistance, this too is a natural phenomenon with low probability. Many bacterial inhabitants of human body are resistant to many antibiotics. The probability of development of streptomycin resistant bacteria due to AAD gene is very low. Pollen flow is again a natural phenomenon, which in fact has contributed to the evolutionary process. In this case also, pollen escape will take place but what is its impact needs to be studied. So far as the effect of Bt gene on non-target species is concerned, this can be studied only after the crop is cultivated.

10. Shri R.C.A. Jain, emphasized the importance of this meeting which would have a bearing on the future of Indian agriculture. Referring to the uncertainties associated with the gene flow, legal and sociological implications, resistance development etc., he felt that many questions pertaining to Bt cotton have been left unanswered. Shri Jain pointed out to the impact of late sowing on pest load, and cautioned that we should not hurry until all questions are answered satisfactorily. For this purpose, he suggested for undertaking more trials under the ICAR procedures.

11. Dr. Mangla Rai appreciated the explanations given by Dr. R.P. Sharma which have put the issues in the right perspective. Dr. Rai brought out a detailed analysis of the data and made the following important observations:

- There was only a marginal increase in yield of the best Bt hybrid (747 kg/hectare) over the inbred variety (611 kg/hectare).
- The pest load in non Bt cotton was only marginally higher (8.3%) than in the Bt cotton (7.6%).
- The coefficient of variability in Dharwar was as high as 113%, whereas it is usually in the range of 20-30%.
- One of the criteria for release of any new variety is that its average yield should be more than the national average. In the present case, the average yield was far less than the national average.

He noted that because of late sowing, the pest load was low and perhaps Bt cotton would give better results if sown timely. Thus, based on the existing field data, it is not proper to conclude that Bt cotton is stable, resistant and high yielding. At the same time, one cannot deny certain advantages that Bt cotton offers. Further field trails with timely sowing will provide a more comprehensive picture. He assured that ICAR could undertake the field trials provided the seeds were given to them 15 days before sowing.

12. Prof. Subhash Chand expressed that the data generated by the company is adequate, and the comments of experts are also positive within the identified parameters. Hence, a prompt and judicious decision should be taken following a cautious approach, and by stipulating conditions relating to packaging and labeling, segregation policy, defining the limit of contamination and environmental impact. Prof. Chand also emphasized the need to put in place laboratories for testing of transgenic traits.

13. Referring to the comments received from the Ministry of Health during the meeting, Shri Jain mentioned that human safety issues have not been considered. Some of the issues raised by the Ministry of Health are as follows:

- The food safety evaluation is based on the concept of substantial equivalence which is a starting point for safety assessment and not the end point.
- Cotton seed oil is used in manufacturing vanaspati which in turn is used in manufacturing a number of food products in the country. Impact of cotton seed oil derived from transgenic cotton on humans has not yet been studied.

14. Summing up the discussions, the Chairman stated that some issues have not been answered satisfactorily. To address these issues, the Committee may consider the following two options:

- (i) The proponents may be asked to conduct further trials.
- (ii) The GEAC clears the proposal from environmental angle, and the unresolved issues may be addressed by the Ministry of Agriculture.

15. The participants preferred the first option and the following decision was taken:

15.1 The three cotton Bt hybrids of Mahyco designated as Bt MECH 12, Bt MECH162, and Bt MECH 184 were subjected to large scale field trials during year 2000-2001 on the basis of the authorization granted by the GEAC. On behalf of GEAC, a detailed environmental assessment as well as food safety evaluation was carried out by the RCGM and it concluded that Bt hybrids of Mahyco are eligible for release into environment. Most of the relevant environmental safety questions are addressed by the RCGM which included change in the germination rate, stability of the trans gene, extent of pollen flow under different environmental conditions, change in the aggressiveness properties and weediness characteristics, and effect on soil micro-organisms. In none of these parameters the Bt hybrids show any difference with their non transgenic counterparts.

15.2 As regards food safety, the RCGM observed that crushed Bt cotton seeds fed to adult lab animals, goats, cows, buffalo, chicken and fish did not show any difference between Bt seeds fed animals and non Bt seed fed controls. RCGM also observed that there was no difference in the manifestation of allergenicity properties to Brown Norway rats with Bt cotton versus controls.

15.3 On the basis of directives from DBT, data were generated to assess the impact of Cry 1A(c) proteins on the neonats of *Helicoverpa armigera* and *Earis* species. The Moulting Inhibitory Concentrations (MIC) at 95% level of inhibition of the neonats were determined. At the same time the expression level of Cry 1A(c) proteins were determined in the different plant parts of Bt cotton at different age. It was observed that upto 118 days after sowing the Bt cotton leaves expressed much higher levels of transgenic proteins than the MIC 95 values. Even in the bolls the expression level was above the MIC 95 values upto 74 days. These indicate that the plants were effective to provide sufficient resistance to boll worms to prevent the emergence of resistance. It was however, observed that cry protein expression was coming down with the age of plants.

15.4 One environmental issue that could not be studied was whether any transgenic DNA present in Bt hybrids moved to soil microorganisms. This issue becomes relevant in the context of transfer of nptII and aad gene, the latter being under the control of bacterial promoters. It was concluded on the basis of available literature and experience that the frequency of such transfer was very low. Therefore, even if such phenomenon occurred, to control such transformed microbes there are presently several alternative products available.

15.5 Concerns relating to the spread of cry protein resistant bollworm in Indian cotton field and impact of cry protein to non target insects of cotton were also raised.

15.6 GEAC observed that Bt hybrids generally performed better than the controls in terms of requirement of lesser sprays and insecticides. However, the trial could not be conducted in time. Dates of planting were late in some cases by as much as three months. Therefore the insect pest load was also low. The yield data and the net agronomic advantage derived from the study could not reflect true values. It was therefore felt that the trials be repeated on a large scale and such trials should be done under direct supervision of the ICAR under their Advanced Varietal Trials of All India Co-ordinated cotton improvement project. The seed must be supplied within one week by the company to the Project Coordinator Cotton, so that the crop could be grown in time.

15.7 It was accordingly agreed that

- (i) These multi locational Advanced Varietal trials will be conducted under the aegis of ICAR under different agro climatic conditions. Trials will also address field level integrated pest and varietal management issues. Additionally, Mahyco may like to conduct field trials on farmer's field in an area of about 100 hectares under close supervision of GEAC and MEC.
- (ii) Need was also felt to simultaneously gear up for assessing the impact of transgenics in human food and animal feed. This issue can be taken up by the animal feed. This issue can be taken up by the Ministry of Health and Family Welfare.
- (iii) The field evaluation shall further address the spread of population of Cry protein resistant boll worms.
- (iv) The impact on soil micro flora and non target insects of cotton shall also be studied.

15.8 These field trials will be monitored through a committee set up by ICAR with representatives from the MOEF, DBT, DAC, and Ministry of Health. This Committee shall report to GEAC.

Agenda item 3.2: Import of finished Hepatitis B vaccine and bulk concentrate of Hepatitis B vaccine by M/s. Halfkine Bio Pharmaceuticals Corporation Ltd., Mumbai from M/s. L.G. Chemicals, Korea.

16. Earlier GEAC in its 13th meeting had approved the import and marketing of EUVAX-B vaccine (Recombinant Hepatitis B) by M/s. Ranbaxy Laboratories Ltd., New Delhi in 1997 from M/s. L.G. Chemicals, Korea. The present proposal related to import of same product from the same source. The representative of DCGI informed that the proposal is under examination. The Committee decided that on receiving DCGI's comments, the Chairman may approve import and marketing of Hepatitis B vaccine as per the standards prescribed by the DCGI.

Agenda item 3.3: Import and marketing of Hepatitis B EUVAX-B by M/s L.G. Chemicals Pvt. Ltd., New Delhi from M/s L.G. Chemicals, Korea

17. The GEAC in its 13th meeting had approved limited import of the product to M/s Ranbaxy for conducting PMS on 100 subjects in December 1997. Thereafter M/s Ranbaxy called off its collaboration with M/s L.G. Chemicals, Korea and collaborated with Pasteur Merieux Connaught. They also did not proceed further and called off the arrangement and transferred the registration to L.G. Chemicals Ltd., India.

18. M/s L.G. Chemicals Pvt. Ltd., New Delhi has now submitted reports of clinical trials. This report was sent to DBT and DCGI for comments. The representative of DCGI informed that the proposal is under examination. The Committee decided that on receiving DCGI's comments, the Chairman may approve import and marketing of Hepatitis B vaccine as per the standards prescribed by the DCGI.

Agenda item 3.4: Import and marketing of PEG interferon alpha 2b from M/s Schering Plough Corporation, Brinny, Ireland by M/s Fulford (India) Ltd., Mumbai

19. This proposal which was considered in the 24th meeting of GEAC was deferred as the proponents had not submitted data on immunogenicity. The immunogenicity data submitted earlier by the applicant was referred to DBT/DCGI. The 25th meeting of GEAC considered the proposal alongwith DBT's comments and decided that on receiving DCGI's comments, the Chairman may approve small scale import of the product for limited Phase III clinical trials as per the standards earlier laid down by the Committee for generating data as suggested by the DBT. Accordingly, on receipt of a no objection from DCGI, the proposal for small scale import of the product for Phase III clinical trials was approved by the Chairman and sanction issued to the applicant.

20. Thereafter, the applicant submitted the data and information on clinical trials conducted with pegylated interferon, with a request for permission from GEAC for import and marketing of the product. This report was again referred to DBT/DCGI for comments. The representative of DCGI informed that the proposal is under examination. The Committee approved the proposal for import and marketing of PEG Interferon alpha 2b. The Committee also decided that the proponents be asked to generate Post Market Surveillance data as per the norms of DCGI.

Agenda item 4.1: Suggestion from the Agriculture Ministry regarding GM foods.

21. The Agriculture Ministry has requested the Ministry of Environment & Forests for the following with respect to GM foods:

1. To take urgent steps to issue necessary notification under EPA 1989, making it binding on importers to declare whether the commodity being imported is of GM or non-GM origin.
2. In case it is GM origin, to obtain necessary permit for its importation.

3. While granting permit, the MoEF should also ensure that the product is approved in the country of origin from biosafety view point.
4. MoEF should also carry out necessary safety assessment before allowing their release in the country established under EP Act.

22. Recognizing the importance of the issues involved, the Committee felt that Ministry of Environment & Forests can issue such a notification as suggested by Ministry of Agriculture. For developing the detailed modalities, including developing the proforma and implementation issues, it was decided that the Ministry of Environment & Forests may set up a small Committee with representative from Ministry of Health, Deptt. of Biotechnology, Indian Council of Agricultural Research, Deptt. of Agriculture & Cooperation and others.

23. The meeting ended with a vote of thanks from the Chair.

List of participants who attended 26th GEAC meeting held on 19.6.2001

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