

High Stakes in Agro Research

Resisting the Push

In a country where the majority of the population depends wholly on agriculture and agro-related activities for livelihood and survival, seeds and agrochemicals are critical inputs, whose control must lie with the people. At least two attempts have been made in the past – the first one between 1980 and 1985 and the second in 1981 to control our agrochemicals business. We are now seeing a third attempt being made to control the seed business. Some lessons from the past.

PUSHPA M BHARGAVA

One day in the late 1970s Robi Atal, the then chairman of what is now VST Industries (VSTIL), the makers of Charminar cigarettes asked my opinion on their proposal to work out an arrangement with an American company, Cytozyme Laboratories, which called itself a world leader in biotechnology, but of which no one I knew had heard. According to this arrangement VSTIL would produce and market the American company's product Cytozyme in India as a part of its diversification programme. Cytozyme – a different one for each agricultural produce – was supposed to augment nutritional support for plants, enrich soil fertility, help crops absorb and assimilate plant nutrients better (thus reducing the input of fertilisers), make plants more drought and stress resistance, increase yield by 20-50 per cent and increase the quality of the product.

When I examined the scientific literature on the product. I found it to be no more than gibberish. It simply did not make any scientific or technological sense. Following my input, VSTIL declined to put a stake in the production of Cytozyme in India. However, in 1979 a financing agency of the government of Andhra Pradesh gave a loan of, I believe, close to Rs 1 crore to a woman entrepreneur, Deep Bedi, the daughter of a former (now deceased) chairman of the State Bank of Hyderabad, to set up a company to make and market Cytozyme in India under licence from the parent American company.

Deep brought her proposed venture to my notice with a sense of pride and was taken aback when I (recalling the VSTIL's reaction of the product) raised serious doubts about the efficacy of the product and said that its use could, in fact, reduce yields of our major agricultural crops and thus take us back to the pre-green revolution period. This view was supported by several 'happenings around the world at that time. For example, *The Times of India*, February 21, 1981 published a news release from Nairobi, which said "The economies of Kenya and other East African countries like Tanzania and Uganda have been greatly damaged by proliferation of sub-standard and fake agrochemicals dumped in these coffee-growing regions by some European chemical companies in the last three years". Deep responded by getting the entire Cytozyme team from the US to make a presentation to us at Hyderabad. This was later fixed for March 5, 1980 at the Banjara Hotel (now Taj Banjara) in Hyderabad

I have rarely seen such a farce of presentation by any commercial organisation, Indian or foreign, anywhere: as on the above date. As it turned out, many luminaries, including the state agriculture minister were present. The handout at the presentation described Cytozyme as a product containing "various bacteria, hormones...and other elements essential for the improvement of physical condition of soils" and claimed that it "improved the ability of the plant to maximise nutrition offered to it". For those readers who are familiar with elementary chemistry and

biochemistry, I reproduce below verbatim (as I had recorded it), the dialogue between me (PMB) and the research director (RD) of Cytozyme Laboratories during the question and answer session following the above presentation.

PMB: I am afraid in your talk you have given no scientific information.

RD: I thought I have stated everything.

PMB: I did not gain this impression. I do not even know what Cytozyme is. Is it of animal, plant or mineral origin?

RD: I showed the bacterial growth curve.

PMB: Does it mean that it is derived from bacteria?

RD: Yes.

PMB: Does it consist of whole bacteria?

RD: No we hydrolyse them.

PMB: So, it is essentially a bacterial protein hydrolysate.

RD: Yes.

PMB: In that case, all the protein is hydrolysed to aminoacids?

RD: Yes

PMB: Then, I do not see why you should need a different Cytozyme for different agricultural products as the hydrolysate from all bacterial will consist of the same twenty aminoacids.

RD: But, we do need a different Cytozyme for different crops.

PMB: May be then you only have a partial hydrolysate.

RD: Yes.

PMB: With 6 N hydrochloride acid?

RD: (No reply.)

PMB: What is the average molecular weight of the products in the hydrolysate?

RD: 10 million daltons.

PMB: Are you serious? This is impossible as no protein in bacteria, even when unhydrolysed has this molecular weight

RD: But, we have polyribosomes there.

PMB: With 6 N hydrochloric acid? I am afraid I cannot believe that.

RD: But I showed you a slide of the cell cycle. We are also going to do polyacrylamide gel electrophoresis and ultracentrifugation.

PMB: I doubt if you understand what you are saying.

One wonders if anything could possibly be scientifically more absurd than the answers of the so-called director of R and D of the American company. The

exact composition of the product had not been stated; the data so far made available did not justify its use on a large scale; no well known and reputed laboratory had been associated with this product; there was no published information on Cytozyme; there was no confirmation of the claims being made nor of its use in the US and nor had the company approached Indian institutions like the Indian Agricultural Research institute to test the product.

My fears about the possible damage to our agriculture if Deep Bedi's Indian company was permitted to function according to the American company's plan grew. Between March 10, 1980 and February 1984, I had extensive correspondence in this regard with MS Swaminathan, then secretary, ministry of agriculture and irrigation who headed the Scientific Advisory Committee to the cabinet; G Rangaswami, agriculture advisor to the Planning Commission; M G K Menon, secretary, department of science and

technology (DST); K V Srinivasan, also of the DST and several well known science correspondents such as V S P Kurup of *The Times of India*, New Delhi and Praful Bidwai of *The Times of India*. Bidwai came to Hyderabad and spent a fair amount of time investigating the Cytozyme story. These investigations brought to light many interesting facts which confirmed our suspicion about the company. Praful wrote a letter on January 7, 1984 to one Chakravarti, technical advisor and marketing manager of Cytozyme Andhra Pradesh (Deep Bedi's company) in which he asked 14 questions. I quote below four of these questions:

(i) One finds that the positive results of Cytozyme applications are much less adequately documented than demanded by the well known norms of agricultural research and evaluation of products or seeds or farm chemicals. Can you explain this?

(ii) The data cited in respect of the major cereal crops is either less than significant

or only weakly supportive of the claims made. Thus not a single reputed institution in India has been quoted to prove that Cytozyme is effective in raising yields of wheat, rice, jowar, bajra, maize, pulses or groundnut. Please comment.

(iii) You claimed that Cytozyme has received clearance and approval from the US Environmental Protection Agency, Food and Drugs Administration, and the US department of agriculture. On cross-checking, however, we find this claim to be incorrect. A mere letter saying that Cytozyme is outside the purview of that country's regulatory agencies for agrochemicals does not amount to clearance/approval either for sale or for safety and efficacy. Please clarify the factual position in this respect and let us know in which states of the US and in which western countries Cytozyme products are allowed to be sold and are being sold. and under what conditions

(iv) What is the turnover of Cytozyme Laboratories (US) from domestic sales,

sales in west Europe, sales in the third world and sales in India?

Praful never received a reply from Chakravarti. To make a long story short the above efforts did have an impact: Deep Bedi's company disappeared from the scene and we thought we had 'killed' Cytozyme. But we were wrong.

One day in the middle of 1985, MGK Menon mentioned to me that SPIC, Madras had resurrected Cytozyme. The evidence was a quarter page advertisement titled, 'Cytozyme from SPIC' in *The Indian Express* of October 12, 1985: this ad made the same claim for Cytozyme as in its earlier incarnation in India. I spoke to Gopi Arora, then additional secretary in the prime minister's office (PMO), about the background of Cytozyme at a personal meeting with him on October 4, 1985 in the PMO and wrote a letter to him. I also brought this matter to the notice of T N Seshan who was then secretary, department of environment and forests. Eventually SPIC stopped making it. I do not know how much money was lost in this venture. None of my contacts in SPIC have ever agreed to talk to me about it.

I hate to think what would have happened to our agriculture if Cytozyme had been marketed in our country from 1980 onwards, with no interference from any government authority. Fortunately there were enough people around at that time in the government and outside of it who understood the implications of marketing a product like Cytozyme and fought the matter out. We, therefore won a small battle to prevent control of an outside organisation over our agriculture.

The Second Battle

In mid-1981, when I was the director of the Centre for Cellular and Molecular Biology (CCMB), at Hyderabad, I received a letter from one David R Watkins, project officer, Industrial Environmental Research Laboratory, United States Environmental Protection Agency (EPA), saying that he wanted to visit the CCMB in Hyderabad and have a dialogue with us about some possible collaborative work which could be financed from the PL 480 funds. His visit with me was fixed for the afternoon of Monday, November 9, 1981. That was the morning that the Nobel-prize winning scientist, Francis Crick was arriving in Hyderabad to spend a few weeks with us

at the CCMB. (I later, discovered that Watkins, who said he had a PhD in biology, had never heard of Francis Crick.)

Watkins arrived in Hyderabad on Saturday, November 7, 1981 without any prior notice to us. He called me from the airport at about 7.30 pm asking (ordering?) me to arrange accommodation for him and to have him picked up from the airport. Although annoyed to the core but conscious of our tradition, I politely told him the name and address of what is now the Taj Banjara Hotel. I added that I was sure he was 21 or above, and could take a taxi from the airport to the hotel on his own after calling the hotel and confirming that they had a room. I also told him that I was going to have dinner that evening at the same hotel with an old friend visiting us from the US, Boris Rotman, of the University of Rhode Island at Providence and that I would be happy to see Watkins for a few minutes in the hotel before the dinner

At this meeting on November 7 evening, Watkins said that he wanted me and the CCMB to work on the detoxification and metabolism of chlorinated aromatics. It did not escape my notice that what was being said to me was not a request but a kind of politely worded order. It also didn't take me a moment to realise that as chlorinated aromatics (hydrocarbons) were being banned in the west as pesticides, he was trying to get a foothold in a large country like ours for having them eventually marketed here. Exploiting our ignorance and the susceptibility of most of those in power to various temptations, the western countries and their MNCs making these pesticides could build a strong case for marketing their products (no longer marketed in the west) in India if our research laboratories could work out methods of detoxifying them. I was also aware that there were many institutions in India which, if paid heavily enough, would accept Watkins' proposal. I therefore, told Watkins that the problem he had in mind for us to work on, was of no interest to us and should be of no interest to the country as well. He was clearly annoyed and added that scientists at the University of Baroda and the Indian Institute of Science at Bangalore had already agreed to his proposals. Being in a hurry that evening, I postponed our further discussion to the afternoon of November 9, 1981 as had been fixed earlier. I told Watkins that a CCMB car will pick him up and then pick

up Boris Rotman from another hotel on the way to the lab and that he could spend the morning talking to three of my young colleagues, Pramod Srivastava (now a full professor and a well known scientist in the US), Bharat Chattoo (now the Vice-Chancellor of a new university) and Shyamala Rao who is retired from the CCMB.

I then had a conversation with him in the afternoon on that Monday. The most important point of this discussion was his telling me 'frankly' that "India and Indian scientists should feel grateful to the US for all the aid and assistance that it has provided to India and the Indian scientists should, therefore, be prepared to do something for the US". I politely objected to this statement and made four points. Firstly, if he wished to consider the question as to who should be grateful to whom and why, the question must be looked at from the point of view of the totality of the situation. I pointed out that in fact, India too had given significant 'aid' to the US by providing it with ready-made trained and skilled manpower. The second point was that this aspect should, if need be, be discussed at an entirely different level. The third point was that I did not feel that for our present discussion the point he made was relevant. The fourth point I made was that the onus of deciding what we shall do here must rest with us and not with anyone outside the country. All this apparently irritated him even more.

My above suspicions was confirmed when Rotman reported to me the discussion that he had with Watkins in the car en route to the Centre. Watkins had first thought that Rotman was an Indian but when he realised that he was an American, he confided to him that he was furious with me the previous Saturday evening as I was totally uncooperative. Watkins also made the following two points to Rotman: US has been 'feeding' India and giving it so much aid and assistance. Indians, therefore, had an obligation towards US. They must, therefore, "do what they are told to do". When Rotman mentioned that his University also got funds from the US government but if the government tried to dictate terms on scientific issues, the scientific staff would retaliate. To this Watkins said that was a different matter, as there they were dealing with fellow citizens.

In the above context, the following excerpts from the note submitted to me by the above-mentioned three colleagues of

mine on their discussion with Watkins on November 9 would be relevant

Watkins pointed towards the difficulties of enforcing any kind of regulation in the US in asking industry to limit the discharge of hazardous wastes, and the general apathy of industrial managers towards finding solutions to problems which they, in fact, are responsible for creating in the first place. When asked which specific compounds he had in mind, he mentioned in particular chlorinated aromatics and compounds like dioxin that would receive top priority. He further pointed out that they would be very happy to provide us with any amount of the samples for experimental use. The strategy he outlined for such work was essentially to isolate and grow different microorganisms that thrive in environments which are highly polluted with such wastes.

After going through the discussions with him and pointing out to him that most of the work that he had described was essentially routine and in view of the goals of this Centre, where we are mainly doing basic work in the virgin areas of modern biology, we asked him why this project would be of mutual interest to us and the EPA. He said, "Well, I mean, we are going to fund this research and there is potential for work in this area and with the kind of expertise available in this country. It should not be difficult to solve these problems and as I said, quite frankly that due to the budget cuts proposed by president Reagan, we are in a bit of a problem and looking around for other sources of money and expertise".

Since we do not see collaboration in this particular area, of interest to CCMB, in view of our objectives as outlined earlier, it is recommended that the subject need not be discussed further with the EPA. A note of caution however has to be made and communicated to the appropriate Indian agencies, particularly the Indo-US Sub-Commission on Science and Technology and the Department of Science and Technology, advising them of our meeting with Watkins and desirability of using discretion in selecting projects for collaboration with the US agencies utilising PL-480 funds.

What, perhaps, was most interesting in this case was that, in spite of the above response from us, in his letter dated November 20, 1981 to N L Ramanathan, director in the department of environment, government of India, he made the following three statements:

Prior to my visit Modi, at the University of Baroda, Department of Microbiology had given considerable thought to our

programme that he would propose for funding and in fact had prepared a short written technical proposal.

The Indian Institute of Science's Department of Biochemistry at Bangalore has a very impressive laboratory facility with appropriate personnel to conduct the research that we have proposed. They seemed to be very interested in the technical aspects of the proposed work and had also prepared a brief technical proposal but were uncertain as to whether funds could or would be made available to them.

The Centre for Cellular and Molecular Biology at Hyderabad also has a very impressive laboratory facility with appropriate personnel to conduct the work which we have proposed. The technical people with whom I spoke showed a definite interest in the biological degradation studies. However, Bhargava may have some reservations for conducting the work and utilising the PL 480 funds. In spite of these apparent reservations we would be interested in proposals from the Centre

Knowing that no one from CCMB who had talked to Watkins had evinced any interest whatsoever in his proposal, I was now convinced that if we fell into the trap being carefully laid out for us it would be disastrous. The letter outlined the proposal to develop organisms for the biological degradation of chlorinated aromatic and chlorinated cyclic compounds including PCBs, dioxins, etc, which were extremely toxic substances. I, therefore, brought this matter to the notice of G S Sidhu the then director general of the Council of Scientific and Industrial Research (CSIR) and secretary, department of scientific and industrial research; M S Swaminathan, member, Planning Commission; Raja Ramanna, chairman, Atomic Energy Commission; Prem Prakash Gupta, secretary, department of electronics and Nurul Hasan, vice-president of the CSIR. It was the concerted action of all of the above notably, Raja Ramanna and G S Sidhu – that the government of India issued a secret circular to all its departments and scientific agencies, prohibiting any of them to take any money for any research work from the Environmental Protection Agency of the US government. We had won another battle in the war to maintain autonomy over our agriculture.

On the Seeds Front

At a state-sponsored biotechnology meeting in Bangalore in April 2002 a group of Indians and non-Indians representing

foreign seed interest made two important points. First, that, as of then, nearly 30 per cent of seed business was under the control of MNCs, 20 per cent was in the hands of Indian seed companies and the remaining in the hands of small stakeholders in the country. The second point was that they had no doubt that in the coming few years the entire seed business of India would be in the hands of MNCs. That they had the courage to make the second statement shows how deep the nexus is between the MNCs such as Monsanto and Proagro and our politicians and bureaucrats, including of course, the scientist bureaucrats. The three departments or agencies of the government of India primarily involved in making this nexus work are the department of biotechnology (DBT), the Indian Council of Agricultural Research (ICAR), and the department of environment and forests (DOEnF).

How does this nexus operate? It does so by its representatives stating to all parties concerned in this conspiracy that we can take care of our growing need for agricultural products only by resorting to new technologies for which the monopoly exists (according to them) only with the MNCs. We must therefore open the business of producing and marketing seeds that are a product of new technologies such as genetic engineering to the MNCs without any reservations and without asking any questions for they know it all better than us – just as the British stated during their rule in India that they knew better than us what was good for us.

In this respect, our people, specially our farmers and others engaged in agricultural activities, are being cheated in two ways. Firstly, the MNCs have made sure that in spite of our having all the capabilities to develop any technology that any multinational company has as of today we do not actually use these capabilities as then how would the nexus mentioned above be able to justify having MNCs with us? Thus, in spite of our never-doubted demonstrated ability to produce our own Bt cotton (as China has done), we discouraged and did not adequately support our own scientists in this endeavour, while welcoming with open arms Monsanto's Bt cotton. As a consequence of this policy, the production and marketing of Bt cotton seeds by Monsanto's Indian network was permitted by the government of India through its Genetic Engineering Approval

Committee (GEAC) of DOEnF in March this year.

In this connection, one may justifiably ask as to what the DBT has been doing since 1983 when the National Biotechnology Board (NBTB) which was the precursor of DBT was set up. I had a role in setting up the NBTB and later, the DBT. One of the primary objectives of setting up these apex bodies for biotechnology was to ensure that commercial genetic engineering technology develops in India soon. The background for this had been laid earlier through the Programme Advisory Committee on Genetic Engineering and Molecular Biology of the Science and Engineering Research Council (SERC) of the DST, which I had chaired for many years. The DBT totally failed in meeting the above objective. It would seem that this failure was deliberate, to allow Monsanto's Bt cotton technology to come in.

It is interesting that when C R Bhatia was the (second) secretary of the DBT Monsanto had tried to sell to India the Bt cotton seed technology for about Rs 60 crore. Many of us were upset about this and when I wrote to Bhatia in this regard, he replied saying that they had brought down the price to a little over Rs 30 crore, when we could have developed this technology for less than Rs 3 crore, be it in the public sector or the private sector. Eventually, DBT was prevailed upon by the hue and cry we raised not to purchase the Bt cotton seed technology at that time. Now, we have thrown all caution, rules and regulations, and the country's interest to the four winds in approving the Bt cotton of Monsanto-Mahyco the Indian seed company in which Monsanto has a controlling interest.

We thus never looked at the poor credibility of Monsanto and its widely known and documented habit of misleading and exploiting people and even going against the law. Monsanto had manufactured Agent Orange that was responsible for defoliating plants in Vietnam during the country's war with the US, which the US lost. The company has paid enormous amounts of money as fine in its own country for contravening laws: these fines would have probably been orders of magnitude greater if the company had not found ways and means of keeping the regulatory authority in the US on its side. Our government did not take any note also of the

fact that a severe indictment was passed in the summer of 2000 against Monsanto (and three other MNCs) by the People's Permanent Commission on Global Corporations and Public Harm (the successor to the Bertrand Russel War Crimes Tribunal) following a public hearing in England.

Today, we can identify a whole range of risks entailed by the release of GMOs – specially, plants, animals and microorganisms – in the environment and the damage such a release can cause to human and animal health and the environment. I have listed these risks (See *EPW* April 13, 2002: 1402-1405). I have also stated in this article how these risks can be assessed; this has also been done in a two-volume booklet brought out by the Edmonds Institute of the US. We have no evidence that any reasonable risk assessment was ever done either by the RCGM or the GEAC, the concerned committees of DBT and DOEnF, respectively, before permitting the release of Monsanto's Bt Cotton in March 2002. Surely, if there is any evidence that this has been done it should be in the public domain. In spite of repeated statements by a large number of serious concerned citizens including scientists, of the country that all the data that the above two concerned committees of the government that are involved in approval of the release of genetically engineered products or GMOs for marketing, have in this regard should be made public there is not a shred of information available as to the basis on which these committees approved the marketing of Monsanto's Bt cotton.

On the other hand there is evidence that Monsanto has falsified its data of trials in India of its Bt cotton. Further contrary to our law the RCGM did not make a single site visit during the course of Monsanto's early trials on a limited scale in the country. It is therefore no surprise that Bt cotton planted last summer after the above permission was granted, has totally failed in some parts of the country. Further, our farmers who are highly trusting of people, have been taken for a ride on many counts by Monsanto/Monsanto-Mahyco (I use the two names synonymously). Thus the farmers were told that the use of Bt seeds would totally eliminate the use of pesticides and increase the normal yield (that is, what one would have if there was no pest attack) by some 10

per cent. This, we all know, is an absurd statement. It is unfortunate that even some of our agricultural scientists have made this statement.

We have deliberately put road blocks in respect of the use of alternatives to Bt cotton for minimising pest attacks. For example, integrated pest management (IPM) was successfully developed and tested for cotton by the ministry of agriculture years ago. However, this has not been used in the country as extensively as it should have been. Similarly, we have not encouraged the use of natural cotton varieties which would be less susceptible to pests or of traditional or modern agricultural practices that would bring down the use of pesticides. Moreover, no farmer was told during the trials that resistance to Bt will gradually develop in the pests and that the farmers would need to put in some 50 per cent refuge of pest-susceptible crop at the end of five years or so of use of Monsanto-Mahyco's Bt cotton seeds.

Keeping the above in mind, the GEAC, while approving Monsanto-Mahyco's Bt cotton for marketing laid down certain conditions such as planting of a certain proportion (20 per cent) of non-Bt seeds and keeping track of how the Bt cotton crop behaved. The job of ensuring that these criteria was, however, left to Monsanto itself. The first condition (of planting 20 per cent refuge crop) is totally non-workable for small holdings which predominate in our country. As regards the monitoring, shouldn't this have been done by a group of socially responsible and sensible outsiders – individuals or organisations? The nexus between the politicians, the bureaucrats and the MNCs like Monsanto, which seems hell-bent on selling of our country's agriculture (and therefore, the country) to MNCs is also exemplified by the fact that neither the government of India nor the government of Gujarat took any serious action to find out who the culprit was that was responsible for unauthorised plantation of Bt cotton in Gujarat and in Andhra Pradesh (AP) in over 10,000 acres in the summer of 2001 when the permission for doing so had still not been granted by the GEAC. We do not even know whether the Bt cotton seeds used in Gujarat and AP were authorised for trials – that is, they contained only one copy of one Bt gene.

In spite of repeated demands, the government has not set up a viable independent agency to test whether the seeds given to the farmers are genetically engineered and if so, what the nature is of the foreign genes that have been put in, and how many of them and where in the genome. Thus you can buy (mostly spurious) packets of 'Bt cotton seeds' for prices varying for Rs 70 to Rs 1,600 per 450 grams – at least in Gujarat. Moreover, the farmers, without knowing the consequences legal and/or economic – are using F1, F2 and F3 seeds of Bt cotton initially purchased by them, in the cases where the yield per rupee spent by them on the original seeds was higher for the Bt seeds than for traditional non-Bt seeds. Against this background, it is not surprising that Monsanto-Mahyco's Bt cotton which was planted in several parts of the country during the summer of 2002 following granting of permission by the GEAC in March 2002, has been a failure to varying degrees in many parts of the country, for example, in Maharashtra, Madhya Pradesh and Gujarat.

The tentacles of unethical companies like Monsanto have spread widely in our country. There exists in the US an organisation to 'educate' those who are in a position of making decisions, including the judiciary about the benefits of products such as Bt cotton. There is evidence on record that representatives of this organisation have had meetings with members of our highest judicial body not long ago.

Finally, one may ask as to why the ICAR has not used the tools of modern biology to develop pure varieties that will have all the advantages of hybrids but the seeds of which could be produced and used by the farmers themselves as per the provisions of this year's Plant Varieties Protection Act. If we continue permitting foreign seed companies blindly and without adequate checks and controls, to exploit our trusting farmers and dominate our seed business even when numerous other better local alternatives exist, we would need to change the slogan. 'Mera Bharat Mahan' to 'Unka Bharat Mahan'. **EW**