

Traitor technology – A threat to the national food security

A year after the identification of terminator technology, the Rural Advancement Foundation International (RAFI), a Canadian-based rural advocacy organization, has identified several technologies that can be used to genetically teach the plants to respond only to certain combinations of agrochemicals, popularly called 'traitor technology'. While terminator technology is a threat to food security, agricultural biodiversity, and future scientific research, traitor technology will be a tool for agroterrorism propagated by Multinational Corporations (MNCs). Although traitor technology is still in its infancy, with a dozen such patents, the blueprint has already been prepared for execution. The technology, as described in Zeneca's new plant killer patent, is to insert a gene into the plant which produces barnase, a compound which kills cells. This barnase gene is linked to a cysteine protease promoter, which is active during germination and growth of the plant. If the plant is left alone, the promoter will induce barnase production and the plant will kill itself during germination or shortly thereafter. This can be overcome by another pair of disrupter genes linked to an inducible promoter. The disrupter gene, when activated, blocks the action of either the cysteine protease promoter or stops the barnase-producing gene itself. The disrupter gene is turned on by the inducible promoter when the plant or seed is exposed to a chemical. Another patent of Novartis explicitly claims the introduction of traitor genes by the

deactivation of essential, natural resistance functions of plants. By linking this deactivation to inducible promoters, patented plants can be sold that will not exhibit natural positive traits like germination and pest resistance unless exposed to a chemical.

Thus, in the years to come, we may find farmers sowing seeds that will develop into productive crops only if they use agrochemicals sold by the seed company. Thomas Schweiger of the Green Peace International has criticized such technologies as 'not genetic engineering, but genetic pollution', now taking place due to the misuse of tools and techniques of biotechnology.

These technologies are extremely dangerous as more than 1.4 billion poor farmers in Africa, Asia and Latin America depend on farm-saved seed as their primary seed source. Real control over food supply is exercised through control over seed supply and if the MNCs stop supplying seeds and/or the required inputs, the whole agriculture system of the country will collapse. This spells disaster for the global food security. There is an added concern about the transgenic plants (carrying terminator and traitor genes) passing genes on to their wild relatives, and they could wreak havoc for the farming community and national food security. If not banned, traitor technology could expand rapidly to occupy the entire transgenic seed market by 2010, if not sooner.

The seed and agrochemical companies may argue that these technologies (termi-

nator and traitor) are highly beneficial to the environment and unless they get a fairly good return on their investment, they cannot continue to develop new, high-yielding varieties with novel traits for agriculture. These technologies are not acceptable to Indian conditions and the following strategies may be considered to combat the adverse implications of these technologies:

(i) National patent office should reject claims for patenting these technologies on the legal grounds of *ordre public* (against public morality). (ii) No material containing any of these genes (terminator or traitor genes) should be allowed to enter our country. (iii) Molecular probes can be developed to detect these genes. These probes can be used by the National Bureau of Plant Genetic Resources (NBPGR), which has a single window clearance for any plant or seed material entering into India, for screening against the presence of any of these genes. (iv) While retaining the right to carryout research on these genes, India can ban the transfer of these genes to any varieties of crop plants.

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Nagpur University scandal: Will the real culprit stand up please?

How very ridiculous a history are we leaving behind for the next millennium that even after more than three months now, the media report news which are the expected routine events only sequel to what P. C. Alexander initiated at the Nagpur University following the exposure of the marks scandal? None of the eminent academicians or heads of premier research

institutions have either expressed their concern about the marks scandal or put in a word of praise for the Chancellor publicly. The Chancellor's efforts are probably rationalized as his official duty. The community seems to be numbed by the pressure of its own weight of mediocrity!

Nagpur University will certainly rate far above average amongst nearly

250 Universities in India by any criterion of excellence and service. However, it is highly unlikely that this is the only one with corrupt practices. A recent potential scandal of the Mumbai University, again concerning dubiousness in enhancement of marks, was quickly contained by the Chancellor though it left a bad taste behind.

These events raise several disturbing questions.

Should we wait for internal squabbles amongst the beneficiaries of corrupt practices, as it happened in the Nagpur University, to clean up our centres of higher education?

These malpractices must be accumulating in most, if not all, universities for many years before growing to such proportions. Several academicians remain indifferent to this, perhaps, because their personal immediate interests are not affected and the institution's future does not seem to matter to them. Presumably, they hope to retire peacefully with all the possible personal benefits and an amiable, non-controversial, saintly image. But at what cost to the nation? What are the quantitative estimates of the *cost of this silence*? We forget that it is our children who will have to study in these corrupt institutions.

Can a system which has commercialized education without instituting mechanisms to ensure fair competition, eliminate corrupt administration and deliver the intended quality products? Have our more serious academicians the will, or are they in a position to fight this mediocrity? Can they reverse the tide of entry of the fake and uneducated 'degree' holders in educational institutions, right from the primary schools? Assuming that half of the universities in the country are free from the Nagpur syndrome – possibly an overestimate – it will take at most one generation for the corrupt lot to replace the few good unyielding teachers and administrators. Can anyone honestly deny this writing on the wall?

The most important question, however, concerns the future of the good students who are studying in these universities and the unemployed degree holders seeking jobs. Can they ever hold their

heads high in any respectable gathering? Who will console these sensitive youngsters and undo the injustice that they are bound to invite life-long in their careers? Some of us may directly or indirectly, consciously or unmindfully contribute to this damage too, and kill the spirits of our future Ramans, Boses and Sahas along with the dreams of enlightenment of a whole nation. Do we realize the extent of damage we are causing to the nation because of our silence? Indeed, it is not silence anymore, but the death-knell of the whole gamut of education, enlightenment, and institutions of learning, higher and lower alike – if only we have the heart and the courage to listen!

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Green chemistry

The Economic Times of 20 August 1999 carried on its centre page an interview with one of the senior scientists of Greenpeace International. The interview highlights the degradation of the environment caused by polluting chemical industries in India. The size of the industry is immaterial in this context. According to Greenpeace, 'relying on end-of-the-pipe pollution control technologies like common effluent treatment plants, landfills, and incinerators' can only lead to ecological disaster. The solution lies only in changing the processes adopted to produce the chemicals. Development of new eco-friendly processes may be more cost-effective in the long run than treatment of effluents and disposal of toxic wastes.

Modern advances in homogeneous and heterogeneous catalysis have helped in developing alternative strategies for gently persuading reactions to proceed in the required direction, obviating the necessity for employing brutal methods. But it takes a lot of dedicated effort to apply such new ideas to industrially important reactions. The push for this has to come from research-oriented chemists who have access to the relevant information,

and who have the ability to innovate. However, this has not happened so far in our country to any great extent.

Why is it that the record of our R&D in this respect is so dismal? Industry, of course, is primarily responsible for creating the mess we are in at present, with their pitiable allocation for R&D. However, our science establishments are not free of blame either. They have so far shown scant interest in the subject. The reason for this seems to lie in the obsession of our scientists with doing 'fashionable' research. Consequently, all funding is diverted towards this objective. The scientist is encouraged to import the most expensive reagents, dump them on 'new' substrates, and get a paper! No matter if this paper is ignored in the outside world, or if it is grouped along with a dozen others which report the use of this particular reagent or method. Impact factors are placed on a pedestal and worshipped; such glorification was never dreamt of by their creator! Unfortunately, both the practitioner and the assessor have forgotten that these impact factors are designed just to promote fashionable research. I find it extremely difficult to justify public fund-

ing of the umpteenth synthesis (but the first in Asia, excluding Japan!) of a natural product; whatever happened to our admiration of art in organic synthesis? To come back to the point, surely we can deploy at least part of our resources in trying to avoid the use of iron, tin or aluminium chloride in the age-old chemical transformations. Why don't we ever hear of National Symposia to discuss such problems and to monitor progress in the greening of our industry?

How many of our research establishments subscribe to the RSC journal *Green Chemistry*? And yet we all know that this is one of the most challenging tasks for our scientists – to replace the polluting technologies with more eco-friendly ones. Shouldn't we be allocating more funds towards developing products and processes which are less damaging to the environment?

Individual scientists too appear to have shirked their responsibility. How many of us have even thought of replacing organic solvents with water or super-critical carbon dioxide? Again the reason for this neglect is that research in such areas is not glamorous enough, and so is less likely to result in flashy awards to the