Genetically modified crops claim their first victim

Arpad Pusztai of Rowett Research Institute, Scotland lost his job for publicizing his concern about the adverse effects of genetically modified crops on our health. The effect of a diet containing genetically modified potatoes expressing snowdrop lectin on the small intestine of a rat was published in a British medical journal[1]. It led to a spurt of media reports causing worldwide public concern about this issue. The research in question was funded by the Scottish Office of Agriculture, Environment and Fisheries Department and was carried out at three different research institutes located in Aberdeen, Dundee and Durham. The latter two groups were solely involved in the production and supply of transgenic plants and neither of them was involved in feeding studies made with rats at the Rowett Institute, Aberdeen.

Lectins are the group of proteins that bind to specific sugar moieties on body tissues. Lectins stimulate class II HLA antigens on cells that do not normally display them, such as pancreatic islets and thyroid cells[2]. Wheat gliadin, which causes coeliac disease, contains a lectin-like substance that binds to human intestinal mucosa[3]. This has led to the discovery of coeliac disease toxin but could be managed by gluten avoidance and nothing really to prove the lectin hypothesis. A few lectins, like those found in red kidney bean (PHA), concanavilin (Con A) have been found to cause dietary problems and damage to intestines[4]. Lectins as such are found in most of the foodstuffs and tubers like cereals, beans and potatoes. Soaking and boiling of the food naturally causes loss of lectin activity and even the most toxic lectins like PHA lose their activity on cooking. Besides their clinical and histological uses, lectins have been implicated in plant defence as far as back in 1976. After this first report of PHA killing cowpea weevil, many more lectins have been tested for their insecticidal activity. Since then genes for these lectins have been cloned and quite a few transgenics developed, which are in field trials. These transgenics are expected to be resistant against sap-sucking insects like aphids, plants and leaf hoppers. Other than potato, GNA lectin has also been introduced in crops like tobacco, sweet potato and maize. Lectins being highly resistant to digestion, also suppress the immune system. In some cases they have also been reported to cause allergic reactions. Before these genes could be put into commercial crops and made available to public, their toxicity to model mammal systems like rats was to be tested by feeding trials. With this in view, Rowett Research Institute, an internationally recognized centre for research in human and animal nutrition, of relevance to health, food and agriculture was chosen. The GNA or snowdrop lectin is mannose-specific and earlier studies showed it to be less toxic to humans. Experiments concerning the effect of GNA–GM potatoes were headed by Pusztai. Both GNA-modified and unmodified potatoes and also Con A (gene isolated from the American Jack bean) containing potatoes were used. The experiments showed that GNA-modified potatoes affected the rat intestine when fed for 110 days continuously. Further, ELISA results showed that the amount of GNA decreased drastically when potatoes were boiled for 1 h. The Con A containing potatoes did not significantly reduce the growth rate unless used at a concentration of 5000 times that expressed in normal transgenics. The lectins used in Pusztai's experiments were known to be toxic to insects and Gatehouse who developed these transgenic potatoes for the study was not surprised to find that GM-potatoes stunted the growth and damaged their immune system. Though the experimental results showed them to be less toxic than perceived, Pusztai went public about his views in a television programme even before his experiments were complete and consistent data were obtained.

This sparked much controversy on the safety of genetically modified foodstuffs. The Scottish office had commissioned Pusztai's study to investigate the role of lectins which might be used to increase resistance of plants to insects. Therefore, the potatoes were not intended to be commercially developed for human consumption and were really not put through the rigorous tests required for genetically engineered plants developed for human consumption. It was agreed upon earlier that published concepts relating to the use of lectins in transgenics could be discussed but not data which were not published or peer reviewed. Pusztai was soon suspended because some of the claims that he had made about the effect of GM-potatoes could not be substantiated by his data and a number of long-term feeding studies conducted by him were found to be incomplete.

This raised a huge hue and cry in the public for a moratorium on all GM crops. The Pusztai episode clearly shows the consequences of miscommunicating scientific facts to the public. Drawing premature conclusions from unconfirmed data will only complicate the issues. A moratorium on GM crops may not be necessary but carefully controlled research and progress in the area is needed.

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SUBHOJIT DATTA*
P. K. LAWRENCE
K. R. KOUNDAL

National Research Centre on Plant Biotechnology,
Indian Agricultural Research Institute,
New Delhi 110 012, India
**For correspondence.*
(e-mail: subho99@yahoo.com)