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Views on transgenics

Genetically modified crops, reality and fiction

In 1985, the Belgian company Plant Genetic System —also known by its acronym, PGS— surprised the international scientific community by publishing an article in *Nature* titled "Transgenic plants protected against insect attack". The article described the first transgenic plant in history —tobacco— into which the gene of the bacterium *Bacillus thuringiensis* had been introduced to provide insecticide properties and protect the plant from butterfly larvae, which eat tobacco leaves and cause major losses.

The first transgenic varieties were sold around the world in 1996. Twelve years later, genetically modified crops cover one hundred million hectares in twenty-three countries. Almost a quarter of the maize grown in the world is transgenic. Furthermore, most rapeseed grown (64%) is genetically modified.

The area given over to GM crops is growing at lightning speed all over the world, showing just how successful they are. No agricultural technique has ever been adopted so fast. While part of the explanation for this growth lies in globalisation, the main reason is farmers' acceptance of the new varieties, which give greater yields and keep insects and plant diseases at bay.

THE CONTROVERSY

The success of GM crops contrasts with their bad image. It is pretty clear that

people do not like transgenics. Ecological groups warn us of the seemingly unacceptable risks of biotechnology. However, it is not a matter of imagining all kinds of dire consequences but rather of establishing how likely they are.

We therefore have to focus on each of the risks in the light of what we know and only raise the alarm if there is a real and present danger. In other words, are transgenics really dangerous? Let us see what science has to say on the subject.

A great deal has been said about the effects of transgenics on human health but no rigorous scientific study has established negative side effects from eating authorised genetically modified foods. Despite the production and consumption of millions of tons of GM cereals around the world, they have poisoned no one. It is much more dangerous to breakfast on an omelette in summer than to tuck in to a bowl of muesli.

There has also been a lot of talk about the impact of GM crops on non-targeted insects – for example, bees and certain kinds of butterflies. A study that found GM maize to be toxic to the Monarch Butterfly is now unanimously considered as gravely flawed because of serious mistakes in the design of the experiment and the interpretation of the results. There are few studies indicating that GM crops adversely affect beneficial insects and there are doubts about the findings in many cases. One should recall that conventional insecticides affect many non-targeted species.

Another concern is the frightening possibility that GM crop genes resistant to antibiotics could be passed on to human bacteria. While this is known to be possible, it is highly unlikely. Furthermore, as doctors well know, many antibiotic-resistant genes are already present in bacteria. While this is a serious problem, it is not biotechnology that is to blame but rather the excessive use of antibiotics. In any event, the latest GM crops do not use antibiotic-resistant genes.

When crops are genetically modified to produce *B. thuringiensis*, the plants poison the insects that feed upon them. One might ask whether the target insects acquire resistance to the toxin through repeated contact and natural selection. This is a real risk and a complex strategy has been formulated to minimise it, to wit, combining a strong dose of the toxin with crop areas seeded with the non-GM variety. If any insects survive in the GM-planted areas, their resistant genes will be diluted by crossing with insects in the non-GM crop areas. The efficacy of this strategy is debatable and the risk of GM-resistant insects and plant diseases appearing in the future is a real one. However, it would be a mistake to think this risk is limited to GM crops. There are insect populations that are resistant to virtually all chemical insecticides. The problem has not yet arisen with GM crops and to that extent we have an edge on insects.

A similar risk concerns GM crops that are resistant to herbicides. If the resistant genes are passed on to weeds through cross-pollination, the result could be "super weeds" that run riot because they too would survive the herbicides. As we noted earlier in connection with insecticides, the risk of selection for

Con el temor que da el conocimiento (With the fear that comes from knowing), Carmen Calvo (2001)
Mixed media, collage, photography, 150 x 107 cm

resistance is not confined to GM crops. Any farmer will tell you that there are weeds that are resistant to herbicides. Here, it is not GM crops that are to blame but rather the excessive use of chemical herbicides in conventional farming.

Another consequence of using GM crops may be a drop in biodiversity. This is a real risk but is not linked to the use transgenics. Farmers have always planted the best-yielding varieties (GM or not) and have discarded the rest. This practice is as old as agriculture itself.

Lastly, it has been said that GM crops are in the hands of a few multinational companies with the resources to engineer them and that this constitutes a dangerous monopoly of basic foodstuffs. However, once again, the problem of monopolies is not confined to GM crops (just consider the computing industry, for example). The risk lies not in the technology but in the use made of it. Dealing with monopolies is a legal problem, not a scientific one.

To sum up, the supposed risks of GM crops are very low and are shared with conventional farming methods and there are no sound reasons for rejecting these products. Why is it then that GM crops are so unpopular with the general public? The following example may help provide an answer.

When biotechnology shines

In 2000, two European research groups (a German one and a Swiss one, directed by Ingo Potrykus) created Golden Rice, a genetically modified variety containing a high concentration of beta-carotene, a precursor of Vitamin A. The beta-carotene accumulated in the endosperm, which is the part of rice that people eat. Golden Rice was a remarkable achievement, it was the first time a GM crop was engineered for purely humanitarian ends, namely to fight Vitamin A Deficiency (VAD). The condition afflicts many of the world's poor and is caused by a diet based almost solely on rice as a source of carbohydrates. It is estimated that 124 million people around the world suffer grave health problems for lack of green vegetables in their diet. It is thought that some 500,000 people with VAD suffer irreversible blindness and that between one and two million a year die from the condition.

When anti-GM groups learnt of Golden Rice's existence, they initially sat on the fence. A GM crop that saves lives in poor countries, especially those of children, is hard to fault. Benedikt Haerlin, co-ordinator of the Greenpeace campaign in Europe at that moment, consulted various experts at the World Health Organisation (WHO) and travelled to Zurich to talk to Ingo Potrykus. The latter desperately tried to persuade Haerlin of the merits of Golden Rice as a weapon against VAD but to no avail.

Golden Rice was strongly criticised by ecologists as containing insufficient beta-carotene to treat VAD. Greenpeace used a photo of an Asian child looking with surprise at a pile of boiled rice. Greenpeace noted that one would have to eat over three kilos of Golden Rice a day for the body to synthesise the recommended daily dose of Vitamin A. The claim was true but just two years later, scientists came up with Golden Rice 2. This second GM variety employed a maize gene instead of a daffodil gene to synthesise beta-carotene in the plant. The result was a much higher concentration of the vitamin precursor. Eating a little over 70 g. of the new variety was enough to ensure a baby would receive the

recommended daily dose of Vitamin A. However, Greenpeace stuck to its guns and that meant Golden Rice had to meet a rising tide of legal requirements before it could be sold. The red tape for approving field trials proved endless. Now, almost ten years after its announcement, Golden Rice is still stuck in the lab.

Caught between knowledge and fear

One of the most oft-repeated arguments against GM crops is that the plant varieties are lab experiments created by big multinationals in order to make money at the expense of Third World farmers. This is true but the vociferous campaign against Golden Rice is hard to understand when the beneficial properties of the plant variety are beyond all reasonable doubt. It reveals that the opposition to GM crops largely stems from fear. There are three strands, fear of the unknown, fear of the artificial, and fear of something that is new or different. The artificial nature of GM crops is what frightens people most. Let us delve into this a little deeper.

Think about the connotations of "artificial". If one says something tastes "artificial" it is tantamount to saying it is inedible and light years away from granny's home cooking. Someone who is "artificial" is simply false and puts on a mask to the world. Perhaps this is why we tend to think anything that is artificial is bad. However, this is a mistake. "Artificial" merely means wrought by man. Thus a car, a microscope, granny's stew pot, a love poem are all artificial. So too are prehistoric man's flint tools and, by extension, crop plants. Maize is a prime example of Man's craft.

Maize was brought to Europe by the Spanish conquistadors. It had been farmed for thousands of years in the Americas but the maize grown by the Aztecs was no longer a natural jungle species but rather the product of deliberate selection. The plants yielding the most cereal were the ones sown over the years. The crop that surprised Europeans in the 16th century was the result of the labours of Indians over generations and looks nothing like its wild cousin, which can still be found along the country lanes of Mexico. The plant we know today is thus just as artificial a product as cow's milk. Maize, with its spectacular corn cobs, is an artificial plant *par excellence*. Strictly speaking, a genetically modified plant is really no more artificial than a cultivated variety for both are the product of Man's actions. Indeed, there is a much bigger difference between ordinary crop maize and wild maize than between the GM and non-GM crop varieties.

Take carrots: this vegetable we grate for our salads and use as dressing has been eaten since ancient times. However, the carrots eaten a few centuries ago looked nothing like the ones we eat today. They were white or brown but never orange. They only acquired the colour we think so natural in the 18th century when a Dutch farmer selected some mutant carrots because their colour was that of the Royal House of Orange-Nassau. Every time we bite a carrot, we are eating a mutant chosen for its colour and political connotations. It is hard to think of a more artificial foodstuff but, as everyone knows, carrots are good for you.

What now?

The controversy surrounding GM crops is useful because it fosters greater knowledge on the advantages and

drawbacks of this powerful technology. However, a consensus needs to be reached on removing arguments from the debate that merely seek an emotional response rather than taking a rational approach to the challenges posed by biotechnology. These subliminal messages aimed at the heart rather than the head are the stock-in-trade of anti-GM campaigns. Take the poster used by the French Green Party which cunningly asks "Who really knows what effects genetically modified organisms might have?" The answer is self-evident, nobody. One could say just the same about solar power yet that does not mean the technology is harmful. There is a world of difference between science and crystal ball gazing.

Let us look at another anti-GM campaign slogan: "Ask for clear information so that you can say no". Why bother asking for information in the first place if the answer is a foregone conclusion? This kind of pseudo information has more to do with prejudices than scientific proof but it is what shapes public opinion. The latest surveys reveal that around 75% of Europeans either distrust or totally reject GM foods, a big majority by any reckoning. However, these surveys should be compared with an astounding questionnaire that reveals 60% of Europeans believe that tomatoes (and by extension, all plants) do not contain DNA. The debate on GM crops needs to be rational and far-reaching II

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