# Agency 'ignoring its advisers' over *Bt* maize

**Jonathan Knight, San Francisco**

A strain of maize that is genetically modified to fight rootworm — a major crop pest — has won approval from the US Environmental Protection Agency. But scientists who were consulted before the 25 February decision say that the agency ignored their advice and is doing too little to ensure that insects don't develop resistance to the insecticide produced by the plant.

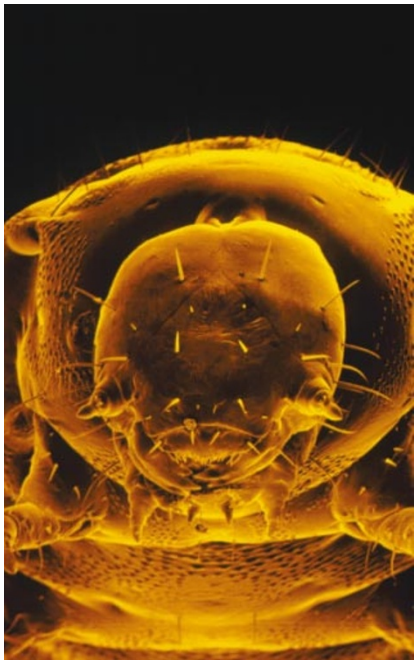
Last October, a scientific review board recommended that the strain should only be grown if farmers plant an equal area of non-transgenic maize next to it. Such a stipulation would have undermined the commercial viability of the strain, however, and the EPA has rejected it, saying that a 20% "refuge" of non-transgenic maize will suffice.

The decision has drawn immediate fire from members of the review board.

"They are putting the issue of sustainability on the back burner," argues Fred Gould, an entomologist at North Carolina State University in Raleigh.

The new *Bt* maize — developed by Monsanto of St Louis, Missouri, to express an insect toxin gene from the bacterium *Bacillus thuringiensis* — differs from existing varieties in several ways. The *Bt* maize that is already widely planted in the United States targets the European corn borer, a moth whose larvae eat stalks and leaves, but is useless against the corn rootworm, a beetle that costs farmers US$1 billion a year in pesticide treatments.

The various strains of *Bt* bacteria collectively produce some 40 classes of insect toxin, and the new variety of maize incorporates one that attacks only the corn rootworm and its close relatives. But it also produces much less toxin than existing *Bt* crops — increasing the prospect that insect populations will have time to develop resistance to the toxin. To mitigate this risk, refuges of non-*Bt* varieties are planted so that susceptible insects can multiply. These then mate with resistant insects and dilute out the resistance genes in the next generation.



DAVID SCHARF/SPL

**Rootworm: could low-dose *Bt* create resistance?**

But this strategy only works if the transgenic plants produce enough toxin to ensure that only a very small number of insects (which might spawn resistant offspring) survive, say Gould and other critics of the EPA decision. If the crop produces too little *Bt* toxin, the survivors will include a large number of partially resistant insects who are likely to find each other and enrich the gene pool for resistance, they say.

Whereas established *Bt* maize varieties produce high doses of toxin, the new variety kills only about half the rootworm larvae, according to data provided by Monsanto to the EPA. This is enough to help farmers, Monsanto claims, because it is just as effective as pesticide treatments and has the advantages of saving time and doing less damage to the environment.

But with such a low mortality rate, resistance is certain to arise, the strain's critics say — the only question is when. Farmers can delay resistance by planting larger refuges. So Gould and ten other members of a scientific review board that looked at Monsanto's application urged the EPA to require a refuge size of at least 50% of the total area planted with corn.

In its ruling, however, the EPA sided with three dissenting review-board members, and sanctioned the 20% refuge size that Monsanto had requested. EPA spokesman David Deegan says that the agency's own calculations suggest that even if the new variety were planted all over the United States, it would take between 7 and 16 years for resistance to become a problem. Monsanto expects its anti-rootworm corn to cover no more than 5 million acres — 6% of US cornfields — by 2005.

"The registration is just for three years, and I don't think resistance is going to emerge in three years," argues Richard Hellmich, one of the board's dissenters and an entomologist with the Agricultural Research Service, the research arm of the US Department of Agriculture, in Ames, Iowa. Hellmich's group is one of several that will be monitoring rootworm in *Bt* fields for signs of resistance during this time. Refuge requirements can be changed later if necessary, he adds.

But by then it may be too late, warns Margaret Mellon, who directs the Food and Environment programme at the Union of Concerned Scientists, an advocacy group based in Cambridge, Massachusetts. It is hard to get farmers to plant less of something if they like it, she argues, and once a resistant population of insects arises, it can be very hard to eliminate.

"We need to protect *Bt* as a valuable resource and not use it up," she says. ■

**to send 1.85 billion cubic metres of water to Mexico via the river, with the salinity level not exceeding set limits. The desalination plant could make a partial contribution to this target by removing salt from part of the river's water flow — it can desalinate 92.5 million cubic metres of water per year.**

**Reopening the plant would cost about $25 million, and annual operating costs are also about $25 million, so bureau officials only want to do this if it will be needed for a sustained period. In January, they convened a group of researchers at the University of Arizona in Tucson to develop a model for predicting droughts and higher-precipitation periods for the next 50 years.**

**University of Arizona palaeontologist Karl Flessa told the meeting that studying tree-ring records in forests in the Colorado River basin could allow him to track droughts, but not short periods of high precipitation, for the past 500 years.**

**Flessa and his colleagues are also examining the ratio of two oxygen isotopes in clam shells in the river delta to estimate historical higher-precipitation periods. The isotope ratio reflects the degree of salt water and fresh water to which a clam was exposed, as one isotope is more abundant in fresh water.**

**If the scientific studies show that it would be cost-effective to reopen the desalination plant, bureau officials expect such a move to face legal challenges from environmental groups. Just keeping the facility on stand-by costs about $3 million a year.** ■