

GM and non-GM maize crops



From Gaudí to Bt maize - Catalonia embraces progress.

Innovation is alive and well in the Spanish cornfields. Spain is the only country in Europe where genetically modified crops are grown commercially. Bt maize is commonly included in pig feeds, and mops up most of the production capacity. Biotech companies and the Spanish national research institute IRTA are responsible for making sure everyone can be comfortable with the situation.

By Sarah Mellor

The Catalonia region of north-eastern Spain is no stranger to bold new innovations. From the first major re-building of the historical city of its capital, Barcelona, to the innovative designs of one of its most famous sons, Gaudí, Catalonia has always grappled with the juxtaposition of the traditional and ultra-modern. Perhaps this is the reason why Spain is the only country in the European Union that has registered genetically modified varieties of crops for commercial use. That is not to say that the debate is not as active in Spain as in other parts of Europe, but Spanish experts believe that the potential benefits to the country's agricultural economy are enough to merit serious research. Following on from a four-year collaborative

study into co-existence of GM and non-GM rice and the effects on the environment, in 1998, the first commercially grown Bt maize was sown and last year, the national and regional governments embarked on a collaborative project with the Spanish national research institute, IRTA and Syngenta Seeds to establish effective simultaneous production of Bt and conventional maize.

Maize production in Spain

Spain is Europe's third biggest maize producer, accounting for around 11% of total EU area planted and about 13% of production in 2001/2. Traditionally, though, Spanish maize grain production has been

grow side by side in Spain

insufficient to fulfil the demand of the grain processors - for the animal feed, wet and dry milling industries. The shortfall was historically made up by imports, with preferential agreements having been set up to import some two million tonnes from third countries such as the US and, more recently, from Argentina. France is also a key supplier for users near the border. More than 80% of the total maize available in Spain from production and imports is used for animal feed production - this figure is likely to be higher when it is considered that most of the wet and dry milling industries are located near to the ports to make use of imported grain.

Why Bt maize?

In 1998, two hybrids of Bt maize were registered in the commercial variety register for Spain. These were Compa CB and Jordi CB. But, until 2003, only Syngenta Seeds' Compa CB (Bt 176) variety was available to the Spanish market. In 2003, however, five further varieties from other companies (Limagrain, Monsanto, Nickerson and Pioneer) were registered for commercial use.

The first planting occurred in 1998, when sufficient seed was sold to plant 20,000 hectares and has remained at this level. On a national level, this represents only 4-5% of total maize sowings in Spain, but in some areas this percentage is far higher. In Catalonia, for example, Bt maize represents 13% of all land area used for maize production.

The figures are not random - they in fact relate to demand, based on regional prevalence of the pest against which Bt corn was developed - the European corn borer. The nature of the genetic modification (Bt or conventional varieties) and the agronomic characteristics of the variety - namely late maturity - result in the absence of GM maize in some of the more important maize production areas, such as Castilla y Leon. This can be attributed either to the fact that the target pest is absent in these regions and/or the agronomic requirement is to plant mid- or early-maturity varieties.

Co-existence is a reality

Co-existence between GM and non-GM (conventional) varieties of crops is not a theoretical puzzle in Spain - it is a reality. The proponents of GM technology aim to be as open as possible with their work and hold regular meetings with farmers, the public, press and environmentalists, including anti-GM campaigners, detailing what measures are being taken to ensure safety



Complete transparency means that protestors are welcomed to attend meetings. Here local anti-GM protestors are included in a presentation of Syngenta's co-existence study.

and transparency in the co-existence programme.

Following the recommendations of the seed suppliers, genetically modified varieties are grown within a so-called "blocking zone", surrounded by conventional varieties. This is done as a security measure so that neighbouring farms wishing to grow and market conventional or even organic grains can continue to do so without encountering problems of contamination due to cross-fertilisation. Examples of typical blocking patterns are given in *Figure 1*. Thus, where GM grains are marketed, the grain is typically a mixture of the true GM variety and non-GM grains from the blocking zone.

But how can the market be organised so that farmers and their customers can have free choice in their production, marketing and purchasing decisions? The Spanish market is fairly simply structured in this sense and geared towards allowing maize producers to produce what they want. There is no significant market in Spain for GM-free animal feed, reflected in the fact that 80% of all Bt maize produced is consumed by the feed industry and that imported GM soybeans are also used in feed.

Huge feed demand

The huge demand for maize for feed use is greater than the entire national maize production capacity. Coupling this with the geographical location of the feed processing facilities, near to maize-growing areas, means that all the GM grain that Spain produces is destined for animal feed. There are still some feed as well as food producers that prefer to source conventional, non-GM grain, aiming to use this as a selling point for their products. In Spain, this is largely enabled by the

Raw materials

fact that some producers hardly grow GM maize and by co-existence programmes as are outlined in *Figure 1*. In Catalonia, direct agreements are sometimes set up between grain operators and farmers, or co-operatives are established before planting, thus ensuring a guaranteed buyer. Organic maize does exist in Spain, but at a very low level - less than 1000 hectares were planted last year.

During the five years that Bt maize has been cultivated in Spain, only two incidents of cross-contamination have been reported. Both were in the Navarra region and involved contamination levels below 1%. These two incidents suggest that, although setting acceptable contamination levels below 1% is achievable in an effective co-existence programme, zero tolerance thresholds are unattainable in practice.

Ensuring a secure market

Co-existence is a particular issue with maize because it

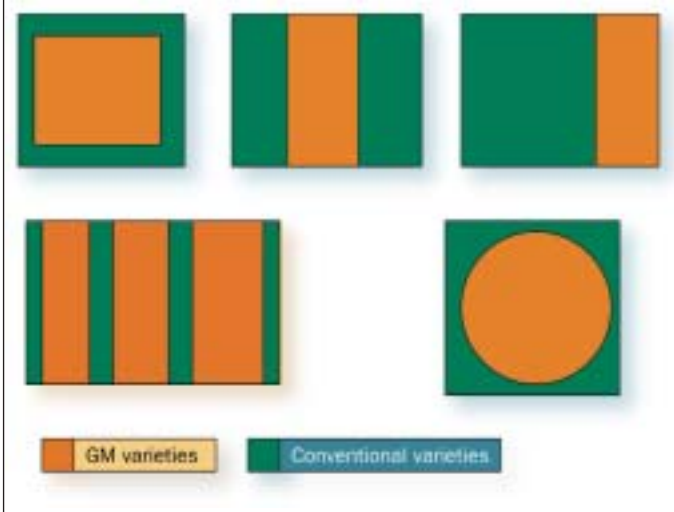


IRTA's Dr Enric Melé said local data indicates the success of co-existence.

is a wind-pollinated plant. In addition to the guidelines supplied by the seed companies, research is underway in Catalonia in a joint project sponsored by the national and Catalan governments, seed company Syngenta and undertaken by Dr Enric Melé of the Spanish national research institute, IRTA. The project was initiated this year to evaluate gene flow in fields given over to planting Bt corn. The experiments are intended to derive a mathe-

matical risk model to predict gene flow from GM to conventional plants. The incorporation of the effects of local wind patterns is particularly important in a gene-flow model for maize since it is a wind-pollinated crop. The group is aiming to establish a scientific basis for measuring the probability of gene flow to give concrete data on which to make planting decisions. This will be valuable information in an open market in which GM, non-GM and even organic maize is in demand. So far in Spain, although guidelines exist and it is estimated that a two kilometre protection zone is needed to prevent cross-pollination, prevailing weather conditions sometimes mean that this needs to be extended or can be shortened on one or more side(s) of the planting area. ●

Figure 1 - Examples of blocking patterns used to secure the success of co-existence



The scourge of the corn borer



The European corn borer appears to be a particular problem in Catalonia. This small moth larva burrows into the stalks of growing maize plants where it hatches from the egg. As it happily munches away inside of the stalk, it causes such damage that the plant is unable to siphon water from the soil, reducing productivity or, at worse, leading to the death of the plant. The reduction in water uptake is particularly problematic in areas like Catalonia, which are not only dry during the summer months, but also where the crop is traditionally grown without irrigation (even when irrigation is used, it is of no benefit when the plant cannot benefit from the water at its roots). However, the problem doesn't end with plant productivity. Another habit of the moth is to lay eggs on the corn cobs as they develop, so that the larvae burrow into the cob. This exposes nutrients to the air, where fungal spores find a convenient growth medium. This can lead to mycotoxin contamination of the cobs, causing production losses in animal production.