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Breeding tough new vegetables to resist drought

European scientists are applying hi-tech breeding to develop vegetables that can grow through blight and drought – a GMO-free way to help Europe cut down on animal feed imports and help the environment.

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Near Dijon in France, hundreds of plants move along a robotic conveyor belt around a football pitch-sized compound. At various points along their motorised journey they are fed, weighed, photographed and x-rayed, offering huge amounts of computerised data from leaf to root.

The Dijon plant laboratory is one part of a multi-locational EU-funded project called ABSTRESS – involving the Czech Republic, Germany, Spain, France, Italy, Hungary, and the United Kingdom – which is trying to lessen Europe's dependence on imported animal feed by identifying other naturally grown drought- and disease-resistant substitutes.

'Protein sustainability in Europe is an absolutely huge problem. We rely on imported soya protein from South America for between 70 % and 80 % of all protein that goes into animal feed,' Adrian Charlton, the ABSTRESS project leader from the United Kingdom's Food and Environment Research Agency (FERA), said.

The reason protein-rich leguminous plants are not extensively cultivated in Europe for animal feed is because they are susceptible to disease, drought, and other environmental changes.

At least 11 % of Europe's population and 17 % of its territory has been affected by water scarcity, putting the cost of droughts in Europe over the past thirty years at EUR 100 billion, the European Commission said in a preamble to its 2012 Water Scarcity and Droughts Policy Review. It added that it expects further deterioration of the water situation in Europe if temperatures keep rising as a result of climate change.

Until new plant varieties can be grown that are able to withstand this scarcity of water, Europe continues to import soya beans. In 2011 alone, the EU imported more than 12 million tonnes of soya beans, over ten times more than it produced, according to the most recent data from FEDIOL, an industry organisation.

Adrian Charlton, the ABSTRESS project leader. © ABSTRESS
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That's why the five-year ABSTRESS project is working to change the way in which new plant varieties are produced, by using molecular and computational techniques to identify drought and disease-resistant crop strains. 'What we are looking for is which genes are switched on for drought and fungus. We have to catch the gene expression at exactly the right time to identify the resistant genes,' Charlton said.

The researchers use clover-like plants called Medicago truncatula to look for the traits they want. Once they have found the right characteristics, they cross breed them into top-performing species, and then they test them against commercial crops.

This method of filtering for natural genes underlines a significant aspect of this project: its search for a solution free from genetically modified organisms (GMOs).

By the time it finishes at the end of 2016, the project hopes to have made plants that are more resistant to drought and disease, and in the process to have developed high-tech ways of selecting plants for specific traits.

Deforestation

If they get it right, the ABSTRESS researchers' work could at the same time help remove a major source of damage to the environment: deforestation. 'Some of the environmental problems arising from feed importation are quite horrific: a lot of the deforestation that has occurred in South America has been to make way for soya crops,' Charlton said.

In addition, Europe's large-scale importation of such a relatively low-value soya crop is incurring a giant carbon footprint, the European Feed Manufacturers' Federation said in a 2012 report. Sourcing animal feed through vegetables grown in the EU would help to reduce this phenomenon.

The techniques that ABSTRESS is developing could also be used to identify other genetic varieties of foods that are resistant to drought and disease. Cultivating these on a mass scale would be hugely advantageous in terms of both food production and lowering the carbon footprint, especially if they were all grown naturally, too.

More info

ABSTRESS

FEDIOL

European Commission 2012 water policy review