

FOOD

BIOTECHNOLOGY RESOURCE

SWEEPSTAKES

SPECIAL
ISSUE

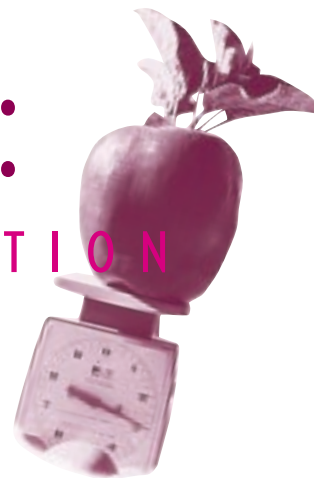
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CURRENT NEWS ON FOOD BIOTECHNOLOGY

Organic food:

FACT VERSUS FICTION

by Milly Ryan-Harshman, Ph.D., R.D.



If one were to conduct an informal survey of grocery shoppers about their attitudes toward organic foods, the belief that these foods are healthier would most certainly arise. This belief is in part due to the promotional claims of organic food producers.

Is there any truth to these claims?

Organic foods have been promoted as a healthier alternative to conventional foods for some time now. The present controversy surrounding the introduction of biotech foods into the marketplace has created fresh opportunities for organic growers.

According to Canadian Food Inspection Agency regulations, any product labeled as organic must also indicate the certifying body which has carried out the inspection. All stages of production, processing, packaging and distribution of the product in question must meet the criteria for organic certification. In Canada, genetically modified components are not allowed in organic foods.

However, organic and biotech foods are not mutually exclusive. Some food ingredients are produced through biotechnology techniques which do not involve genetic modification. For example, some biotechnology techniques involve *microbials*, microscopic organisms which are, by definition, organic.

So what does an organic label mean?

Organic growers have long contended that organic growing methods eliminate synthetic pesticide residues and provide more nutritious foods grown in healthier soils.

Nutritional quality

A Tufts University study has disproven the claim that organic foods are more nutritious. Crops with the highest nutritional quality are achieved by balancing regional and individual farm soil conditions with varieties chosen for planting.

Moreover, the mix of foods commonly available from grocery stores can easily provide consumers with diets that meet a high nutritional standard.

Tradeoffs and the balancing of risks are an integral part of food production and consumption. For example, while use of less nitrogen may increase the sugar content of crops, yields are lower.

In the future, crops will be grown whose nutritional content has been improved with plant biotechnology. Agricultural research has already provided consumers with abundant food at low

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cost, and the use of new farm technology such as biotechnology will continue to make contributions to an efficient food production system.

Soil quality

Organic growers claim that their soils are healthier because they have a more balanced mineral composition, are less compact, and are "living" soils with ample worm and microbial populations.

While inappropriate use of fertilizers can reduce soil quality, their proper use can improve crop yields and preserve the soil for future growing seasons. Indeed, a farmer depends on good soil quality for continuing high yields.

Biotechnology has the potential to improve agricultural productivity and preserve the environment. For example, field trials are underway for microbial fertilizer supplements that will help maintain soil quality. Also, farmers can reduce soil erosion by adopting high-yield agricultural practices in combination with low-till or no-till systems. Farm reports indicate that some genetically modified crops like herbicide tolerant canola are well suited to no-till systems.

Pesticide residues

The claim that organic foods are healthier than conventional foods is based on the perception that pesticide residues cause cancer (The term *pesticide* refers to any chemical compound, natural or synthetic, which kills pests.). In fact, chemical pollution accounts for less than one percent of human cancer. The major causes of cancer in humans are smoking, chronic infections, low dietary intakes of fruit, vegetables and whole grains, and recreational sun exposure.

Bruce Ames, a well-known environmental health and cancer specialist notes that 99.99% of the pesticides humans eat are naturally occurring in plants. Of these natural pesticides, half cause cancer in rats. Reducing exposure to synthetic chemicals will have virtually no impact on the incidence of cancer, yet the perception that chemicals cause cancer persists.

What biotechnology contributes to this issue is a more judicious use of synthetic chemicals in agriculture. As more biotech crops are planted, pesticide use will be eliminated in some situations and will decline in others. Sales of specific pesticides intended for use in conjunction with a biotech application will increase.

It should also be borne in mind that the term "organic" is not synonymous with such terms as "pesticide free" or "no pesticides."

In many ways, the distinction between 'biotech foods' and 'organic foods' is not straightforward. 'Going organic' does not necessarily constitute a healthier choice. Consumers who are making this choice deserve to hear all the facts. ■

GROCCERS' FORUM

Groccers' Forum is a regular feature of this newsletter. It provides food retailers and consumers with an opportunity to ask questions about the use of biotechnology in the food industry.

If you, your customers or your clients have questions about food biotechnology that you would like to have answered through Groccers' Forum, please fax them to the Saskatchewan Agricultural Biotechnology Information Centre at 1-306-975-1966 or call 1-306-668-2660.

Q Mr. B.H. manages a large-scale dairy operation. He has concerns about marketing his product. His question is, "Can food products from animals fed genetically modified feed transfer harmful effects to consumers?"

A There has been no scientific evidence that GMOs cause any harmful effects in consumers, either directly or indirectly.

In addition, Canada's regulatory framework covers all aspects of plants with novel traits, regardless of their entry point in the food chain. This includes strict guidelines for assessing livestock feed derived from GMO crops.

Moreover, DNA and protein consumed by an animal are digested, broken down and absorbed. As such, it is highly unlikely that any intact DNA or protein from the genetically modified feed would be incorporated into any animal products.

This is supported by recent studies examining cattle fed genetically modified feed which found no residues either in tissue or in milk. The study also found no difference in growth performance or milk production in test animals. ■



THE BEET GOES ON:

Transgenic sugar beet may offer sweet alternative

Researchers are well on the way to developing a transgenic sugar beet capable of producing fructan. This so-called 'fructan beet' may be the dawning of a new day for sweet teeth everywhere.

Fructans, a type of fructose molecule, have long been of interest to the food industry as a possible alternative to high calorie sweeteners and fats. Fructans have a sweet taste, akin to sucrose, but minus the calories. In addition, some types of fructans have a texture similar to fat, which makes them potentially useful as fat replacements.

Having no calories also means fructans possess zero nutritional value, since humans lack the necessary enzymes to digest them.

The drawback to fructans from a commercial standpoint has been the high cost associated with production. Current methods of commercial production require a device called a *bioreactor*. Basically, the bioreactor is an industrial fermenting tank used to separate the target

fructans from sucrose. Manufacturing fructans using a bioreactor is an effective, but prohibitively expensive method of production.

Commercial viability a challenge

Alternatively, several natural sources of fructans have been explored in terms of commercial extraction. Fructans occur naturally in about 15% of flowering plants. Researchers have experimented with both chicory and Jerusalem artichoke, which use fructan for energy storage. However, these plants cannot produce fructan in high enough quantities nor of the purity needed for commercial use.

The issue of purity arises because plants naturally synthesize more than one class of fructan, which complicates processing. In order to produce a single class of fructan molecule, fructan synthesis needs to be controlled.

Fructans are a primary constituent of sucrose, a substance which is produced by all photosynthetic plants. Plants which naturally synthesize fructan from sucrose contain two types of enzymes for this purpose, resulting in two classes of fructan. Plants which do not normally convert sucrose into fructan lack these enzymes.

Introducing one of these enzymes into a plant not normally associated with fructan production creates a single class of fructan molecule. This approach has been tried in tobacco, corn and potato plants. While the approach is successful in



terms of purity control, various other problems occur - either normal plant growth is adversely affected or the level of fructan production in these plants is insufficient for commercial purposes.

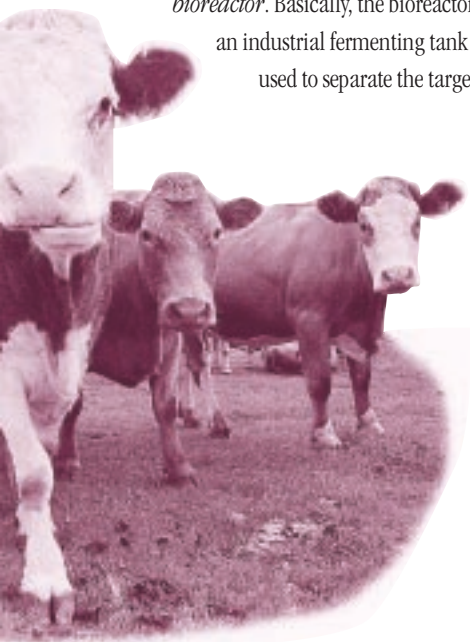
Sugar beet ideal for fructan

Several characteristics of the sugar beet make it a logical choice for fructan extraction; it contains a large store of sucrose, the material needed for fructan production, and it stores the sucrose in its taproot, the location of fructan synthesis. Another advantage is the pre-existing processing infrastructure for sugar extraction and purification in beets.

A drawback to using traditional varieties of sugar beet is that they are difficult to transform genetically. To overcome this, a team of scientists created a transgenic line of sugar beet, the 'fructan beet,' using DNA from Jerusalem artichoke. This variety of beet is able to produce a significant yield of 'pure' fructan without experiencing any adverse side effects on plant growth.

With this breakthrough in research, sweet success in commercialization may be just around the corner.

This story is based on an Information Systems for Biotechnology <<http://www.nbiap.vt.edu>> news report published in February 2000. ■



The great biosafety debate:

UN meeting establishes global treaty on GMOs

At a United Nations-sponsored meeting held in late January, over 130 countries formed a Biosafety Protocol agreement addressing the issue of genetically modified organisms (GMOs) and the environment.

The Protocol comes under the auspices of a UN convention with a mandate to preserve global biological diversity. Since genetic resources fall under the Convention on Biological Diversity, GMO products are a key area of concern.

Complex negotiations

The Montréal meeting marked the conclusion of a lengthy and contentious process.

One of the chief players in the Protocol debate was the Miami Group, a coalition of six major agricultural exporters including Canada and the United States. The Miami Group, whose members rely extensively on GMO crops and export them widely, lobbied to soften the terms of the agreement, which they argued were excessively restrictive to trade.

Under the new Protocol, a country which approves a GMO product commercially must send information about that product to an Internet-based 'clearing house.' Other countries then have the opportunity to

conduct their own risk evaluation of the GMO product before allowing importation. In addition, shipments of GMO commodities must be marked with a 'may contain' label. Stricter Advanced Informed Agreement Procedures (AIAs) will apply to seeds, live fish and other GMOs that are to be intentionally introduced to the environment.

The 'clearing house' policy applies only to products developed with gene-splicing technology. That is, the policy considers only the method used to produce a product rather than its individual biological characteristics.

Critics of the policy call this an arbitrary way of categorizing products, comparing it to categorizing cars based solely on whether they have been made on an assembly line.

Protocol versus WTO

Recently, two other major international summits have also focused on agricultural biotechnology; the December 1999 meeting of the World Trade Organization (WTO) and a February 2000 conference held by the Organization for Economic Cooperation and Development (OECD) tackled many of the same issues.

The OECD is an economic and social policy forum for industrialized nations. The OECD-sponsored conference presented a general dialogue on the subject, intended to form the basis of international policy recommendations.

WTO and the Biosafety Protocol have more specific objectives; WTO is a trade agreement while the Protocol is an environment agreement. The major difference between the two is that the latter is premised on the "precautionary principle" (which states that potentially dangerous activities can be restricted or prohibited even before they can be scientifically proven to cause serious damage), while decisions under trade law require "sufficient scientific evidence." Another difference is that the Protocol contains no enforcement mechanism, unlike WTO.

After much debate, negotiators agreed that the Protocol and the WTO are to be "mutually supportive."

The Protocol will enter into force once it is ratified by 50 countries, likely by the end of the summer. The issue will then be a matter of implementation for policymakers. ■

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