

Flavr Savr

Long-lasting Tomatoes



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Preface

The motivation for the work we are doing about genetically modified tomatoes is that they are such a commercially recognized product and they have been part of our staple diets for a very long time. The prospect of them being genetically modified is very exciting. The tomato is an iconic member of the exclusive group of plants that have been genetically modified. It was the first GMO to get on to the open market and the first one to be consumed by the general public. These facts make the simple tomato very interesting. Despite all this the long lasting tomato, as it is usually known, only lasted commercially for a few years. Four years after they were created and placed on the market they disappeared again supposedly because they did not live up to expectations. But there were more controversial reasons why the production and sale of these tomatoes stopped.

The questions that came up while researching this topic include:

- How is the tomato modified exactly?
- What does the modification change?
- Who developed this tomato and where?
- Why did the GM tomato disappear from the market so soon?
- Were there health hazards for humans?

Introduction

We came by this topic while researching genetically modified plants on the internet. We eventually found the GM tomato on a website called Bionet which showcased four typical examples for genetically modified plants and the one that we found to be the most interesting was the long-lasting tomato. This tomato was first introduced in 1994 but production stopped in 1997 because of the company's financial troubles, which means that this topic is no longer relevant for today and yet it is a good example of genetically modified plants and the reasons we need them and the reasons we don't. This particular tomato also known as the Flavr Savr was discovered and produced in the United States by a Californian company called Calgene. It was the first GMO to be granted a license for human consumption by the FDA; it was a revolutionary step for mankind. Everybody was talking about the tomato and there were lots of people who supported the venture. However, the "friends of the earth" also known as environmentalists and other people who were opposed to the idea soon let their voices be heard. This did not seem to influence the sale of the tomato but it did bring up another topic which is hotly debated still today. Whether GM products should be specially labeled or not? This question grew when Calgene who were struggling to make a profit on their tomatoes was bought by the food production giant Monsanto. It sparked a discussion because

Monsanto had made their position on the labeling issue very clear. They did not want GM foods to be labeled. Though Monsanto denied that was the reason why they bought up their competitors Calgene. Monsanto claims that it was down to patents that Monsanto needed for their own research.

The GMO technique was used to extend the shelf life of tomatoes so that they could be picked as ripe fruits and not be picked prematurely and then artificially induced to ripen later. This meant, in theory, that the consumer would have a long lasting, fresh tasting fruit that would be superior to normal tomatoes. Although this plan worked to all intents and purposes Calgene could simply not sell enough to make a profit which meant a premature pulling from the market for the long lasting tomatoes.

These GM tomatoes were unique: no one created them before or since but tomatoes are still sold in supermarkets because they are picked green and then only later ripened to become the finished product- This involves the use of some chemicals that ripen the fruit after it has been harvested. This method is said to be inferior because of the use of chemicals and because the tomato tastes “artificial”.

Genetic Engineering

Generally, genetic engineering is the way to isolate, characterize and change genetic material. These principles have been used especially in agriculture in the past decades. An example would be gene-manipulated corn which was made resistant to herbicides by transferring genomes from bacteria to maize. This has allowed farmers to use herbicides on whole acres instead of targeting every small unwanted plant growing on the cultivated field.

The Flavr Savr Tomato

We explored the genetically modified tomato, called Flavr Savr which was first commercialized in 1994. This tomato was longer-lasting than the average tomato because of its manipulated genetic code. A “normal” tomato ripens more rapidly and its cell membrane decays more quickly which together lead to the softening and then finally to the uselessness of the fruit. In developing countries like India this leads to huge food wastage because tomatoes are difficult to transport. Therefore, American scientists from Calgene Inc. including Roger Salquist (former CEO, Calgene); Bill Hiatt (Researcher in Development); and Belinda Martineau (Principal Scientist) had a closer look at the ripening of the tomatoes. After eight years of research and costs of 20 million dollars they discovered that an enzyme called Polygalacturonase (PG) was key to fruit softening because it has the ability to dissolve the

cell-wall pectin. By introducing the “antisense”, a reverse-orientation copy of the gene, the formation of PG could drastically be reduced and with that losses decreased. The antisense was taken out of one tomato and then put into the treated one, forming Flavr Savr. In May, 1994 these tomatoes were brought to the market. Big demand was expected and actually remained. Despite this Flavr Savr was not as successful as expected because costs of production were too high and supermarkets like Sainsburys and Safeway did not want to sell genetically modified organisms.

Interview

Our interview partner was Mike Neale, an English chemist who has many years’ experience of GMOs. From 1986 to 2013 he worked for Syngenta in Basel. Before that he was employed by the government in the regulatory division in England. His work included accessing the safety of chemicals and later collecting data for regulators. We got in contact through Kevin because Mike is a friend of Kevin’s family.

The interview developed as follows:

- How is the tomato modified exactly?

Mike: I believe that a specific sequence in the DNA was taken out of the bacteria in a sterile environment and then inserted into a tomato.

- What does the modification change?

Mike: The modification changes the DNA sequence to stop producing a certain enzyme.

- Why did the GM tomato disappear from the market so soon? Was it down to financial problems or was it because the public lost faith in GMOs?

Mike: I think that Monsanto could not be bothered with producing this Flavr Savr tomato because they thought that their reputation may be tarnished.

And they were not ready to give out this tomato because they had bigger plans for their company, for example their pesticide resistant corn and maize.

- Were there health hazards for humans?

Mike: Not that I am aware of. There were perceived health hazards but the tomato was not on the market long enough to notice any of them.

- Did they have negative influence on the environment?

Mike: No. They may have even benefited the environment because fewer chemicals were used to ripen the tomato and to preserve it.

- Do you think that GMOs are a positive addition to our planet?

Mike: Yes, they will help to feed the world as the population grows. How else could one do this?

- Why do you think many people are skeptical of GMOs?

Mike: Fear is a big factor. The friends of the earth are very much against GMOs. There is also a lack of information and even though GMOs go through rigorous testing, regulators are only human too.

- Do you think the long-lasting tomato was useful or necessary?

Mike: Well, it was a gimmick but it was an important step for science to take. It was more of a “cosmetic pimp up” for the tomato rather than anything of any use.

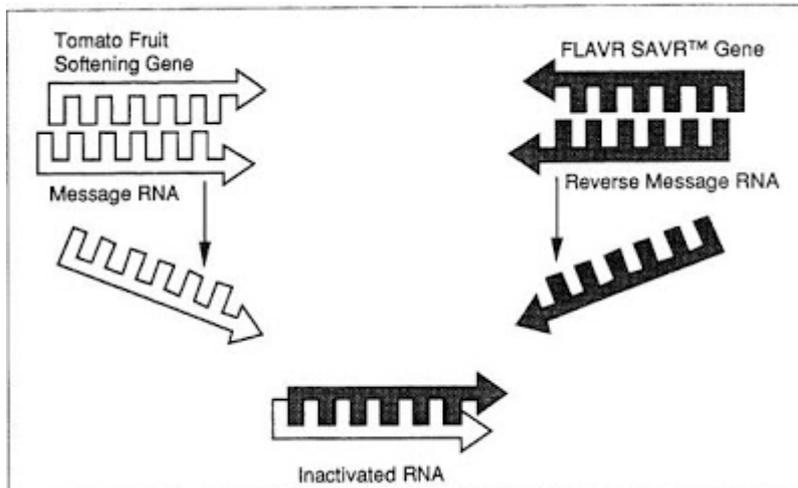
- Do you think certain qualities are lost once an organism is genetically modified?

Mike: Change will always occur even just through breeding something may be gained or lost but only time can tell.

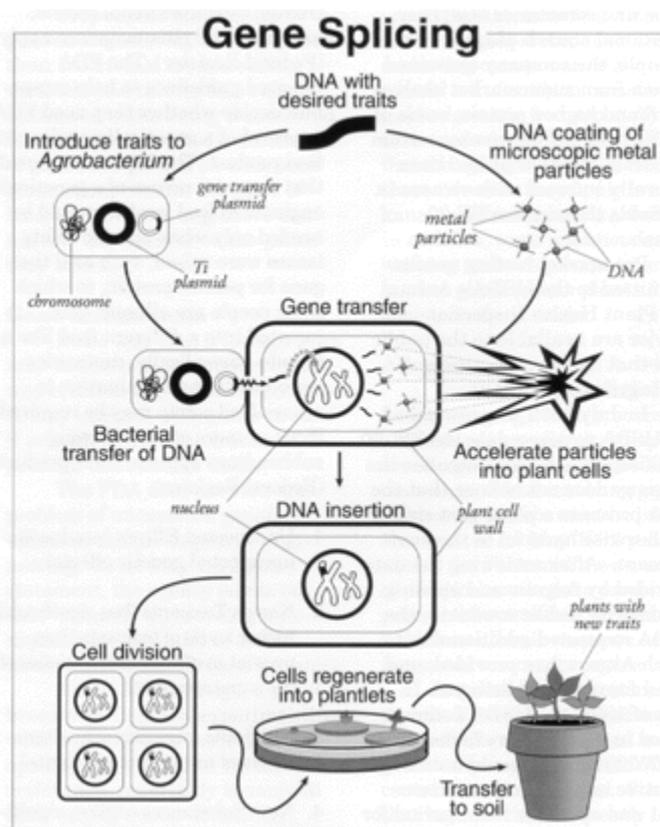
- Is it expensive to produce GMOs?

Mike: It was and still is I guess. Companies pour loads of money into projects like this.

Pictures of Labs and Procedures

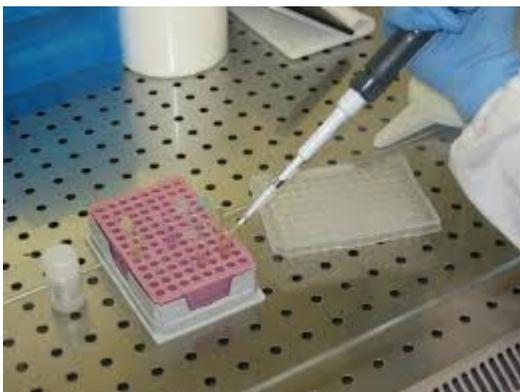
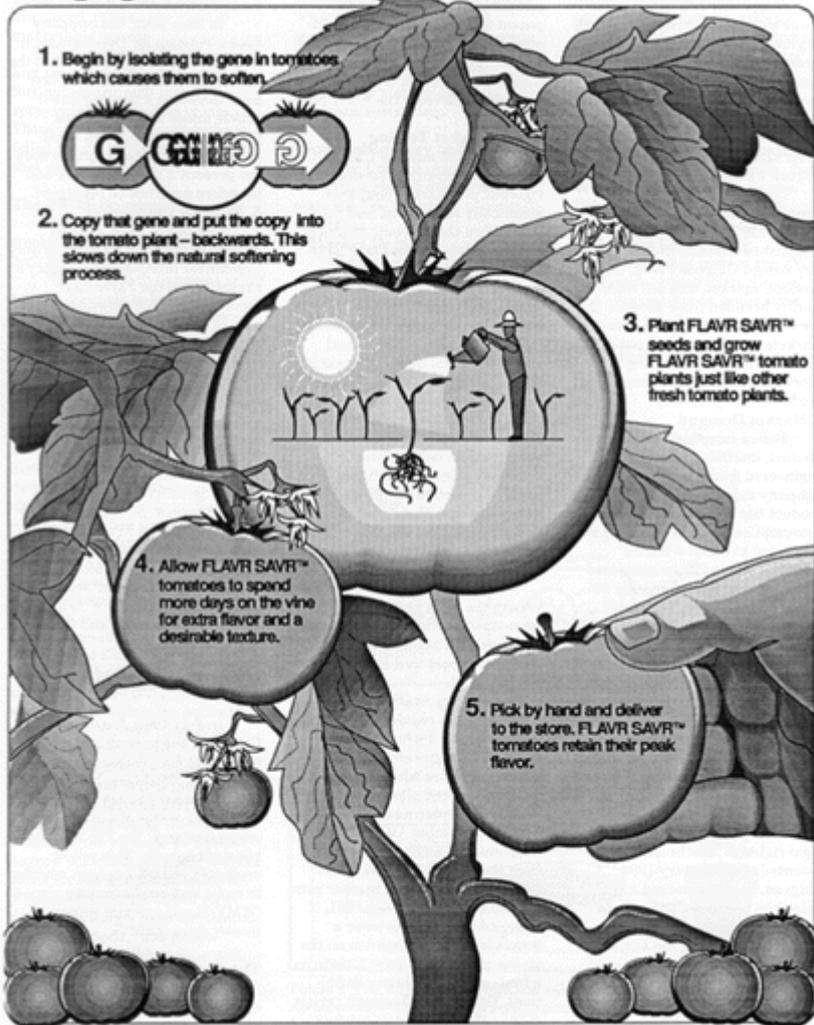


Method Used to Modify the Tomato



Description of Gene Splicing

Bringing the FLAVR SAVR™ tomato to consumers



DNA sample being made



Tomatoes in a GMO laboratory

Discussion

With the introduction of the Flavr Savr tomato the first step into the commercial use of genetic engineering was made. The Flavr Savre became a symbol of GMO's progress. GMOs had disadvantages and advantages: we discuss both starting with the advantages.

One of the advantages of these tomatoes was that they were predecessors of the whole GMO market and served as an example for industry and for consumers. The tomato was said to taste better because of the fact that it was allowed to ripen fully in nature and was not picked green and artificially induced to become ripe later. The amount of wastage was reduced drastically too because the GM tomatoes did not go off as fast as normal tomatoes. This was a vital point because the population of the world is constantly growing and wastage is something we can no longer afford.

Disadvantages were hard to come by but there are a few. Some people did not like the idea of a tomato which was produced in a laboratory rather than in a field. The project was also very expensive and although they sold a large amount, in the end the product was a failure: from the 20 million dollars that was invested no profit was made. Very importantly GM tomatoes developed resistance to antibiotics which meant that any bacterial illnesses contracted by the GM tomatoes could not be treated.

In conclusion we argue that the GM tomato Flavr Savr was a good idea but it was not useful. Flavr Savr tomatoes were also directed at the consumer market instead of targeting farmers directly. Directly targeting farmers is what Monsanto did with their corn: if they had turned to the public it would not have been a sustainable business plan. When Monsanto bought Calgene they had no further interest in the project which was a shame because with a bit of work this product could have been a very successful GMO. We do not believe that it was a dangerous product for the environment or for the people who ate it. However, this topic is controversial and in part depends on opinions because Flavr Savr was not consumed by the public for long enough to study if they could be any adverse effects.

Short Summary

In our project about the Flavr Savr tomato we have found out many interesting facts about the GMO world and it is safe to say that we have all been able to formulate opinions on the matter. The Flavr Savr: we think is a very good idea that one can manipulate an organism so that it stops producing an enzyme that makes it go soft. It is amazing and although ultimately the plan failed we think that the tomato was a very important step into the future of producing food. We have learnt a lot: we are now more conscious about the food we eat knowing that

there are other plant products that are genetically modified and without which our nutritional choices would be the poorer.

Quellen

- <http://de.wikipedia.org/wiki/Flavr-Savr-Tomate>
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