

Are Seedless Fruits, Super Sweet Corn and Purple Sweet Potatoes Genetically Modified? Myths and Facts about Genetically Modified Food

Seedless fruits, like grapes, oranges and watermelons, are commonly found in the local market. Spitting out seeds is socially embarrassing and not enjoyable, therefore, we are welcome to eat fruits without seeds, or at least to a manageable number of seeds. Apart from seedless fruits, crops such as super sweet corn and purple sweet potatoes are also in more demand, as many consumers consider them tasting better or looking more attractive than some other varieties in the market. Although there are rumours that these seedless varieties produced from genetically modified organisms (GMOs), no current seedless crops are GM food.

Simply speaking, GM food is any food that is or is derived from a GMO, in which the genetic material has been modified using genetic engineering techniques. The modification which aims to introduce desirable characteristics to the organisms can either be done by alteration of existing genes or insertion of new genes. Let's take a look into the myths and facts about seedless fruits.

Are seedless fruits all genetically modified?

In fact, seedless fruits have existed long before the application of genetic modification. The mechanism underlying the production of seedless fruits is to develop the fruits without fertilisation, or with abortion of the embryos after fertilisation, leaving traces of aborted seeds inside the fruits. Pollination may or may not be required in these plants in order to induce the synthesis of hormones that cause the ovary wall to expand and develop fruit. In fact, seedless fruits occur naturally, such as bananas, pineapples, avocados and some varieties of grapes. Seedless fruits can also be induced by cultural practices (see Figure 1). One example is the application of plant growth regulators which can induce fruit development without fertilisation, therefore forming fruits without seeds, such as seedless citrus fruits and some varieties of grapes. Another example is the production of seedless watermelon by cross breeding, to form the watermelon which does not produce viable reproductive cells and therefore cannot form seeds properly (see Figure 2).

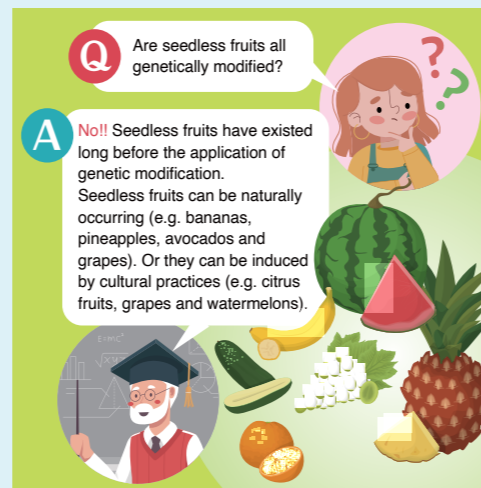


Figure 1: Rumours about seedless fruits being all genetically modified.

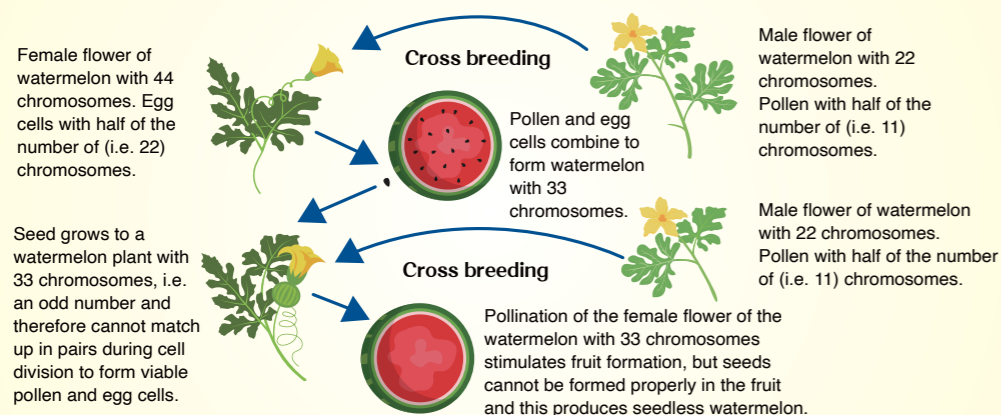


Figure 2: The production of seedless watermelon by cross breeding.

Watermelon generally contains 22 chromosomes but can be induced to double the number of chromosomes to 44 by cultural practices. To produce seedless watermelon, pollen from the male flower of the watermelon with 22 chromosomes is used to fertilise the female flower of the watermelon with 44 chromosomes (the pollen and egg cells of the watermelons contain half of the number of chromosomes, i.e. 11 and 22 chromosomes, respectively). Combining the pollen and egg cells during cross breeding produces fruit with 33 chromosomes, which is an odd number and cannot match up in pairs.

Since the pairing up of chromosomes is essential during the cell division process to form reproductive cells, failure of the pairing up process leads to the formation of reproductive cells which cannot function properly. Therefore, after pollination of the watermelon, seeds cannot be formed properly in the fruit and this produces seedless watermelon.

Are super sweet corn and purple sweet potatoes genetically modified?

Super sweet corn is a commonly seen variety of corn which has a higher sugar content and tastes sweeter. There are also the purple sweet potatoes with a vibrant purple colour due to the presence of the natural pigments called anthocyanins, and therefore they look very different from the sweet potatoes with yellow or orange flesh. In addition, new varieties of grapes with a "cotton candy" like taste, or a long shape like a finger have emerged on the local market in recent years. Though less commonly found in the local market, you may have seen pictures of beefsteak tomatoes which are one of the largest varieties of cultivated tomatoes and have a huge fruit size.

These characteristics are the results of conventional cross breeding of closely related individuals and selection of varieties with the desirable properties. In fact, humans began to selectively breed plants with desired characteristics (e.g. high yield) and cross breed them to create new varieties for a very long history. The production of the aforementioned varieties does not involve the genetic engineering techniques and they are not GM crops (see Figure 3).

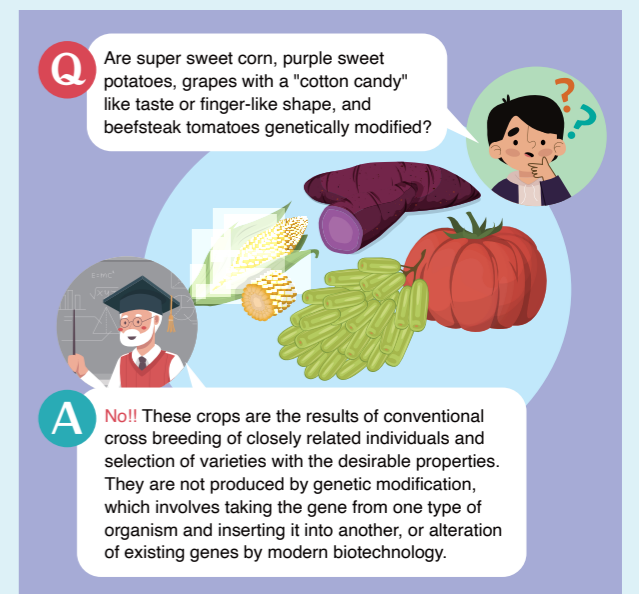


Figure 3: Rumours about super sweet corn, purple sweet potatoes, grapes with a "cotton candy" like taste or finger-like shape, and beefsteak tomatoes being genetically modified.

What kinds of crops are genetically modified?

To be honest, we cannot determine if a crop is GM solely from its external appearance or taste. Biochemical analyses are commonly employed to identify GM ingredients in foods, but these testing methods required sophisticated analytical techniques or a specific targeted testing kit.

Currently, the most common GM crops include soybean, corn and canola. The majority of the GM crops are developed for particular benefits such as tolerance to herbicides and resistance to insects, though some GM crops with improved nutrition value and other characteristics which target the consumers have been developed.

If you are interested in knowing more about what types of crops have GM counterparts and the characteristics introduced, you may refer to the Food and Agriculture Organization of the United Nations (FAO) GM Foods Platform. It is an online platform maintained by FAO with information on the results of food safety assessments of GM foods. Further information about the types of GM crops which have already gone through food safety assessments in different countries or places and their characteristics introduced is available in this database (<https://www.fao.org/food/food-safety-quality/gm-foods-platform/browse-information-by/commodity/en/>).

For more information on GM food, please visit our website

http://www.cfs.gov.hk/english/programme/programme_gmf/programme_gmf.html