

# GM Food Newsletter

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## Unauthorised GM rice found in supermarket in Mainland China

In August 2014, it was reported in the media that a type of unauthorised genetically modified (GM) rice namely "Bt-63" was detected in rice samples collected from a supermarket in mainland China. This has raised concerns from the public since rice is considered an inseparable part of the daily diet by the majority of people in Hong Kong and mainland China. So what exactly is GM rice Bt-63? We will discuss GM rice in more details in this issue of the GM Food Newsletter.

## Global rice consumption and GM rice

According to the International Rice Research Institute (IRRI), rice is a staple for nearly half of the world's seven billion people. Currently, more than 90% of this rice is consumed in Asia but it is understood that demand for rice is rising in other parts of the world, for example in Africa demand is rising by almost 20% a year. It has been estimated that if the world's population grows by 1 billion, we will require an additional 100 million tonnes of rice to avoid the problem of starvation. Given the fact that the world's population will continue to grow in the foreseeable future, it is important for us to find ways to improve rice yields to meet the increasing demand for rice. GM rice, such as those developed for insect resistance, has been proposed by some people as one of the potential solutions.

## GM Rice Bt-63

GM rice Bt-63, officially known as Bt Shanyou 63, was developed by Huazhong Agricultural University. It is a type of genetically modified rice that has been incorporated with the *cry1Ab* and *cry1Ac* genes from the soil bacterium *Bacillus thuringiensis*. Within the GM rice crop, these newly introduced genes encode for insecticidal proteins known as Bt proteins (Bt stands for the bacterium *Bacillus thuringiensis*) which are toxic to rice pests of the order Lepidoptera (e.g. stem borers) and therefore make the crop resistant to attacks by this group of insects. While these Bt proteins are effective against their target insects, they are completely harmless to humans as only the target insects possess the target receptors for these Bt proteins.



Stem borer - a major rice pest

In fact, Bt proteins are not exclusively found in GM rice. Various GM crops have genes incorporated in them to encode for different Bt proteins (see Table 1. Also for details of discussions of Bt proteins, please see the December 2013 issue of GM Food Newsletter: [http://www.cfs.gov.hk/english/programme/programme\\_gmf/programme\\_gmf\\_newsletter\\_issue\\_20.html](http://www.cfs.gov.hk/english/programme/programme_gmf/programme_gmf_newsletter_issue_20.html)). After going through years of evaluation, a Safety Certificate for Production (生產應用安全證書) was issued to Bt Shanyou 63 in 2009 by the relevant mainland China authority (valid from 17 August 2009 to 17 August 2014 with approval for extension pending). However, commercialised cultivation is yet to be approved and therefore it is still illegal for the trade to sell such GM rice in supermarkets in mainland China at the moment.

## GM Rice Huahui-1

Apart from Bt Shanyou 63, Huahui-1 is another type of GM rice that has also obtained a Safety Certificate for Production in mainland China (valid from 17 August 2009 to 17 August 2014 with approval for extension pending). Similar to Bt Shanyou 63, Huahui-1 is also modified to resist Lepidoptera rice pests. Like Bt Shanyou 63, Huahui-1 has not yet been approved for commercialised cultivation either.

Table 1. Examples of GM crops incorporated with genes that encode for Bt proteins

GM Crops	Bt Proteins produced	Target Pests
Bt Shanyou 63, Huahui-1	Cry1Ab and Cry1Ac	Rice pests of the order Lepidoptera (e.g. stem borers)
GM Corn MON810	Cry1Ab	European Corn Borer
GM CPB Resistant Potato	Cry3A	Colorado Potato Beetle
GM Soya bean	Cry1Ac, Cry1F	Soya bean looper, velvetbean caterpillar, fall armyworm, tobacco budworm

## Golden Rice

Golden Rice is another example of a new variety of rice developed using modern genetic modification technology. The current version of Golden Rice was developed using genes from corn and a common soil microorganism. Unlike Bt Shanyou 63, Golden Rice is not modified for insect resistance but for enhanced nutrient content. The yellow or golden, as its name suggests, colour of Golden Rice is due to its enhanced content of  $\beta$ -carotene which is converted to vitamin A in the body when consumed. Some studies have shown that eating about one cup a day of Golden Rice could provide half of an adult's vitamin A daily needs. It is therefore seen by many people as having the potential to solve the vitamin A deficiency problem (Box 1) which is not uncommonly seen in the population of some developing countries.



Golden Rice

However, it should be noted that at the moment, Golden Rice is still under development and evaluation. It has not yet passed safety assessments by national food safety authorities and therefore has not been proven safe for human consumption yet.

Box 1

### Vitamin A Deficiency (VAD)

Vitamin A is an essential nutrient needed for our visual system, growth, development as well as maintaining a healthy immune system. It is especially important for pregnant women and young children. Lack of vitamin A in the diet can lead to VAD which can damage the immune system and decrease our body's ability to resist infections. VAD can also impact on our vision and result in night blindness or even permanent total blindness if left untreated.

## Conclusion

The Bt Shanyou 63 and Huahui-1 are two varieties of GM rice modified for pest resistance. They have been evaluated by the relevant authorities of mainland China and obtained the Safety Certificate for Production. However, they are yet to be approved for commercial cultivation. On the other hand, Golden Rice which is genetically modified for its enhanced nutrient content ( $\beta$ -carotene) is yet to pass safety assessments by national food safety authorities.

Under current legislation, all food for sale in Hong Kong must be fit for human consumption and this applies equally to both conventional and GM foods. The Centre for Food Safety (CFS) will remain vigilant and continue to monitor the safety of all foods, including rice, sold in the local market to ensure they meet the required safety standards.

For more information on GM food, please visit our website

[http://www.cfs.gov.hk/english/programme/programme\\_gmf/programme\\_gmf.html](http://www.cfs.gov.hk/english/programme/programme_gmf/programme_gmf.html)

