

Thème 2 – Enjeux planétaires contemporains
2-B – La plante domestiquée

Super-rice defies triple whammy of stresses

Question 1. Sum up this article.

Question 2. Arcadia explains that Super rice “plays a critical role in sustaining future generations”. Do you agree?

For the first time, a single strain of genetically modified rice has been developed to handle drought¹, salty soils and a lack of fertiliser. The aim is to "climate-proof" rice farms in Asia and Africa so that they can grow the same variety each year, regardless of the conditions.

- 5 Crops have previously been developed that cope with individual environmental stresses such as drought and salt, but this rice is the first to counter three at once.

"Considering the impact of climate instability on crop yields² and food security, trait combinations such as our triple-stack technology will play a critical role in sustaining future generations," says Eric Rey, president of Arcadia Biosciences in Davis, California, which developed the rice.

The salt-tolerance gene came from *Arabidopsis thaliana* (Fig. 1), a type of cress widely used in plant research, and the drought-tolerance gene came from a common soil bacterium called *Agrobacterium tumefaciens* (Fig. 2). The gene that enables the plant to use nitrogen more efficiently, so that it does not need fertiliser, came from barley.

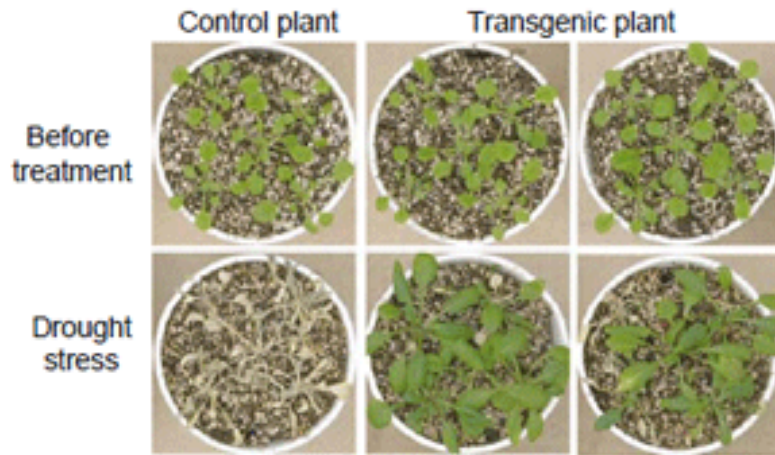
- 15 According to the International Rice Research Institute, drought affects 23 million hectares of rice in south and South-East Asia and costs \$13 billion a year globally. In some states in India, it can reduce rice yields by 40 per cent. Salt is similarly problematic. According to the Food and Agriculture Organization of the United Nations, about 800 million hectares of land are affected by salt, costing agriculture an estimated \$1 billion per year.

- 20 On 21 February, Arcadia announced it had completed two years of trials on the rice. The company compared the performance of its super rice with that of the unmodified parent rice in different environments. Under a range of drought conditions, the yield of the modified rice was 12 to 17 per cent greater than that of the parent rice. With low levels of fertiliser, its yield was 13 to 18 per cent greater. When exposed to both of these stresses at once, the yield of the modified rice was 15 per cent more than that of the unmodified rice. Trials using a range of salty conditions showed the altered rice had a yield that was as much as 42 per cent more than the parent rice.

Adapted from Andy Coghlan, February 2014, <http://www.newscientist.com>

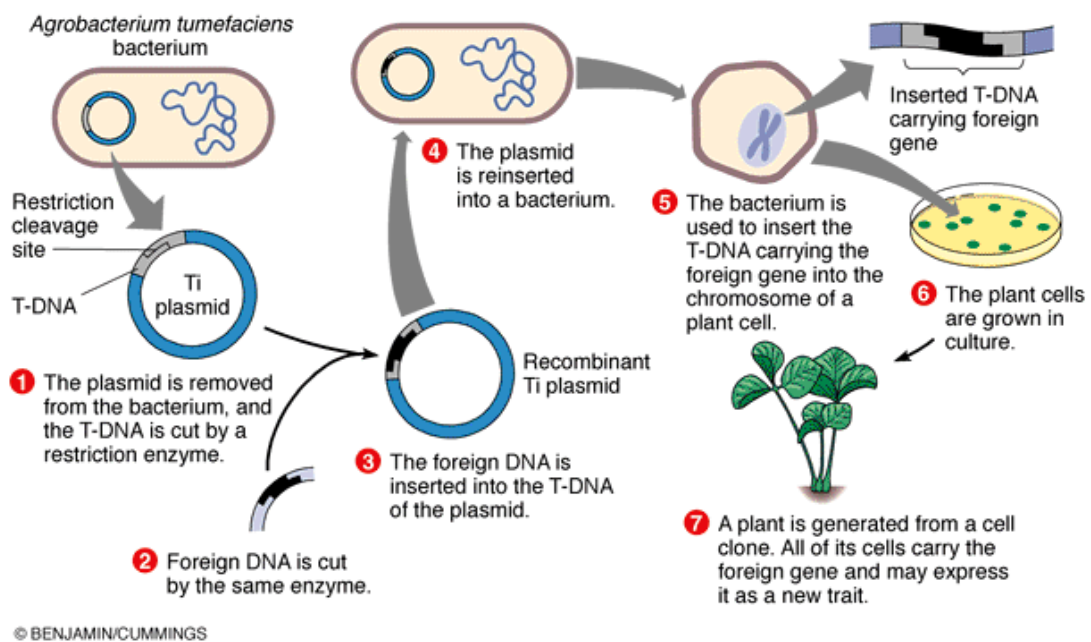
- 30 1: A long period of abnormally low rainfall, especially one that adversely affects growing or living conditions.
2: Produce of cultivated plants

Fig. 1. Drought stress tolerance of transgenic *Arabidopsis*



https://www.jircas.affrc.go.jp/english/publication/highlights/2007/2007_07.html

Fig.2. Illustration of the process of using *Agrobacterium* for genetic engineering



http://sphweb.bumc.bu.edu/otlt/MPH-Modules/PH/GMOs/mobile_pages/GMOs3.html