Solving Food problems through genome editing

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The Food problem is one of the biggest problems which our society is facing today. According to a report in 2018, there are more than 820 million hungry people in the world, with one in nine people facing hunger. Moreover, nine million people die each year from hunger-related causes. As the population grows, this issue is expected to become increasingly important. There are some causes of the food problem.

The first reason for the food problem is the strong dependence of the yields of crops on the weather. Each Crop has a suitable weather condition to grow up sufficiently. For example, it is known that when the temperature is high and the sunshine hours are short, wheat will not yield much. This means that wheat only grows under suitable weather conditions with cool temperatures and stable sunny weather. In this way, the cultivation of crops is greatly affected by the local weather, which creates places where it is hard to get food.

Secondly, crop diseases accelerate the food problem. Many crops are lost due to diseases and it leads to the lack of crops. It was reported that 36 percent of the crop in the world were lost by plant diseases. Then, preventing crop diseases helps us to solve the food problem and it is required to make the hardy variety.

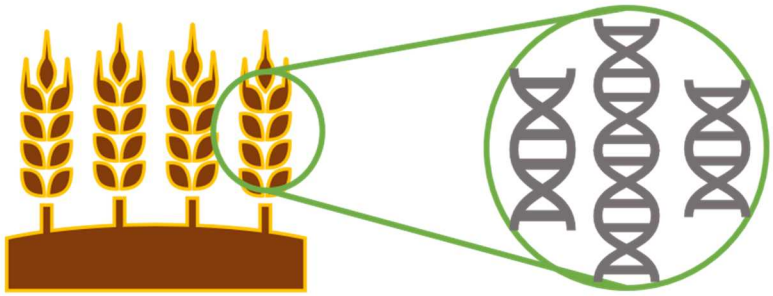
Finally, poverty also causes the food problem. Poverty leads the starvation due to a lack of money to buy food, but it is related to the weather dependence of the yields and crop diseases. If you live in places where the weather is not suitable for the cultivation of crops like deserts, the crops become more valuable and more expensive. The crop diseases cause the same result. Then, poor households under these situations cannot buy food and this leads the starvation.

Until now, we have shown some reasons why the food problem occurs. We can conclude that it is crucial for solving the food problem to improve crops to be less dependent on weather conditions and stronger for diseases. Next, we discuss genome editing, which can improve the property of crops, and argue why the genome editing of crops can solve the food problem.

In 2012, revolutionary technology was invented for genome editing [1]. The basic idea of genome editing technology is to cut off a specific part of the entire genetic information of an organism called

a genome. The organism has a mechanism to correct the broken DNA. However, in rare cases, mutations occur due to the occurrence of errors when repairing. Genome editing technology takes advantage of this phenomenon to create mutations at targeted locations. This means that we can promote mutations associated with desired properties such as the hardiness of plants. This is different from naturally occurring mutations and artificial mutations. The research in [1] showed that a kind of genome editing called CRISPR/Cas9 can implement mutations at desired locations much efficiently.

This technology has the potential to solve the food problem. Firstly, genome editing enables us to make crops that are less susceptible to weather conditions and strong for plant diseases. We will not have to worry about the dependence of amounts of crops on weather conditions and plant diseases. Genome editing has the potential ability for solving the food problem by improving the properties of plants.



Secondly, genome editing stabilizes the price of crops. The price of crops is strongly affected by weather conditions and so on, but genome editing enables us to cultivate crops that are less susceptible to them. For this reason, the price of crops is stabilized. We can also expect that the price of crops becomes low. There is an example of rice. Genome editing has been used to mutate genes involved in the number of ear branches and the size of rice grains, resulting in the development of rice plants with more ears and larger grains. The more you harvest, the cheaper crops get. Thus, the food problem caused by poverty can be solved by genome editing.

Finally, we note that genome editing is safe. We have been breeding crops since before genome editing was realized. Breeding is the process of cultivating crops with genes that are useful to humans by generating mutations. This process has a long history and is safe. Genome editing involves genes directly, but the essential process is the same as breeding, which is trying to generate mutations. The only difference is that genome editing is much more efficient than breeding because

genome editing targets a single piece of DNA to promote mutation. Then, genome editing does not appear to have any safety issues.

From above, the application of genome editing will lead to more land which we can use for growing crops and lower the price of crops. In addition, there will be no problems with safety. Thus, the food problem can be solved by genome editing.

The research in genome editing has been developed rapidly. However, the food problem is becoming more and more pressing due to population growth. We expect further progress in genome editing.

Reference

[1] M. Jinek *et al.*, “A Programmable Dual-RNA–Guided DNA Endonuclease in Adaptive Bacterial Immun0ity”, Science Vol. 337, Issue 6096, pp. 816-821