

Check your understanding



1 What is the difference between genetically modified organisms and altering cell activity through bioactive molecules?

Answer When geneticists create GMOs, they alter the organism's genome. That means new (foreign) DNA is integrated into the genome and stays in future generations. Applying bioactive molecules doesn't change the genome. It rather changes the way natural genes are expressed inside the cell. Another difference is that producing GMOs takes a lot more time and is expensive.

2 What did the reduced fluorescence in the third part of our experiment show us?

Answer We sprayed the leaves of the fluorescing plant with a nanocarrier/RNA combination that was supposed to interfere with the expression of the fluorescent protein. The reduced fluorescence showed that we were able to silence the expression of this gene.

3 In our experiment, we silenced the gene expressing fluorescence, not a very important trait. Can you think how gene silencing can be useful?

Answer Gene silencing can be targeted at pests – they eat the leaves, ingest the bioactive molecule and die because it silences a vital gene in their cells. Gene silencing can lead to the reduction of allergen production, thus reducing food allergies. It can also reduce the production of irritants (like the ones in onions) so that you don't cry when cutting them.

4 Resistance to drought and diseases are two examples we gave for positive traits desired in crops. Can you think of any others?

Answer Resistance to pests, delayed ripening, bioremediation, easier reproduction, improved photosynthesis, improved growth, etc.



Can a spray make our crops better?

TEACHER'S KEY
UPPER READING LEVEL

5

Do you support GM crops? Why or why not? Consider how they have helped to address global hunger as well as the risks they present to humans and the environment. Discuss this in small groups in class, or do some research online!

Answer

Pros: GMO crops may have more nutrients; be more resistant to weather, diseases, and pests, leading to less pesticide use; grow faster; and be more resilient, resulting in a greater agricultural yield and more affordable food.

Cons: GMO crops can cause allergic reactions, since they contain DNA for another organism; may increase antibiotic resistance, because often GMOs include genes resistant to antibiotics; carry a risk of crossing over to wild plants, causing a loss of biodiversity; and have a negative impact on insects, which are an important part of the ecosystem.

Why is there fluorescence in the first two microscopic images?
And why is there hardly any fluorescence on the third image?

Answer

The genetically modified plant is designed to express the yellow fluorescent protein. If we spray it with only a carrier (first image) it will still glow, because there is nothing to stop the expression of the gene that causes fluorescence. If we spray it with only the interfering RNA (second image) it will still glow, because the RNA can't enter the cells on its own. The combination, however, shows no fluorescence because the RNA can enter the cell via the nanocarrier and interfere with the expression of the gene responsible for the fluorescence.