Changing Corn Traits

How breeding and biotechnology affect inherited traits

MS-LS4-5 "Obtain, evaluate, and communicate information about how technological advances have changed the way humans influence the inheritance of desired traits in organisms. (SEP: 8; DCI: LS4.B, CCC: Cause/Effect) Alignment may include MS-ETS1-1..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each way people change which traits crop plants may inherit. Circle one reason scientists must test whether a new trait works as intended.

From Saved Seeds to Bt Corn

1. A farmer walks through a cornfield and finds a few plants with less insect damage than their neighbors. Long before gene editing, farmers could save seeds from plants with useful traits and grow their offspring. By repeatedly choosing and crossing plants over many generations, people increased the chance that the next crop would inherit those traits. This method, called selective breeding, works with genetic differences already present in plants that can breed together. A healthy-looking plant is not proof of an inherited advantage, though. Weather or luck might explain its condition.

2. In cornfields, caterpillars eat leaves and ears. Scientists developed Bt corn by adding a gene from a soil bacterium to corn DNA. The gene gives the corn instructions for making a protein that harms certain insect larvae when they eat the plant. When a Bt corn plant produces seeds, its offspring can inherit that added gene. Unlike selective breeding, this technology can introduce a useful gene from an organism that cannot breed with corn. It may reduce the need for insecticide sprays against those pests, but it does not protect corn from every insect.

3. A new tool, gene editing, can make a targeted change to an organism's DNA without necessarily adding a gene from another species. Scientists might use it to change a plant gene linked to a desired trait. But a lab result is only a start. To judge whether a new corn variety helps farmers, researchers compare it with other corn in field tests and check whether the trait passes to offspring. They also watch for effects on other organisms. Insects can evolve resistance to Bt protein, especially if the same control method is used repeatedly.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why is finding a corn plant with little insect damage not enough evidence that saving its seeds will produce less-damaged offspring?

2. How did the technology used to make Bt corn change where a desired trait could come from, compared with selective breeding?

3. Explain how adding the bacterial gene can affect both a Bt corn plant and its offspring.

4. A seed seller claims, “Bt corn will stop all insect damage, so farmers never need to check it again.” Use the passage to evaluate this claim.

3 YOUR TURN

Your own words

A bean grower finds one plant unharmed by beetles while nearby plants have holes. A lab also offers beans with a newly added resistance gene, but those plants have only been tested in a greenhouse. Choose a method to develop beetle-resistant beans, explain what offspring could inherit, and describe a test and one reason the first result might mislead you.

ANSWER KEY

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GRADES 6-8 · MS-LS4-5

PART 1 · READ AND MARK

Underline each way people change which traits crop plants may inherit. Circle one reason scientists must test whether a new trait works as intended. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why is finding a corn plant with little insect damage not enough evidence that saving its seeds will produce less-damaged offspring?	**Weather or luck might explain the plant's condition. Its offspring must be checked to see whether they inherit the trait.**
2	How did the technology used to make Bt corn change where a desired trait could come from, compared with selective breeding?	**Selective breeding uses differences in plants that can breed together. Bt technology introduced a gene from a bacterium that cannot breed with corn.**
3	Explain how adding the bacterial gene can affect both a Bt corn plant and its offspring.	**The gene lets the plant make a protein that harms certain insect larvae. Offspring can inherit the added gene through seeds.**
4	A seed seller claims, “Bt corn will stop all insect damage, so farmers never need to check it again.” Use the passage to evaluate this claim.	**The claim is not supported. Bt corn does not protect against every insect, and insects can evolve resistance to Bt protein.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would save seeds from the unharmed bean plant and grow them beside seeds from damaged plants. If its offspring inherit a useful trait, they may suffer less beetle damage. I would compare the groups under the same conditions for several generations. The first plant might have escaped damage by chance rather than carrying an inherited trait.

Accept either method if the response explains how the chosen method could affect offspring and proposes a test. The reason for caution should fit the method, such as chance in the field or limited greenhouse evidence.