Flowers Take Hold

Use evidence to explain the spread of flowering plants.

BOT.2.4 "Research information to develop, produce, and communicate a scientifically justifiable argument for the rapid amplification and success of angiosperm compared to other plant divisions."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline two observations that show angiosperm expansion, then circle three traits or processes that could help explain it.

How Flowering Plants Spread

1. Imagine a Cretaceous floodplain where conifers tower over low flowering plants. Fossils show that flowering plants appeared by the Early Cretaceous, about 130 million years ago, and became far more varied during the Cretaceous. Pollen grains preserved in rock reveal new flowering plant lineages; later fossil leaves show a wider range of shapes and veins. Today, angiosperms make up the great majority of living plant species. These observations document expansion and lasting diversity, but fossils alone cannot tell us which traits caused that rise. Comparing reproductive and dispersal systems provides testable explanations for their success.

2. A pine, a gymnosperm, usually relies on wind to carry pollen to ovules on cone scales. Many angiosperms also use wind, but flowers can attract insects with nectar or scent. As insects visit flowers, they may transfer pollen between plants of the same species, even when those plants are scattered. This targeted delivery can increase the chance of fertilization where wind pollination is inefficient. Angiosperms also produce seeds enclosed in fruits. A berry eaten by a bird may carry seeds well beyond its parent, allowing descendants to establish in new sites. Neither method guarantees success in every habitat.

3. In angiosperms, double fertilization usually forms an embryo and endosperm, tissue that nourishes the embryo. Because endosperm generally develops after fertilization, the plant may avoid investing as much food in ovules that never become seeds. In many gymnosperms, food tissue begins to develop before fertilization. Such differences could help flowering plants reproduce efficiently, especially where resources are limited. Yet conifers still dominate some cold or dry forests, and wind pollination works well for dense stands. The fossil record documents angiosperm diversification; comparisons of living plants suggest mechanisms. Together, these lines of evidence support a stronger argument than any single trait.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do the fossil pollen and leaves together support a claim that angiosperms diversified during the Cretaceous? What can they not establish?

2. Why might insect pollination help scattered angiosperms reproduce more effectively than wind-pollinated pines?

3. How could a bird eating a berry help angiosperms spread into new sites?

4. How might the timing of food-tissue development give angiosperms an advantage over many gymnosperms when resources are limited?

3 YOUR TURN

Your own words

A river floods an open patch beside a conifer forest. Insects visit wildflowers there, and fruit-eating birds cross the patch. Write one paragraph predicting which plant division is more likely to spread there over several generations. Support your claim with two different mechanisms from the passage and fossil evidence for a broader pattern, then state one limitation of your argument.

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PART 1 · READ AND MARK

Underline two observations that show angiosperm expansion, then circle three traits or processes that could help explain it. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do the fossil pollen and leaves together support a claim that angiosperms diversified during the Cretaceous? What can they not establish?	**Pollen reveals new flowering plant lineages, and later leaves show more varied forms. These fossils document diversification but do not establish which traits caused it.**
2	Why might insect pollination help scattered angiosperms reproduce more effectively than wind-pollinated pines?	**Insects visiting flowers can carry pollen between scattered plants of the same species. Wind delivery to pine ovules may be less effective when plants are scattered.**
3	How could a bird eating a berry help angiosperms spread into new sites?	**The bird may carry seeds away from the parent plant, allowing descendants to establish elsewhere.**
4	How might the timing of food-tissue development give angiosperms an advantage over many gymnosperms when resources are limited?	**Angiosperm endosperm generally develops after fertilization, so less food may be invested in ovules that never become seeds. In many gymnosperms, food tissue begins developing before fertilization.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Angiosperms are more likely than conifers to spread across this patch over several generations. Insects may transfer pollen between scattered flowers, while birds can carry seeds from eaten fruits to new ground. Fossil pollen and leaves show that flowering plants diversified during the Cretaceous, so this prediction fits a broader pattern of expansion. However, the fossils do not prove that insects or birds caused that increase, and conifers might still succeed if conditions favor them. Counting seedlings of each group over time would make the local prediction easier to test.

Accept other well-supported predictions if students connect two distinct mechanisms to the conditions in the patch and distinguish fossil evidence of diversification from evidence of its cause.