

Questions 22-32 are based on the following passage.

This passage is adapted from Elsa Youngsteadt, “Decoding a Flower’s Message.” ©2012 by Sigma Xi, The Scientific Research Society.

Texas gourd vines unfurl their large, flared blossoms in the dim hours before sunrise. Until they close at noon, their yellow petals and mild, squashy
 Line aroma attract bees that gather nectar and shuttle
 5 pollen from flower to flower. But “when you advertise [to pollinators], you advertise in an open communication network,” says chemical ecologist Ian Baldwin of the Max Planck Institute for Chemical Ecology in Germany. “You attract not just
 10 the good guys, but you also attract the bad guys.” For a Texas gourd plant, striped cucumber beetles are among the very bad guys. They chew up pollen and petals, defecate in the flowers and transmit the dreaded bacterial wilt disease, an infection that can
 15 reduce an entire plant to a heap of collapsed tissue in mere days.

In one recent study, Nina Theis and Lynn Adler took on the specific problem of the Texas gourd—how to attract enough pollinators but not
 20 too many beetles. The Texas gourd vine’s main pollinators are honey bees and specialized squash bees, which respond to its floral scent. The aroma includes 10 compounds, but the most abundant—and the only one that lures squash bees
 25 into traps—is 1,4-dimethoxybenzene.

Intuition suggests that more of that aroma should be even more appealing to bees. “We have this assumption that a really fragrant flower is going to attract a lot of pollinators,” says Theis, a chemical
 30 ecologist at Elms College in Chicopee, Massachusetts. But, she adds, that idea hasn’t really been tested—and extra scent could well call in more beetles, too. To find out, she and Adler planted 168 Texas gourd vines in an Iowa field and,
 35 throughout the August flowering season, made half the plants more fragrant by tucking dimethoxybenzene-treated swabs deep inside their flowers. Each treated flower emitted about 45 times more fragrance than a normal one; the other half of
 40 the plants got swabs without fragrance.

The researchers also wanted to know whether extra beetles would impose a double cost by both damaging flowers and deterring bees, which might not bother to visit (and pollinate) a flower laden with
 45 other insects and their feces. So every half hour throughout the experiments, the team plucked all the beetles off of half the fragrance-enhanced flowers and half the control flowers, allowing bees to respond to the blossoms with and without interference by
 50 beetles.

Finally, they pollinated by hand half of the female flowers in each of the four combinations of fragrance and beetles. Hand-pollinated flowers should develop into fruits with the maximum number of seeds,
 55 providing a benchmark to see whether the fragrance-related activities of bees and beetles resulted in reduced pollination.

“It was very labor intensive,” says Theis. “We would be out there at four in the morning, three
 60 in the morning, to try and set up before these flowers open.” As soon as they did, the team spent the next several hours walking from flower to flower, observing each for two-minute intervals “and writing down everything we saw.”

What they saw was double the normal number of beetles on fragrance-enhanced blossoms. Pollinators, to their surprise, did not prefer the highly scented flowers. Squash bees were indifferent, and honey bees visited enhanced flowers less often
 70 than normal ones. Theis thinks the bees were repelled not by the fragrance itself, but by the abundance of beetles: The data showed that the more beetles on a flower, the less likely a honey bee was to visit it.

That added up to less reproduction for fragrance-enhanced flowers. Gourds that developed from those blossoms weighed 9 percent less and had, on average, 20 fewer seeds than those from normal flowers. Hand pollination didn’t rescue the seed set,
 80 indicating that beetles damaged flowers directly—regardless of whether they also repelled pollinators. (Hand pollination did rescue fruit weight, a hard-to-interpret result that suggests that lost bee visits did somehow harm fruit development.)

85 The new results provide a reason that Texas gourd plants never evolved to produce a stronger scent: “If you really ramp up the odor, you don’t get more pollinators, but you can really get ripped apart by your enemies,” says Rob Raguso, a chemical ecologist
90 at Cornell University who was not involved in the Texas gourd study.

22

The primary purpose of the passage is to

- A) discuss the assumptions and reasoning behind a theory.
- B) describe the aim, method, and results of an experiment.
- C) present and analyze conflicting data about a phenomenon.
- D) show the innovative nature of a procedure used in a study.

23

As presented in the passage, Theis and Adler’s research primarily relied on which type of evidence?

- A) Direct observation
- B) Historical data
- C) Expert testimony
- D) Random sampling

24

Which statement about striped cucumber beetles can most reasonably be inferred from the passage?

- A) They feed primarily on Texas gourd plants.
- B) They are less attracted to dimethoxybenzene than honey bees are.
- C) They experience only minor negative effects as a result of carrying bacterial wilt disease.
- D) They are attracted to the same compound in Texas gourd scent that squash bees are.

25

The author indicates that it seems initially plausible that Texas gourd plants could attract more pollinators if they

- A) did not have aromatic flowers.
- B) targeted insects other than bees.
- C) increased their floral scent.
- D) emitted more varied fragrant compounds.