tpo_34_passage_1

Many plants-one or more species of at least 68 different families-can secrete nectar even when they have no blossoms, because they bear extrafloral nectaries (structures that produce nectar) on stems, leaves, leaf stems, or other structures. These plants usually occur where ants are abundant, most in the tropics but some in temperate areas. Among those of northeastern North America are various plums, cherries, roses, hawthorns, poplars, and oaks. Like floral nectar, extrafloral nectar consists mainly of water with a high content of dissolved sugars and, in some plants, small amounts of amino acids. The extrafloral nectaries of some plants are known to attract ants and other insects, but the evolutionary history of most plants with these nectaries is unknown. Nevertheless, most ecologists believe that all extrafloral nectaries attract insects that will defend the plant. Ants are probably the most frequent and certainly the most persistent defenders of plants. Since the highly active worker ants require a great deal of energy, plants exploit this need by providing extrafloral nectar that supplies ants with abundant energy. To return this favor, ants guard the nectaries, driving away or killing intruding insects that might compete with ants for nectar. Many of these intruders are herbivorous and would eat the leaves of the plants. Biologists once thought that secretion of extrafloral nectar has some purely internal physiological function, and that ants provide no benefit whatsoever to the plants that secrete it. This view and the opposing "protectionist" hypothesis that ants defend plants had been disputed for over a hundred years when, in 1910, a skeptical William Morton Wheeler commented on the controversy. He called for proof of the protectionist view: that visitations of the ants confer protection on the plants and that in the absence of the insects a much greater number would perish or fail to produce flowers or seeds than when the insects are present. That we now have an abundance of the proof that was called for was established when Barbara Bentley reviewed the relevant evidence in 1977, and since then many more observations and experiments have provided still further proof that ants benefit plants. One example shows how ants attracted to extrafloral nectaries protect morning glories against attacking insects. The principal insect enemies of the North American morning glory feed mainly on its flowers or fruits rather than its leaves. Grasshoppers feeding on flowers indirectly block pollination and the production of seeds by destroying the corolla or the stigma, which receives the pollen grains and on which the pollen germinates. Without their colorful corolla, flowers do not attract pollinators and are not fertilized. An adult grasshopper can consume a large corolla, about 2.5 inches long, in an hour. Caterpillars and seed beetles affect seed production directly. Caterpillars devour the ovaries, where the seeds are produced, and seed beetle larvae eat seeds as they burrow in developing fruits. Extrafloral nectaries at the base of each sepal attract several kinds of insects, but 96 percent of them are ants, several different species of them. When buds are still small, less than a quarter of an inch long, the sepal nectaries are already present and producing nectar. They continue to do so as the flower develops and while the fruit matures. Observations leave little doubt that ants protect morning glory flowers and fruits from the combined enemy force of grasshoppers, caterpillars, and seed beetles. Bentley compared the seed production of six plants that grew where there were no ants with that of seventeen plants that were occupied by ants. Unprotected plants bore only 45 seeds per plant, but plants occupied by ants bore 211 seeds per plant. Although ants are not big enough to kill or seriously injure grasshoppers, they drive them away by nipping at their feet. Seed beetles are more vulnerable because they are much smaller than grasshoppers. The ants prey on the adult beetles, disturb females as they lay their eggs on developing fruits, and eat many of the eggs they do manage to lay.

question 1

According to paragraph 1, floral nectar and extrafloral nectar are alike in that

A they are likely to be produced by the same plants

B they basically consist of the same chemical components

C they attract only insects that will defend the plant

D they are produced by the same parts of the plant

question 2

To say that ants are "persistent" defenders of plants means that

A they defend plants against a wide variety of threats

B they continue to defend plants for as long as the plants are threatened

C they are successful defenders of plants

D they are easily observable defenders of plants

question 3

What can be inferred from paragraph 2 about the ants that are attracted to the extrafloral nectaries?

A They do not eat the leaves of the plants that produce extrafloral nectar.

B They live almost entirely on extrafloral nectar.

C They spend most of their energy guarding extrafloral nectaries.

D They frequently fight among themselves over extrafloral nectar.

question 4

According to paragraph 3, what was the position of the opponents of the "protectionist" hypothesis?

A Extrafloral nectar provides plants with a direct defense against attack by insects.

B Ants substantially benefit plants that secrete extrafloral nectar.

C The secretion of extrafloral nectar plays a role in the plant's internal functioning.

D Ants visit plants that secrete extrafloral nectar as often as they visit plants that do not.

question 5

Which of the sentences below best expresses the essential information in the highlighted sentence in the passage? Incorrect choices change the meaning in important ways or leave out essential information.

A We now have ample proof that ants benefit plants.

B Barbara Bentley has called for additional proof that ants benefit plants.

C In 1977 Barbara Bentley conducted research that proved that all prior studies were wrong.

D Proof that ants benefit plants will require many more observations and experiments.

question 6

According to paragraph 4, what effect does the destruction of the corolla have on plants?

A It leaves the seeds exposed and unprotected.

B It prevents the stigma from developing.

C It keeps pollen grains from attaching properly.

D It prevents the flower from attracting pollinators.

question 7

What role does paragraph 5 play in the passage?

A It offers various kinds of evidence for the protectionist view.

B It presents the study that first proved that ants benefit plants.

C It explains how insects find sources of nectar.

D It presents information that partly contradicts the protectionist view.

question 8

According to paragraph 5, what did Bentley's comparative study show?

A Many more plants grew in places where ants were present than where they were absent.

B The ants preferred plants with low seed production to plants with high seed production.

C The plants occupied by ants produced many more seeds than those that were not occupied by ants.

D The plants that grew in places without ants were much smaller and weaker than those that grew in places where ants were present.

question 9

According to paragraph 5, ants defend morning glory plants from seed beetles in each of the following ways EXCEPT

A driving adult beetles off the plants by nipping at their feet

B catching and eating adult beetles

C eating beetle eggs they find on developing fruits

D making it difficult for beetles to lay eggs on developing fruits

question 10

Look at the four squares [ ] that indicate where the following sentence could be added to the passage.

Many plants-one or more species of at least 68 different families-can secrete nectar even when they have no blossoms, because they bear extrafloral nectaries (structures that produce nectar) on stems, leaves, leaf stems, or other structures. These plants usually occur where ants are abundant, most in the tropics but some in temperate areas. Among those of northeastern North America are various plums, cherries, roses, hawthorns, poplars, and oaks. Like floral nectar, extrafloral nectar consists mainly of water with a high content of dissolved sugars and, in some plants, small amounts of amino acids. The extrafloral nectaries of some plants are known to attract ants and other insects, but the evolutionary history of most plants with these nectaries is unknown. Nevertheless, most ecologists believe that all extrafloral nectaries attract insects that will defend the plant. Ants are probably the most frequent and certainly the most persistent defenders of plants. [] Since the highly active worker ants require a great deal of energy, plants exploit this need by providing extrafloral nectar that supplies ants with abundant energy. [] To return this favor, ants guard the nectaries, driving away or killing intruding insects that might compete with ants for nectar. [] Many of these intruders are herbivorous and would eat the leaves of the plants. [] Biologists once thought that secretion of extrafloral nectar has some purely internal physiological function, and that ants provide no benefit whatsoever to the plants that secrete it. This view and the opposing "protectionist" hypothesis that ants defend plants had been disputed for over a hundred years when, in 1910, a skeptical William Morton Wheeler commented on the controversy. He called for proof of the protectionist view: that visitations of the ants confer protection on the plants and that in the absence of the insects a much greater number would perish or fail to produce flowers or seeds than when the insects are present. That we now have an abundance of the proof that was called for was established when Barbara Bentley reviewed the relevant evidence in 1977, and since then many more observations and experiments have provided still further proof that ants benefit plants. One example shows how ants attracted to extrafloral nectaries protect morning glories against attacking insects. The principal insect enemies of the North American morning glory feed mainly on its flowers or fruits rather than its leaves. Grasshoppers feeding on flowers indirectly block pollination and the production of seeds by destroying the corolla or the stigma, which receives the pollen grains and on which the pollen germinates. Without their colorful corolla, flowers do not attract pollinators and are not fertilized. An adult grasshopper can consume a large corolla, about 2.5 inches long, in an hour. Caterpillars and seed beetles affect seed production directly. Caterpillars devour the ovaries, where the seeds are produced, and seed beetle larvae eat seeds as they burrow in developing fruits. Extrafloral nectaries at the base of each sepal attract several kinds of insects, but 96 percent of them are ants, several different species of them. When buds are still small, less than a quarter of an inch long, the sepal nectaries are already present and producing nectar. They continue to do so as the flower develops and while the fruit matures. Observations leave little doubt that ants protect morning glory flowers and fruits from the combined enemy force of grasshoppers, caterpillars, and seed beetles. Bentley compared the seed production of six plants that grew where there were no ants with that of seventeen plants that were occupied by ants. Unprotected plants bore only 45 seeds per plant, but plants occupied by ants bore 211 seeds per plant. Although ants are not big enough to kill or seriously injure grasshoppers, they drive them away by nipping at their feet. Seed beetles are more vulnerable because they are much smaller than grasshoppers. The ants prey on the adult beetles, disturb females as they lay their eggs on developing fruits, and eat many of the eggs they do manage to lay.