

Question 1-11 are based on the following passage.

This passage is excerpted from Yan Zhao, “Aspirin-Like Compound Primes Plant Defense Against Pathogens,” © 2014 by Yan Zhao.

Willow trees are well-known sources of salicylic acid, and for thousands of years, humans have extracted the compound from the tree’s bark to alleviate minor pain, fever, and inflammation.

Line 5 Now, salicylic acid may also offer relief to crop plants by priming their defenses against a microbial menace known as “potato purple top phytoplasma.” Outbreaks of the cell-wall-less bacterium in the fertile Columbia Basin region of the Pacific Northwest in 2002 and subsequent years inflicted
10 severe yield and quality losses on potato crops. The Agricultural Research Service identified an insect accomplice—the beet leafhopper, which transmits the phytoplasma to plants while feeding.

Carefully timed insecticide applications can deter such
15 feeding. But once infected, a plant cannot be cured. Now, a promising lead has emerged. An ARS-University of Maryland team has found evidence that pretreating tomato plants, a relative of potato, with salicylic acid can prevent phytoplasma infections or at least diminish their severity.
20 Treating crops with salicylic acid to help them fend off bacteria, fungi, and viruses isn’t new, but there are no published studies demonstrating its potential in preventing diseases caused by phytoplasmas.

Wei Wu, a visiting scientist, investigated salicylic acid’s
25 effects, together with molecular biologist Yan Zhao and others at ARS’s Molecular Plant Pathology Laboratory in Beltsville, Maryland. “This work reached new frontiers by demonstrating that plants could be beneficially treated even before they become infected and by quantifying gene activity
30 underlying salicylic acid’s preventive role,” according to Robert E. Davis, the lab’s research leader.

For the study, published in the July 2012 *Annals of Applied Biology*, the team applied two salicylic acid treatments to potted tomato seedlings. The first application
35 was via a spray solution 4 weeks after the seedlings were planted. The second was via a root drench 2 days before phytoplasma-infected scions were grafted onto the plants’ stems to induce disease. A control group of plants was not treated.

40 In addition to visually inspecting the plants for disease symptoms, the team analyzed leaf samples for the phytoplasma’s unique DNA fingerprint, which turned up in 94 percent of samples from untreated plants but in only 47 percent of treated ones. Moreover, symptoms in the treated
45 group were far milder than in untreated plants. In fact, analysis of mildly infected treated plants revealed phytoplasma levels 300 times below those of untreated plants, meaning that the salicylic acid treatment must have suppressed pathogen multiplication. Significantly, the

50 remaining 53 percent of treated plants were symptom- and pathogen-free 40 days after exposure to the infected scions.

Researchers credit salicylic acid with triggering “systemic acquired resistance,” a state of general readiness against microbial or insect attack. Using quantitative polymerase
55 chain reaction procedures, the team also identified three regulatory defense genes whose activity was higher in treated plants than in untreated ones.

Why salicylic acid had this effect isn’t known. Other questions remain as well, including how treated plants will
60 fare under field conditions. Nonetheless, such investigations could set the stage for providing growers of potato, tomato, and other susceptible crops some insurance against phytoplasmas in outbreak-prone regions.

1

- Over the course of the passage, the main focus shifts from
- A) an overview of all research done to date on a scientific topic to the future opportunities for studying this topic.
 - B) background information needed to understand an experiment to a description of the experiment itself.
 - C) a summary of the experiments leading to a particular scientific discovery to a philosophical discussion of the discovery’s implications.
 - D) a description of a scientific inquiry to a description of the pivotal moments in solving a mystery related to that inquiry.

2

- The author mentions willow trees in order to
- A) argue that only natural compounds should be used to treat infections that have their basis in nature.
 - B) show that natural objects known for their aesthetic qualities can also be sources of medicine.
 - C) use a colorful and familiar metaphor to draw the reader into a dense scientific passage.
 - D) introduce the topic by showing that salicylic acid has been helpful to humans before.

3

- The word “Now” (line 5) primarily serves to
- A) highlight the recent nature of the scientific findings.
 - B) interject a note of informality into a formal passage.
 - C) suggest that humans no longer perform the activity mentioned in the first paragraph.
 - D) create a sense of urgency in the passage.

4

“Promising” (line 16) most closely means

- A) partially encouraging.
- B) extremely supportive.
- C) potentially valuable.
- D) generally positive.

5

It can be reasonably inferred that the study discussed in the passage was

- A) an extension of other studies that examined the effects of phytoplasma-based diseases on crops.
- B) the only study to examine the links between potatoes and tomatoes.
- C) a continuation of the researchers’ previous work on bacteria, fungi, and viruses.
- D) one of several studies conducted over the years about the effects of salicylic acid on crops.

6

Which choice provides the best evidence for the answer to the previous question?

- A) lines 15–16 (“Now . . . emerged”)
- B) lines 16–19 (“An ARS . . . severity”)
- C) lines 20–23 (“Treating . . . phytoplasmas”)
- D) lines 24–27 (“Wei Wu . . . Maryland”)

7

The main purpose of the sixth paragraph (lines 40–51) is to

- A) describe the steps in an experiment.
- B) present the results of an experiment.
- C) explain why an experiment was conducted.
- D) argue that an experiment should be reproduced.

8

The author uses the information in lines 49–51 mainly to support the assertion that

- A) salicylic acid may help prevent certain crop diseases in vulnerable regions.
- B) further research into the mechanisms of salicylic acid is needed.
- C) salicylic acid can permanently eradicate phytoplasma-based infections in crops.
- D) future experiments require control groups to draw accurate conclusions.

9

The author implies that research into the uses of salicylic acid to prevent phytoplasma infections

- A) needs to occur in a variety of settings before definitive claims can be made.
- B) has demonstrated how to prevent diseases caused by phytoplasma on farms.
- C) has shown how the acid works to prevent phytoplasma-related diseases.
- D) must be further tested in a laboratory setting before being used by the general public.

10

Which choice provides the best evidence for the answer to the previous question?

- A) lines 52–54 (“Researchers . . . attack”)
- B) lines 54–57 (“Using . . . ones”)
- C) lines 58–60 (“Other . . . conditions”)
- D) lines 60–63 (“Nonetheless . . . regions”)

11

Which choice best describes the author’s attitude towards potential uses of salicylic acid in agriculture?

- A) Unreservedly enthusiastic
- B) Generally wary
- C) Cautiously optimistic
- D) Resolutely opposed