

Coffee rust

Why do the British drink so much tea? The answer to this question can be traced back, unexpectedly, to a humble fungus, *hemileia vastatrix*, which attacks the leaves of coffee plants causing a disease popularly known as coffee rust. The appearance of this disease was first reported in the British colony of Ceylon (now Sri Lanka) in 1867. Over the next twenty years, coffee production in Asia and Africa was virtually wiped out. Following a period of severe economic and social upheaval, planters in British colonies shifted to planting tea, and the British were gradually transformed into a nation of tea drinkers.



Under British rule, the island of Ceylon was stripped of its forests to turn over every available acre to coffee production. By the 1870s, Ceylon was exporting nearly 100 million pounds of coffee a year, much of it to England. This empire, however, was swiftly devastated by the arrival of the coffee rust fungus. The rust organism can be recognized by the presence of yellowish powdery lesions on the undersides of the leaves of the coffee plant. Occasionally, green shoots and even the green coffee berries can be infected. The infected leaves drop prematurely, leaving long expanses of bare twigs. This defoliation causes shoots and roots to starve and consequently to die back, reducing the number of nodes on which coffee can be produced the following season.

The rust fungus is dispersed by both wind and rain. By observing the patterns of infection on individual leaves, it can be deduced that splashing rain is the most important means of local, or short-range dispersal. Dispersal over wider areas is primarily by wind, although insects such as flies and wasps may also play a small part. How the fungus first made its way from its native Ethiopia to Ceylon is unknown, but human intervention seems to be the only plausible explanation. Insects as carriers can be ruled out, and it is doubtful whether the fungus could have been blown so far.

The coffee growers probably hoped at first that the disease would disappear as quickly and unaccountably as it had begun. By 1879, however, it was clear that it was not going away, and the Ceylon government made an appeal for someone to be sent to help. The British government responded by sending Harry Marshall Ward, whose brief was to investigate the coffee rust phenomenon and hopefully come up with a cure.

Ward recommended that to effectively protect the plant from invasion, the leaves should be treated with a coating of fungicide (lime-sulfur). Unfortunately; in the case of the Ceylon plantations, the rust epidemic was too well established for this protective measure to save the coffee trees. He also pointed out the risks of intensive monoculture. The continuous planting of coffee trees over the island, without even the benefit of windbreaks, had created a perfect environment for a fungus epidemic to spread. Despite Ward's warning, when the coffee trees were replaced with tea bushes,

they were planted at the same density. It was only by good fortune that no similar fungus arrived to invade the tea bushes and that improved fungicides were soon available to protect the crop.

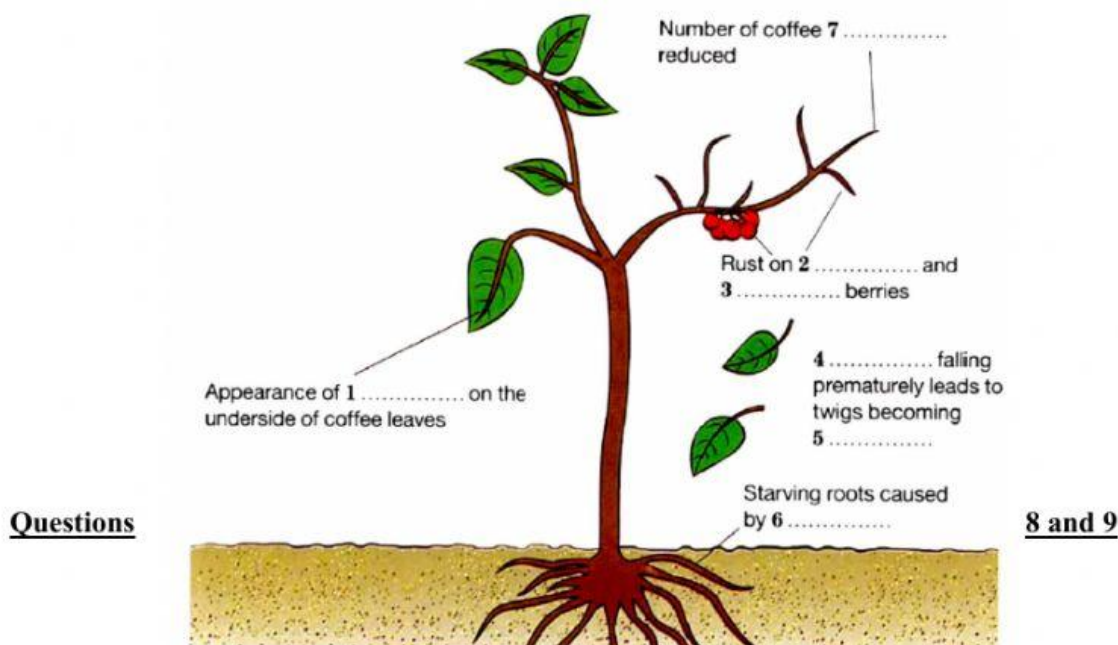
With the destruction of the coffee plantations in Ceylon and subsequent arrival of coffee rust in Java and Sumatra, the world's coffee production shifted to the Americas. Plantations were swiftly established in the tropical highlands of Brazil, Colombia and Central America. Brazil soon became the world's major coffee supplier, closely followed by Colombia.

Coffee rust was successfully excluded from the Americas for over 100 years by careful quarantine measures. However, in 1970, the fungus was discovered in Brazil, again probably brought in accidentally by humans. Once the barrier of the oceans had been breached, wind dispersal came into play. Infected trees were isolated by creating an 80 km coffeeless 'safety zone' around the infected area, but within eighteen months the rust had jumped the gap in the direction of the prevailing winds. Today, the fungus has spread throughout all the coffee-growing areas, including Colombia and the countries of Central America

Fungicide applications are now part of the routine production practices on coffee plantations, despite the expense for small growers. Good cultural management taking into account the density of planting and the climate, is also paramount. Rust-resistant strains of coffee have also been developed but the crop is of poorer quality. Unless a truly rust-resistant variety with more desirable genetic traits can be produced, coffee rust will have to be managed as a continuous epidemic on a perennial crop.

Questions 1-7

Complete the diagram below. Choose NO MORE THAN THREE WORDS from the passage for each answer.



Choose the correct letter, A, B, C, or D

8. The most important means of long-range dispersal is

- A. rain
- B. wind
- C. wasps
- D. flies

9. Coffee rust spread easily in Ceylon

- A. due to the density of the coffee trees.
- D. due to the windbreaks.
- C. because the fungicide didn't work.
- D. because it was well established.

Questions 10-14

Complete each sentence with the correct ending, A-G.

(Note: there are more endings than you need.)

10. The move of coffee production to the Americas was triggered by

11. Before 1970, American plantations were protected through

12. Attempts in the Americas to isolate the infected trees failed due to

13. The coffee trees now have to be protected continuously by

14. In the management of the coffee crops, it is also important to consider

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- A the density of planting and the climate.
 - B the application of fungicide.
 - C the coffee rust devastation in Ceylon.
 - D the increased demand for coffee in Europe.
 - E careful quarantine measures.
 - F the genetic traits of the coffee tree.
 - G the prevailing winds
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