



Maryland Department of Agriculture

Office of Resource Conservation

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Nutrient Management Program

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Nitrogen Fixation 101 (Course #1583_2 CEU's)

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- 1) Nitrogen is important for all living creatures because it is a component of:
 - a) fats
 - b) carbohydrates
 - c) water
 - d) proteins

- 2) Rhizobia are actively fixing nitrogen when the interior color of the nodules is:
 - a) green
 - b) pink
 - c) white
 - d) blue

- 3) Which statement best describes the relationship between Rhizobia bacteria and legume roots?
 - a) Rhizobia are partitioned off by cell walls in a kind of "jail."
 - b) Rhizobia have open access to the entire legume root system.
 - c) Rhizobia live outside but close to the legume plant's roots.
 - d) Rhizobia have open access to the entire legume plant.

- 4) The benefit to Rhizobia bacteria of living within the legume root nodules is:
 - a) rhizobia are protected from predators
 - b) rhizobia are supplied with carbon compounds (sucrose) for energy
 - c) rhizobia are supplied with available nitrogen
 - d) none of the above

- 5) How does a legume plant benefit from Rhizobia living within the legume root nodules?
 - a) Rhizobia supply an available form of nitrogen to the legume plant.
 - b) Rhizobia convert organic N to inorganic N.
 - c) Rhizobia protect legumes from pathogenic organisms.
 - d) Rhizobia supply carbon compounds (sucrose) to the legume plant.

- 6) Inoculation of legume seeds with Rhizobia will likely lead to enhanced legume growth if:
 - a) the field has had a long history of producing the legume
 - b) the center (interior) of nodules is white in color
 - c) water supply is limiting growth
 - d) the soil is water-saturated

- 7) Biological nitrogen fixation:
- a) allows legumes to more efficiently use water
 - b) is energetically costly to legumes
 - c) enhances photosynthesis in legumes
 - d) is of no benefit to the plant; it's just a biological curiosity
- 8) Which of the following statement is false?
- a) Oxygen increases respiration of Rhizobia in the nodule.
 - b) Oxygen blocks the binding site needed to fix nitrogen on the nitrogenase enzyme.
 - c) Leghemoglobin scavenges oxygen within the nodule.
 - d) Nitrogen fixation helps legumes produce protein-rich feed.
- 9) As nitrogen fertility in the soil increases, nitrogen fixation by Rhizobia within legume roots:
- a) increases slightly
 - b) increases greatly
 - c) decreases
 - d) remains the same
- 10) The relationship between leguminous plants and Rhizobia bacteria is best described as:
- a) associative
 - b) photorophic
 - c) interspecific competition
 - d) symbiotic

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