



# Maryland Department of Agriculture

Office of Resource Conservation  
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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