Compositions and Methods for Increasing Plant Yield

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BACKGROUND

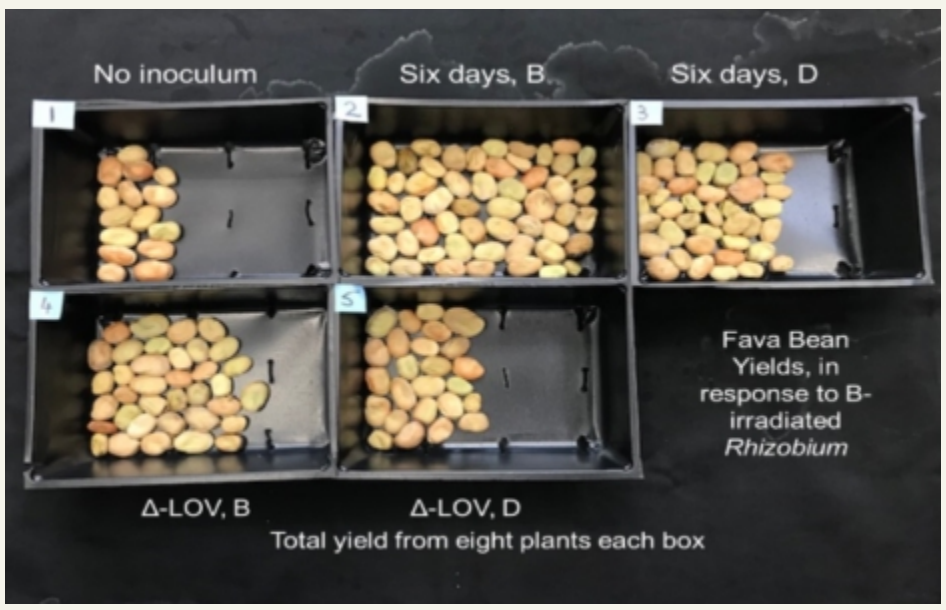
Nitrogen-fixing bacteria can transform atmospheric nitrogen into fixed nitrogen, compounds which are usable by plants. For example, *Rhizobium* is a symbiotic nitrogen-fixing bacteria that invade the root hairs of host plants where they multiply and stimulate the formation of root nodules. Within these nodules, nitrogen-fixing bacteria convert free nitrogen into compounds such as ammonia, which the host plant uses for its development.

Legume plants such as peas and soybeans can be infected by nitrogen-fixing bacteria for such benefits. Legume crops are extremely valuable in the United States and around the world. A modest increase in crop yield could increase profits by billions of dollars. Thus, there is an interest and need to improve methods of cultivating crops and increase crop yield. A UC Santa Cruz researcher, in collaboration with The Carnegie Institution for Science, has developed improved approaches for infecting legume plants with nitrogen-fixing bacteria.

TECHNOLOGY DESCRIPTION

The approaches involve treating nitrogen-fixing bacteria populations with light before infecting legume plants with them. This improves the bacteria population's capacity to infect legume plants. The legume plants are then inoculated with the light-activated bacteria, potentially via an irrigation system. Some approaches involve delivering the light-activated population after the legume plant has already developed a root with a functional root hair.

These approaches improve legume plant yield in several ways, such as by improving seed yield.



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INVENTORS

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OTHER INFORMATION

KEYWORDS

legume, nitrogen fixation, rhizobium, inoculation, photoreceptor, LOV domain, BLUF domain, PYP domain, rhodopsin, PAS domain, leghemoglobin, LED light, blue light, drip irrigation, fertilization, bacteria, nodule, light-activation, crop, agriculture

CATEGORIZED AS

- **Agriculture & Animal Science**
  - Other
- **Materials & Chemicals**
  - Agricultural

RELATED CASES

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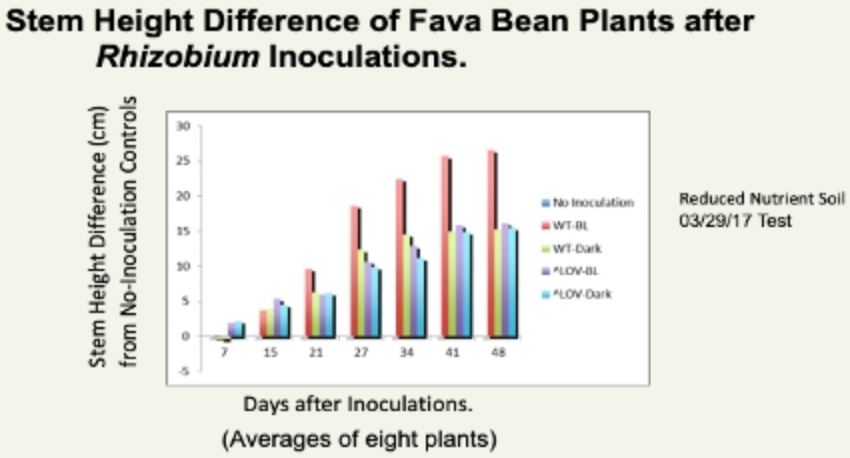

Fig. 2. Blue-light irradiation of *Rhizobium leguminosarum* cells prior to inoculation into soil six days after planting fava-bean seeds accelerates elongation growth, plotted as differences from non-inoculated controls. ^LOV, bacterial photoreceptor inactivated.

APPLICATIONS

- legume agriculture
- optogenetics
- nitrogen fixation

ADVANTAGES

- improves crop yield
- improves fertilization
- increases nodule formation
- increases seed yield
- increases stem height
- increases bean yield
- increases chlorophyll production
- readily adaptable

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