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Improving plant growth through increasing nitrogen-use efficiency

What is this research about?

Nitrogen is an important element required for plant growth and productivity. Nitrogen fertilizers are used to help crops grow. The plants do not use most of the nitrogen fertilizer because they do not have efficient ways to use it. The nitrogen that isn't used by the plants causes nitrogen pollution; therefore there is a need for crops with better nitrogen-use efficiency (NUE). The following research is about a gene that could play a role to improve NUE. The gene's name is OsENOD93-1 and is related to genes whose expression is increased during nodule formation in leguminous plants.

How can you use this research?

Food industry and agricultural organizations as well as any companies involved in **horticulture** can benefit from this research because it shows a method of developing better crop lines with increased biomass formation and seed production. It also provides a method of reducing the amount of nitrogen that does not get used by the plant, therefore reducing the amount of nitrogen pollution, and providing a more efficient use of nitrogen fertilizer.

What you need to know:

Structures, called nodules, on the roots of plants, take nitrogen from the air and absorb it so that plants can use nitrogen to grow. This process of nodule formation is triggered by genes in the plant, and one of these, of unknown function, is similar to the gene used in these studies. An overexpression of the OsENOD93-1 gene in the transgenic rice plants soiled to an increase in plant biomass and seed yield under differing nitrogen conditions. This shows that the gene causes the plant to absorb more of the nitrate and to produce more seeds and grow bigger.

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What did the researchers do?

The researcher compared the growth of wild and transgenic rice plants under different nitrogen conditions (low, medium, and high). The wild type plants already have a OsENOD93-1 gene, whose exact function is not known. The transgenic plants received an additional copy of the OsENOD93-1 gene, to see how the over-expression of the gene effects the plant's growth and seed production. Plant growth was measured by the plant's shoot and root biomass. These plants were grown under different nitrogen conditions, including one in which the amount limited growth and also where different nitrogen sources were used. Biochemical analyses were performed and the resulting data analyzed.

About the Researchers:

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What did the researchers find?

In the high-nitrogen condition, the plants show the most growth, seed production, and reduction in nitrate concentration in the soil. Plants in the medium- and low-nitrogen conditions display a reduced growth, seed production, and reduction in nitrate concentration in the plants. The OsENOD93-1 plants having the extra expression of the gene had an increase in shoot dry biomass and seed production. Further, they showed an increase in the levels of amino acids, which are components of proteins, compared to the wild type plants, which might help explain the enhanced growth and production.

Keywords:

Amino acids, gene treatments, nitrogen induction, nitrogen limitation, nitrogen reduction, transcriptional profiling, plant growth.

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