



## METHOD FOR IMPROVING PLANT GROWTH WITH A TRNA SYNTHETASE GENE THAT ACTIVATES TOR

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**WARF: P230137US02**

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### The Invention

A UW-Madison researcher has discovered that overexpressing a cytosolic asparaginyl tRNA synthetase called NARS1 in plants improves plant growth and yields. The inventor discovered that the kinase Target of Rapamycin (TOR) in plants is strongly activated by NARS1, a cytosolic asparaginyl tRNA synthetase encoded by the *Arabidopsis thaliana* genome. His discovery that NARS1 activates TOR represents the first proposed amino acid sensor in plants. Since he discovered that NARS1 activates TOR, and TOR is known to affect growth and metabolism, he decided to test whether constitutively overexpressing NARS1 in plants would impact plant growth and development. He used two distantly-related model species, *Arabidopsis thaliana* (closely related to mustards and crucifers, like broccoli and cabbage) and *Nicotiana benthamiana* (closely related to solanaceous crops, like tomato, potato, and eggplant), and generated several stable transgenic lines overexpressing NARS1 fused to GFP as a reporter. Consistently, he found that NARS1 transgenic plants with visible GFP fluorescence (indicating successful overexpression of the NARS1 protein) grew larger and faster than wild-type controls. Overexpressing another annotated asparaginyl tRNA synthetase, NARS2, had no effect on growth (nor on TOR activity), suggesting that this effect is specific to the NARS1 gene (and not a general property of asparaginyl tRNA synthetases). Given the results showing that overexpressing NARS1 in two unrelated species increases growth rates, the inventor expects that this method would be broadly applicable to any flowering plant and could be used in agricultural contexts to improve plant growth and yields.

### Additional Information

#### For More Information About the Inventors

- [Jacob Brunkard](#)

#### Tech Fields

- [Animals, Agriculture & Food : Plant biotech](#)

For current licensing status, please contact Emily Bauer at [emily@warf.org](mailto:emily@warf.org) or 608-960-9842