Animals, Agriculture & Food

New Tool to Boost the Production of Tyrosine and Downstream Natural Products in Plants

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The Wisconsin Alumni Research Foundation (WARF) is seeking industry partners interested in commercializing a genetic tool to boost the production of tyrosine in plants for use in nutritional or medicinal products. The gene could also be used to enhance herbicide resistance, enabling new weed treatment options.

Overview

The aromatic amino acid tyrosine cannot be synthesized *de novo* by mammals and must instead be obtained through the diet or through conversion of dietary phenylalanine. Through complex pathways, tyrosine and related products serve as precursors for numerous important plant compounds with nutritional and pharmacological activities in humans, including antioxidants, various defense compounds, analgesics, antibiotics and compounds with clinical indications for cancer, malaria, HIV and Parkinson's disease.

Two parallel pathways are associated with plant biosynthesis of tyrosine. These pathways involve related enzymes called arogenate dehydrogenase (ADH) and prephenate dehydrogenase (PDH). ADH and PDH convert closely related substrates and are, in fact, homologous proteins.

The Invention

A team of UW researchers identified a protein with PDH enzyme activity and discovered that the protein is not feedback-inhibited by downstream tyrosine. This gene is uniquely present in legumes and, unlike other plant ADHs, is completely insensitive to tyrosine. Accordingly, the downstream product tyrosine does not inhibit the activity of this enzyme, which potentially provides a useful genetic tool to boost the production of tyrosine, as well as the downstream natural products.

Boosting the production of tyrosine can lead to plants that express high levels of the PDH gene, resulting in increased PDH protein activity. These plants could be grown for production of complex plant metabolites.

Furthermore, the product of PDH is the precursor of the enzyme HPP dioxygenase (HPPD), which is a common target of herbicides, so the identified gene could be upregulated to generate transgenic lines that are resistant to the herbicide treatment. and may display an herbicide resistance. If herbicide resistant, the genetically manipulated plants will have a growth advantage over unmodified weeds, which will facilitate new weed treatment options, such as spraying the herbicide during growth periods of crops.

Applications

- Production of nutritional or medicinal products
- Development of herbicide-resistant plants

Key Benefits

- PDH could be introduced and/or upregulated in a variety of plant types.

- May enhance herbicide resistance

Additional Information

For More Information About the Inventors

- Hiroshi Maeda

Publications

- Non-plastidic, tyrosine-insensitive prephenate dehydrogenases from legumes

Tech Fields

- Animals, Agriculture & Food : Plant biotech
- Animals, Agriculture & Food : Plant varieties

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842