Beta carotene-fortified potatoes paving way for biofortified African cassava

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The humble potato has potential to become an important source of beta-carotene and may lead to more nutritious cassava crops in developing countries, thanks to newly patented research from the Boyce Thompson Institute (BTI).

Assistant Professor Joyce Van Eck has received a new patent on a method to bulk up beta-carotene—a precursor of vitamin A—in potatoes. She is now collaborating with Paul Anderson, executive director of the Institute for International Crop Improvement at the Donald Danforth Plant Science Center in St. Louis, MO, to apply lessons learned in potatoes to cassava plants. Biofortified cassava roots could help alleviate vitamin A deficiency, which causes blindness and premature death in hundreds of thousands of malnourished children each year.

“The idea was to produce potatoes and use it as a model for other crops in developing countries, especially in areas where vitamin A deficiency is a problem,” said Van Eck.

Potatoes are an ideal crop for biofortification because they are both popular and easy to grow, even in poor soils. Though they are rich in vitamin C, potassium and fiber, they are not a source of vitamin A, which is vital to good eye health, proper growth and a strong immune system.

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Potatoes can synthesize beta-carotene, but an enzyme called beta-carotene hydroxylase then converts it into another carotenoid, called zeaxanthin. Yukon Gold potatoes and yellow corn get their golden color from zeaxanthin, but the body cannot use it to make vitamin A.

To increase the beta-carotene levels in potatoes, Van Eck inserted a specially designed segment of DNA into the potato genome to silence the gene that codes for the enzyme that converts beta-carotene into zeaxanthin. She used a technique that ensures that the activity only occurs in the tuber, while the rest of the plant is unaffected.

When the beta-carotene hydroxylase gene was silenced, beta-carotene built up to levels that would satisfy up to 18 percent of a toddler’s daily nutritional requirement. Though they will need to use additional strategies to boost beta-carotene levels further, the research shows that biofortification is indeed possible.

Paul Debbie, the director of technology transfer at BTI, said that the potential of Van Eck’s work to biofortify crops with beta-carotene was immediately obvious. They began the patent process in 2004, filing with collaborator David Garvin of the USDA Agricultural Research Service.

Read full, original post: A-plus potatoes may lead to more nutritious cassava crops