Iowa State study finds corn bred to contain beta-carotene is a good source of vitamin A

September 7 2010

(PhysOrg.com) -- A new Iowa State University study has found that corn bred to contain increased levels of beta-carotene is a good source of vitamin A. The discovery gives added support to the promise of biofortified corn being developed through conventional plant breeding as an effective tool to combat vitamin A deficiency in developing countries.

Beta-carotene is converted in the body to vitamin A. The researchers found that the beta-carotene in the corn was converted to vitamin A at a higher rate than what's predicted for corn, and higher than the rate for beta-carotene in vegetables - including spinach and carrots, among others.

Wendy White, an ISU associate professor of food science and human nutrition, led the six-week study conducted at Iowa State's Nutrition and Wellness Research Center. The results validate the promise of 'orange' maize that will soon be released to combat vitamin A deficiency in sub-Saharan Africa.

According to a 2009 World Health Organization estimate, vitamin A is deficient in more than half of the world's countries, with Africa and Southeast Asia having the highest deficiencies. Medical researchers have reported vitamin A deficiency to be one of the most serious causes of malnutrition in developing countries and can cause blindness, poor immune function and even premature death -- particularly in young children.

Working with HarvestPlus on biofortified corn

The effort to biofortify corn with beta-carotene is being led by HarvestPlus - a global research initiative directed, in part, by the Washington, D.C.-based International Food Policy Research Institute.

"Biofortification is a revolutionary approach to combating micronutrient malnutrition in developing countries and it has the potential to be self-sustaining," White said. "The seeds are bred by plant breeders to be naturally high in key micronutrients, such as vitamin A, zinc and/or iron. And then the seeds will ultimately be distributed to poor farmers in developing countries and they'll be able to reproduce the seeds so they can share them with their communities.

"This study answered a major feasibility concern for the biofortification program because plant breeders were quickly successful in ramping up the beta-carotene content in the corn, but then the question was, 'Would it be available to be absorbed and utilized by people?,'" she continued. "So what we've shown is the beta-carotene is bioavailable to be converted to vitamin A in the body, and much more so than previously expected."

The study was posted online this month by the *American Journal of Clinical Nutrition*, which is published by the American Society for Nutrition. Iowa State graduate students Shanshan Li and Angela Nugroho, and Purdue University researcher Torbert Rocheford -- who was at the University of Illinois at Urbana-Champaign at the time the research was conducted -- collaborated with White on the study. An abstract is available at: www.ajcn.org/cgi/content/abstr … ct/ajcn.2010.29802v1 .

The researchers had their six healthy female subjects, between the ages of 18 and 30, consume 250-gram portions of maize porridge three times

at two-week intervals. Each subject consumed the beta-carotene biofortified maize porridge, as well as two white maize control porridges that were naturally devoid of beta-carotene, but contained known amounts of added beta-carotene or vitamin A. Blood samples were drawn after they ate each porridge to determine the amount of vitamin A that was absorbed in the blood.

An important step in fighting malnutrition

White says the study's findings provide an important step in the process of making the biofortified corn available to the people who desperately need vitamin A in their diets.

"These [their subjects] were mostly graduate students based in the U.S. who were screened for excellent health. So this study was conducted under ideal conditions," White said. "And so the next step -- knowing that under ideal conditions the beta-carotene can be well absorbed -- is to take it into a more field setting."

White reports that there is already a pilot program being conducted in Zambia to feed the beta-carotene, biofortified maize to young children to increase their vitamin A intake. HarvestPlus is conducting that project and supported the development of the maize for the Iowa State study.

The HarvestPlus Challenge Program was launched when it became the first recipient of funding for biofortification research granted by the Bill and Melinda Gates Foundation.

Provided by Iowa State University

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