Plant Topic: GM Plants Improves Nutrition
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A common worldwide problem is iron and zinc deficiencies in about one-third of the world's population, according to the World Health Organization (WHO). Trace element nutrition increase in grown crops can improve nutrition. Human lactoferrin, which is the major iron-binding protein in breast milk and in rice, is proven to have high levels of protein (6% of total protein/5grams) after using the gene gun technology with a strong endosperm-specific promoter from rice and selecting for high-lactoferrin cultivars. The gene gun delivers exogenous DNA to cells and is used essentially to alter plants. (1,2). The lactoferrin molecules bind to 2 atoms of ferric iron (3) and doubles the iron content of the rice but has no other effect on other nutrients. The iron content is increased by 120% but is not sufficient enough for adults even if rice was a major part of their diet. Human lactoferrin is proven to bind to receptors in the human small intestine (4,5), which proves that it is unlikely that inhibitors of iron absorption (phytate) will inhibit iron absorption from lactoferrin. Even if bioavailability of iron from lactoferrin is high, iron quantity that is absorbed is limited. However, the total iron requirement for infants and young children is relatively low, this can be of use for them. Ferritin makes this possible for adults. Ferritin is a blood cell protein that contains iron and each molecule can bind as many as 4,500 atoms of it (6). The gene for soybean ferritin has been inserted in to rice (7), which was tested on by iron depleted rats (8). A research group did another study where they inserted the ferritin gene from Phaseolus vulgaris (a herbaceous annual plant grown worldwide for its edible dry seeds or unripe fruit) into rice (9). Using Agrobacterium (mediated transformation and the rice glutellin promoter) they were able to double the amount of iron in rice. This shows that the iron content of rice that expresses ferritin does seem similar to that of rice that expressed lactoferrin and is unlikely to substantially increase the iron intake of adults. There have been recent studies that suggest that ferritin iron may be as available as iron from ferrous sulfate (8,10), which is an iron supplement used to treat or prevent low blood levels of iron. A potential concern that ferritin expresses in rice is the color change that could affect the attitude and allergenicity of the consumer.

References

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