

Alternative Approaches for Enhancing the Nutritional Content of Rice

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Rice is a good source of readily digestible starch and protein, which are important to humans for energy or as a source of amino acids. Rice's concentration of vitamins, minerals, and health-promoting phytochemicals, however, is quite low, especially when one assesses the polished grain. Because of these limitations, and because there is much interest from consumers to have highly nutritious food products, researchers have been working to design novel genetic engineering strategies to enhance the nutritional value of rice. Available approaches are focused both on macronutrient and micronutrient targets, and could feasibly result either in quantitative or qualitative changes. Sufficient molecular information is now available to manipulate the expression of diverse biosynthetic pathways in the developing rice grain, in order to alter carotenoids, tocopherols and tocotrienols (vitamin E), and even amino acid or protein levels. One example of this is the development of Golden Rice, a transgenic product that makes beta-carotene in its grains; beta-carotene is an ideal precursor of vitamin A. Possibilities exist to alter other carotenoids, such as lutein or zeaxanthin, which are important antioxidant phytochemicals that accumulate in the macula of the eye. Similarly, there are strategies available to enhance the mineral composition of rice through alterations at the grain and/or whole-plant levels. In this presentation, we provide an overview of the range of nutritional strategies that are possible for rice, and discuss the issues that must be addressed to affect these types of changes.