



NRI Research Highlights

* * * * * National Research Initiative Competitive Grants Program

2007 No. 6

Enhancing Antioxidant Availability in Wheat-Based Foods for Improving Human Health



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Developing functional foods that provide bioactive components, such as antioxidants, is an emerging multidisciplinary area in food science and human nutrition. The findings from this project will improve food quality for disease prevention and health promotion, while simultaneously enhancing U.S. agriculture.

The pathology of numerous chronic diseases, such as cancer, involves cellular damage from oxidation. Reactive oxygen species (ROS) have been associated with carcinogenesis, coronary heart disease, and many other health problems related to advancing age. Minimizing oxidative damage may well be one of the most important approaches to the primary prevention of these age-related diseases and health problems. Antioxidants terminate ROS damage and appear to be of primary importance in the prevention of diseases and health problems. Developing functional foods rich in bioavailable antioxidants may play an important role in reducing the risk of age-related diseases.



Photo Credit - Edwin Remsberg

The bioavailability of food antioxidants depends on several factors. Ingredients contain different concentrations of antioxidants and this concentration may be altered by post-harvest treatments. How the ingredients are stored may also impact the stability of the antioxidants and the antioxidant availability may be impaired or improved based on interaction with other ingredients during the food formulation or processing procedure.

WHEAT

Wheat is a major cereal food crop consumed in many parts of the world and contains considerable beneficial nutritional components. For this reason, wheat and wheat-based food ingredients are ideal for development of functional foods designed to improve the health of millions of consumers.

Researchers investigated the effects of post-harvest treatments and storage conditions on antioxidant availability in wheat-based food ingredients as well

Figure 1. Whole wheat is full of antioxidants that can be used as a preventative measure to rid the body of free radicals that cause diseases.



Photo Credit - Edwin Remsberg

Figure 2. Dr. Liangli (Lucy) Yu displaying her antioxidant packed wheat crust pizza.

as the effects of food processing conditions on the availability/bioavailability of wheat antioxidants in functional food, specifically whole-wheat pizza crusts.

The researchers developed a “green” processing procedure to enhance the antioxidant availability in wheat-based food ingredients that involves no chemical or organic solvents and generates no waste. These processing procedures require no special equipment or operation, and can be easily scaled up for commercial production. In addition, the researchers determined whole wheat grain preserves antioxidant properties better than the milled grain fractions. The researchers

determined that reduced bran particle size enhances the release of wheat antioxidants, however, reduced size may result in a loss of antioxidant properties during storage. Thus, post-harvest treatment and storage should be considered when developing wheat-based food ingredients rich in available antioxidants.

Food processing conditions may also alter antioxidant properties of food products. When examining the antioxidant property of wheat pizza crust, the researchers determined that higher baking temperatures and longer baking times may increase antioxidant availability. In addition, increasing dough fermentation time may

increase antioxidant availability. These findings may have important implications for commercial food producers, the food service industry, and even home bakers who would like to improve the health promoting antioxidant properties of their whole-wheat food products.

IMPACT

The research findings suggest the availability of health beneficial antioxidants in wheat-based functional foods may be enhanced by optimizing post-harvest treatments, storage conditions, and food formulation and processing techniques without significant extra effort or cost. These findings provide a scientific basis to promote the production and consumption of wheat-based functional foods in general. The information obtained from this research may also be applied to other grains and improve the quality and nutritional value of other grain-based food ingredients and food products. In addition, this research may promote the food utilization of U.S. wheat and enhance profitability and sustainability of the farm economy.

The research reported in this fact sheet was sponsored by the Improving Food Quality and Value Program of the National Research Initiative Competitive Grants Program. To be placed on the mailing list for this publication or to receive additional information, please contact the NRI (202-401-5022 or NRICGP@csrees.usda.gov). The fact sheet also is accessible via the NRI section of the Cooperative State Research, Education, and Extension Service Web site (<http://www.csrees.usda.gov/nri>).

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May 2007

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