Research at West Virginia State University uses a multi-disciplinary approach to characterize various vegetables for traits such as yield, nutrient content and resistance to disease while developing new varieties with value-added traits to improve the health of our citizens and our economy. This project has led to the development of crops that are more disease-resistant and are known to help in reducing the risk of cancer and cardiovascular diseases.

Vegetable Genomics and Plant Breeding

Who cares and why?

The prevalence of obesity, heart disease, cancer and diabetes in West Virginia is among the highest in the nation. Every year in the United States, nearly 1.3 million cases of cancer are diagnosed, and more than 2.5 million people die from strokes and heart disease. With these and other health statistics on the rise, many Americans are eating healthier and becoming increasingly interested in value-added foods.

Demand for fruits and vegetables richer in compounds like capsaicin, beta-carotene and lycopene is increasing exponentially in U.S. markets. The future production of cultivated vegetables depends on improving their genetics and developing new superior cultivars with traits such as disease resistance, higher yield potential and nutritional quality.

Increasing agricultural yields to meet increasing demand, while decreasing the use of fertilizer, pesticides, water and fossil fuels, requires the development of genomic-assisted strategies introducing novel genes into elite cultivars to accelerate the development of desired enhanced traits.

What has the project done so far?

Research at WVSU is focused on using a multi-disciplinary approach to characterize various vegetables for traits such as yield, nutrient content and resistance to disease, and to develop new cultivars with value-added traits to improve the health of our citizens and the economics of our state and country.

Novel techniques in genomics and genetics are being used to understand evolution in cultivars, enhance nutritional and taste quality, and to increase resistance to diseases and insects. Data gathered on each crop is compared to genome wide DNA sequence information

from collaborators to identify genes and cultivars that can be used for pre-breeding materials.

Activities involve developmental and applied aspects of plant genomics and biotechnology, focusing on developing ~15,000 DNA markers for 300 varieties in each study crop; identifying candidate genes and cultivars for value-added traits using developed markers; identifying genes for resistant traits; and studying mechanisms that sustain vegetable production by analyzing genetic vulnerability in cultivated forms of various crops.

Impact Statement

This research has led to increased development of cultivars with value-added traits and improved disease resistance. Using genomic and molecular techniques, Aji and American peppers are being characterized for nutraceutical traits known to help in reducing the risk of cancer and cardiovascular diseases. The value-added traits of the Aji are then transferred into the American peppers, using genomics-driven plant breeding, to develop value-added pepper varieties adapted to local conditions.

The genomic assisted characterization of eastern European melons for quality and resistance traits is being used to produce high-yielding, disease resistant U.S. melon varieties with improved fruit quality.

What research is needed?

A multi-disciplinary approach is being used to characterize pumpkin and squash varieties for value-added and resistance traits. Combining these traits will create derivative cultivars with greater profit value and more potential to reduce cancer, diabetes and cardiovascular diseases.

Want to know more?

Dr. Umesh Reddy, Associate Research Professor
(304) 766-3066
ureddy@wvstateu.edu

Additional links: http://www.umes.edu/ard/Default.aspx?id=46285

This project was supported by USDA-NIFA Formula Funds and USDA-NIFA Capacity Building Grant Funds.