This research has allowed adding value to the American native grapes, promoting local viticulture industry by opening new marketing opportunities for muscadine grape as 'superfruit" , functional food, and cosmeceuticals as well.

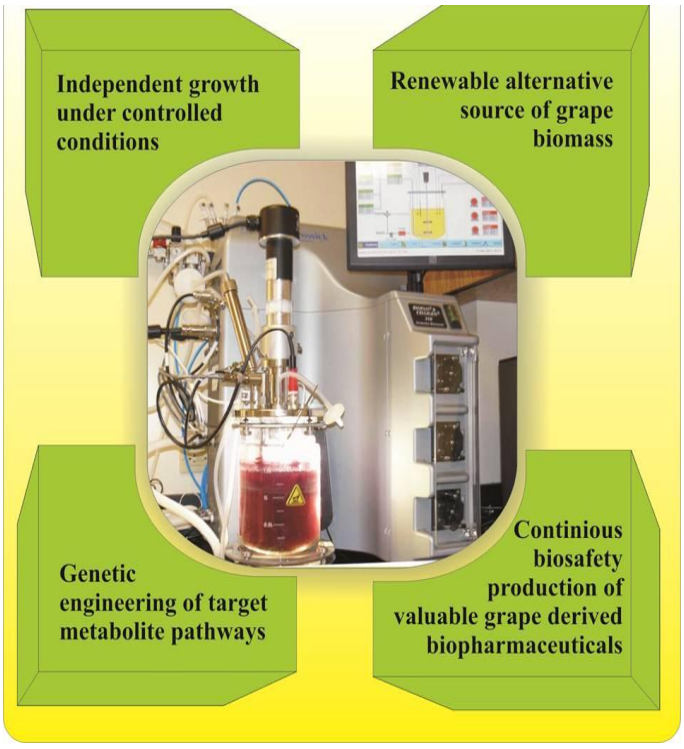
Genetically Enhancement of American Native Grapes for Overexpression of Flavonoid Nutraceuticals

Who cares and why?

Molecular farming (using crop plants and plant cells as new efficient alternative for producing important industrial and pharmaceutical compounds) is an immerging multibillion dollar industry and appears as one of the fastest growing job markets for young university graduates in biology, chemistry and agricultural science. There is no hypothetical limit to the amount of value that can be added to a crop. As nutriceuticals are foods to which food-based supplements have been added to impart health benefits, cosmeceuticals are cosmetic products to which natural ingredients have been added to impart health benefits.
The common muscadine, *Muscadinia rotundifolia* is native to the Southeastern United States and has been cultivated for more than 400 years. Muscadine is the only grape containing ellagic acid and possesses one of the highest antioxidant levels among fruits. The discovery of high volume anti-oxidant compounds in muscadine berry, juice and wine has brought more attention to muscadine grape, not only as an important alternative cash value crop for the Southeast, but a new healthy food as well. Bulk grape nutraceuticals currently available on the market as skin and seed extracts have limited bioavailability for human intake.

What has the project done so far?

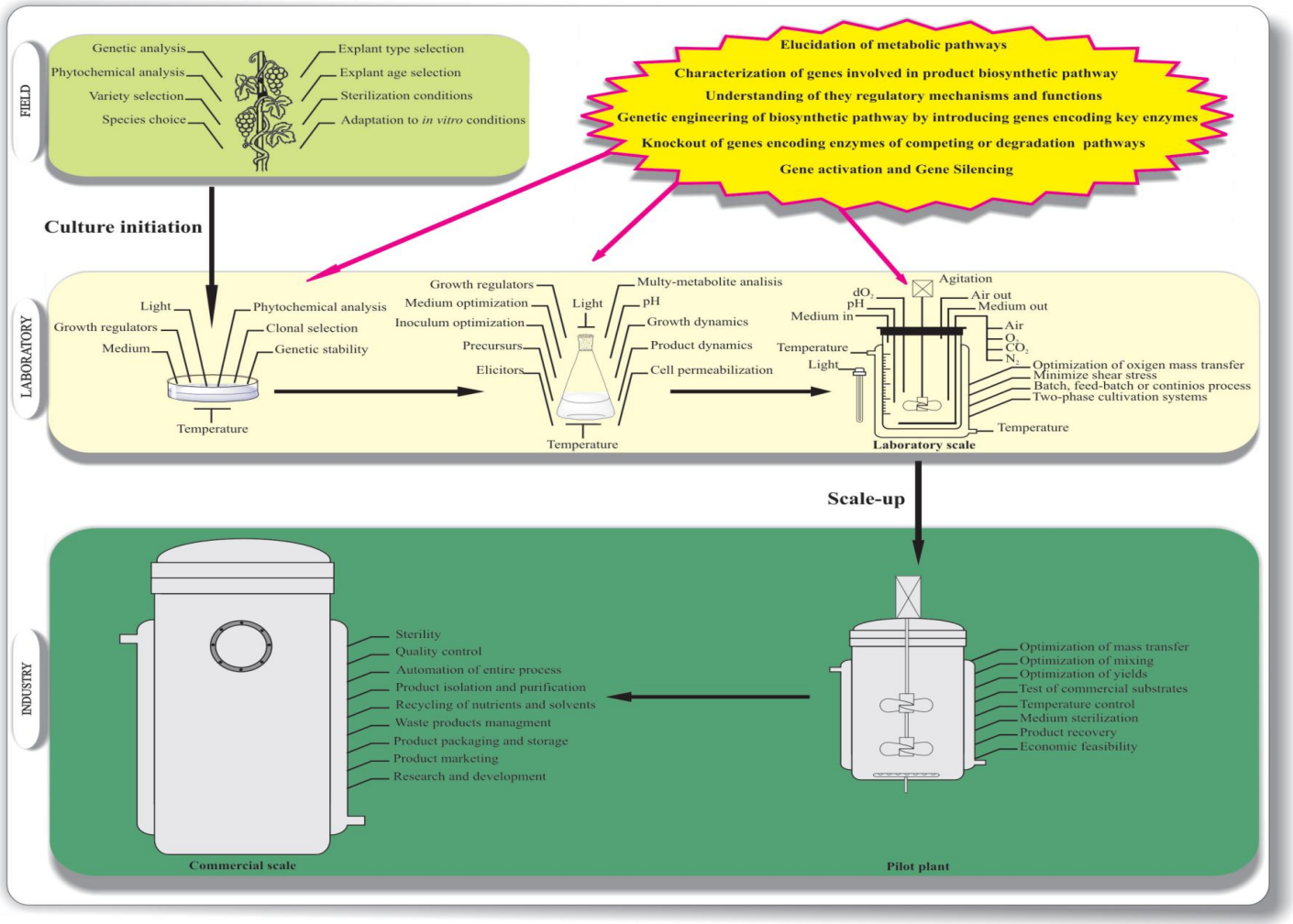
We developed novel synchronized *in vitro* strains of subepidermal cells of Muscadine grapevine pericarp containing powerful flavonoid compounds. These cell strains are well defined, consistent and highly bioavailable relative to polyphenols from other fruit products such as wines, juices and fruit extracts.
Some of the advantages of this technology are: 1) the American native muscadine grapes from which the cell strains emanate have a stronger "cocktail" of flavonoids than their European counterpart; 2) the cell lines are alcohol-free, sugar-free, tasteless and odorless; and 3) the cell strains can be produced 24/7 in controlled conditions on a "green", consistent, space-efficient and scalable fashion using bioreactors. The technology is currently in scale up bioreactor and prototypes development stage.



Impact Statement

Focused on the multidisciplinary research activities at the intersection of the agricultural and medical biotechnology, we contribute fundamental knowledge in the newly developed research areas as gene microarrays and metabolomics of medicinal qualities of American native grapes. As a research strategy, we are positioning ourselves to integrate the emerging molecular information and tools (transcriptomics, functional genomics and metabolomics) with our capacity as a gene transformation facility for grape and small fruits, into practical applications such as using genomics sequences to improve nutritional and health benefits of American native grapes. Our project is building capacity in the newly developed research areas of gene microarrays and functional genomics and student training and experiential learning by upgrading the laboratory facility, providing materials and supplies and financial assistantships to our students.

The project is directed towards the grape research community, commercial grape growers in Florida and southeastern states as well as small farmers who are growing grapes and those contemplating growing grapes. In addition to that, year around, we are providing experiential learning opportunities in the area of STEM/biotechnology for high school students and college prospects.



What research is needed?

1.Out of the already analyzed 11 key genes involved in the'muscadinia' s flavonoid pathway 3, more genes need to be cloned. 2. Genetic transformation experiments with the DFR silencing gene constructs need to be completed. 3. Evaluation of the parameters needed for scale up of the muscadine cell cultures in the larger bioreactor need to be defined.

Want to know more?

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Strategic Priority: Plant Products

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

Year and Institution: 2014 Florida A&M University

Funding: USDA/ NIFA Capacity Building Grant # 2010-38821-21560