**Amaranth as a Climate-Resilient, Nutrient-Dense, Cultural-Preferred Crop to Be Integrated in New Jersey Agriculture**

**Tori Rosen,** **Erin Quim,** Norah Pereira, Layla Elkhathit, Albert Ayeni, Qiwei Wu, Renu Govindasamy, James Simon, 1 New Jersey Agricultural and Natural Foods Program, Rutgers University, Department of Food, Nutrition & Health and New Product, Rutgers University, 640 Dudley Road, New Brunswick, NJ 08901 2 Department of Plant Biology, Rutgers University, 99 Dudley Road, New Brunswick, NJ 08901 3 Department of Agricultural, Food, and Resource Economics, Rutgers University, Cook Office Building, New Brunswick, NJ 08901

**ABSTRACT**

Demand for culturally preferred leafy greens in the US is rising rapidly due to the increased awareness among cultural groups about their caloric value and the desire for diverse and healthy diets. This demand is heightened when considering the disproportional effects of food insecurity on minoritized communities. 

Amaranth (Amaranthus spp.) is a crop of economic and nutritional importance among ethnic minority communities within the Northeastern United States and around the world. Consumer surveys along the Eastern US identified amaranth as a top 10 desired leafy green among Asian Indian, Chinese, and Mexican consumers, though it has limited market availability in the US. It is a hardy, drought-tolerant species that exhibits a strong resiliency to climate change and abiotic stress and has the potential to supplement locally grown spinach in summer months due to its similar flavor and nutrient density. It is incredibly resilient to drought and heat stress, which makes it an ideal leafy green in summer months, during which most greens cannot grow. Its neutral to slightly bitter flavor is comparable to that of other greens within all three communities. 

**CULTURAL PREFERENCE SURVEYS**

Survey Methods

- Online focus group bulletin board sessions with representative members of Chinese, Indian, Mexican and Puerto Rican communities along the US East Coast were used to compile an initial list of culturally preferred leafy greens and herbs.
- A panel of marketing, crop specialists and field/extension faculty reviewed the list and removed greens with production barriers that could limit marketability.
- Voluntary participants who self-identified as Asian Indian (n=277), Chinese (n=276), Mexican (n=283) and Puerto Rican (n=232) were the primary food shoppers of their households who were randomly selected along the US East Coast to participate in phone surveys.
- Surveys were offered in English, Mandarin, Cantonese, Hindi, and Spanish. Questions included frequency, proximity, purchase locations, quantity, price and expenditures of culturally-preferred leafy greens and herbs.

**GLOBAL GERMPLASM EVALUATION FOR YIELD AND NUTRIENT DENSITY**

Two consecutive variety trials were performed in 2021 and 2022 at NJAES Rutgers Horticulture Farm 3 to evaluate a global collection of germplasm, coming from the USDA-GRIN, the World Vegetable Center, commercial sources, and Rutgers breeding lines. There were 7 species within the *Amaranthus* genus represented. Year 1 consisted of 97 unique lines. Yield-related traits were evaluated 6 weeks after transplanting, including flowering time, plant height, stem diameter, leaf area, petiole length, whole plant fresh, and dry weight. Dried samples were then saved for nutritional analysis: specifically total antioxidants, provitamin A, chlorophylls A and B, and total polyphenols. Based on this data, 38 lines of amaranth were advanced to year two of the study, again collecting yield-related data and using dried samples for mineral analysis. Four Rutgers lines have been selected for continued breeding based on these variety trials, along with cultural preferences of leaf shape and color.

**AMARANTH AS A CLIMATE-RESILIENT CROP**

Our research uses a market-driven approach to identify culturally relevant produce options that are lacking in consistent production, with the purpose of increasing the accessibility and affordability of such key foods in minority diets. The initial evaluation of global germplasm allows us to select for climate-resilient traits, like heat and drought tolerance, as these issues are driving New Jersey farmers to adjust their production. New Jersey agriculture relies on high-value specialty crops that do not require a lot of land and cater to the state’s diverse population. Amaranth is a key food in diets around the entire world. It is incredibly resilient to drought and heat stress, which makes it an ideal leafy green in summer months, during which most greens cannot grow. Its neutral to slightly bitter flavor is comparable to that of spinach, and it holds the same of nutritional properties. By connecting with grocers and consumers from South Asian, East Asian, African Diaspora, and Latin communities, we are working towards breeding strong climate-resilient varieties that are suitable for New Jersey’s climate, its nutritional value, and representative of the cultural expectations of this crop.

**REFERENCES**


**CITATIONS**

Support for this project came from the New Jersey Department of Agriculture Specialty Crop Block Grant 2022-2023, “Developing Culturally Preferred, Nutrient-Dense Leafy Greens as Promising Specialty Crops for New Jersey Farmers” and USDA NIFA Graduate Student Fellowship 2022-2024, “Handholding Farming Practices of Leafy Greens Amaranth in the Northeast to Ensure Cultural Availability and Nutrient Density” to Dr. James Simon, Dr. Reena Govindasamy, and Ph.D. student Tori Rosen. Special thanks to Rutgers New Use Agriculture Program, to John Bombardi and the staff at Rutgers NAGS Hort Farm 3, to Joseph Florentine and his staff at the NIAS Research Greenhouse. Thank you to Rutgers professors Dr. Albert Ayeni for connections to farmers, grocers, and consumers. More thanks to the undergraduate students on our team, including Erin Quim, Norah Pereira, Layla Elkhathit, LaVena Gordon, Disha Paul, Mahoney Andrews, and Michelle Gardner.