CITRUS ADVANCED TECHNOLOGY PROGRAM

QUARTERLY & FINAL PROGRESS REPORT FORM: Control of Citrus Greening, Canker & Emerging Diseases of Citrus

SELECT PERIOD July 2021 ◉ Quarterly Report ○ Final

Proposal Title

Near-term approaches of using alternative HLB-tolerant cultivars for increased production and improved juice quality

Today's Date 8/12/2020

Sponsoring Organization (drop-down) Citrus Research and Development Founda

Category (drop down) Other

ABSTRACT (750-word Executive Summary-public report-do not disclose proprietary information or intellectual property)

This project will end at the end of October, 2021,so this is the second to last report. There are two objectives in this project, and the progress of each objective is listed here:Objective 1. Evaluation of blended juice using released HLB-tolerant sweet orange/mandarin cultivars via analyses of sensory and consumer acceptance. In this quarter, we did the sensory and consumer study for Valencia blended with Sugar Belle at the end of May. In this study, 100% Sugar Belle® juice, 100% Valencia juice, 90% Valencia and 10% Sugar Belle® blended juice, 50% Valencia and 50% Sugar Belle® blended juice, and the same 100% commercial NFC orange juice product were prepared and consumed by 61 sensory panelists. Panelists were pre-screened based on their orange juice consumption frequency to ensure they are familiar with orange juice. Compared to 100% commercial NFC orange juice, 50% Valencia and 50% Sugar Belle® blended juice was rated significantly higher in overall appearance, overall liking and flavor liking. In the subsequent evaluation on sensory attributes (i.e. sweetness, bitterness and sourness etc.) that are closely related to fruit quality, 50/50 and 90/10 blended juices received higher ratings on sweetness, lower ratings on sourness and bitterness, which indicated Valencia orange juice blended with Sugar Belle® increased the consumer preference. In addition, from the sensory aspect, 90/10 Valencia/Sugar Belle® blended juice were preferred the most by consumers. Surprisingly, when panelists were asked their general opinion on their willingness-to-pay of 100% orange juice and mandarin and orange blended juice without tasting any specific samples, it was observed that they expected to pay higher price for juice containing higher ratio of orange juice. For example, the 100% orange juice receiving the most votes on $3.49 per 52 FL oz. More information will be collected in the next quarter to explain the mismatch between willingness-to-pay expectation for known ratio of orange juice in blended juices and the results obtained from the real tasting environment. Even though the acceptance of tangerine juice is currently limited, it was noteworthy that the Valencia orange juice and Sugar Belle® juice blends had a better performance in sensory evaluation than that of pure orange juice. In addition, there were considerable number of consumers holding neutral opinion on juice quality and willingness-to-pay of blended orange and mandarin juice indicating the potential improvement on acceptance and consumption of mandarin juice in the future. We wrote an article for the Citrus Industry and this article will be published in September based on our findings from this quarter and the previous quarters. Objective 2. Identify more tolerant cultivars resembling the quality of Valencia for the juice market, and identify a chemistry definition of consumer accepted orange flavor. All the analytical work has been completed in the last quarter, so in this quarter we focused on data analysis and writing a manuscript. We investigated citrus fruit flavor and identify key flavor compounds in a diverse group of citrus fruits through multivariate statistical analysis. Volatile and non-volatile chemicals were determined by MS spectrometric techniques while the rating of sensory attributes was collected from a trained sensory panel. The results of Pearson Correlation showed the extent of positive/negative correlation between the sweet attribute and other sensory attributes in different groups of citrus fruits. Based on the correlation between chemicals and sensory attributes, sugars were highly correlated with the sweet attribute while flavonoids and limonoids were highly correlated with the bitter attribute. Organic acids showed a strong correlation with the sour attribute and demonstrated contribution to the citrusy attribute. Terpenes were highly associated with the terpene-like attribute while octanal, decanal, ethyl hexanoate and ethyl octanoate were demonstrated to be highly correlated with the citrusy attribute. The correlations between linalool, citronellol, and 1-octanol and the fruity/floral attribute were also observed. In addition, pathway enrichment analysis demonstrated a close correlation between the biosynthesis of terpenoids and steroids pathway and the identified key flavor compounds in sweet orange-like mandarin hybrids.

PI First Name Yu

PI Last Name Wang

Email yu.wang@ufl.edu

Phone 863-956-8673

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% Completion of Objectives 90