



International Citrus &
Beverage Conference

UF | IFAS Extension
UNIVERSITY of FLORIDA

FS Human Nutrition
Food Science *HN*

September 18-21, 2018
Clearwater Beach, FL, USA



September 18-21, 2018

Sheraton Sand Key Resort
Clearwater Beach, Florida, USA

www.conference.ifas.ufl.edu/citrus

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Welcome to the 2018 International Citrus and Beverage Conference

This year's conference will once again focus on key issues facing our industry and will span the topics of the global fruit production and processing to the marketing of new and innovative products. Please join us for discussions on the impact of regulations, particularly FSMA, on our industry, advances in quality and consumer insights, and the evolution, application and outlook of new flavor technology and new beverage categories. The Friday morning "Hot Topics" session will focus on new perspectives in thinking about citrus greening and offer insight into some of the current strategies in managing HLB.

Appreciation goes to everyone who has contributed to this year's event. We would like to recognize our committee members, whose expertise within academia, industry and government led to the selection and invitation of our knowledgeable speakers. We would also like to give a special thank you to our invited speakers, who enthusiastically agreed to share their insights and knowledge. Lastly, we would like to express a very heartfelt thank you to our sponsors, whose generosity enhances the value, affordability and uniqueness of this event each year.

We look forward to the next few days of talks and interaction, with opportunities to meet old friends and business contacts and the chance to make new ones. Once again, we hope you will find this conference a rewarding and valuable experience.

Renée Goodrich Schneider

Program Organizer and Professor

UF/IFAS Food Science & Human Nutrition



Planning Committee

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Firmenich Inc., Lakeland, FL

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USDA Agricultural Research Service, Ft. Pierce, FL

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Florida's Natural Growers, Lake Wales, FL

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Savy Quality Review, Inc., Daytona Beach, FL

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Douglas P. Van Strijp

Southern Gardens Citrus, Clewiston, FL

Yu Wang

UF/IFAS CREC, Lake Alfred, FL

Elizabeth Webb

Vincent Corporation, Tampa, FL

Barry Wilson

Safe Chem Inc., Zellwood, FL

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2018 Agenda

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Tuesday, September 18, 2018	
4:00pm - 7:00pm	Registration [Sand Key Room]

Wednesday, September 19, 2018	
7:30am - 5:00pm	Registration [Sand Key Room]
7:30am - 8:25am	Morning Refreshments [Island Ballroom] Sponsored by: • Vincent Corporation
GENERAL SESSION [Grand Ballroom]	
8:30am - 9:00am	Welcome and Introductory Remarks - Renée Goodrich Schneider UF/IFAS Food Science & Human Nutrition; <i>ICBC Program Organizer</i> - Susan Percival UF/IFAS Food Science & Human Nutrition - Linda Staten USDA Agricultural Marketing Service; <i>ICBC Program Chair</i>
Session 1: The World of Fruit, Juices and Beverages – A Global Perspective	
Moderator: Keith Schneider , UF/IFAS Food Science & Human Nutrition	
9:00am	Dominican Republic: Creating New Value in Fruit Processing - Horacio Lomba , Consorcio Citricos Dominicanos, S.A. (pg. 12)
9:40am	Citrus Production – A Global Perspective - Fred Gmitter , UF/IFAS CREC (pg. 13)
10:20am	Beverage Break [Island Ballroom]
10:40am	Current Situation and Outlook for the Chinese Juice Industry - Russell Rouseff and Houjiu Wu, Southwest University, Citrus Research Institute of China (pg. 14)
11:20am	An Update on the Cuban Citrus Industry - William Messina and Ariel Singerman, UF/IFAS FRE and UF/IFAS CREC (pg. 15)
12:00pm	Lunch Break (<i>on your own</i>)

Wednesday, September 19, 2018 (continued)	
Session 2: Consumers, Markets and Trade	
Moderator: Nick Shields , The Coca-Cola Company	
1:30pm	Millennials and Orange Juice Consumption - Lisa House and Yan Heng , UF/IFAS FRE (pg. 16)
2:05pm	Orange Juice Flavor Balancing - Stephan Raeker , Symrise (pg. 17)
2:40pm	Break [Island Ballroom]
3:10pm	How is Consumer Health & Wellness Driving Growth for Citrus Beverages? - Will Polese , MarketsandMarkets (pg. 18)
3:45pm	International Trade Policy 2018 Update: Challenges and Opportunities - Anthony Noguera s, Alliance Drawback Services (pg. 19)
4:20pm	Juice Products Association (JPA) Update - Carol Freysinger , JPA (pg. 20)
4:55pm	Announcements
5:05pm	Session Concludes
6:00pm - 7:00pm	Networking Reception [Poolside] Sponsored by: <ul style="list-style-type: none"> • Alliance Drawback Services • Astral Extracts, Ltd • Brown International Corporation, LLC • Chemical Systems • CitraSource • Citrus Oleo • Doehler GmbH • Ecolab • FGF Trapani • Firmenich • Florida Chemical Company, Inc. • Givaudan Flavors Corp. • International Flavors & Fragrances Inc (IFF) • Kerry • Odyssey FoodTrans, LLC • Quattro Citrus Products, LLC • Separator Technology Solutions US Inc • Sun Rapt Foods, Inc. • Takasago International Corporation • Treatt

Thursday, September 20, 2018	
7:30am - 5:00pm	Registration [Sand Key Room]
7:30am - 8:25am	Morning Refreshments [Island Ballroom] Sponsored by: <ul style="list-style-type: none"> Givaudan Flavors Corp
GENERAL SESSION [Grand Ballroom]	
Session 3: Ideas for Industry: From Food Safety to Market Research	
Moderator: Savy DiBenedetto, Savy Quality Review, Inc.	
8:30am	Electronic Record-keeping in the Era of FSMA - Bryan Banks, Kiptraq (pg. 21)
9:05am	FSVP Implementation – Notes from a Retailer - Angela Valadez, Publix Super Markets, Inc. (pg. 22)
9:40am	Using Scientific Nutrition Research to Reach Millennial Consumers - Rosa Walsh, Florida Department of Citrus (pg. 23)
10:15am	Break [Island Ballroom]
10:45am	Marketing to Today's Millennial Mom - Samantha Lane, Florida Department of Citrus (pg. 24)
11:20am	Millennials: Disrupting Consumerism - Jennifer Zhou, Robertet (pg. 25)
11:55am	Lunch Break (<i>on your own</i>)
Session 4: Processing Technology and Strategies	
Moderator: Greg Schrader, JBT Corporation	
1:30pm	Alignment of the FDA Office of Regulatory Affairs - Stewart Watson, U.S. Food and Drug Administration ORA (pg. 26)
2:05pm	Commercialization of HPP Food Products - Emmanuel Onuoha, JBT-Avure Technologies (pg. 27)
2:40pm	Coffee Break [Island Ballroom] Sponsored by: <ul style="list-style-type: none"> Juice Products Association Purkel Products Inc Rio Grande Juice Company
3:10pm	Citrus Fiber Technical Update - John Haen, Fiberstar (pg. 28)
3:45pm	Sustainability and 10-year Strategy of the Spanish Citrus Market - José Antonio García, Ailimpo (pg. 29)
4:20pm	Juice and By-Product Processing - Elizabeth Webb, Vincent Corporation (pg. 30)
4:55pm	Announcements
5:05pm	Session Concludes
5:30pm - 7:00pm	Poolside Reception Sponsored by: <ul style="list-style-type: none"> Enerfab, Ltd JBT Corporation Vita-Pakt Citrus Products Co.

Friday, September 21, 2018	
7:30am - 10:00am	Registration [Sand Key Room]
7:45am - 8:30am	Buffet Breakfast [Grand Ballroom] Sponsored by: <ul style="list-style-type: none"> • Bell Chem Corp. • BioSun Flavors & Food Ingredients • D.L. Newslow & Associates • Flavor Materials International • Marc Neil Soudijn Research Foundation • Renewable Citrus Products Association • Safe Chem Inc. • Symrise, Inc. • Winniczuk Family
GENERAL SESSION [Grand Ballroom]	
Session 5: Hot Topics in the Industry	
Moderator: Doug Van Strijp , Southern Gardens Citrus	
8:30am	HLB R&D in the Commercial Sector - Tim Eyrich , Southern Gardens Citrus (pg. 31)
9:10am	CRISPR Technology – A Primer - Nian Wang , UF/IFAS CREC (pg. 32)
9:45am	Flavor and Consumer Science for Supply Security and Flexibility in the HLB Era - Yu Wang , UF/IFAS CREC (pg. 33)
10:20am	The Effect of HLB on Orange Oil Quality - Jinhe Bai , USDA Agricultural Research Service (pg. 34)
10:55am	Huanglongbing (HLB) and Asian Citrus Psyllid (ACP): Detection, Monitoring and Control - Timothy Gottwald , USDA Agricultural Research Service (pg. 35)
11:30am	Conference Concludes

Speaker Abstracts

Listed in order of presentation.
Presenting author names appear in **bold**.

We sincerely thank all speakers for agreeing to share their expertise and work. Our speakers have graciously prepared abstracts and we hope these will be useful to you as a possible source of industry practices. While informative, opinions and recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of UF/IFAS.

Dominican Republic: Creating New Value in Fruit Processing

Horacio Lomba

Consorcio Cítricos Dominicanos, Villa Altagracia, Dominican Republic

Dominican Republic has been a traditional fresh and processed fruit exporter to the American market based on its location and commercial trade agreements. In 2009 Huanglongbing (HLB) was detected in DR. The favourable climate conditions, the efficiency of the vector and the failure of experimental treatments allowed the rapid spread of the disease and drastically reduced citrus production. This event also showed how vulnerable the current business model was in the event of a catastrophic new threat or disease. In order to survive, the citrus industry started a transformation to mitigate risk and create new income sources through the conversion of its orchards and processing plants from monoculture, mono-product and few local customers into a diversified and flexible tropical fruit growing and processing export industry. The production of seedlings in psyllid-protected nurseries, the elimination of symptomatic trees, increasing planting densities, improving psyllid control and tree nutrition allowed private growers to remain in business and start a new citriculture. New areas have been prepared for new plantings of cocoa, coconut, guava, limes, passion fruit, pineapple and soursop. Every stage of production has been analyzed and improved from the seeds to the finished products, making possible the use of all the co-products, creating new interrelations, reducing costs, introducing new aseptic filling technologies giving as a result the creation of a diversified product portfolio that now includes biomass, cattle feed, coconut products (cream, milk, oil, substrate and water), fruit purees and concentrates.

Citrus Production - A Global Perspective

Fred Gmitter

UF/IFAS Citrus Research & Education Center, Lake Alfred, FL

Citrus fruits and juices are important global commodities, and their industrial bases are significant economic engines in areas of major production. The history of the world's citrus industries has always been one of change, but the rate of change has increased dramatically since the turn of the millennium. Many forces are at play driving these changes including shifting consumer preferences in different markets, the internet and new sources of (mis)information, politics, economics, a rapid expansion in the portfolio of new cultivar options, globalization in all things, and certainly the spreading devastation of Huanglongbing (HLB or citrus greening) worldwide. Per capita consumption of orange juice in the traditional major OJ markets is declining because of concerns regarding the connections between dietary sugar intake and chronic human diseases; this trend coincides with the rapid spread of HLB particularly in Florida, but also to a lesser degree in Brazil, impacting supply and creating real uncertainty in the future of this staple commodity. Production of most types of citrus in China is increasing dramatically, and this trend will likely continue with vast new plantings. New centers of production, especially in the Southern hemisphere, likewise are quickly expanding capacity. Fresh orange consumption is decreasing in many markets, as consumers switch their preferences to much more convenient to consume seedless and easy to peel mandarins. Grapefruit consumption continues its slow decline, as older consumers are warned about potential interactions with medications, and younger generations show little interest in it because of inconvenience and product quality attributes. Nonetheless, global demand for citrus fruit and products has continued to grow, and likely will grow into the future. Consequently, it is important for citrus growers and the downstream industries to understand the current global citrus portfolio in order to anticipate the future and make investment decisions now to be strategically situated to meet the ever-changing demands of the marketplace. This presentation will provide an overview of the trends taking place globally, and discuss challenges and possible future opportunities for citrus, a most important fruit crop.

Current Situation and Outlook for the Chinese Juice Industry

Russell Rouseff and *Houjiu Wu*

Southwest University, Citrus Research Institute, Beibei, Chongqing, China

The Chinese beverage industry has enjoyed phenomenal growth in the last 10-15 years. The soft drink consumption has increased an average of 20% since 1980. In past 16 years, juice drink production grew at an annual rate of 19%, from 1.46 m t in 2001 to 24 m t in 2016. In terms of citrus production, planting area increased 9 times but yield increased 46 times in China during past 34 years. The greatest part of this growth has occurred during the last 15 years. Even with greatly increased production, China is a net importer of OJ as the vast majority of citrus production in China is sold as fresh fruit. Per capita consumption of OJ in China has increased tremendously, but the average per capita OJ consumption is still only about 2.5 L which is about ½ that of average worldwide consumption. Juice consumption in China has followed trend with the increases in the Chinese economy. The average income of Chinese people has increased with the increasing economy which has led to changes in food purchases and consumption. There is also a trend toward healthy eating which has benefitted citrus juice consumption as OJ is still considered to be a healthy beverage. These trends in China will be compared to world citrus production and consumption as well as an outlook for the future.

An Update on the Cuban Citrus Industry

William A. Messina, Jr. and *Ariel Singerman*

UF/IFAS Food and Resource Economics and UF/IFAS Citrus Research and Education Center, Gainesville, FL

The citrus industry in Cuba is struggling to combat the devastating effects of HLB. Cuba's citrus production volume is declining and represents only about 10 percent of its peak level in the late 1980s. Considerable acreage has been moved out of citrus and into other crops and livestock grazing – a situation similar to that in some areas of Florida. Critical differences between the two regions, however, are that the Cuban government has few financial resources to support greening research, and their most important (foreign) investors in citrus have left the island. Together, these factors make it especially difficult to address the challenges posed by this virulent disease. Despite these constraints, the citrus industry in Cuba continues to replant trees, and is looking at alternative low-cost methods to manage the disease.

Millennials and Orange Juice Consumption

Lisa House and ***Yan Heng***

UF/IFAS Food and Resource Economics, Gainesville, FL

Millennials account for about one fourth of the entire population in the US with \$200 billion buying power annually. For the beverage industry, it is important to connect and communicate with this generation effectively. To do so, we need first to understand millennials' preferences and shopping behaviors, as well as the differences between this generation and older generations. The orange juice industry has been experiencing challenges from both the supply side and demand side. From the industry's perspective, how to target the millennial generation effectively is essential to enhance consumers' demand for orange juice. The Florida Agricultural Market Research Center (FAMRC) has developed and managed a monthly consumer tracker for the orange juice consumption since July 2016. As of June 2018, the database has collected over 12,000 household data points. The tracker collects information on demographics, buying behavior, household attitudes, health status, product attributes preferences, and media effects. With this rich database, we are able to track the trends and patterns of consumers' habits and shopping behaviors and capture changes in perceptions and attitudes over time. In this analysis, we aim to use this consumer tracker to identify the demand drivers of orange juice for Millennials. Moreover, we compare the shopping and consumption preferences and behaviors between the Millennials and the overall population. We develop an econometric model to illustrate how various factors derived from the consumer tracker influence the orange juice purchase.

Orange Juice Flavor Balancing

Stephan Raeker

Symrise AG, Noerdlingen, Germany

The global orange juice industry faces severe challenges these days. In the Western World the image of orange juice is turning more negative due to consumers' concern about calorie intake. This coincides with a troubled supply side which is affected by Citrus Greening / HLB, availability, price fluctuations and competing cash crops. Especially the impact of HLB on the taste of orange juice and its by-products like peel oil together with shrinking juice yields poses a significant threat to the industry. As a consequence juice companies find it harder and harder to secure their "golden standard" juice quality of balanced sugar-acid ratios with low bitterness levels, the orange juice taste profile consumers prefer.

Strong research activities have been conducted throughout the last years to better understand the molecular triggers of HLB off-taste, both in juice and peel oil. Already known and previously unknown components are responsible for HLB induced bitterness, besides a negatively perceived shift in the overall composition of volatile components. The decoding of molecular causes was complemented by joint investigations with the USDA to discover fractions and molecules showing HLB off-taste mitigation properties.

Based on the outcome of combined work streams, prototypes of innovative orange juice flavour balancing systems have been developed. Sensory data confirmed that balancing low ratio / high bitterness juices into the direction of mid to late season qualities is possible to a certain degree. This opens up possibilities to use more of early season or HLB affected juice in packaged juices, nectars and (low calorie) juice drinks while maintaining high consumer-liking as well as brand specific sensory signatures.

How is Consumer Health & Wellness Driving Growth for Citrus Beverages?

William Polese

MarketsandMarkets, Seattle, WA

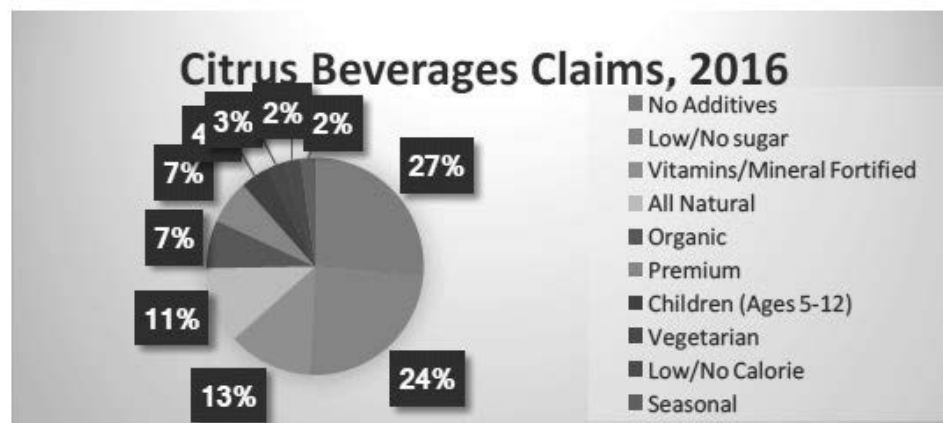
Nutritional benefits without sacrificing on taste continue to drive the thriving healthy citrus juice market. Fortified juices account for 4.1% of the functional/fortified F&B products market in 2015 will reach US\$2.9 billion by 2022. This segment continues to gain shelf space in conventional supermarkets due to a growing awareness and demand among consumers for functional food & beverage products that enhance health and wellness. Consumers expect products to be more natural, tasteful and loaded with healthy ingredients.

Companies have exploited the utilization of citrus products, either whole or parts, into their products, and have modulated citrus flavor to capture the largest number of customers. The five top product categories that use citrus in their products are beverage, confectionery, bakery, dessert, and savory. Health beverages are the new opportunistic category; utilizing citrus blends as an emerging trend to augment the product flavor and satiety. The varieties of citrus that enable beverage manufacturers to bolster the health benefits and simplify label claims will drive the greatest growth whilst masking off-notes of the added fortifying agents.

Attendees will come away with:

- Insights into the citrus health beverages fortified or enriched with minerals, vitamins and other healthy ingredients; and significance of citrus natural flavors on food and beverage industry.
- A clear understanding of the challenges faced across the supply chain:
 - Identify high growth drivers and their level of impact on market,
 - Market positioning of brands present in the market,
 - Identify emerging opportunities in fortified citrus health beverages and natural flavor.
 - Asses the regional growth pockets in the market that will help in expansion and investment.
- A five year forecasts of the citrus fortified beverage and the natural citrus flavor broken out by geography.

Citrus Beverage Claims, 2016



Source: MarketsandMarkets Analysis

International Trade Policy 2018 Update: Challenges and Opportunities

Anthony Nogueras

Alliance Drawback Services, Naples, FL

The Trade Facilitation and Enforcement Act of 2016, Section 232 Steel Tariffs, Section 301 Tariffs on \$50 Billion in goods imported from China, Retaliatory Tariffs from Trading Partners, European and US Free Trade Agreements.... Federal government trade policy currently dominates business headlines like at no other time in recent history. While Administration policy disrupts supply chains as US importers and exporters seek strategies to mitigate duties, companies also need to understand and assess the impact of game changing trade legislation to determine the best path forward.

As an example, the Trade Facilitation and Enforcement Act of 2016 known by its acronym TFTEA, significantly liberalized the duty drawback refund program. The duty drawback provision of the United States tariff law initially originally enacted in 1789 allows for the refund of duties on imported merchandise that is subsequently exported either after a manufacture process or in the same condition as imported. The new and more flexible rules for matching imports and exports will result in a massive expansion of drawback refunds under this program.

The presentation will include a review of the latest up to the minute news regarding government trade policy, offer options for mitigating additional duties through various strategies, and provide an overview of key changes to the duty drawback regime that will allow claimants to maximize future recoveries.

Juice Products Association (JPA) Update

Carol Freysinger

Juice Products Association, Washington, DC

What is the Juice Products Association? What are JPA's strategic goals? Should your organization be involved? Representing the US juice products industry, the Juice Products Association's mission is to *connect members to strengthen the juice products industry; provide a unified voice; serve as the expert resource, enhance industry best practices; and promote consumer benefits of juice products*. Carol Freysinger, JPA's Executive Director, will give an update on JPA's work, including the new Sip Smarter! program promoting the healthfulness of juice.

Electronic Record-keeping in the Era of FSMA

Bryan Banks

Kiptraq, Salinas, CA

Bryan Banks is the founder and COO of KipTraq (pronounced “Keep Track”). KipTraq is a six year old software platform that offers a suite of flexible data collection and analytics tools across many industries and departments, with a primary focus on food safety. KipTraq customers currently log around 20,000 transactions every day, mostly for Food Safety and QA, but in many other areas as well. Bryan has been consulting and developing software to manage complex business processes for over 20 years.

Processors and growers are feeling the increased burden of reporting, both from FSMA as well as customer specific requirements. Existing legacy processes (paper, Excel) have never been efficient, and may now no longer be compliant. Technology companies, from established vendors to startups, are responding with different solutions in the marketplace. Without an understanding of what is possible, companies may end up investing in a less-than-optimal solution.

We will be covering recent trends in data collection, analytics and reporting tools available to food growers and processors. This will be an informational presentation to inform attendees about approaches they may not be familiar with, and the pros and cons of several different technologies.

Some of the topics covered:

- How to move away from paper and Excel
- Pros and cons of using phones or tablets for data capture in wet/cold/remote environments
- Using barcode, RFID and/or BLE (Bluetooth Low Energy) for employee presence verification
- Novel uses of GPS in data capture: geofencing, navigation, employee path tracing, and presence verification
- Capturing hundreds of pictures every day, and how to use the data once you have it
- Using both simple and complex barcodes to streamline data entry and product spec verification
- Communicating out-of-spec events to key players in a timely manner
- Electronic authorization of records by supervisors
- Use of reporting and dashboards in-plant and in-office
- Discussion on integration with financial systems, processing equipment, labs, and other 3rd parties

Rather than seeing the additional reporting requirements driven by both new regulations and customers as a burden, we will attempt to reframe it as an opportunity. Companies that do a better job of data collection and reporting will be able to leverage that into increased efficiency, throughput, and quality. The right tools, implemented correctly, will not just ensure regulatory compliance, but will also be a competitive advantage in the marketplace.

FSVP Implementation – Notes from a Retailer

Angela Valadez

Publix Super Markets, Inc., Lakeland, FL

Publix Super Markets, Inc. will share their journey to comply with the recently implemented Food Safety Modernization Act (FSMA) Foreign Supplier Verification Program (FSVP) for Importers of Food for Humans and Animals.

Using Scientific Nutrition Research to Reach Millennial Consumers

Rosa Walsh

Florida Department of Citrus, Lake Alfred, FL

Millennials are the largest generation in American history and with that comes unprecedented spending power. Understanding their preferences and perceptions of the health and wellness of food and beverages for themselves and their families is crucial to reaching this generation, particularly as it relates to orange juice. This presentation explores how scientific nutrition research plays a role in engaging and educating millennial moms on the health benefits of 100% orange juice through social media, digital media and influential nutrition experts. Topics of interest to millennial moms include weight management, diet quality, and nutrient density as well as research on orange juice that looks at hesperidin, heart health, hydration and cognition. Examples of how the Department of Citrus is leveraging this information specifically with influencers will be shared.

Marketing to Today's Millennial Mom

Samantha Lane

Florida Department of Citrus, Bartow, FL

Building on the previous presentation, “Using Scientific Nutrition Research to Reach Millennial Consumers,” we dig deeper into the digital lives of millennial moms and the decisions they make for themselves and their families. With a focus on digitally-based campaigns that reach millennial moms where they already spend much of their time, this presentation highlights how messages on the health benefits of 100% orange juice are built upon a foundation of scientific nutrition research but custom-tailored for and delivered to a highly skeptical generation. From sharing recipes to empowering moms, every message is backed by data and retargeted through multiple touchpoints to ensure repeated exposure and higher engagement, leading to success beyond the television screen. Examples of how the Florida Department of Citrus is leveraging these insights will be shared.

Millennials: Disrupting Consumerism

Jennifer Zhou

Robertet Flavors, Piscataway, NJ

Who are Millennials and how are they disrupting and shaping the future of consumerism? What are the fundamental differences between this key demographic and non-millennial generations? The “nice-to-haves” of previous generations are now a clear expectation from Millennial consumers. They are even shifting focus away from traditional channels of distribution. How are we seeing all types of industries respond to their needs and desires? We will endeavor to explore all these questions and more through a fun session of infotainment.

FDA's Office of Regulatory Affairs Aligns for the Future: An Overview of the Office of Human and Animal Food Operations

Stewart Watson

U.S. Food and Drug Administration, Office of Regulatory Affairs/Office of Communications, Maitland, FL

The Office of Regulatory Affairs (ORA) many are familiar with has historically been organized by geographic area. ORA's regions previously captured our district offices and field operational staff. This previous model had little emphasis on specialization. In the new organizational model, for a given product type, the entire reporting chain for ORA's inspection and compliance staff--from the employees on the front lines to the assistant commissioners at headquarters--now specializes in that particular commodity. Under Program Alignment the Human and Animal Food Program (HAF) was formed to coordinate and manage all domestic and foreign field investigatory operations related to human and animal food regulated by the Agency, serve as the central point within the Agency through which Directorates and other Headquarters offices obtain field support services for human and animal food activities and serve as the Agency focal point in coordinating, directing, and assisting the field and headquarters offices with investigative human and animal food activities.

Commercialization of HPP Food Products

Emmanuel Onouha

JBT- Avure Technologies, Erlanger, KY

Visits to the grocery store now come with required reading. Today's savvy consumers want to know what's in the products they're feeding their families; clean labels have become an important part of the shopping experience and a simpler ingredient list increases the likelihood the product will be purchased. Minimally processed food, preserved without the use of additives or chemicals, is becoming an important avenue for food and beverage manufacturers to explore.

High Pressure Processing (HPP) is an innovative technology that inactivates potentially harmful bacteria in food without the use of chemicals and other additives. The result? Cleaner labels and greater appeal to consumers.

By processing foods and beverages with extremely high, hydrostatic water pressure, up to 87,000 psi (6000 Bar), HPP inactivates pathogens such as *listeria*, *salmonella*, *E. coli* as well as spoilage bacteria. Unlike thermal and chemical treatments, HPP does not significantly alter flavor, texture, or quality of foods. It also keeps healthy vitamins and enzymes intact that thermal processing can destroy. HPP is especially desirable for foods and beverages that are sensitive to heat such as guacamole, fresh juices and high nutritional beverages, wet salads, sliced deli meats, and several other food categories.

The HPP industry has seen significant growth in recent years, driven largely by consumer demand for food safety, nutritional quality, and clean ingredient labels. Speedy adoption of HPP technology by food and beverage manufacturers, as well as a growing number of tolling service providers, has allowed swift delivery on these consumer demands as well as expansion into new product categories and geographic regions. While some challenges do exist for this growing technology, continued growth is expected to accelerate through 2026.

Fiberstar Citrus Fiber – A Technical Update

John Haen

Fiberstar, Inc., River Falls, WI

Fruit supply and marketplace demand for citrus based products have experienced a multitude of challenges in recent years. However, recent technological advances needed to make citrus based materials, i.e. byproducts, co-products, etc., into value-added ingredients with significant global demand, especially from fiber based sources, continues to grow. The demand from food and beverage manufacturers for natural based ingredients that are clean label is higher than ever. Partnerships with innovative companies willing to invest in research and development, universities, and federally funded research institutions, e.g. USDA, have been shown to be an effective strategy for developing new understanding, technology, and innovations needed to make citrus based materials into marketable products, which are expected to make a significant contribution to the citrus industry's future. Because citrus fruits are composed of nearly 50% byproducts, there is a large opportunity to make citrus fruits into something bigger than just juice. As a result of this investment in the aforementioned research strategy, one peer reviewed research article has been published with another one pending, seven US and international patents have been issued, several new product line expansions, and new product launches have been made in recent years that involve citrus fiber technologies.

While Fiberstar commercialized its first citrus fiber based material in 2004 based on pulp cell raw materials, new technologies have enabled the commercialization of other products, raw materials, and new applications. For instance, an expansion of production capabilities have added new raw material sources, e.g. segment membranes, rag/core, and peel into value added ingredients. To help aid the growth of new technologies, the National Science Foundation awarded a federal Small Business Innovation Research (SBIR) research grant for the development of fibrous citrus based materials into a natural suspending agent for use in juice and other beverage based products. As a result of this research along with collaboration with the University of Minnesota and USDA, ground breaking technology is being developed for the use of citrus fiber sources with minimal flavor and color that can help create juice and beverage suspensions that remain in suspension. The SBIR research project seeks make functional food ingredients from natural raw materials and improve sustainability and clean label alternatives compared to other thickening, suspending, or hydrocolloid ingredients sold today, e.g. pectin, hydroxypropyl methylcellulose, and/or carboxymethylcellulose. Due to its natural composition sourced from citrus fiber byproducts, the technology platform will withstand alkaline and acidic conditions ranging from pH 2-10, be thermally stable up to 100 °C, and withstand multiple freeze/thaw cycles. These citrus fibers can also be used as an oil replacer, thickener, emulsifier, texturizer, moisture retention agent in bakery, yogurt, sauce, dressing, beverage, and meat applications. In recent studies, a novel citrus fiber-oil composite powder was formulated and prepared, which can also be used as a flavor carrier.

Sustainability and 10-year Strategy of the Spanish Citrus Market

José Antonio García

Ailimpo, Murcia, Spain

AILIMPO is the Spanish inter-professional association based in Murcia (Spain), representing the economic interests of growers, traders and lemon and grapefruit processors – a sector in which Spain is the world leader for the export of fresh lemons and second in the ranking for processing countries with an annual turnover of USD 870 million and generating more than 20,000 direct jobs. Spain plays a key role in the citrus business worldwide both in the fresh and processed market for oranges, easy peelers, grapefruits, and more intense in the case of lemons.

Spanish production of lemon exceeds one million tonnes as an average in the last ten years, but showing a clear increasing trend. Spain is therefore the world's second-largest lemon producing country. In terms of processing, Spain varies between 260,000- 300,000 tonnes, depending on the season, being the second-largest processor of lemons worldwide.

The production of lemon in Spain is oriented to the fresh market and the processing industry acts as a subsidiary using the fruit whose qualities are not suitable for the fresh market. Basically, Spanish industry processes lemons with skin defects, or defects in shape but which maintain the internal quality of the fruit intact. Spain is a world leader in exporting lemon as fresh fruit and that is only possible by producing the best lemon in the world with the best farmers. The same fruit produced with passion, sustainability and quality is the fruit processed to obtain, juice, essential oil and dehydrated peel.

Spain is the only country in the world where lemon production is possible for almost 12 months a year thanks to the fact that Spain produces two varieties: Fino and Verna, harvested in winter and summer respectively, allowing a global service to customers who can be supplied with Spanish lemon throughout the year. This advantage of Spain also has an impact on the processing, especially in NFC lemon juice. Thanks to the indisputable quality of the fruit and the uniqueness of these two varieties, Spain can offer fruit and freshly squeezed juice all year round.

Looking at the future, the strategy of the Spanish citrus industry is based on increasing production while keeping quality, food safety and service to consumers, consolidating our position in the EU market and expanding the business to new markets, specially Asia and the USA. The Spanish sector is very dynamic, developing new products tailored to the technical specifications of each client. Finally, but extremely important, the Spanish lemon sector is committed with sustainability, considering the social, environmental and economic approach, and using tools like GlobalGAP and GRASP certification schemes to ensure sustainable production. Spain is also promoting the cultivation of organic lemon.

Fortunately, until now, Spain has not suffered the impact of any important pests that are causing serious damage in other citrus producing countries. European regulations establish a system of control and protection that is proving for the time being to be effective to prevent the introduction of harmful organisms. In any case, the threat is real and it is our responsibility to guarantee plant health in our industry.

Juice and By-Product Processing

Elizabeth Webb

Vincent Corporation, Tampa, FL

Today's marketplace is filled with a myriad of juice and juice ingredient choices, both pedestrian and exotic. Old standards like orange, grapefruit, pineapple, apple, and cranberry and the like stand side-by-side with newer entries such as kale, spinach, ginger, acai, jalapeño, red beet, goji, lemongrass, watermelon, cucumber, horseradish, mint... well, you get the picture.

Two key questions are ever-present, regardless of the juice or juice ingredient produced. How do you produce the juice? What do you do with the leftovers?

This talk will address juicing technologies in general. In addition, both conventional and novel byproduct solutions will be discussed.

HLB R&D in the Commercial Sector

Tim Eyrich

Southern Gardens Citrus, Clewiston, FL

Southern Garden Citrus has been active in researching and developing innovative ideas and products to address the Citrus Greening disease. In recent years we have moved this research from the greenhouse to active replicated field trials. In this presentation SGC will provide an update on their two pronged approach in creating trees to manage Citrus Greening.

CRISPR Technology – A Prime

Nian Wang

UF/IFAS Department of Microbiology and Cell Science, Citrus Research and Education Center, Lake Alfred, FL

Clustered regulatory interspaced short palindromic repeat (CRISPR) technology (e.g., Cas9/single guide RNA (sgRNA) (hereafter named Cas9/sgRNA)) has been widely employed to edit genome in many organisms. Cas9/sgRNA requires no changes in the Cas9 protein, but only in the recombinant sgRNA for target specificity. Cas9 creates a double-stranded break (DSB) 3 bases from the NGG sequence that makes up the protospacer adjacent motif (PAM) site. DSB repair will produce a deletion by non-homologous end joining (NHEJ) in most cases. Mutations or insertions can be created by homologous repair (HR), by adding a donor sequence that has homologous overlaps to the DSB site. Here I will introduce the general concept about CRISPR, and its applications. Specifically, citrus industry faces multiple disease challenges in Florida, including citrus Huanglongbing (HLB) caused by *Candidatus Liberibacter asiaticus* (Las) and citrus canker caused by *Xanthomonas citri* subspecies *citri* (Xcc). Generating disease resistant citrus varieties will provide an efficient and sustainable term solution to either HLB or canker disease. However, the traditional approach of breeding for resistant plants for citrus is difficult and has not provided a timely solution to control HLB or canker due to the long juvenility, large tree size, and prevalence of polyembryonic seeds in commercial varieties. Here we will present our progress in generating disease resistant citrus varieties via CRISPR technology.

Flavor and Consumer Science for Supply Security and Flexibility in the HLB Era

Yu Wang

UF/IFAS CREC, Lake Alfred, FL

The major concern for the entire citrus industry is a significant decline in citrus production due to HLB disease in Florida; The spread of HLB to other citrus growing areas across the United States will continue to reduce the US citrus supply. In addition to the production shortfalls are additional losses due to fruit rejection by packing houses and juice processing plants as a result of inadequate size and low sugar content. Nonetheless, large quantities of high quality citrus fruits are needed to keep pace with demand and projected market growth, as well as ensure supply security for the next decade and beyond. Nearly all of the relevant citrus agencies and organizations have recognized that breeding HLB tolerant/resistant cultivars and novel pre-harvest interventions have the potential to dramatically increase the supply of citrus fruit under these adverse circumstances. However, successful development of HLB tolerant/resistant cultivars or treatments should also be consumer-driven, because the consumer is the key to driving product success in the contemporary marketplace. For our citrus industry, the goal is not only mitigating HLB and ensuring citrus supply security, but also enhancing consumer liking of citrus products, as well as expanding market share. Based on the Food & Health Survey conducted by the International Food Information Council Foundation, flavor has been the top-ranking driver of food/beverage purchasing decisions, followed by price, which indicates consumers are willing to pay more for better tasting products. This talk will focus on use of flavor and consumer science to enable high throughput and reproducible production of consumer-liked fruits in large scale to match the expected increased demand for citrus fresh/juice markets.

The Effect of HLB on Orange Oil Quality

Jinhe Bai

USDA ARS, Fort Pierce, FL

Huanglongbing (HLB)-affected oranges are typically green or yellow in color, rather than orange, and the latter is more common in the Florida citrus groves. The yellow color is often associated with insufficient accumulation of carotenoids (the reason for lack of orange color) in the flavedo, lack of natural shine, and shriveled peel (due to water loss). The green color is an indicator of maturity due to HLB-associated phloem malfunction and resulting retarded growth and development of the fruit. All HLB-affected fruit produced a lower volume of peel oil compared to healthy fruit, however, only green fruit showed substantially different volatile profiles from healthy fruit. The green fruit contained low concentrations of most of sesquiterpene hydrocarbons and derivatives, such as, nootkatone, valencene, α -selinene, 7-epi- α -selinene and caryophyllene oxide, some monoterpene hydrocarbons and derivatives with orange/citrus characteristics, such as, limonene, myrcene, α -pinene, neral, geranial, and α -terpineol, and straight-chain aldehydes, such as, octanal, nonanal and decanal. However, eight compounds were determined in the green fruit peel which were not present, or present in very minor quantities, in the healthy fruit. Other compounds found more in HLB-affected green fruit than in healthy fruit peel oils were cis-3-hexenol, cis-pinocarveol, carvone, and α -cubebene. A preliminary research on utilization of HLB degraded fruit for the creation of value-added co-products was conducted. In comparison of essential oils collected from HLB-affected peels, the oil from whole fruit showed higher abundance of aliphatic aldehydes, alcohols and esters which contribute fruity flavor, and monoterpene aldehydes, alcohols and esters which contribute citrus and fruit flavors. On the other hand, oils from peels alone were higher in monoterpenes and aliphatic alcohols, and overall sesquiterpenes.

Huanglongbing (HLB) and Asian Citrus Psyllid (ACP): Detection, Monitoring and Control

Tim Gottwald

USDA ARS, US Horticultural Research Laboratory, Fort Pierce, FL

Vigilant biodefense, against incursions of new pathogens and pests, is vital as increasing world travel and trade continues to bolster introductions. This is critically important for long-living arboreal agrosystems such as citrus, for which introductions can be devastating and recovery is long term. The recent introduction into the western hemisphere of citrus Huanglongbing (HLB), subsequent rapid spread, and resulting devastation exemplifies this concern. Where HLB exists, commercial citrus industries decline due to current inadequate control methods. The pillars of HLB management are: Asian citrus psyllid (ACP) vector control, nursery sanitation to ensure clean planting material, inoculum reduction via diseased tree removal, and early detection. HLB is caused by the bacterium, *Candidatus Liberibacter asiaticus* (CLas). HLB increase and regional spread are related to psyllid vector populations. HLB inoculum dispersal is particularly rapid, compared with other arboreal pathosystems. Disease dynamics of HLB results from multiple simultaneous spatial processes, suggesting that vector transmission is a continuum from local to very long distance and often combined with inadvertent propagative spread. However, multiple asymptomatic infections per tree, incomplete systemic distributions within trees, and prolonged incubation periods make HLB detection difficult and greatly complicate disease control. Early detection has become a key pillar for control; the earlier disease can be detected and removed, the less disease spread occurs and the more manageable the epidemic. Visual detection is inadequate due to prolonged and variable incubation periods for both pathosystems that leads to an underestimation of disease. New early detection methods are under development to accurately detect and enumerate subclinical infections over the vast orchard acreage of most growing regions, such as canine detection, HLB related volatile organic compounds, metabolomics, proteomics, serological methods, etc. Because the disease spreads over long distances area-wide control, where growers band together to manage psyllid populations regionally, has shown to be effective in some parts of Brazil and Florida and has been implemented proactively in Texas and California to reduce vector populations and resulting disease transmission and thereby slow the epidemic. Disease spread and regional decline can be slowed further with intensive, risk-based survey to predict infected areas, combined with risk-based targeting of management strategies. Other topics of discussion will be incursion detection via a census-travel model based on international travel linked to the US census, and risk-based statewide survey models/methods plus a brief glimpse of canine early detection technology.

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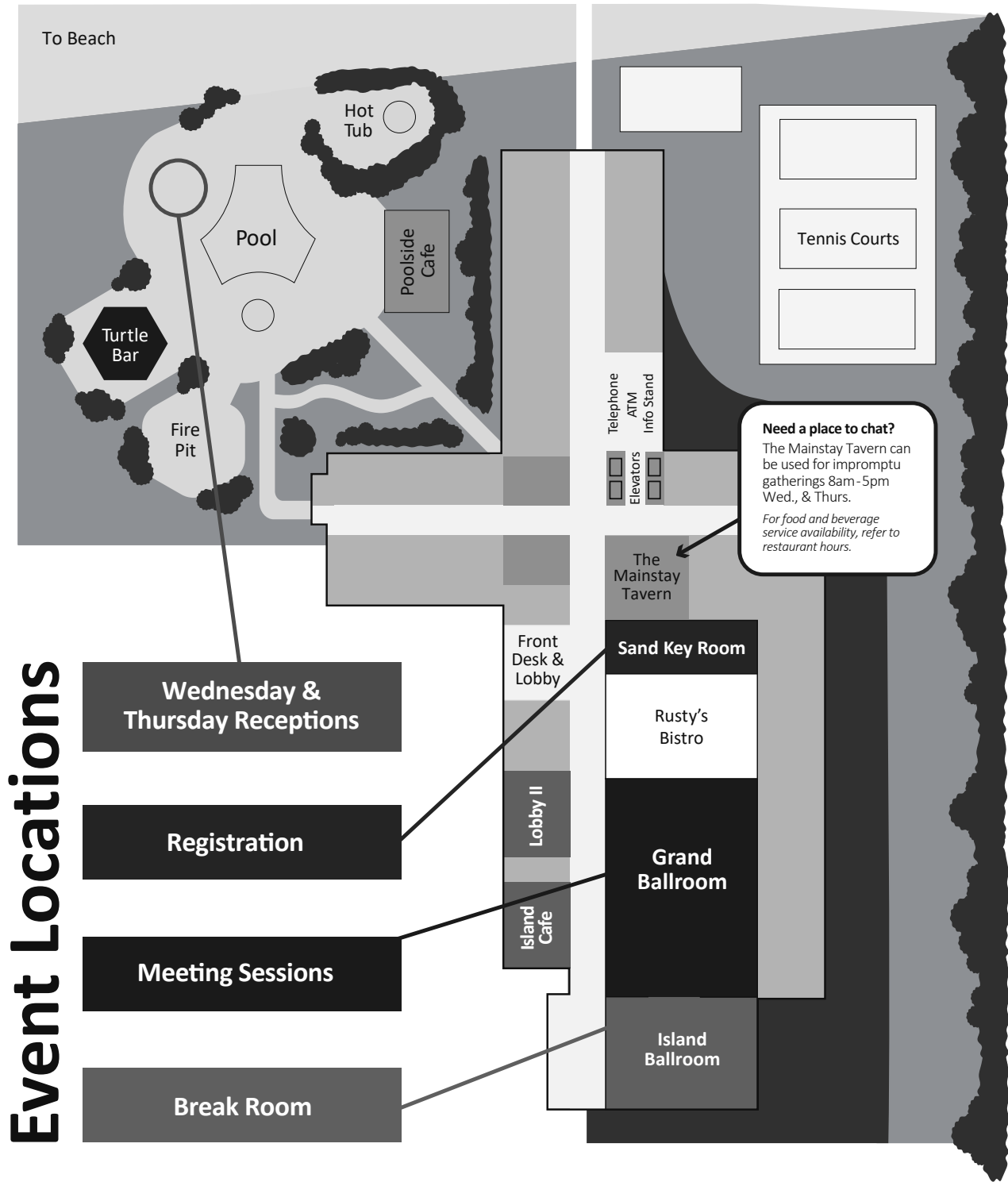
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