



International Citrus & Beverage Conference

Program & Abstracts

September 19-22, 2023

Clearwater Beach, Florida, USA

conference.ifas.ufl.edu/citrus

UF | IFAS Extension
UNIVERSITY of FLORIDA

FS *Human Nutrition*
Food Science *HN*
University of Florida





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Wi-Fi Information

Wifi Network: SANDKEY MEETING

Password: ICBC23

Welcome Letter

Welcome back to Clearwater Beach and the 2023 International Citrus and Beverage Conference! This year's conference will focus on key issues facing our industry spanning the topics of global juice and beverage operations to the marketing of new and emerging products and ingredients. Please join us for discussions on recent research and consumer insights regarding the beverage category (especially orange juice) and the impact of new regulations and technical innovations on the food, beverage, and value-added industries (including AI). The Friday morning "Hot Topics" session will again focus on research and new approaches to issues facing the citrus industry, including HLB research strategies, both short and long term.

We were happy to have a successful in-person event in 2022, and this year promises an equally rewarding event. Appreciation goes to everyone who has contributed to this year's conference. 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

"Providing Solutions for the Citrus and Beverage Industries Since 1960"

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FS Human Nutrition
Food Science **HN**

Planning Committee

Clarissa Albarran, Brown International, LLC, Winter Haven, FL

Beto Amador, Evera by Citrusuco, Lakeland, FL

Jennifer Davis, dsm-firmenich, Lakeland, FL

Savy DiBenedetto, Savy Quality Review Inc., Daytona Beach, FL

Brandy Geiger, Florachem, Jacksonville, FL

Renée Goodrich Schneider, *Program Organizer*, UF/IFAS FSHN, Gainesville, FL

Stephen Heding, USDA, AMS, Winter Haven, FL

Michael Mas, JBT Corporation, Lakeland, FL

Anne Plotto, USDA-ARS, Ft. Pierce, FL

Keith Schneider, UF/IFAS FSHN, Gainesville, FL

Nick Shuman, The Coca-Cola Company, Apopka, FL

Linda Staten, USDA-AMS, Winter Haven, FL

Christopher Stone, ADM, Winter Haven, FL

Terica Turlington, Florida's Natural Growers, Lake Wales, FL

Yu Wang, UF/IFAS CREC, Lake Alfred, FL

Elizabeth Webb, Peace River Citrus, Arcadia, FL

Barry Wilson, Safe Chem, Inc., Zellwood, FL

Detailed Agenda

Tuesday, September 19, 2023 | Registration

4:00pm–7:00pm	Registration Open Registered attendees may pick up nametag and program [Coastal Room]
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Wednesday, September 20, 2023 | First Day of Sessions

7:30am–5:00pm	Registration Open [Coastal Room]
7:30am–8:25am	Light Morning Refreshments [Island Ballroom] Sponsored by: Vincent Corporation
General Session [Beach/Gulf/Palm Rooms]	
Welcome and Introductory Remarks	
8:30am–9:00am	- Renée Goodrich Schneider UF/IFAS Food Science & Human Nutrition, <i>Program Organizer</i> - Barry Wilson Safe Chem, Inc., <i>Program Chair</i>
Session 1: The Global Citrus Industry	
Moderator: Clarissa Albarran, <i>Brown International, LLC</i>	
9:00am	The Greek Citrus Industry - Alexandros Christodoulou, <i>Christodoulou Bros S.A.</i> (pg. 15)
9:40am	Overview of the Citrus Production in Mexico - Ricardo Martinez, <i>Citrofrut</i> (pg. 16)
10:20am	Coffee Break [Island Ballroom]
10:40am	California Citrus Processing - Sergio Lobo, <i>Vita Pakt Citrus</i> (pg. 17)
11:20am	Brazilian Citrus Overview - Vinicius Trombin, <i>Fundecitrus/ Markestrat</i> (pg. 18)
12:00pm	Lunch Break (on your own)

Wednesday, September 20, 2023 | First Day of Sessions (continued)

General Session [Beach/Gulf/Palm Rooms]

Session 2: Worldwide Economics, Trade, and Marketing

Moderator: Jennifer Davis, *dsm-firmenich*

1:30pm	<p>World Citrus Organization – An Update - Jose Antonio Garcia, <i>AILIMPO - Lemon from Spain®</i> (pg. 19)</p>
2:05pm	<p>Marketing the Lime Industry in Mexico - Leo Espinosa, <i>Rio Grande Juice Co./ Wonderful Citrus</i> (pg. 20)</p>
2:40pm	Coffee Break [Island Ballroom]
3:10pm	<p>Consumer Insights on Juice and Beverages - Ed Koza, <i>dsm-firmenich</i> (pg. 21)</p>
3:45pm	<p>IFU's Overview: Unveiling Initiatives and Vital Facts Shaping the Fruit and Vegetable Juice Industry - Tatiana Campos, <i>IFU</i> (pg. 22)</p>
4:20pm	<p>Global Alcohol Trends: Challenges and Opportunities for Citrus - Zareena Valappil, <i>ADM</i> (pg. 23)</p>
4:55pm	Announcements
5:00pm	Session Concludes
6:00pm–7:00pm	<p>Networking Reception [Poolside] Sponsored by:</p> <ul style="list-style-type: none"> • ADM • Advanced Logistics • Brown International • Chemical Systems • Cvista • dsm-firmenich • F.G.F Trapani • Flavor Materials International • Florachem • FlowTrans LLC • Givaudan • S.A. Veracruz • Separator Technology Solutions • Treatt • Trisun • Vicente Trapani S.A. • Ziemann Holvrieka GmbH

Thursday, September 21, 2023

7:30am–5:00pm	Registration Open [Coastal Room]
7:30am–8:25am	Light Morning Refreshments [Island Ballroom] Sponsored by: Givaudan
General Session [Beach/Gulf/Palm Rooms]	
Session 3: Consumers, AI and New Business Models	
Moderator: Keith Schneider, <i>UF/IFAS FSHN</i>	
8:30am	Innovation and ESG Developments - Evera by Citrosuco - Alex Schuermans, <i>Evera by Citrosuco</i> <i>(pg. 24)</i>
9:05am	GMOs: Can We Get a Do-Over? - Kevin Folta, <i>UF/IFAS</i> <i>(pg. 25)</i>
9:40am	The Talent Shortage and What is Next - Gerry Hoeffner, <i>Personal Dynamics, Inc.</i> <i>(pg. 26)</i>
10:15am	Coffee Break [Island Ballroom]
10:45am	Using AI and Mind Genomics as a “Daily Tool” to Understand the Consumer Mind and Generate Opportunities - Howard Moskowitz, <i>Mind Genomics Associates, Inc.</i> <i>(pg. 27)</i>
11:55am	Lunch Break (on your own)

Notes

Thursday, September 21, 2023 (continued)

Session 4: Technical and Processing Solutions

Moderator: Elizabeth Webb, *Peace River Citrus*

1:30pm	Advances and Comparisons of Sterilization Technologies - Juan Martinez, <i>JBT Corporation</i> (pg.28)
2:05pm	Helios Artificial Intelligence - Dino Cardelli, <i>The Procurement Framework Company LLC</i> - Francisco Martin-Rayó, <i>Helios Artificial Intelligence, Inc.</i> (pg. 29)
2:40pm	Coffee Break [Island Ballroom]
3:10pm	Modification of Pectin Structure and Improvement of Pectin Gelling Capacity by a Physical Pre-treatment of Fresh Orange Peel Prior to Pectin Extraction - Wei Zhao, <i>USDA-ARS</i> (pg. 30)
3:45pm	Practical and Effective Strategies to Debitter the HLB-affected Citrus Fruits and Juices - Liwei Gu, <i>UF/IFAS</i> (pg. 31)
4:20pm	Understanding the Orange Juice Supply and Consumer - Lisa House, <i>UF/IFAS</i> - Marisa Zansler, <i>FDOC</i> (pg. 32)
4:55pm	Announcements
5:00pm	Session Concludes
5:30pm–7:00pm	Networking Reception [Poolside] Sponsored by: <ul style="list-style-type: none">• AILIMPO - Lemon from Spain®• Citromax Group• Evera by Citrosuco• International Flavors & Fragrances Inc. (IFF)• JBT Corporation

Notes

Friday, September 22, 2023

7:30am–10:00am	Registration Open [Coastal Room]
7:45am–8:30am	Morning Breakfast [Grand Ballroom] Sponsored by: <ul style="list-style-type: none"> • Bell Chem • D.L. Newslow & Associates • Safe Chem Inc.
General Session [Beach/Gulf/Palm Rooms]	
Session 5: Hot Topics in the Citrus Industry	
Moderator: Anne Plotto, <i>USDA-ARS</i>	
8:30am	Pesticides in the Citrus Industry - Elizabeth Berdis, <i>dsm-firmenich</i> <i>(pg. 33)</i>
9:10am	Symbionts™: The Prototype for Tomorrow's Plant Health, Growth and Characteristics - Michelle Heck, <i>USDA-ARS</i> - Mark Trimmer, <i>AgroSource, Inc.</i> <i>(pg. 34)</i>
9:45am	Effect of Antibiotic Injections on Citrus Trees - Ute Albrecht, <i>UF/IFAS</i> <i>(pg. 35)</i>
10:20am	Update on Genetic Engineering Citrus Field Trials - Matt Mattia, <i>USDA-ARS</i> <i>(pg. 36)</i>
10:55am	An Overview of Citrus Research - Rick Dantzler, <i>CRDF</i> <i>(pg. 37)</i>
11:30am	Conference Concludes

Notes



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.

THE GREEK CITRUS INDUSTRY

Alexandros Christodoulou

Christodoulou Bros S.A., Greece

In this presentation, we explore the significant role of Greece, as a Mediterranean country, in the global citrus industry. We provide an overview of the orange cultivation and production trends over the last two decades, the geographical distribution and the regional variations. From the sunny orange groves of Argolida in Peloponnese to the fertile plains of Chania in Crete we discover the premium quality of the nutritious Greek oranges, and we understand dynamics of the delicious Greek orange juice. Lastly, we offer an insight to the citrus fruit areas cultivated in organic farming with more sustainable production practices and the expectation of growth in the future.

Contact Information

Alexandros Christodoulou, CCO, CHB, General Management, Greece, Phone: 00302106803115,

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OVERVIEW OF THE CITRUS PRODUCTION IN MEXICO

Ricardo Martinez

Citrofrut SA de SV, Monterrey, Nuevo Leon, Mexico

Mexico plays an important role in the world's citrus industry, both as a producer and processor of a wide range of citrus fruits. Mexico is the leading producer of lime and is gaining a prominent relevance within lemon, grapefruit, and orange. Our conversation will provide a historical perspective and analyze the challenges and upsides to Mexico's future citrus production growth. I hope to provide a clear picture of where we are coming from, where we are today, and what you can expect from Mexico in the future.

Contact Information

Ricardo Martinez Zambrano, Citrus Business Unit Director, CITROFRUT, Av. Constitucion 405, Citrus Business Unit, Monterrey, Nuevo Leon 64000, Mexico, Phone: 5281838942004214; Email: ricardo.martinez@citrofrut.com

CALIFORNIA CITRUS PROCESSING

Sergio Lobo

Vita-Pakt Citrus Products Co., USA

California citrus processing is a major contributor to the economic value of the agricultural sector of the state. The value of the state citrus production during the 20/21 marketing year was \$3.63 billion with a total economic impact of the citrus industry in California's estimated at \$7.6 billion. Oranges, mandarins, lemons, and grapefruit, accounted for 2.3% of total crop acres in the state with a total citrus acreage of 276 thousand acres. California citrus production is solely focused on the fresh retail market rather than processing side. The proportion of citrus that is packed for fresh market in California are on average by main commodity the following: 80% of Oranges, 75% of Grapefruit, 74% of Lemons and 71% of Mandarins. This differentiates California from Florida, Texas, Brazil, Mexico, Argentina, and other countries where over 70-85% of their production goes to processing not fresh. California citrus processing utilization is between 17 to 20 million 90# Boxes equivalents.

Sergio Lobo holds the position of VP of Supply Chain and Logistics at Vita-Pakt based at one of the company locations in Lindsay, California. He joined Vita-Pakt Citrus in 2014, as the Specialty Fruit Division Manager, and he has over 30 years of service in the industry across Latin America and the US. During his tenure with Vita-Pakt he has helped the company procure seasonal fruit, build strong relationships with growers, packers, shippers, all supply side partners, while working on the Operations side and restructuring departments. Born in Chile he is a graduate of Pontifical Catholic University of Valparaíso, Chile, where he majored in Agronomy. He lived many years in Mexico before coming to the US where he became a US citizen. He currently lives in Visalia, CA.

Contact Information

Sergio Lobo, VP of Supply Chain and Logistics, Vita-Pakt Citrus Products Co., USA, Phone: 8886848272238,
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BRAZILIAN CITRUS OVERVIEW

Vinicius Trombin

Fundecitrus/Markestrat, Crop Forecast Survey (PES), Brazil

The figures for Brazilian citriculture are impressive. Brazil shoulders over 73% of production and an impressive 76% of exports in the realm of orange juice. However, these figures represent more than just economic indicators; they mirror a complex dynamic involving job generation, high efficiency, and the preservation of environmental biodiversity.

A shining beacon within this landscape is the Crop Forecast Survey (PES), which entered its ninth iteration in 2023. This initiative has evolved into a global benchmark, bringing together collaborative efforts, and fostering invaluable transparency for the industry. Beyond its primary role in predicting orange production, the PES also sheds light on production sustainability.

The lecture will provide a comprehensive overview of the methodology employed to conduct the Crop Forecast Survey (PES). Moreover, it will provide attendees with a deeper understanding of the industry's achievements and the challenges it faces.

Contact Information

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WORLD CITRUS ORGANIZATION – AN UPDATE

Jose Antonio Garcia

AILMPO – Lemon from Spain®, Spain

The World Citrus Organisation (WCO) is the platform for dialogue and action for the global citrus community. The WCO unites citrus producing countries and citrus stakeholders to facilitate collective action in the citrus sector, for both fresh and processed categories.

Since its establishment in October 2019 the WCO's membership has grown rapidly to 12 full members (citrus producing countries or state associations) and 21 associated members (private companies and service providers to the citrus supply chain). As a membership-based organisation, WCO's mission is to:

Discuss common issues affecting citrus producing countries.

Exchange information on production and market trends.

Foster dialogue on policy issues of common concern.

Identify and promote Research and Innovation projects specific to the citrus sector.

Liaise with public and private stakeholders on citrus-related matters to highlight the importance of citrus producers and the need for a fair return.

Promote the global consumption of citrus.

3 main pillars:

Statistics

As part of WCO's core activities, the organisation undertakes citrus forecasting. Forecasting activities take place on a biannual basis, ahead of the Southern Hemisphere and Northern Hemisphere seasons. All forecasting is undertaken on a pre-competitive basis only.

The objective of the citrus forecasting is to allow WCO members to facilitate understanding of current global citrus market developments. As a knowledge-sharing exercise, through WCO's citrus forecasting activities the sector is able to better position the citrus category not only on domestic markets but also further afield. WCO's citrus forecasting activities are supported by proactive member engagement in citrus data collection.

The second part of the presentation will focus on the analysis of future trends in production, fresh marketing and processing worldwide, studying the potential imbalances between supply and demand.

Nutrition & Health

Amid low fruit and vegetable intake levels, citrus consumption has also stagnated. With growing competition from other fruit categories as well as other food commodities, the future of the citrus sector and citrus fruit's place in a healthy, balanced, sustainable diet is at stake.

To aid the citrus sector in communicating the nutrition and health benefits of citrus consumption, the WCO explores claims for citrus at WHO level.

Promotion

Resource efficient promotion is vital for a sector with limited margins for product positioning. Collaborative work limiting fragmented efforts for general sector promotion is crucial for the citrus sector to compete with other growing fruit and food sectors now and into the future.

In 2022-2024 the design of a global marketing concept accessible to all WCO members has begun. The global marketing concept will cement the notion of collective citrus promotion by the sector at large for efficient and effective marketing results.

Contact Information

Jose-Antonio Garcia, Director, AILMPO, Spain, Phone: 34968216619, Email: director@ailimpo.com

MARKETING THE LIME INDUSTRY IN MEXICO

Leo Espinosa

Rio Grande Juice Co. / Wonderful Citrus, USA

Mexico's Persian Lime production has become the second largest in volume behind orange production; its growth is clearly driven by the US fresh market but also a strong domestic consumption. Mexico is the largest exporter of Limes into the US, and Lime has been also a key element for the Mexican citrus Industry for both fresh and juice in the recent years. Mexico's Persian Lime exports accounts for 90% of their total fresh citrus exports. This presentation will try to show today's Mexico's outlook with our main focus on Persian Lime including some US marketing information that hopefully helps to link how recent demand has increased the Persian lime production in Mexico.

Contact Information

Leo Espinosa, General Manager, Rio Grande Juice Co. / Wonderful Citrus, United States, Phone: 956-598-6870,
Email: leo.espinosa@wonderful.com

CONSUMER INSIGHTS ON JUICE AND BEVERAGES

Ed Koza

dsm-firmenich, USA

It's 2023 and innovation is strong across beverage segments. Consumers continue to redefine what they expect from their beverages as they look to their drinks to provide a breadth of benefits including moments of indulgence, support for well-being, and even mini escapes. Join us for a look at key macro trends as well as insights across dayparts to inspire innovation for your brand. We'll take a close look at consumer attitudes, the functional benefits they seek, as well as trending flavors and claims being launched. We will focus on the juice segments as well as adjacent categories and even take a look beyond beverages for our inspiration. Now is the time to lean into a classic beverage segment and excite consumers with new possibilities.

Contact Information

Ed Koza, Senior Director - Marketing, Consumer Insights & Sensory, dsm-firmenich, United States,
Phone: 215-266-4527, Email: ed.koza@firmenich.com

IFU'S OVERVIEW: UNVEILING INITIATIVES AND VITAL FACTS SHAPING THE FRUIT AND VEGETABLE JUICE INDUSTRY

Tatiana Campos

IFU, France

The presentation will provide a comprehensive exploration of the International Fruit and Vegetable Juice Association (IFU), detailing its core purpose, foundational pillars, and wide-ranging initiatives.

Beginning with an overview of the IFU and its primary objectives, the presentation will reveal the organization's multifaceted approach to the juice industry. This approach includes the development of quality standards, research facilitation, and regulatory advocacy before international bodies such as CODEX.

Particular mention will be made of recent IFU initiatives and working groups, reflecting the organization's multifaceted approach to the industry. This includes the formation of a sensory working group focusing on the evaluation of "new" citrus hybrids and their alignment with accepted characteristics of orange juice, as well as the release of IFU method 17c (Ascorbic acid, 2023) and recommendation Rec 18 (Pulpwash and second extracts of citrus fruit, 2023). Furthermore, the presentation will briefly touch upon recent critical reviews and papers, such as the IFU Nutrition Paper, the Sustainability Report, and the forthcoming publication "Health effects of 100% fruit and vegetable juices: evidence from human intervention studies."

Throughout the presentation, attendees will receive a broad and insightful overview of the IFU and its many facets. From research to quality control, the presentation will touch on how the IFU, its members, and the juice industry at large are currently addressing key global issues. Participants will gain valuable insights into the IFU's pivotal role in shaping and responding to the evolving landscape of the fruit and vegetable juice industry.

Contact Information

Tatiana Campos, Executive Director, International Fruit and Vegetable Juice Association – IFU, France,
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GLOBAL ALCOHOL TRENDS: CHALLENGES AND OPPORTUNITIES FOR CITRUS

Zareena Valappil

ADM, USA

Classic Margaritas, the latest twist on the Negroni, experiential spicy savory cocktails or the expanding choices for no or low alcohol alternatives: who isn't fascinated by the divers abundance of the global alcohol category and its ability to always re-invent itself?

Alcoholic beverages provide plenty of opportunities to innovate, but they also pose special application challenges, specifically for citrus flavors. Following an introduction to global trends in alcohol, this session will give insight into the ins-and-outs when formulating citrus flavored alcoholic beverages that consumers will enjoy.

Speaker Info:

As an enthusiast for citrus and taste, it makes perfect sense that Zareena Valappil is ADM's Chief Citrus Flavorist and a Global Technical Director for the Flavors business unit. In her role, Zareena is driving technical strategy and flavor creation in the Citrus and Taste Modulation platforms to lead global teams in helping customers shape their citrus tastes. Zareena comes from a deep background of industry experience with over 20 years in flavor research, development and flavor. She received her Doctorate in Food Science from the University of Florida and is a Certified Flavorist from the Society of Flavor Chemists.

Contact Information

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INNOVATION AND ESG DEVELOPMENTS - EVERA BY CITROSUCO

Alex Schuermans

Evera by Citrosuco, Austria

What is necessary to drive innovation and sustainability in today's challenging business market environment? We invite you to find out how Citrosuco is investing in innovation and technology through its recently created new business unit "Evera by Citrosuco", which was born to unveil the full potential of the citrus industry and more.

We would also like to share Citrosuco/Evera's latest actions and commitments on ESG, as a solid example of long-term commitment to the business, as well to the planet and society as a whole.

Join us as we share our experiences and views about these two very interesting topics.

Contact Information

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GMOS: CAN WE GET A DO-OVER?

Kevin Folta

UF/IFAS, Gainesville, FL, USA

In recent memory, many agricultural industries were forced to wrestle with the issue of integrating genetic engineering (GE, familiarly “GMOs”) into a major food crop. Citrus is a great example. While scientists proposed GE solutions for HLB and citrus canker, there was no widespread deployment of modern technologies, with major brands even sporting “non-GMO” labeling. Over the last 26 years we have observed the benefits of GE in a suite of crops and understand their relative risks, with no detrimental impacts on human or animal health. Today, if we found ourselves at a crisis vs. technology crossroads, would decisions be different?

Certainly, we understand how to communicate the science of biotechnology in more effective ways that resonate with consumers. This presentation will address why we must rethink how we engage the public about biotechnology issues and apply these strategies effectively. The next major industry-threatening pest or pathogen is poised just below the horizon. How can we earn social license to implement the fastest, most agile technologies when it strikes?

Contact Information

Kevin Folta, University of Florida/IFAS, Horticultural Sciences, Gainesville, FL 32611, United State,
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THE TALENT SHORTAGE AND WHAT IS NEXT

Gerry Hoeffner

Personal Dynamics, Inc., Lakeland, FL, USA

The landscape of Human Resources is changing. For all our working lives, employers have controlled the talent market. We managed our workforce in a culture that allowed us to reach into the community, identify talent, establish expectations for performance and then set the monetary exchange for those services. We freely hired and fired to meet our needs. Today, that freedom is being challenged.

The nation continues to grow jobs at an alarming rate, and those looking for jobs continues to decline. As a result, the nation's job openings are at the highest rate in our lifetime with two openings for every person looking for a job.

Employees have choices, and good employees have a lot of choices. So, the question must be asked, why would a really good employee want to work for you?

In this session we will review:

Why the present talent shortage will continue.

The leadership challenges with today's worker and changes you need to make.

The value of marketing and branding your employment.

Contact Information

Gerry Hoeffner, President, Personnel Dynamics Consulting, PO Box 92239, Lakeland, Florida 33804, United States,
Phone: 772-979-5028, Email: Gerry@PersonnelDynamics.net

USING AI AND MIND GENOMICS AS A “DAILY TOOL” TO UNDERSTAND THE CONSUMER MIND AND GENERATE OPPORTUNITIES

Howard R Moskowitz

Mind Genomics Associates, Inc., White Plains, NY, USA

The presentation teaches by a series of 'screen-shots' how any person can use Mind Genomics, an emerging AI-powered consumer research technology. Based upon Idea Coach, an AI tool in the web-site 'www.BimiLeap.com', a relevant topic was created, one simply for convenience, and not particularly defined: 'Bringing together the world of citrus agriculture, the trade, and the consumer.' The topic was totally new to the presenter. The presentation shows how AI-powered inquiry through Mind Genomics (Idea Coach), creates a book of sets of questions and answers (15 of each for every iteration, several iterations possible), and then how AI summarizes the learning from the AI-generated sets of questions and answers. This first part is the Idea Book, which becomes a powerful, comprehensive reference for the researcher. The second part shows the selection of the questions and answers from the Idea Book, and then evaluation of these by 74 young respondents (under 23 years old) in a structured way, through conjoint measurement (Mind Genomics). The vision is to create a system which educates through what might be called 'Socrates as a Service'. The system enables anyone in the world to educate themselves at a very low cost, and in a matter of a few hours. The actual study was done in a period of 15 hours, including a few hours to learn about this topic in the novel way presented by the Idea Book.

Contact Information

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ADVANCES AND COMPARISONS OF STERILIZATION TECHNOLOGIES

Juan Martinez

JBT Corporation

Heat Exchangers are widely used in the fruit and beverage industry, mainly to pasteurize and/or sterilize juices and beverages. There are different types of Heat Exchangers, with Plate Heat Exchangers and Pipe Heat Exchangers being the most widely used ones. In the last years, Pipe Heat exchangers have become more popular in the food and beverage industry due to their flexibility and efficiency.

Within the Pipe Heat Exchangers, the biggest install base are the Straight Pipe Heat Exchangers and less common are the Helicoidal Coiled Heat Exchangers.

The reason why the Helically Coiled Heat exchangers are the most efficient ones, when compared to the Straight Pipe ones, is mainly due to the specific geometry of the pipes. Coiled Heat Exchangers offer the most efficient Heat transfer levels, and help reduce product loss, lower the number of CIP/SIP and increase running times. All of this contributes to the reduction of energy use, product waste and chemical usage, making the processors more efficient and sustainable.

Keywords: Helical coil heat exchanger, heat transfer, straight tube heat exchange, sustainability.

Contact Information

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HELIOS ARTIFICIAL INTELLIGENCE

Dino Cardelli¹ and **Francisco Martin-Rayó**²

¹The Procurement Framework Company LLC, USA

²Helios Artificial Intelligence, Inc., USA

Helios Artificial Intelligence, Inc., is building the world's most predictive AI software for agricultural supply chain disruptions. Our AI platform analyzes billions of signals in real time to identify and predict supply chain disruptions before they happen, helping our customers identify risks from political, economic, and climate changes.

Our open beta software, available to the public at www.helios.sc, predicts agricultural supply chain disruptions of 200 crops across 180 countries. Our newest feature tracks global catastrophes, like floods, hurricanes, and earthquakes, in real-time, and immediately alerts our customers to which of their suppliers are impacted and how.

This is an unparalleled advancement in the supply chain software market. Most competitors in the space have huge gaps in global coverage and are often weeks behind in alerting their customers. We've fixed all of that. Our platform tracks catastrophes anywhere in the world, in real-time, so the moment one occurs that impacts suppliers our customers will be the first to know.

Contact Information

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MODIFICATION OF PECTIN STRUCTURE AND IMPROVEMENT OF PECTIN GELLING CAPACITY BY A PHYSICAL PRE-TREATMENT OF FRESH ORANGE PEEL PRIOR TO PECTIN EXTRACTION

Wei Zhao, Yixiang Xu, Christina Dorado, Hoa K. Chau, Arland T. Hotchkiss, and Randall G. Cameron

Pectin is a complex polysaccharide widely used in the food and pharmaceutical industries due to its gelling properties. Pectin obtained with the commercial extraction method is usually high-methoxyl (HM), which needs high sugar and low pH to gel. Low-methoxyl (LM) pectin is more popular because its gelation doesn't need sugar. LM pectin is generated from HM pectin by controlled demethylation with pectin methyl-esterase (PME) or chemicals. Enzymatic demethylation of pectin with plant PME generates high quality pectin with much better gelling properties than the pectin generated by chemical demethylation. However, the PME is very costly. We found a physical pre-treatment of fresh orange peel before pectin extraction had similar effects as enzymatic demethylation of HM pectin with orange PME, which involved activation/enhancement of endogenous orange PME. Fresh orange (Hamlin) peel from a local commercial juice plant was pretreated with the physical process at different conditions, followed by pectin extraction with the commercial method. Experimental results indicate the pre-treatment led to an increase of pectin extraction yield up to 41.10 %; and more importantly, it led to partial demethylation of pectin and blocky distribution of non-esterified galacturonic acid (GalA), debranching of pectin without degrading the main chain. These structural features are known to be beneficial to pectin gelling properties. The gelling properties were evaluated and compared among pectins extracted from un-treated (control), pre-treated peel (Tp), as well as commercial LM and HM pectins. Results indicate the Tp pectins had dramatically higher calcium sensitivity and capacity for calcium-mediated gelation than the control and commercial HM pectin. The strength and viscoelastic properties of Tp pectin-calcium gels were comparable to that of commercial LM pectin. Meanwhile, most of the Tp pectins also showed a comparable capacity for sugar-acid-mediated gelation to that of the control and commercial HM pectin. The data reveal the great potential of extracting high quality pectins with increased gelling capacity and a broadened scope of applications as well as a low cost, by adding a simple physical pretreatment of fresh orange peel.

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PRACTICAL AND EFFECTIVE STRATEGIES TO DEBITTER THE HLB-AFFECTED CITRUS FRUITS AND JUICES

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Over 90% of Florida citrus trees are affected by HLB, which promotes the biosynthesis of bitter phytochemicals in fruits and their accumulation in juices. Practical and effective strategies to remove bitter phytochemicals will help citrus processors partially mitigate this problem.

Our research showed that resin adsorption of juice was superior to post-harvest ethylene treatments of fruits for removing bitterness. The Purolite PAD550 resin was identified as the most effective adsorbent to remove bitter naringin from cv. Ruby Red grapefruit juice out of seven candidate resins screened for adsorption ratio, kinetics, and isotherm. A fixed-bed column packed with PAD550 processed over 10 bed volumes of grapefruit juice to reduce the concentration of bitter naringin below its taste threshold. A consumer panel rated the untreated grapefruit juice the worst for acceptability due to its intense bitterness. The acceptability of half-debittered juice was much improved and slightly higher than the fully debittered juice partially because some bitterness was anticipated for grapefruit juice.

The most effective resin to remove bitter limonin from HLB-affected cv. Hamlin orange juice was the Purolite PAD900 based on adsorption ratio, kinetics, and isotherm. A fixed-bed column packed with PAD900 processed over 40 bed volumes of orange juice to reduce limonin below its taste threshold. A consumer panel reported higher acceptability for debittered orange juice with increased sweetness and decreased sourness than the untreated juice.

Post-harvest treatments using ethylene did not affect the concentration of bitter naringin in Ruby Red grapefruits or limonin in Hamlin oranges. Hot water or ethephon treatments of grapefruits also yielded negative results on bitter phytochemicals. These treatments were only found to reduce the green color of citrus fruits.

In summary, post-harvest degreening treatments of citrus fruits had no impact on the bitter phytochemicals. Adsorption using correctly selected macroporous resins should be adopted as an effective and practical approach to remove bitter phytochemicals from citrus juices. These resins are approved by FDA for food processing, and the operation can be easily scaled up for commercial use.

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UNDERSTANDING THE ORANGE JUICE SUPPLY AND CONSUMER

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Over the course of the past two and a half years, as the economy experienced the highest rates of inflation in 40 years, the orange juice category saw prices climb by as much as 14% compared to the previous year, resulting in an average price of \$8.78 per gallon. In addition to elevated domestic inflation, the OJ category encountered its own array of obstacles stemming from supply shortages and increased production costs. The surge in domestic prices has reverberated through various sectors, impacting consumer behavior even at the supermarket. Confronted with the upward price trend, consumers have adopted various strategies to save on grocery costs, including seeking discounts, transitioning to store-branded products, altering shopping venues, and modifying their purchasing preferences. Within the orange juice category, consumers who had indicated that price was a barrier to purchase was on the rise. Distinguishing between OJ consumption and the demand for OJ has never been more critical for the Florida citrus industry.

This presentation explores the distinction between shifts in orange juice (OJ) consumption and changes in OJ demand. It begins by analyzing how changes in world OJ production and global inventories influence OJ consumption. Next, we examine how OJ marketing programs can play a pivotal role in maintaining OJ demand, particularly during periods when OJ prices face adversity due to supply shortages and elevated production costs. Our analysis reveals that consumers who possess awareness of OJ marketing initiatives exhibit a higher willingness to pay for orange juice.

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PESTICIDES IN THE CITRUS INDUSTRY

Elizabeth Berdis

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The world population is estimated to reach 10 billion by 2050. This will create more demand for food and more demand for crop production, which currently is met by pesticide applications. Global governments and local governing bodies establish maximum residue levels (MRLs) for citrus, which are not harmonized. Consumer awareness is greatly affected by media coverage and lacks a proper understanding MRL limits and concentration (processing) factors for end products. Perhaps more importantly, MRL's established for fresh fruit are applied to processed citrus (juice, essential oils, peel products, etc.) without considering the difference in strength and usage level. Furthermore, pesticide testing for citrus products is not standardized and discrepancies between certified labs are prevalent. All of this results in a trickle-down effect from consumers to retail suppliers, manufacturing, processors to the grove creating expectations which sometimes are unrealistic.

Pesticide usage on citrus is a mitigation strategy to eliminate pests, improve quality and yield and provide post-harvest protection. However, widespread pesticide use has also prompted persistent public concerns over the adverse effects of residues on non-target organisms and human health. This presentation reviews the challenges facing the citrus industry and potential solutions.

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SYMBIONTS™: THE PROTOTYPE FOR TOMORROW'S PLANT HEALTH, GROWTH & CHARACTERISTICS

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Citrus greening disease has devastated Florida's citrus industry and is spreading in other citrus growing states. In the US, the disease is caused by the phloem-limited bacterium, '*Candidatus Liberibacter asiaticus*' (CLAs) and spread by the psyllid *Diaphorina citri*. Therapeutic delivery *in planta* presents a major challenge in disease management. Using *Agrobacterium tumefaciens*'s ability to insert DNA into plant genomes, we delivered therapeutic peptides to treat infected trees. We call our approach Symbiont™ technology. The technology involves inoculating citrus with a disarmed strain of *A. tumefaciens* that has a binary transformation vector that expresses both the *A. tumefaciens* plant growth regulator genes together with a gene or genes of interest. After inoculation, Symbionts grow into a cluster of cells that recruit and initiate vascular connections with the tree. Using infected citrus seedlings in greenhouse experiments, we are testing Symbionts expressing a variety of antimicrobial peptides to identify those that lower bacterium titer and restore plant health. In these preliminary experiments, we identified one bacteriocin and three antimicrobial peptides that reduce CLAs titer and restore the growth of asymptomatic leaf tissue after Symbiont treatment. Our experiments show that live *A. tumefaciens* does not persist in Symbionts, greatly minimizing the risk of GM organisms being released into the environment. The Environmental Protection Agency has approved a 10-acre field trial in Vero Beach, Florida and the final release permits from APHIS PPQ will be completed by the end of August, 2023. While Symbiont™ technology is still in the early stage, one day it may supersede transgenic plants and reduce the need for chemical inputs for crop protection in crop agriculture. Beyond the potential to treat trees for citrus greening disease, the team is exploring a serendipitous discovery which raises the possibility of using Symbionts to produce proteins in culture. Biomolecules made by these Symbionts may be used for other applications, including possibly treatment of other crop disease or diseases of humans and other animals.

™ Symbiont is a trademark of Perpetual Peptides, Inc.

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EFFECT OF ANTIBIOTIC INJECTIONS ON CITRUS TREES

Ute Albrecht

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This year's citrus crop in Florida was less than 16 million boxes, a steep decline from 2000-2004 when Florida produced more than 200 million boxes. The main reason for this dramatic decrease in production is huanglongbing (HLB, citrus greening), which was discovered in 2005 and is now endemic. The disease is associated with a bacterial pathogen that inhabits the vascular system, i.e., the phloem, of infected plants. The most effective way to treat bacterial diseases is through antibiotics. Antibiotics were approved for use in agriculture in the US in the 1950s and have been employed extensively, though mainly in livestock production. The amount of antibiotics used in plant agriculture is less than 1%. Currently, streptomycin and oxytetracycline are the most used antibiotics for plant crops. Their mode of application is usually by spray. Because of the phloem-limited, systemic nature of the HLB pathogen, the efficacy of foliar applied antibiotics is low. One way to deliver disease therapies directly into the vascular system is through injection. Trunk injection of tetracyclines to treat HLB-affected citrus trees has been investigated in the 1970s in South Africa and other countries. Although it was effective, it was not pursued as a practical therapy. With the dire situation in Florida, interest in trunk injection to deliver antibiotics reemerged. We have conducted numerous field studies that demonstrated significant improvements in tree health, fruit production, and fruit quality after trunk injection of oxytetracycline. In October 2022, a special local need label was approved allowing trunk injection of oxytetracycline for use in Florida citrus. The technology has since been widely adopted. This presentation will provide information on the history of antibiotics and trunk injection and the effects of oxytetracycline injections on citrus tree health, fruit quality, and yield under Florida growing conditions.

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UPDATE ON GENETIC ENGINEERING CITRUS FIELD TRIALS

Matt Mattia

USDA-ARS

Genetic engineering (GE) has revolutionized agriculture by conferring traits that enhance crop productivity and resistance to pests and diseases. Citrus, a cornerstone of global fruit production, has faced significant challenges, particularly the devastating Huanglongbing (HLB) disease. This presentation is an overview of the current status of GE citrus field trials: this highlights the historical context of GE in citrus, the gene-editing technologies employed to identify candidate genes for HLB resistance, and the latest advancements in generating transgenic citrus varieties. Initial approaches involved transgenic techniques and introducing foreign genes to confer resistance; however, public concerns and regulatory challenges have encouraged a shift towards more precise gene-editing methods. Among these, CRISPR-Cas9 has emerged as a powerful tool, enabling targeted modification of citrus genomes. Researchers are leveraging this technology to identify and modify candidate genes associated with HLB resistance, with a focus on genes involved in immune response, pathogen recognition, and phloem function. Transgenic citrus plants with potential HLB resistance are undergoing field trials at the USDA. These trials assess performance under natural conditions and evaluate long-term resistance/tolerance. While challenges remain in terms of regulatory frameworks and societal acceptance, ongoing field trials and technological advancements underscore the potential of GE citrus to mitigate the impact of HLB and ensure the future of citrus cultivation.

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AN OVERVIEW OF CITRUS RESEARCH

Rick Dantzler

CRDF

From injecting oxytetracycline to getting serious about developing genetically engineered trees, Florida citrus growers are swinging for the fences. Driven by plummeting production and the reality that they were running out of time because of the citrus disease huanglongbing, known as "HLB" or "citrus greening," nothing is off the table. Dantzler is the Chief Operating Officer for the Citrus Research and Development Foundation (CRDF), a Direct Support Organization of the University of Florida and research organization that has funded nearly 470 citrus research projects over the last 13 years, most of which were intended to defeat HLB. He will talk about hot research topics and the research space CRDF sees going forward.

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