48th Annual Short Course for the Food Industry

The International Citrus & Beverage Conference

September 16-19, 2008
Sheraton Sand Key Resort
Clearwater Beach, FL

Hosted by:

- University of Florida/IFAS, Food Science and Human Nutrition Department
- University of Florida, Juice and Beverage Center
- Institute of Food Technologists, Florida Section & Citrus Products Division

www.conference.ifas.ufl.edu/citrus

Project # 0801
Welcome to the 2008 International Citrus & Beverage Conference!

This year's conference will focus on key issues facing the citrus processing and related industries: the global nature of our business, challenges facing the Florida citrus industry, technology in the processing plants, and new markets and the research to support them. The manufacturing of by-products, their profitability, and the related topic of biofuels has increased in importance to the industry, and there will be an entire session devoted to this topic. Our invited speakers, active in academia, industry and government, were selected because of their depth of knowledge in these pertinent topics, and their enthusiasm in sharing their insights. We look forward to your participation!

Renée Goodrich Schneider
Program Organizer
University of Florida, IFAS, FSHN
Gainesville, FL
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Program Committee

Liz Baldwin
USDA-ARS, Citrus & Subtropical Products Lab., Winter Haven, FL

Richard Bogey
Florida’s Natural Growers, Lake Wales, FL

Robert J. Braddock
Professor Emeritus, University of Florida, Winter Haven, FL

Michelle Danyluk
University of Florida-CREC, Lake Alfred, FL

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Donald L. Hendrix
Firmenich Inc., Safety Harbor, FL

David Johnson
Peace River Citrus, Arcadia, FL

Gary Merritt
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Howard Nivens
Cargill Juice N.A., Frostproof, FL

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University of Florida, FSHN Dept., Gainesville, FL

Phyllis Towns
USDA, AMS, FV, PPB, Winter Haven, FL

Douglas P. Van Strijp
Southern Gardens

Roger D. Waters
Brown Citrus Systems, Winter Haven, FL

Barry Wilson
Safe Chem Inc., Zellwood, FL

Alan Wyland
Coca-Cola North America, Apopka, FL

O. Boyd Wynne, III
Food Equipment & Engineering Co., Tampa, FL
Agenda

Tuesday, September 16, 2008
4:00 PM Registration (until 7:00PM)

Wednesday, September 17, 2008
7:30 AM Registration (until 5:00PM)
7:30 AM Morning Refreshments
Sponsored by:
- Vincent Corporation
8:30 AM Welcome and Introductory Remarks
Renée Goodrich Schneider, UF, IFAS, FSHN
Neil Shay, Department Chair, UF, IFAS, FSHN
Doug Archer, Associate Dean for Research, UF, IFAS
Gary Merritt, Conference Program Chair, JBT FoodTech

Session 1
Global Citrus and Processing Industry

Moderator: Keith Schneider, University of Florida, IFAS, FSHN
9:00 AM European Marketing Focus, Lynn Dornblaser, Mintel International Group
9:45 AM Citrus Industry in Mexico, Central America and the Caribbean,
Jose Guarjardo, JBT FoodTech ................................................................. (p. 7)
10:20 AM Break
10:40 AM Costa Rica – An Update,
Carlos Odio, TicoFrut /Tampa Juice ............................................................ (p. 11)
11:20 AM Citrus Production and Utilization in China, Alvin Cheng, JBT FoodTech .......... (p. 4)

Session 2
Marketing and Consumer-Driven Trends

Moderator: Alan Wyland, Coca-Cola North America
1:45 PM The Science Behind the Superfruits, Liwei Gu, UF, IFAS, FSHN ...................... (p. 6)
2:30 PM Trends in Nutritional Ingredients for Beverages, Ram Chaudhari, Fortitech ...... (p. 3)
3:05 PM Afternoon Refreshments
Sponsored by:
- Paper Systems, Inc.
3:30 PM Sustainable Agriculture: Opportunities and Challenges for the Citrus Industry, Kevin Ogorzalek, World Wildlife Fund .........................................................(p. 13)
Wednesday, September 17, 2008 (continued)

6:00 PM Networking Reception (until 7:00 PM)
Sponsored by:
- Brown International Corporation, LLC
- Chemical Systems
- Firmenich
- Food Equipment & Engineering Company
- Givaudan Flavors Corp.

Thursday, September 18, 2008

Session 3
Processing and Technology Updates

Moderator: Dave Johnson, Peace River Citrus

7:30 AM Registration (until 5:00 PM)

7:30 AM Morning Refreshments
Sponsored by:
- Givaudan Flavors Corp.

8:30 AM State Test House Updates for 2008-09, Shannon Shepp, FDACS

9:05 AM Bioenergy: Separating Science from Politics, Ann Wilkie, UF, SNRE.................(p. 20)

9:40 AM Nanotechnology in the Food Industry, José Reyes De Corcuera, UF, IFAS, CREC...........................................................(p. 15)

10:15 AM Break

10:35 AM New Developments and Applications of Resin Systems for the Treatment of Citrus Products containing Pulp and Cloud, Tim Schofield, Bucher-Alimentech (NZ) Ltd. .................................................................(p. 16)

11:10 AM Florida Orange Juice Outlook: Factors that Impact Sustainability of Florida Citrus, Bob Norberg, Florida Dept. of Citrus...........................................................(p. 10)
Thursday, September 18, 2008 (continued)

Session 4  
Processing By-Products and Quality

Moderator: Savy DiBenedetto, Coca-Cola North America

1:30 PM Validation of Tanker Cleaning Protocols, Paul Winniczuk, UF, IFAS, CREC …….(p. 21)
2:05 PM Citrus Oils: The Regulatory Horizon, Jon Leonard, Florida Chemical Company, Inc………………………………………………………………………. (p. 8)
2:40 PM Break
3:00 PM Biogasification of Citrus Processing Waste – A Case Study, Pratap Pullammanappallil, UF, IFAS, ABE………………………………………………………………………..(p. 14)
3:35 PM The Florida Section IFT: Professional Meetings in the 2008-2009 and Industry Awards Ceremony

6:30 PM Dinner & Entertainment  
(until 8:30PM)  
Sponsored by:  
- ENERFAB, Inc.  
- JBT FoodTech  
- JBT FoodTech FranRica™

Friday, September 19, 2008

Session 5  
Citrus Industry Challenges and Solutions

Moderator: Richard Bogey, Florida’s Natural Growers

7:30 AM Registration (until 10:00AM)
7:45 AM Breakfast  
Sponsored by:  
- Bell Chem Corp  
- BioSun Flavors & Food Ingredients  
- HT/DcR Engineering, Inc  
- Safe Chem Inc.

8:30 AM Huanglongbing - A Research and Extension Update, Megan M Dewdney, UF, IFAS, CREC ……………………………………………………………………………………………………….. (p. 5)
9:05 AM Mechanism for the Release of Genetically-modified Citrus, Greg McCollum, USDA, ARS, USHRL……………………………………………………………………………………………………………………………………….. (p. 9)
9:40 AM Labor Issues Facing The Florida Citrus Industry, Mike Sparks, Florida Citrus Mutual ………………………………………………………………………………………………………………………………………………………………………………..(p. 18)
10:15 AM Mechanical Harvesting and Abscission, Fritz Roka, UF, IFAS, SWFREC
11:00 AM Adjourn
The International Citrus & Beverage Conference
Speaker Abstracts

Listed in alphabetical order by presenter’s name
Trends in Nutritional Ingredients for Beverages

Ram Chaudhari
Sr. Executive Vice President, Chief Scientific Off., Fortitech, Schenectady, NY

Consumers are shifting buying habits and becoming more aware of the direct correlation between proper nutrition and long-term health. Consumers are seeking beverages that not only target overall wellness, but have an added proposition that targets a specific health condition. However, adding multiple in-demand nutrients to a product that aid in specific health conditions and do not affect stability, solubility, appearance, taste or mouth feel can sometimes be very difficult. This presentation by Dr. Ram Chaudhari, Senior Executive Vice President and Chief Scientific Officer of Fortitech, Inc., will take an in-depth look at the latest trends in the beverage industry and how nutrition is being utilized strategically to target top health conditions. This presentation will also address how to overcome some of the major technical challenges in beverage fortification as well as minimize negative ingredient interactions which can produce a less than appealing appearance and lead to a poor tasting product.

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Citrus Production and Utilization in China

Alvin G. Cheng  
AP Technology Development Manager, JBT Corporation, Fresh Produce Technologies, Lakeland, FL

China has been the second largest citrus producing country since 2003. It produced about 18,420,000 MT (451,200,000 90-lbs boxes) of citrus in 2006. Mandarins accounts for about 60% of the total citrus production. The rapid production increase in recent years is the result of both production area expansion and production efficiency improvement. The national citrus industry development plan has been playing an important role in the growth by establishing geographic regions best suitable for citrus production and supporting citrus growth in these regions. China now has the largest citrus production area, ~1,880,000 hectares (4,650,000 acres) in a world total of ~7,800,000 hectares as of 2006. Harvest season of citrus has been expanded through increasing planting more early and late season varieties but is still too concentrated in the months of October to December. Production efficiency achieved by technology innovation, operation standardization, and production cooperation has resulted in yield improvement from ~7.2 MT/hectare in 2000 to ~9.9 MT/hectare in 2006, an increase of ~37%.

The top utilization of citrus in China remains as for fresh fruit. Fresh citrus export consists of mainly easy peeler and some sweet oranges. The volume was less than 3% of its production in 2006. Citrus processing utilized less than 4% of the citrus produced. Canning of mandarin segments continues to be the main citrus processing industry in China, utilizing ~500,000 MT mandarins or about 8% of its mandarin production in 2006. Most of the canned citrus is for exporting and China is the world number one producer. Juice extraction industry is now established in China. An estimate of ~200,000 MT oranges was used for juice extraction in 2006. The current juice extraction capacity is not fully utilized due to limitations including insufficient oranges suitable for juicing, short fruit supply season, inconsistent fruit quality, and high fruit price. For the reason the domestic orange juice supply depends on import. In 2006 China imported about 660,000 MT of frozen orange concentrate. Domestic juice production is expected to increase as more fruit becomes available, including these from groves planted with orange varieties for juicing. China, however, will continue to rely on imported juice for some years since urbanization and living standard improvement will continue to fuel the demand.

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Huanglongbing - A Research and Extension Update

Megan Dewdney
Assistant Professor, University of Florida, IFAS, Citrus REC, Lake Alfred, FL

A brief overview of our current recommendations for Huanglongbing (HLB; formerly known as citrus greening) management will be given. The remainder of the presentation will be a synopsis of the current plant pathology research on HLB at the University of Florida’s Citrus Research and Education Center. Work on the bacterial diversity in HLB infected versus asymptomatic trees will be discussed. We will show evidence that the symptoms of HLB are associated with abnormal sugar distribution in the plant, although no cause and effect has yet been identified. Currently, greenhouse studies are examining whether various Citrus species and relatives have any level of tolerance to Ca. Liberibacter asiaticus, the suspected causal agent, but so far the results have not been promising. The genetic engineering approaches to developing resistant citrus cultivars will also be explored. Other projects may also be presented.

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The Science behind the Superfruits

Liwei Gu
Assistant Professor, University of Florida, Food Science and Human Nutrition Department, Gainesville, FL

Superfruits refer to fruits that combine exceptional nutrient richness and antioxidant capacity with appealing taste. Created as a marketing term in 2004, superfruits have gained interests from public media and the mainstream consumers. The market of superfruits has increased substantially and will continue to grow. The commonly mentioned superfruits include pomegranate, açaí, cranberry, mangosteen, wolfberry, and noni. There are many emerging candidates of superfruits, such as guarana, chokeberry, sea-buckthorn, acerola, cupuaçu, blackcurrant, etc. Not all but certain superfruits had been extensively studied for their biological effects, e.g. pomegranate and cranberry. Numerous animal and cell culture studies suggested that they were beneficial for health in preventing cancers, cardiovascular diseases, inflammations etc. However, very few of these health claims had been evaluated and confirmed in humans in clinical trials. Superfruits, such as Açaí and pomegranate, were shown to have extremely high antioxidant capacities measured as ORAC. They often possess high levels of phytonutrients of unique composition (e.g. the anthocyanins in açaí, ellagitannins in pomegranate, and A-type procyanidins in cranberry). The health benefits were often attributed to these components; however, the exact active components remain unidentified. In conclusion, despite the popularity, superfruits have not been defined by scientific standards and there are many but insufficient scientific evidences confirming the “super” status of supperfruits.

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Citrus Industry in Mexico, Central America and the Caribbean

Jose Guajardo
Commercial Manager Mexico, CA and the Caribbean, JBT Foodtech, Mexico, Santa Catarina, Mexico

The Citrus production of the Mexico and Central American region represents about 10% of the total world citrus production being oranges its major crop gathering about 60% of the production. The industrialization of fruit in the region has been historically low, less that one fourth of the total amount of oranges are actually processed for juice especially because of the internal markets that demand the fresh fruit and the highly competitive export market.

In regards to processing, the main industrial players in the region are Mexico, Costa Rica, Belize, Cuba, Venezuela and Honduras. México process over one million tons of fruit per year being 60% of its production oranges 30% limes and 10% grapefruit and soft skin fruit. Costa Rica processes most of the oranges that are produced in the country and the Nicaraguan Border. Last season 2007-2008 they processed about 230,000 tons of fruit. Belize also sends most of its production of citrus to the industry. Last Season 2007-2008 they processed about 230,000 tons of oranges and 50,000 tons of grapefruit. Cuba sends about 80% of its 300,000 tons of orange production to the industry. They also produce about 235,000 tons of grapefruit. Venezuela processes about 185,000 tons of fruit which represent 50% of the total orange production of the country. Honduras produces about 285,000 tons of oranges but it normally process between 40 and 100 thousand tons of fruit. Other players in the region are Panama, Colombia, Dominican Republic and Jamaica but they mainly serve internal markets.

Despite that historically the region’s the main product has been FCOJ costumers are quickly going to other products to remain competitive and serve market niches. Among this products are aseptic NFC orange juice in 1000 L bins and frozen and aseptic pulp recovery. Also many costumers are modernizing their installations adding skid mounted systems to clean up and control the plant to increase available processing time, Skid mounted systems to recover pulp, to do pulp wash and to recover D-limonene.

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Citrus Oils: The Regulatory Horizon

Jon Leonard
Senior Vice President, Florida Chemical Company, Winter Haven, FL

Citrus oils have a long history of safe use in food, drinks and consumer products. The Citrus industry has formed the Renewable Citrus Products Association (RCPA) to maintain this position. The stated purpose of the RCPA is to proactively address and influence the legislative and regulatory challenges facing citrus oils at the federal, state and international levels.

The objectives of the RCPA:

- Promote citrus oils as natural, renewable and sustainable with the media/public
- Develop the sustainability profile for citrus oils
- Develop an environmental impact/life cycle analysis of citrus oils
- Establish a presence in the regulatory community
- Secure proper treatment of citrus oils with respect to volatile organic compound regulations
- Secure proper treatment of citrus oils with respect to indoor air quality regulations
- Conduct research on citrus oils based on sound-science

The regulatory challenges to the RCPA and the Citrus industry are numerous:

- VOC Regulations (Outdoor Air Quality Issues)
- Indoor Air Quality Issues
- Governmental Certification Issues
- Governmental Affairs
- Non-profit (NGO) Certification Issues
- Environmental Groups
- International Issues
- Health and Safety Issues

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Mechanism for the Release of Genetically-modified Citrus

Greg McCollum  
Plant Physiologist, USDA, ARS, USHRL, Fort Pierce, FL

The appearance of Huanglongbing (HLB) (citrus greening disease) has resulted in intensive efforts to produce genetically-modified (transgenic) versions of existing citrus cultivars which are resistant to the disease. Development of commercially successful transgenic citrus resistant to HLB is not only technologically challenging, but will require dealing with numerous pre-commercialization regulatory hurdles and additionally post-commercialization market restrictions. Three agencies are involved in the regulation of transgenic crops: USDA APHIS, US EPA, and US FDA. Each agency has a complex and costly review process. Although numerous examples of transgenic versions of large commodity crops (corn, soybeans, cotton) have passed through this regulatory process and been developed into commercial successes, this has not been the case for the specialty crops, which include citrus. Two examples of genetically modified specialty crops, papaya and most recently plums, will be compared and contrasted with citrus regarding the process of bringing them into the marketplace.

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Florida Orange Juice Outlook:
Factors that Impact Sustainability of Florida Citrus

Bob Norberg
Deputy Executive Director of Research and Operations, Florida Department of Citrus, Lakeland, FL

The Florida citrus industry is at a cross roads. Devastating diseases, increased costs and decreased demand has called for the question of whether the Florida citrus industry can be economically viable in the long-run. To the extent farmers have other options, such as, commercial land development or alternative crops, the decisions made today will ultimately determine whether we have a Florida citrus industry 10 to 20 years from now.

This report will outline the macro-economic factors that will influence sustainability in the future. Furthermore, we will quantify those factors with an attempt to predict supply and demand conditions for Florida orange juice in the near term.

On the supply-side we know that the most critical factor facing Florida growers today is citrus greening. Research is being conducted today to understand more about greening and determine the most effective and efficient ways for growers to deal with greening. The question becomes, ‘Will the research be successful?’ We will look at what is being done and discuss some future scenarios based on probability of success factors.

Other supply-side considerations include, cost of production increases, labor shortages and labor saving innovations, alternative crops, and alternative land uses. In the short-run, these factors don’t necessarily change location, or shape of the supply curve. However, these factors will impact the long run supply curve, and this presentation will attempt to quantify that impact.

Consumer demand, and consumption, is equally critical for economic viability. Starting in the late-1990’s demand, and consumption, has been declining. The decline has been attributed to many factors. First, and during a period of abundant supplies, OJ demand was negatively impacted by the popularity of low-carb diets. However, that fad, and its impact on OJ consumption, eventually started to wane in 2004, just in time for supply disrupting events of multiple hurricanes and disease spread. These supply impacting events had direct and indirect effects on demand. Prices, the ultimate demand factor, have risen drastically since the supply disruptions and have directly reduced consumption. Indirectly, reduced availability and higher raw material prices, has also reduced the amount of advertising, both generic and branded, as well as, promotional activity. Furthermore, macro economic conditions, such as per capita income, inflation, and strength of the dollar, also have an impact on demand.

The intent of this session is to explore all that we know about factors that could impact the future sustainability of the Florida citrus industry.

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Costa Rica – An Update

Carlos Odio
President, TicoFrut, San Jose, Costa Rica

Costa Rica is one of the small Central American countries. It is located between Nicaragua and Panama, the Pacific Ocean and the Caribbean Sea. Its area is similar to the portion of Florida that falls south of State Road 60.

All citrus varieties grow in Costa Rica but only oranges are produced commercially in significant amounts. These are produced in two areas, both in the north of the country, next to Nicaragua. On the West, near the Pacific there are about 11,000 net acres and one processing plant, Del Oro, and in the center about 31,000 acres, including a portion located on the Nicaragua side of the border, and another processing plant, TicoFrut.

The 11,000 acres produce about 2,500,000 to 3,000,000 boxes annually and the 31,000 acres slightly over twice that. This area however has a very large percentage of non producing trees and should therefore produce over 10 million boxes in the next 4 to 5 years.

Because I know little about the 11,000 acre producing area, I will concentrate my comments in TicoFrut’s producing area, the 31,000 acres.

The tree most important characteristics of this area are:

- Low cost
- Juice quality
- Growth potential

• Low cost

Except for herbicides applied to the grass that grows between the rows of trees, no pesticides are used in TicoFrut’s groves. This, combined with high productivity results in a production cost that is competitive in the world arena. Additionally, TicoFrut’s products have duty free access to the United States and European Union markets.

• Juice quality

The virtual absence of pesticides makes the juice healthier. This combined with a 37/38 flavor score, and average 38 color, average 17/18 ratio make TicoFrut’s juice very desirable for the U.S. market.

• Growth potential

There is enough land suitable for citrus near TicoFrut and enough market support to allow TicoFrut, to make Costa Rica, in a few years, the third largest processor of oranges in the world, after Brazil and the United States. We will see whether we can do it.
The negative features of TicoFrut's area are:

- Shallow soils
- Erratic rainfall

**Shallow soils**

Soil depth varies between 12” and 24” where we encounter a fine clay layer.

To overcome this obstacle we are now planting in terraced land with a difference of about 40” between the peak and valley. This increases our soil depth by about 20”, significantly improves our drainage, controls our soil erosion and results in fast-developing, high-producing trees from which we can expect 75 boxes/acre the third year and around 500 boxes/acre starting the 7th or 8th years.

**Erratic rainfall**

We have plenty of water, about 90” per year, but because we are in the tropics we need a dry period to generate dormancy (stress) in the trees followed by abundant water to induce bloom and set the fruit. Sometimes things do not work that way and we end up with very short crops. To overcome this, we need irrigation to follow up when it rains in the middle of the dry season and the trees bloom.

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Sustainable Agriculture: Opportunities and Challenges for the Citrus Industry

Kevin Ogorzalek
Program Officer, Agriculture, World Wildlife Fund, Washington, DC

Over the last year, the agriculture industry has come to the fore of global concerns through the food crises. Underlying this pressing issue is a need to make current production practices “sustainable.” For the first time in the modern era, agriculture is being driven by demand rather than supply, thereby presenting new issues in sustainability. The sustainability movement presents both opportunities and challenges for agriculture’s sub-sectors, such as the citrus industry.

This presentation will discuss some of the sustainability issues being addressed by various agriculture initiatives, globally, and conclude with some of the opportunities for the citrus industry. Sustainability should be perceived as a moving target to make today’s best practices, tomorrow’s norms through technological transfer and continuous innovation. The citrus industry already has a rich history of production improvements that reduce environmental impacts. These advances include integrated pest management, improved yields, as well as improved water and fertilizer use efficiency.

There are now a number of new, sustainability opportunities for industry producers. These new production options include selling carbon credits on various global markets, and entering other local ecosystem services markets. One Florida citrus producer is already working to enter a water market, wherein the local water management authority will pay for the services his land is providing.

The industry also faces challenges to achieve sustainability. These include consistently improving the efficient use of water, fertilizer, and pesticides in order to mitigate and eliminate the negative impacts on local and regional ecosystems. Soil conservation should become a priority given that much of the global citrus production occurs on sloping land. Overcoming disease problems is amongst the industry’s greatest sustainability challenges. The other great challenges include uncertainties involved with climate change and the fate of beneficial organisms such as pollinators.

Citrus producers can embrace the sustainability movement by emulating their industry’s past successes as well as the past and current gains made by other agriculture industries in a manner to add value to their quality products, while consistently seeking innovations.

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Biogasification of Citrus Processing Waste - A Case Study

Pratap C. Pullammanappallil
Assistant Professor, University of Florida, IFAS, Department of Agricultural and Biological Engineering, Gainesville, FL

Citrus juice processing produces a variety of by-products, co-products and waste streams. These include peels, molasses and wastewater. Currently, wet peels are size reduced, passed through presses, dried and pelleted for use as cattle feed. The press liquid is concentrated to produce a molasses co-product. The wastewater stream is usually treated in aerobic activated sludge process and lagoons before disposal. With the increasing cost of fossil fuels it may be no longer economical to process the wet peel stream to produce animal feeds. Alternatively, due to the increasing demand for biofuels, the wet peel stream (along with wastewater) may be used as a renewable feedstock for producing gaseous and liquid fuels.

This presentation will highlight anaerobic digestion of the wastewater and wet peel streams. Anaerobic digestion (also referred to as biogasification or biomethanation) is a biochemical process in which organic substrates like carbohydrates, protein and fats are mineralized to methane and carbon dioxide through a concerted action of several groups of microorganisms under oxygen free (or anaerobic) conditions. The mixture of methane and carbon dioxide is called biogas and can be used with very little clean up as a fuel for direct heating or electrical power generation. However, previous studies have shown that the limonene content of the waste streams may inhibit the anaerobic digestion process and therefore biogasification is not considered as an option for treating citrus processing waste or for biofuel generation.

The feasibility of biogasification of both streams was investigated in laboratory scale 20 liter fermenters in the Bioprocess Engineering Research Laboratories, Agricultural and Biological Engineering Department, University of Florida using samples provided by Duda Products Inc., La Belle, FL. By employing an anaerobic filter for the wastewater and a patented leach bed design for the wet peels we were able to successfully biogasify both streams. The rate and extent of biogasification was similar or better than other agro-processing wastewater streams and biomass feedstocks. The wet peels yielded more methane than that typically obtained from cellulosic biomass.

A case study for biogasification of these streams at Duda Products Inc. will also be presented and will include methane producing potential, process design and operation, scenarios for biogas utilization and economics of biogasification.

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Nanotechnology in the Food Industry

Jose I. Reyes De Corcuera  
Assistant Professor, University of Florida, Citrus Research and Education Center, Lake Alfred, FL

In 2001 Congress passed the National Nanotechnology Initiative (NNI) to support research on nanoscale science engineering and technology. For the last three years NNI has funded around $1.5 billion annually. In contrast, only $3 million have been allocated to food and agricultural applications through the USDA Cooperative State Research, Education, and Extension Service. Similar amounts have been proposed for FY 2009. Over 20 research projects in food and food byproducts have been funded in the last two years and for FY 2008 about another 15-20 projects are expected to be funded. Several centers for nanotechnology have been created at several National Laboratories and Universities. Networks such as the National Nanotechnology Infrastructure Network that assembles over 20 institutions have been created. In 2007 over 1,200 papers dealing with nanotechnology have been published out of which 28 deal with foods.

Major applications of nanotechnology to foods include the development of sensors for pathogen detection, novel packaging materials with reduced oxygen permeability and encapsulation systems for flavor preservation and nutrient delivery. While nanostructured and nanoscale materials are abundant in nature, their synthesis and manipulation are far from trivial. Moreover, key to nanotechnology is the realization that certain materials behave differently at the nanoscale than at the molecular or the macro scales. Concerns regarding the safety of nanoscale-based products and the safety of producing nanotechnology-based materials have emerged. The fate of goods developed with nanotechnology particularly foods will depend on their safety, functionality and, to a great extent, on the public’s perception of the associated risks and benefits. Government, research institutions and private companies are making strong efforts to inform and communicate with the public.

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New Developments and Applications of Resin Systems for the Treatment of Citrus Products containing Pulp and Cloud

Tim F. Schofield
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This paper describes the latest developments for the debittering of cloudy citrus products. The products include pure juices, WESOS and peel extracts. Other applications described are the ratio adjustment or acid reduction of cloudy juice, WESOS and peel extracts.

The BAN process which is described consists of a centrifuge to separate the cloudy product into two streams. The first stream contains a maximum of 1% spin down pulp, and the majority of the soluble solids including bitter compounds. The second is the high pulp fraction. The pectin is not completely separated from the low pulp fraction. The first stream is passed through twin alternating columns containing polymeric resins. When the debittering activity of the resin is exhausted, the resins are regenerated using caustic soda. The processing time plus regeneration time is known as a cycle. After the first stream has been debittered, it is recombined with all or part of the second stream depending on the final product specifications. Continuous operation (24/7) is possible.

A key difference in this technology is the ability to process full cloud, pulp reduced juice because at the end of the product forward flow in each processing cycle the resin is removed from the process column and washed to remove any adhering pulp to ensure the resin is clean so that the regenerant chemicals can regenerate all the surfaces of the resin beads. This reduces the tendency of the activity of the resin to diminish.

The advantages of this technology compared to others such as separating the juice into two streams by Ultra Filtration, followed by debittering of the clarified stream only, are:

1. Better recombination of the two streams – particularly relevant for products like NFC
2. Shorter processing time
3. Lower energy input (less than 25% of alternative technology) reducing quality risk and cost
4. Ability to debitter products with high oil levels up to 0.1% (1000 ppm). Up to 2000 ppm has been processed under certain conditions.
5. Lower Processing cost (less than 50% of alternative technology)
6. Longer resin life (Over 10 years for debittering)
7. Ability to change over resins if required to produce different products – flexibility.
8. Reduced down time if pulp enters a resin bed.

This technology has made it possible to process debittered NFC to a higher standard such as that required in Europe when other technologies could not achieve the required standard.

The cost of processing products like orange core wash and peel extracts has been dramatically reduced. This is important when processing by-products because of the lower selling prices.
No hazardous chemicals other than dilute caustic soda and dilute phosphoric acid are required. No solvents are required. This is a safety improvement over other similar technologies.

This technology has now been successfully used commercially in 12 countries. Citrus fruits such as orange, mandarine, tangerine, grapefruit, kinnow etc. and their by-products are all processed.

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Labor Issues Facing the Florida Citrus Industry

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Michael W. Sparks is the Executive Vice President/CEO of Florida Citrus Mutual, the state’s largest citrus grower association. Mutual represents more than 8,000 grower members throughout the state of Florida on issues affecting their business in Washington DC, Tallahassee, and locally.

The citrus industry, directly and indirectly, generates roughly 76,000 full time and part time jobs while creating an economic impact of $9.3 billion a year.

Florida citrus - and US agriculture in general - is facing a labor crisis. There is no doubt about it. The US is not producing enough native born workers to fill all of the jobs being created in our economy and US immigration policy does not make-up for the shortfall. Florida Citrus Mutual is aggressively pursuing immigration reform at the federal level; however, it is a complex and tedious process.

Spurred on by Congress’ inability to pass immigration reform last year, the federal government is now pursuing a policy of enforcement. In 2007, Immigration and Customs Enforcement (ICE) dramatically increased the amount of fines and civil judgments in worksite investigations. This past spring, ICE representatives publicly stated that they would be targeting production agriculture.

The policy is putting the Florida citrus industry in a dire situation. Growers are worried the specter of immigration raids will hamper their ability to attract enough workers to pick their crops. The agriculture, construction, and hospitality industries in Florida will collapse without undocumented immigrants. Obviously, this will have a direct affect on processors ability to produce juice.

In a somewhat misguided strategy, the federal government is attempting to modernize the current agricultural guest worker program called H-2A. This solution is inadequate. Even with the proposed changes to the program, H-2A is not a viable alternative for citrus growers. The program is cumbersome and prohibitively expensive.

So what is the alternative? A coalition of agricultural interests and farm worker advocates has crafted the Emergency Agricultural Relief Act (EARA). The act would create a flow of legal immigrant labor for a couple of years as a stop gap solution; however Congress still must craft a long-term answer.

The labor emergency facing American agriculture threatens not only the Florida citrus industry and the future of your processing operations but the ability of our nation to provide a stable and reliable food supply as well. The emergency has many components – regional and local shortages; shortages of authorized workers; and increased enforcement by federal, state and local governments with no solution. At a time when much of the world is experiencing a food crisis, it is unthinkable that policymakers cannot solve this problem.
This crisis cannot wait. It must be addressed right now, with support from both Democrats and Republicans.

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Bioenergy: Separating Science from Politics

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Oil has shaped modern civilization and access to cheap energy has been the foundation of industrial and agricultural development. However, dwindling supplies have the potential to precipitate a global crisis affecting lifestyles and political stability. Yet, there is no single-fuel solution – no “silver bullet” – to resolve the energy conundrum. We must consider multiple fuel options from a diversity of alternative and fossil fuel sources, while at the same time improving the efficiency of energy utilization in all sectors of the economy from transportation to agriculture, industry, and construction.

In this context, the role of politicians is to lead and pave the way for a transition from fossil fuels to a society enriched by renewable fuel alternatives that is energy sufficient and resource efficient, and in the process facilitate creation of new jobs and new opportunities for sustainable growth. Major tasks for politicians are to support education on public awareness and understanding, facilitate research, and define tax and incentive policies that provide a level playing field for development of a multitude of renewable energy sources, rather than a continuation of the present monolithic energy framework.

The role of scientists and engineers is primarily to research and develop new energy solutions, and to determine how to integrate these new fuels into an efficient energy infrastructure that will adequately meet the future needs of society. A new energy model will likely include distributed energy production based on a plurality of biofuels produced from local feedstocks. To encourage development of a rational energy strategy, scientists must also educate citizens and politicians by providing unbiased information that addresses all the pros and cons of different energy sources. Only then can society make rational choices that deliver the optimum balance between energy efficiency, environmental and climatic impacts, and sustainable living.

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Validation of Food Tanker Cleaning Protocols

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Improperly cleaned tankers may be a source of food-borne bacterial and allergen cross-contamination, particularly with non-dedicated tankers. Tanker cleaning procedures are practical guidelines but may not have adequate details in some critical cleaning parameters. This research was undertaken to validate two sanitation protocols for their effectiveness to remove microorganisms and food soils.

To assist in validating the wash protocols, a model tanker with a barrel partially made of Plexiglas® was used. The model tanker aided in visually determining wash flow characteristics of CIP systems and cleaning effectiveness. All washes were conducted at the University of Florida, Citrus Research and Education Center in Lake Alfred to better control the washing parameters. The Juice Products Association’s Type 2 and 4 washes were evaluated with three different CIP devices. The appropriate food slurry containing microorganisms was applied to predetermined areas of the tanker and allowed to dry for 24 hours. After washing, sample sites (100 cm²) were evaluated for microorganisms, residual soils, and allergens by standard microbiological methods and commercial test kits.

When using appropriate CIP parameters, both type 2 and 4 wash protocols were effective to reduce microorganisms by 6 logs per 100 cm² in all sample sites of the tanker. Both washes were also effective to reduce their respective soils by at least 4 logs (<3 µg/100cm² and <1 µg/100cm², respectively).

The current research indicates that JPA Type 2 and 4 wash protocols if properly adhered to and when the proper CIP system parameters are used, can be effective to reduce microorganisms and soil residues to non-recoverable or low levels. It is extremely important to ensure that the CIP system is operated at the optimum conditions for flow impact and volume.

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