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MAY

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INTERNATIONAL JOURNAL FOR THE FRUIT PROCESSING, JUICE AND SOFT DRINKS PRODUCING INDUSTRY

„An essential pillar of circular economy is recycling.“

(Luc Desoutter, Sustainability Officer at Sidel)



The Publication for Practitioners!

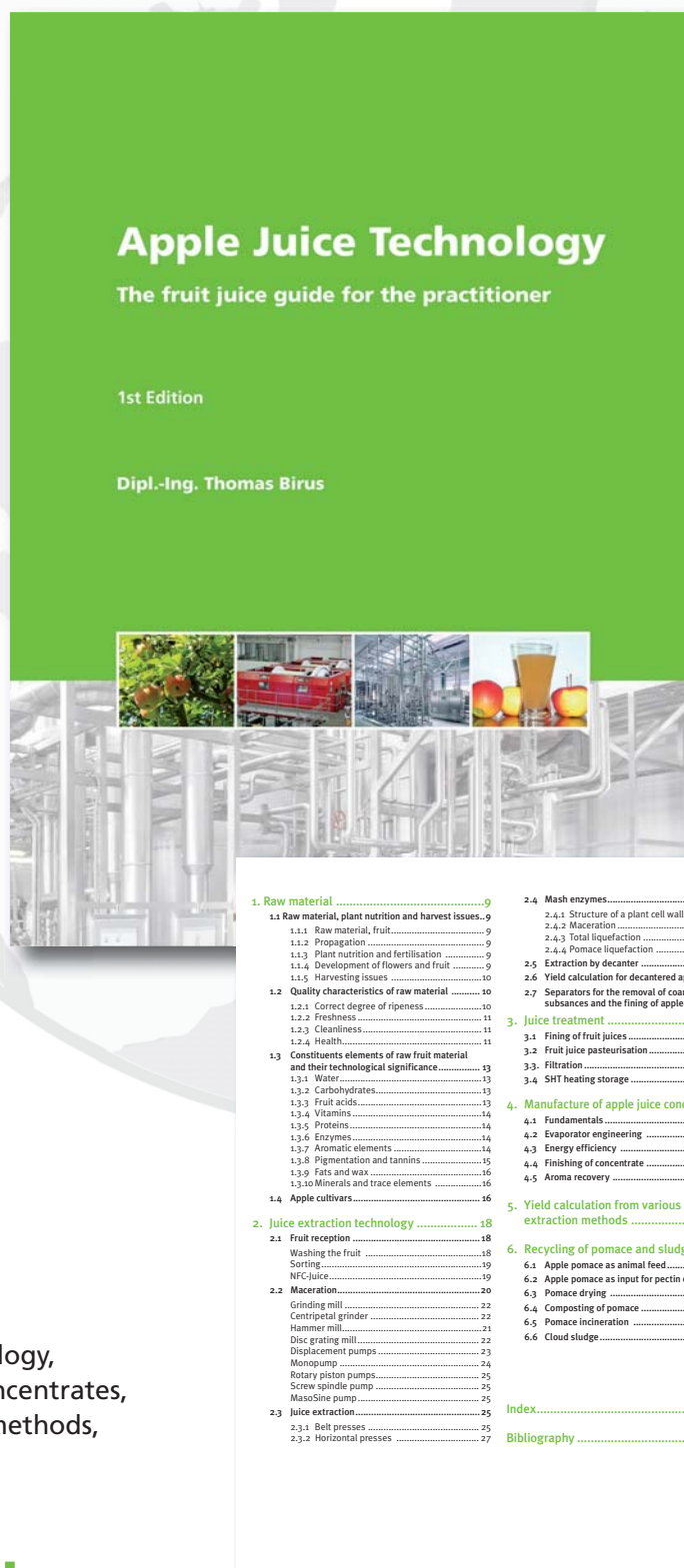
The production of apple juice is a carefully engineered sequence of technological measures aimed at extracting the valuable, flavoursome, enjoyable and desired contents from apples and presenting them to the consumer in the very best packaging.

With this book, up-to-date information is now available to practitioners keen to learn what's new in the increasingly automated production. The book sheds light on the back-ground to modern apple juice technology without delving too deeply into scientific detail.

This book is intended to be of service to school and college students, skilled and master craftsmen and engineers.

It will help to answer the many questions about "How does that work?", "Is there an alternative to this method?" and "Can I do something better in my operation?".

Content: raw material, juice extraction technology, juice treatment, manufacture of apple juice concentrates, yield calculation from various juice extraction methods, recycling of pomace and sludge.



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Dear Readers,

first of all we take a look at the European beverage sector under the motto „There's still room for Growth in Europe“. An extensive interview with Kay Schumacher, Team Manager Product Application and Development at fruit ingredients expert Bösch Boden Spies, on page 150 ff gives you a nice overview about the latest trends.

VOG Products was looking for an easy-to-use sterile filtration solution for clear NFC apple juice that prevents colloidal clogging to achieve a longer service life. A two-stage cartridge filtration system delivers a long service life and easy operation for sterile filtration. Please read the full case study on page 156 ff.

Luc Desoutter, Sustainability Officer at Sidel, talked to us about the company's end-to-end approach and how it can contribute to the circular economy. Find out more what is beyond the bottle on page 158 ff.

On March the 6th the annual IFU Technical Workshop took place in Athens. An enormous international audience listened to a wide range of technically informative presentations and took the chance to enjoy the following network dinner in the heart of the capital of Greece. Please get inspired by reading the summary of the workshop on page 162 ff.

In the beginning of May Fundecitrus published the 2019-2020 orange crop forecast for the Brazilian citrus belt and expect a total production of 388.89 million boxes. To read the full detailed report have a look on page 164 ff.

Enjoy reading,

Yours



marco.brennich@fruit-processing.com

PRODUCT DEVELOPMENT

'There's Still Room for Growth in Europe' 150



Sometimes you can't see the juice for the bottles. Almost every day, a new product enters the global beverage market – and a new trend: holistic, individuality, indulgence, sustainability, naturalness, convenience, and so on and so forth. Together with Kay Schumacher, Team Manager Product Application and Development at the Hamburg-based fruit ingredients expert Bösch Boden Spies, we take a look at the European beverage sector, focusing on a market with quite special characteristics: Germany ...

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New aseptic double-seat valve increases shelf life of beverages 154

GEA launched its new D-tec® D/DV double-chamber valve by end of April 2019. This special double-seat valve is designed with a sterile leakage chamber which is hermetically sealed from the atmosphere by two side valves. As with the entire aseptic D-tec® range, the outstanding sealing properties of the new valve stem diaphragm raise hygiene standards to an UltraClean level, thus increasing the shelf life of soft drinks, fruit juices, as well as milk-based and lactic acid-fermented products ...



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Don't give clogs a chance 156

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PACKAGING

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It's easy to forget that packaging is much more than just the bottle that reaches the consumer. It includes secondary packaging that bundles the bottles or packs together and tertiary packaging that gets the bundles in a format that is easy to transport. Luc Desoutter, Sustainability Officer at Sidel, talked to us about the company's end-to-end approach and how it can contribute to the circular economy ...

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Efficient drying in high-humidity food processing operation 161

Food processing production setups have to take special care with regard to bacteria, micro-organisms and other pathogens to deal with the given high hygiene standards. Uncontrolled airborne moisture in food production and processing companies can result in many big practical difficulties. The moisture present everywhere in the air tends to condense on process equipment, structures and walls inside the facility ...

EVENTS

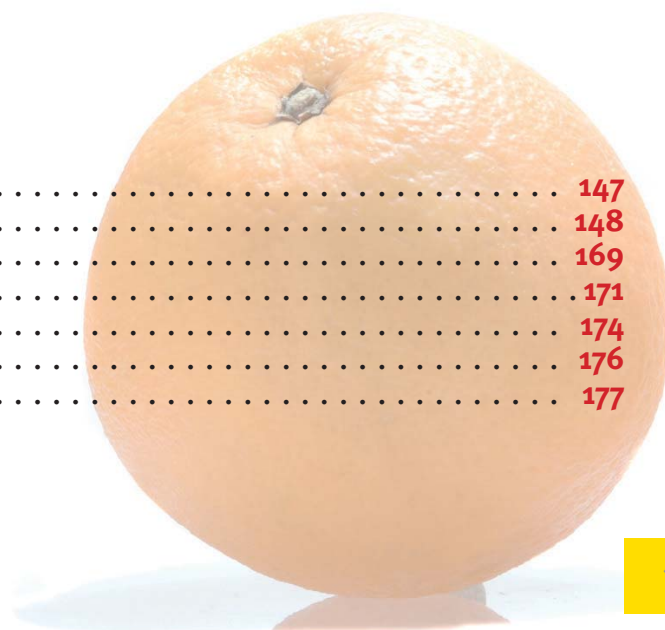
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'There's still room for growth in Europe'

| Beverage Market | Fruit Ingredients | Marketing Concepts | Product Development | Trends |

Sometimes you can't see the juice for the bottles. Almost every day, a new product enters the global beverage market – and a new trend: holistic, individuality, indulgence, sustainability, naturalness, convenience, and so on and so forth. Together with Kay Schumacher, Team Manager Product Application and Development at the Hamburg-based fruit ingredients expert Bösch Boden Spies, we take a look at the European beverage sector, focusing on a market with quite special characteristics: Germany.

Mr. Schumacher, German consumers want a huge product range, but 90 % of the time their usual items end up in the shopping cart. How come?



Kay Schumacher
© all photos Bösch Boden Spies

It's probably our mentality. We like to know that "I have the complete range at my disposal, but my favorite spritzer still tastes best to me." Meanwhile, a large product range is important for producers and manufacturers, otherwise it's difficult to be visible on the shelves.

Is this primarily a German phenomenon?

Yes. In Scandinavia, for example, there are many innovative products, but there, too, it takes quite a while to establish them. In southern Europe, sweetness plays an important role, and there's a greater willingness to spend money on new products.

What is it particularly important to German consumers when it comes to beverages?

Above all, authenticity and the combination of familiar flavors with new nuances, be it with exotics like coconut and guava, herbs like basil or rosemary, or spices like cinnamon and cardamom. Or simply by giving the name of

the varieties used. Does anyone really know the Montmorency cherry?

Could you please give us a brief introduction?

See, I've already made you curious. The Montmorency cherry is a sour cherry grown in the United States, in Michigan. Its health benefits surpass even those of the European sour cherry, because it contains particularly high levels of melatonin.

Where is the juice market heading? In Germany, 4.5 billion liters of juice were sold in 2003, now it is not even 2.5 billion liters. That sounds like a dramatic drop!

Yes, but you can counter this with diversification. That goes for every country. Anyway, I believe producers should evaluate the success of premium drinks containing juice, as well as premium drinks made 100 % of juice, in euros rather than liters. In the low-price segment, margins are small, but in the premium segment we're playing in a completely different league, with significantly more attractive margins. This is the great opportunity for producers.

Juices that don't consist of 100 % juice concentrate continue to record slight growth here in Germany. Plant juices such as coconut water, for example, only have a small share of the market, but their sales are growing faster than in any other segment. How should producers react?

With premium, premium, premium, and exclusive ingredients. And with a good story. The success of coconut water, or, for example, coconut flower syrup for sweetening is primarily the story behind it. At Bösch Boden Spies, for example, we especially like cranberries. A photo of the cranberry harvest with bright red cranberry fields combined with a story about the passion that farmers in America put into the fruit – these are stories that producers can tell and are part of what makes a product a premium product. Consumers like that.

How are smoothies and sports and energy drinks doing?

Smoothies now have the stigma of a relatively high sugar content – no matter how natural they are. In addition, in the early years of the great growth rates they were the only guarantors of 100 % fresh, natural fruit enjoyment for in between meals, apart from orange NFCs. Today's range of fresh juices, which promise greater refreshment due to their consistency, have probably overtaken rich smoothies. And anyone who goes to work in the morning can now buy a freshly squeezed juice or smoothie in the bakery and doesn't need a smoothie from the refrigerated shelf.

Energy drinks, too, are perceived differently by consumers today than they were 15 years ago. They, too, offer natural ingredients such as caffeine from coffee, guarana and the like. Today, an energy drink no longer has to taste like a lollipop and contain only stimulants, water, and refined sugar.

Are there drinks that are threatened with extinction, so to speak?

No, because they're always being reinterpreted and diversified. The huge variety is an enormous blessing for consumers. Producers have no reason to panic, either. Their only job is to guide consumers in the jungle of start-ups, imitation products, and craft beverages: clear messages, clear added value, and one other thing ... first-class taste!

For decades, carbonated spritzers were among the industry's driving forces in Europe. When did their decline begin?

When products with the same or a better taste experience came onto the market. With more refreshment, more taste, the same lower sugar content, and more attractive colors, packaging, and product stories.

At Bösch Boden Spies you advise beverage producers on the development of new varieties. How can juice producers in particular provide new impetus?

Through the honestly-told stories I mentioned earlier, for example, and with clear images of what the product stands for. If a producer can clearly answer why their product is not interchangeable, they have already gained a lot. The ingredients used must, of course, offer consumers significant added value. We currently love to work with our new cranberry juice concentrate.

Do you see the cranberry as a 'super fruit'?

Absolutely! I could sing long hymns of praise to the cranberry here for many reasons. In addition to the scientifically proven health benefits of the proanthocyanidins and organic acids they contain, cranberries have another genuine added value that's often overlooked: fresh cranberries that are processed into juice contain very little sugar – only about half that of mango and only a third of banana. In combination with other fruits, products that taste and look very compelling can be developed, that cater to the trend towards lower-calorie products.

Do you have product solutions for juice producers?

We've developed beverages based on our cranberry juice concentrate. The result are great taste experiences with attractive colors and a reasonable sugar spectrum – both carbonated and non-carbonated. Cranberries have a vibrant taste. They make every drink, whether 100 % fruit juice or not, livelier and more refreshing. More so than any smoothie can deliver. In principle, cranberries offer the opportunity to develop an entirely new product category and respond to the wish for diversification among producers. And that's what it takes these days.





What role does a drink's color play in its success?

The color stability of ingredients plays an important role for several reasons. First of all, a drink has to be eye-catching. I like the term 'instagrammability' in this context. It describes how important it is to many consumers that a photo of a product looks good on Instagram.

Secondly, a contemporary drink needs a short, comprehensible list of ingredients. I can see the use of natural dyes from fruit and plant extracts, citric acid or ascorbic acid on the list of ingredients as becoming less and less contemporary because it's less authentic. As beautiful as a juice drink dyed with black carrot may be, consumers rightly ask themselves: why carrot in a fruit juice drink? The fruit ingredients themselves should make the products attractive, tasty, and extend their shelf life. Depending on the quantity used and the fruit it is combined with, the cranberry can make an attractive contribution with its rather stable anthocyanins. Our partner Ocean Spray has 20 varieties of cranberry juice in the US market alone. So there's still room for growth in Europe.

Does establishing new ingredients require patience and perseverance?

Absolutely! We worked with cranberries for eight years before they were really accepted in Europe. Hardly anyone knew them here, and everyone wondered: "Why do we need cranberries if we have apples and oranges?" By now many people know why, and they are becoming more and more prevalent. We're hoping for the same for the Cape Gooseberry – which we call "goldenberry." We see this as another super fruit that is just as healthy. This will be another opportunity for us to prove our patience and perseverance.

The snacking trend has taken hold of the beverage sector as well. What does this mean, and how can producers profit from it?

Packaging is becoming smaller and smaller, and more and more informative regarding their occasions for consumption and target group. The 1.5-liter family pack has had its day. The challenge of the next few years will be to offer

sustainable packaging solutions that don't compromise on convenience or appearance. Despite the ever-increasing glut of plastics, the trend towards small packaging units will continue – this is the result of our lifestyle and growing urbanization, as well as the number of single and two-person households. The great opportunity for producers, which is already becoming apparent, is premiumization, which goes hand in hand with the snacking trend. These products offer more scope for margins.

The price gap between economy and premium products is widening from year to year. What are your thoughts on that?

I believe the development is very good for consumers. There's something for everyone, and juices in the low-price segment are generally not unhealthy. They will remain as popular and important as Gouda in the cheese segment, and toast in the bread sector.

On the other hand, premium products in a rising price segment are becoming established, – and sustainably. Many consumers have enough buying power to enjoy this personal luxury. And premium products are luxury products – small treats in everyday life. This trend will continue.

Who actually sets the trends today: producers or is it more the consumers?

It's a complex field. I believe that consumers have always been the ones to set the trends. Social and cultural developments result in new trends that producers service. Believe me, it's a rare producer who will set a trend towards more sustainable packaging because they want to improve the world. Nor would they buy any expensive ingredients produced sustainably to high environmental standards and involving high labor costs because they like to spend money. They are rightly forced by consumers to rethink and take advantage of the opportunities offered by changing consumer behavior.

All in all, do the developments make marketing beverages harder or easier?

The beverage market is saturated. We mustn't kid ourselves here. There's no real gap in the market anymore. That's why it's very difficult to get consumers' attention. In addition to consumer requirements, the legal and qualitative requirements placed on producers have also risen enormously. The commodity markets have become more volatile. It's therefore extremely important for beverage producers to be able to rely on their suppliers, not only in terms of price, but also in terms of availability, sustainability, transparency, market information and, ultimately, ideas and advice for using the products.

What are the key points for successful marketing?

I think authenticity, transparency, and speed.

Speed?

To be the first on the market – while also not following every trend is the great art a producer has to master. It's astonishing how short product cycles are, how rapidly one product launch follows another, relaunches and so on. Consumers can hardly keep up. When you consider what machinery needs to be put into motion to bring products to market, it's amazing that the industry can handle it at all. Development costs, pre-production runs, innumerable service providers who work on it, and all of it in the shortest possible time: a logistical masterstroke for the industry.

In a list of all the above-mentioned success factors for a beverage, where does taste rank?

From my point of view, right at the top. It is and will remain the be-all and end-all. Nevertheless, taste is open to debate. And because every consumer wants to define it themselves, appearance- and sensorial-wise, there is this enormous diversity. ■

Bösch Boden Spies GmbH

Bösch Boden Spies GmbH & Co. KG is a Hamburg-based import and innovation agency for high-quality, natural fruit and nut ingredients. Its focus is on products with outstanding functionality. Bösch Boden Spies develops innovative application and marketing concepts for them, thereby creating new markets for its producers and its clients from trade and industry. Food producers and retailers in Germany and Europe profit from the ingredients expert's extensive know-how and tailor-made services. Fairness, transparency and long-lasting partnerships are principles that Bösch Boden Spies actively embraces and advocates.

www.boeschbodenspies.com

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BUCHER
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New aseptic double-seat valve increases shelf life of beverages

| Double-seat Valve | D-tec® Range | Hygiene | Shelf Life | UltraClean |

GEA launched its new D-tec® D/DV double-chamber valve by end of April 2019. This special double-seat valve is designed with a sterile leakage chamber which is hermetically sealed from the atmosphere by two side valves. As with the entire aseptic D-tec® range, the outstanding sealing properties of the new valve stem diaphragm raise hygiene standards to an UltraClean level, thus increasing the shelf life of soft drinks, fruit juices, as well as milk-based and lactic acid-fermented products. If manufacturers adapt their process chain accordingly, the D-tec® can help them achieve a desired shelf life with fewer preservatives.

Equipping process plants from A to Z with D-tec®

With its D-tec® D/DV double-chamber valve, GEA successfully completes its UltraClean valve range, allowing customers to now fully integrate D-tec® equipment into their production processes. “Equipping the interfaces in pro-

cess plants with as few valve types as possible is often a decisive criterion to our customers. Spare parts handling and warehousing become increasingly complex when different valve types must work together,” explains Pascal Bär, Product Manager for GEA Aseptic Valve Technology. After launching the single-seat D-tec® P/DV control valve in 2018, GEA is now introducing the D/DV double-chamber valve as the final piece of the puzzle in its D-tec® range. GEA can now consistently plan greenfield projects leveraging D-tec®; a retrofit for the single-seat valve is available for existing systems.

Implementing a hygiene-driven philosophy

With the D-tec® double chamber valve, GEA now offers aseptic valves for both hygiene classes “Aseptic” and “UltraClean”, which are tailored to the special conditions of the respective applications. According to its hygiene



GEA is launching the D-tec® D/DV double-chamber valve focusing on UltraClean applications in the food, beverage and dairy industries.

© GEA/MarkSwallow

philosophy, GEA recommends this distinction: “Aseptomag®, our metal bellows technology, is the benchmark in hygienic processing, which we use for highly sensitive products such as baby food and UHT milk as they demand an uncompromising aseptic execution of processes and components,” states Bär. “However, a wide range of beverages produced by our customers are not promoted under aseptic conditions. In fact, they fall into the second highest hygiene level according to the VDMA guideline, which is hygiene class IV ‘UltraClean’. That is why our new D-tec® D/DV is meeting the process requirements of this hygiene class.” D-tec® is suitable for iced tea, fruit juice, fruit yogurt and ESL milk and products that require an increased shelf life depending on the pH value, cold chain and storage conditions.

Ensuring operational safety

When it comes to UltraClean applications, GEA systematically opts for the hermetically sealed D-tec® stem diaphragm because it provides improved contamination protection against the atmosphere and ensures microbial stability of products throughout their manufacture. The membranes are made of thermoplastics that are more flexible than stainless steel. For example, this makes them well-suited to compensate for pressure surges, says Bär. They are, to a certain extent, more forgiving to process errors. In the event of a diaphragm rupture, the leakage detection system ensures a high degree of operational safety. The product manager adds: “Our product development is directed towards ensuring equipment availability and profitability for beverage and food producers. The new double-chamber valve fulfills this: It can be used very flexibly and combines a high level of hygiene with manageable operating costs.” In addition, the maintenance-friendly design minimizes system downtimes.

Adapting demanding process conditions

Like the entire D-tec® range, the D/DV double-chamber valve is based on the tried and tested VARIVENT® assembly unit, which is characterized by its adaptability. This enables the valve to be configured according to the required process conditions. The double-seat valve is characterized by the two membranes, which hermetically seal the product interior from the atmosphere. It is avail-



GEA recommends the D-tec® D/DV double-chamber valve for UltraClean applications where processed foods must be completely protected from the environment by a condensate barrier.
© GEA

able in valve sizes ranging from DN 40 up to DN 80 and OD 1.5” up to OD 3”. The valve sizes DN 100 and OD 4” will be introduced within the next weeks. The valve seat can be executed as both soft and hard sealing – the latter with the popular TEFASEP® gold seal, which GEA recently introduced. In addition, D-tec® double-chamber valves can be equipped with one, two or three T.VIS® control tops of various designs. The GEA D-tec® D/DV considers all common industrial standards.

GEA Group
www.gea.com

Don't give clogs a chance

A two-stage cartridge filtration system delivers a long service life and easy operation for sterile filtration of clear NFC juice

| Clogs | Filter Cartridges | Microorganisms | NFC Juice | Sterile Filtration | VOG |

VOG Products uses a two-stage filtration system with BECO PROTECT CS depth filter cartridges as a pre-filter and BECO MEMBRAN PS Pure membrane filter cartridges as a final filter for the sterile filtration of apple juice. This combination not only removes microorganisms and their spores but also enables a long service life with no colloid clogging in the membrane filter cartridges.

An increasing number of consumers prefer high quality products when buying juice. NFC juice (not-from-concentrate juice) is becoming particularly popular and its market share is continuously expanding. VOG Products has benefitted from this rise in demand. The company operates state-of-the-art tank storage with a capacity of over 2.6 million gallons (10 million liters) dedicated to the storage of NFC juice.

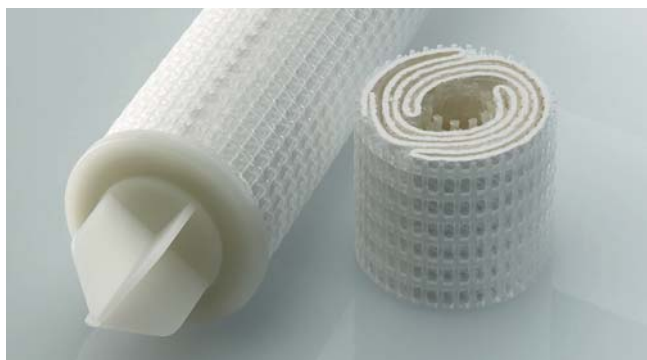
Sterile filtration assures high quality

VOG Products is one of the largest fruit processors in Europe. The company is based in Laives in the South Tyrolean plain and processes around 360,000 tons of fruit per year, including 300,000 tons of apples of which a part is used to produce approximately 21 million gallons (80 million liters) of apple juice. Quality is the top priority: Only handpicked, high-quality fruit is used. After pressing, the juice is pasteurized and then held in the cold store

under controlled conditions. Alternatively, if the customer requires the juice can be produced and shipped “just in time”, thus preserving maximum freshness and the natural flavor of the juice. The juice is sterile filtered a second time before shipping, to preserve the flavor of the clear NFC apple juice. This removes TAB (Thermo Acidophilic Bacteria), in particular the alicyclobacillus acidoterrestris species (ACB), from the fruit juice. If left in the juice, it would have a significant negative effect on the flavor.

Colloids clog membrane filters

“Finding a reliable, safe and easy-to-use filtration solution was important to us,” comments Thomas Meran, Operations Manager at VOG Products. VOG therefore decided to use Eaton filter cartridges. A significant advantage of the filter cartridges is that they work within an enclosed system – so none of the product can escape and impurities cannot enter the system. This is an important aspect in terms of product quality, safety and process cleanliness during juice production. The filter cartridges can also be changed quickly and easily and can be regenerated and sterilized multiple times. “Our collaboration with Eaton began over 15 years ago, with solutions for aroma filtration,” says Meran. “Eaton is now a major supplier of filtration solutions.”



BECO PROTECT CS CellStream™ pre-filter cartridges offer the highest level of protection for downstream membrane filter cartridges due to the separation mechanisms of the filter material, which is made of special cellulose.

© Eaton



BECO MEMBRAN PS Pure™ membrane filter cartridges safely retain spore-forming bacteria, which can harm fruit juice, using an asymmetric pore structure with an LRV (log reduction value) of more than 7 per cm².

© Eaton

A two-stage system was used at VOG: The clear NFC apple juice was initially passed through two housings, each containing 30 pre-filter cartridges, at a temperature of 32 to 34 °F (0 to 1 °C) and 12 °Brix. The juice was then passed through two further housings, each equipped with 30 membrane filter cartridges with an absolute retention rate of 0.2 µm, which safely removed unwanted microorganisms and spores. However, the colloids in the apple juice repeatedly caused clogging of the membrane filter cartridges. The colloids became attached to the fine pored structure of the membrane surface which resulted in a rapid increase in pressure and a lower flow of filtrate. The membranes needed to be rinsed at increasingly shorter intervals, which significantly reduced the filtration performance and the service life of the filter cartridges. “We were therefore looking for a solution that could further improve the cost-effectiveness of the sterile filtration of our clear NFC juices,” says Operations Manager Meran.

New generation of filters for more efficiency

Eaton upgraded the filter cartridges to improve the existing system, especially in terms of service life.

For the removal of microorganisms, VOG Products now equips each of the two cartridge housings with 30 BECO MEMBRAN PS Pure filter cartridges with a length of 30 inches. The asymmetric pore structure of the polyether sulfone membrane offers a high level of microbiological retention with an absolute retention rate of 0.2 µm. These new filter cartridges are designed to have a very long service life. The polyethersulfone membranes are protected by polypropylene support fleece, while the core and cage are made of polypropylene and offer high mechanical stability. Due to its special design, the membrane filter cartridge withstands a differential pressure of up to 73 psi (5 bar) in the direction of flow and 29 psi (2 bar) in the counterflow direction at room temperature – which is another factor that contributes to a long service life. At the same time, more than 100 steam sterilization cycles can be performed at 221 °F (105 °C) for 30 minutes. The maximum temperature for steam sterilization is actually 250 °F (121 °C), which will also safely destroy thermophilic spores.

Membrane filter cartridges also offer advantages in terms of quality: the integrity of the cartridges can also be checked. A corresponding integrity measurement is performed using a pressure holding test. In this test, the pressure drop of the entire filtration system per unit time in millibars is measured for a given testing pressure. If the maximum permissible pressure drop is exceeded, the filter cartridges may be damaged. This makes it easy to confirm the correct operation of the filter cartridges and to ensure the high quality of the juice. This is an important

aspect of seamless quality management, as it provides documented evidence that the apple juice has left the company in perfect condition. These integrity tests can only be performed using water-wetted hydrophilic membrane filter cartridges.

In order to prevent the filter cartridge membranes from becoming clogged, they are protected by the up-stream depth filter cartridges that remove particles and colloids. Two housings are used, each equipped with 30 BECO PROTECT CS115 CellStream depth filter cartridges, which use BECOPAD® depth filter sheets as filtering media. This is made of high-purity cellulose and gently filters the juice whilst preserving its color or flavor. The special wrapping of the filter material also maximizes the filter area. At a nominal retention rate of less than 0.2 µm, these depth filter cartridges ensure high retention rates of ultra-fine particles and colloids and effectively protect the membrane filter cartridges from clogging. The pre-filter stage is also designed to ensure a long service life: The robust construction of the depth filter cartridges provides high mechanical and thermal stability. The maximum pressure difference during filtration may be up to 22 psi at 68 °F (1.5 bar at 20 °C), the maximum pressure during cleaning 29 psi at 176 °F (2 bar at 80 °C) and the maximum temperature during steam sterilization 250 °F (121 °C).

Service life of 1.3 million gallons (5 million liters) achieved

“These new filter cartridges have enabled us to once again improve the quality of our sterile filtration,” says Thomas Meran, who is impressed by the solution. “Above all, we have achieved our goal of significantly improving the service life of the filters – we have now achieved a total system life of approximately 1.3 million gallons (5 million liters). There are no more clogs in the membrane filter cartridges. We only replace the filter cartridges after the maximum permitted 100 steam cycles and only for safety reasons.” All in all, VOG Products has been able to significantly improve the efficiency of its sterile filtration by using the new Eaton filter cartridges. They have provided the ideal conditions for VOG to maintain its status as one of the leading fruit processors and ensure that clear NFC fruit juice from the South Tyrol will continue to grow in popularity in the future.



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Beyond the bottle

| Circular Economy | Life Cycle Analysis | Packaging | PET | Recycling |

It's easy to forget that packaging is much more than just the bottle that reaches the consumer. It includes secondary packaging that bundles the bottles or packs together and tertiary packaging that gets the bundles in a format that is easy to transport. Luc Desoutter, Sustainability Officer at Sidel, talked to us about the company's end-to-end approach and how it can contribute to the circular economy.

Can you introduce us to Sidel's End to End approach?

Sidel looks at packaging and equipment with a 360° perspective. Not only do we need to take into account primary, secondary and tertiary packaging but also their interaction with the equipment in the factory. Also, we need to consider the impacts they create upstream and downstream in the value chain. End to End ties closely with Life Cycle Analysis methodology: When evaluating the environmental footprint of packaging solution options such as PET, HDPE, glass or can, you must take a holistic approach. This means that you need to consider the primary packaging (container, label and closure) in combination with secondary packaging (bundling material such as shrink-film, carton or both) and tertiary packaging (pallet,

liners, hood ...). Additionally, for each type of packaging material used, you need to factor in the origin of the material (i.e. whether it is virgin, recycled or bio-based) and its end of life properties (i.e. whether it is collected for recycling or not).

The upstream and downstream logistics of these packaging materials are also part of the equation, together with the energy, water and chemical consumption at each stage of manufacturing. Capitalizing on the numerous life cycle analyses that we conducted on a selection of packaging solutions, we've created a Life Cycle Analysis tool. It is designed to be used in the same way as a Total Cost of Ownership (TCO) tool and is complementary to it. We can work on various scenarios and propose the best packaging options according to their environmental and TCO performances, their respect for "design for recycling" guidelines and their ability to deliver on customers' and end users' needs. To make a long story short: it doesn't necessarily make sense to lightweight the container (i.e. the primary packaging) if more secondary packaging is required to compensate from it getting misshapen. This is going to be a continued focus area for us.

Weight has been a big subject in the packaging world, as PET bottles have got increasingly lighter. Do you think this will continue?

Primary packaging has always been the low hanging fruit for reducing environmental footprint: every gram saved on a PET bottle translates into 2.15 gr of CO₂ equivalent savings for greenhouse gases. In other words, the impact is 430 tons of equivalent CO₂ greenhouse gas savings a year for a line producing 200 million bottles a year! Thanks to our packaging design capabilities, and particularly to our continuous innovation in stretch blowmoulding and conveying technologies, we are at the forefront of PET bottle lightweighting, breaking record after record. More than 10 years ago, we were introducing the "No-Bottle" concept, allowing a below 10 gr weight for a 500 ml bottle, and now we are talking of weights below six grams for the same bottle size.



Luc Desoutter, Sustainability Officer at Sidel, talks about the company's end-to-end approach. © all photos Sidel



Technically and industrially, PET, can and glass can all be recycled.

Our capabilities would help us reduce the weight even further, however both for the value market and the mainstream/premium segments, lightweighting is not the right answer. This is why we are increasingly concentrating our innovation efforts around the “RightWeighting” approach, making sure that the package is fit for purpose. RightWeighting is about ensuring that the bottle is robust enough to withstand transportation and distribution challenges and deliver performance from production to the consumer. The way we branded this concept is quite powerful, because it clearly reflects the need to match a certain performance level. We must never forget that the main function of a package is to protect the product, which is a must if you want to enhance the brand experience. Another customer desire – regardless of the market they serve – is the need for reducing their environmental footprint. Here, using recycled material as part of the primary packaging formula significantly offsets weight penalties while saving on resources. This represents a big opportunity to give consumers a new experience, via a potentially stiffer package that features a real environmental value.

The packaging industry has come in for a lot of negative press in recent years. Do the ideas of the circular economy actually apply to this business?

As everyone is aware, the negative image around plastic packaging is particularly fueled by evidence of marine litter, itself caused by a mismanagement of waste. Technically and industrially, PET, can and glass can all be recycled. There is also an economical value of doing so: the value of a bale of PET bottles can range between 300 and 600 euros per ton, depending on its quality.

An essential pillar of circular economy is recycling. Recycling means no land filling, no marine litter and less natural resources depletion. The limiting factor today – affecting also the carton, glass and aluminum industries – is collection: indeed, recycling technology is available and the demand for food grade rPET is outperforming

the offer. We know our customers want to use recycled PET; consumers are happy to recycle their PET packages; and we’re seeing a shift in attitudes towards how PET is recycled. The EU directive is, among other things, the collection rates to go up to 90 %, allowing recycling to develop further. However, for any recycling initiative to be successful, it needs the right scheme and the backing of local government and policy makers. Legislators are now realising that to keep PET and other packaging materials in the value chain, an infrastructure for collection and reuse is needed.

In Europe, ambitious targets for the collection and recycling of packaging materials have now been set. How do you see this affecting the packaging industry?

For us in the industry, it actually represents a great opportunity for progress. It will show consumers that materials, like PET with its 100 % recyclability, have an inherent value and can be successfully recycled and reused. PET doesn’t have to be part of the problem. However, we’re very aware that we can’t solve the challenge of reusing PET on our own. With this in mind, we are continuously working with FMCG manufacturers, brand owners, other OEMs and, of course, many associations representing the PET value chain, such as Petcore in Europe and NAPCOR in the US.



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How does Sidel work with the circular economy?

Sidel has been always working along the ideas of the circular economy, but expectations recently evolved. Originally, one of the main drivers behind the conversion from PVC to PET was the latter's 100 % recyclability, with the main outlet being fiber application and other non-food applications. Closing the loop via food grade bottle-to-bottle mechanical recycling could really gain traction. This varies according to countries or region. For instance, it was only in 2008 that a specific and Europe-wide regulation was adopted to ensure that products derived from mechanical recycling could be safely used as food contact plastics. However, there are still countries nowadays that do not accept the use of recycled PET for direct food contact, for instance India and Thailand. In our daily work at Sidel, we strive to avoid all waste, minimise greenhouse gas emissions, cut water and energy consumption, and promote recyclability. Our "Options and Upgrades" service offering fits very well with the circular economy's purpose of keeping products and materials in use, as we provide customers with a range of solutions aimed at prolonging the lifetime of their equipment and getting them ready to handle new opportunities as consumers' needs change.

Additionally, we have decided to re-assess all single use plastics in our catering system at Sidel sites globally.

How do you view the future of PET?

PET "4.0" is a mix of virgin PET, rPET and bio PET, in which rPET is the predominant one (whether coming from the mechanical route or chemical route). Bio PET is partially a reality but must still prove a reasonable economy of scale, which is mainly a matter of time and investment. We are closely following the advances in chemical recycling: it will require significantly more energy compared to the mechanical route but may allow us to push the number of recycling cycles infinitely. There are many initiatives in this direction and I hope that in a few years we'll see the breakthrough that will allow us to close the loop indefinitely.

What is the circular economy?

The Ellen MacArthur Foundation works with business, governments and academia to build a framework for an economy that is restorative and regenerative by design. It defines the circular economy as an economy that aims to redefine growth, focusing on positive society-wide benefits. This entails gradually decoupling economic activity from the consumption of finite resources, and designing waste out of the system. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural and social capital. It is based on three principles:

- Design out waste and pollution
- Keep products and materials in use
- Regenerate natural systems

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Efficient drying in high-humidity food processing operations

| Condensation | Dehumidification | Drying Systems | Hygiene | Moisture |

Food processing production setups have to take special care with regard to bacteria, micro-organisms and other pathogens to deal with the given high hygiene standards. Uncontrolled airborne moisture in food production and processing companies can result in many big practical difficulties. The moisture present everywhere in the air tends to condense on process equipment, structures and walls inside the facility.

In order to ensure compliance with all-important quality and hygiene standards, most food processing operations resort to frequent, intensive cleaning using large quantities of water and steam. The water and omnipresent humidity involved in such cleaning operations then have to dry out – or be dried – before you can resume processing operations. Dehumidification systems reduce the drying time of floors, surfaces and production facilities significantly.

Condensation dripping from the ceiling onto the food items being processed is a direct source of contamination. Simply waiting for key areas to dry is one way to deal with

this, but the longer the drying time, the shorter your production time, the less the potential output from your operations, and the less revenue your operations can bring in. You can, of course, use manual labour to mop up and dry moisture and condensation, but this is not a sustainable or efficient approach, and is often difficult and impractical – especially when drying ceilings is involved.

Cotes adsorption dehumidification systems are the only ones that are consistently effective throughout the entire temperature range from 40 °C down to -25 °C. The standard Cotes All-Round range has the additional benefit of easily integrated add-on modules that you can select to meet particular requirements, with a heat recovery module, an air-cooled condensation module or modules for post-heating, pre-cooling and post-cooling.

The All-Round C105 is the largest and most recent model in the standard ranges of Cotes dehumidifiers. These dehumidifiers are designed for maximum reliability, low operating costs and easy servicing. This makes an All-Round C105 an inexpensive long-service solution to your mainstream humidity management challenges. This model provides moisture removal capacities of 25.7 – 50.7 kg per hour and is able to provide approx. 4000 – 8800 m³ of dry air per hour. Cotes All-Round units are also available with built-in electronic monitoring and control capabilities, fans, filters and sensors. These make it easy to customise the dehumidifier to each customer's specific operating requirements. All-Round C105 dehumidifiers are also available with an aluminium cross-flow air-to-air heat exchanger to recover heat from the regeneration air leaving the unit, so it can then be reused to preheat the incoming regeneration air. These heat recovery units can save as much as 20 % on your energy bills, resulting in dehumidifier payback in as little as 24 months.



The All-Round C105 is the largest and most recent model in the standard ranges of Cotes dehumidifiers. © Cotes

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IFU Technical Workshop 2019



| Analysis | Processing | Quality | Sustainability | Technical Workshop |

The fourth IFU Technical Workshop for the Juice Industry (in conjunction with SGF and AIJN) took place on the 6th March at the Electra Palace Hotel close to the Parthenon in Greece. Well-known speakers from the juice industry gave presentations and recommendations to laboratory workers, technicians and scientists. In addition, a technical tour on March 7th gave participants the possibility to see a highly distinguished juice plant, the Aspis factory, including a tasting of some of their juices.

Dirk Lansbergen, IFU president, welcomed the international participants eager to see the wide spectrum of the topical presentations by the industry experts that would cover a broad range of fruit juice technical issues divided into 5 sessions.

Norman Gierow, SIG, opened the first session on the Sustainability of Packaging. He pointed out that SIG have two sustainable aseptic carton alternatives. The SIGNATURE PACK drives the replacement of conventional plastics from fossil fuels with certified and sustainable plant-based polymer materials.

Tim Neal, O-I, reminded the audience that glass bottles are 100 % and infinitely recyclable. He underlined that 10 glass reuses can lower CO₂ by 85 %, energy by approx. 90 % and explained the technology evolution in glass manufacturing.

Claudia Bierth, European Sustainability Manager at Ball Beverage Packaging Europe stated that beverage cans are a perfect choice for the circular economy. While up to 40 percent of other materials may be lost during recycling, aluminium beverage cans only lose about two to ten percent. Even when incinerated as part of the residual waste, the material can be recovered from the bottom ash. As a study by the British system Valpak revealed, beverage cans have the lowest net recycling costs of all beverage packaging materials, and with a recycling rate of 74 percent, they are the most recycled beverage containers in Europe.

David Berryman challenged the audience by the question whether the juice industry is a dirty business. Bottles and

cartons have made fruit juices into a huge global industry (906,000,000,000 Litres; \$ 170,000,000,000 in 2018). He gave an example of the successful recycling efficiency of PET achieved in Germany as a model to perhaps follow. Moreover, he explained how plastic waste can be genuinely broken down by the use of enzymes.

The next session focused on the processing of juices and juice-based beverages. **Dr Martin Foltz**, Doehler Group, gave an overview of how the communication landscape is changing putting the pressure on sugar and then provided a technological review of how sugar levels may be reduced, considering the impact on product design and legal status. Apart from product reformulation there are opportunities with fermentation/bio transformation and physical separation. A number of products are available to the consumer that are clear in appearance, however without careful manufacturing controls, undesirable hazes and clouds may develop.

Professor Dr Frank Will, Geisenheim University, provided a detailed explanation of the main aspects to control the instability of fruit juices (clouds, hazes and sediments) and pointed out the necessary technological processes and strategy required to avoid them. Will concluded that sometimes all possible things had been done and haze formation still occurs, because that is nature and there are too many reactive and interactive substances coming together.

Being in Greece IFU participants were delighted that **Mario Chronis** from Aspis could give them an overview of how the Greek fruit processing industry has developed, the range of products available and challenges faced in the future. The following day the participants had a chance to see operations in action with a technical tour to the **Hellenic Juice Industry ASPIS S.A. C Dedes** factory including a juice tasting.

For years coconut water was a by product of little or no value. Coconut water has become more popular in recent years and **Dr David Hammond** showed the differences between coconut water, milk and cream with pictorial and schematic demonstrations of the manufacturing process.

The analytical composition was reviewed in order to show what an authentic product should analytically look like. He emphasised the importance of the use of isotopic methods for coconut water to ensure that no added sugars are present in the juice.

The **IFU commission excellence award** was presented to Dr David Hammond for his dedicated contributions to the Methods of Analysis Commission and Legislation Commission during the networking dinner on the first day.

Rounding off the session **Maria Norlin**, Tetra Pak, gave the worlds first presentation on Tetra Pak's new low energy technology for the processing of juices and still juice based drinks. The new combination of micro filtration with heat processing now offers bottlers improved sustainable processing opportunities for the future.

The following session provided a focus on analysis. Colour is an important quality criterion for juice products. The human perceives 10 million colors. Color instrumentation can quantify all of them. **Christian Jansen** of Hunter Lab underlined how consumers react to colour and then showed different scales that can be used for measurement. It was completed with a practical application for use by manufacturers. Brix measurement is very common in the juice industry but how well is the science of measuring soluble solids understood? **Mathis Kuchejda** of Schmidt and Haensch draw the attention back to basics with the theory and how it is applied with commercial measuring equipment, guiding the audience through some of the challenges presented by the user.

Moving onto microbiology **Carina Post**, DoehlerGroup, presented the topic on heat resistant mould, informing the workshop of the main species of concern with their characteristics, spoilage types and control strategies that should be applied in the supply chain.

The juice industry is proud of the authentic nature of its products and the care that goes into maintaining that enviable status. As one of the leading organisations in this field SGF International contributed a presentation with **Dr Susanne Koswig**. She presented a definition of fraud, together with the control strategies that are applied along the supply chain. Demonstrating successful outcomes, continued vigilance is necessary, and it was shown how SGF continues to partner and support the juice industry to that end.

The workshop was completed by **John Collins**, IFU Executive Director, representing the IFU on the Codex Alimentarius structure and operations. Some of the key guidelines impacting the juice industry were reviewed and changes to be expected were also shown.

The 2020 workshop will take place in March in Vienna.

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Brazilian citrus belt 2019/2020 crop forecast

| Brazil | Citrus Belt | Crop Forecast | Orange Crop | Orange Trees |

1. 2019-2020 Orange crop forecast

The 2019-2020 orange crop forecast for São Paulo and west-southwest Minas Gerais citrus belt, published on May 10, 2019 by Fundecitrus in cooperation with Markestrat, FEA-RP/USP and FCAV/Unesp, is 388.89 million boxes (40.8 kg/90 lb). The total orange production includes:

- 76.97 million boxes of the Hamlin, Westin and Rubi varieties;
- 19.75 million boxes of the Valencia Americana, Seleta and Pineapple varieties;
- 116.20 million boxes of the Pera Rio variety;
- 128.30 million boxes of Valencia and Valencia Folha Murcha varieties;
- 47.67 million boxes of the Natal variety.

27.21 million boxes of the estimated production are expected to be produced in the Triângulo Mineiro. The projected figure is 36 % above the previous one of 285.98 million boxes, and 21 % larger than the average crop size for the last ten years. The grove yield recovery was triggered mainly by a climate that favored bloom and fruit set, differently from that of last crop. The average yield per hectare in this crop season is estimated at 1,051 boxes per hectare and 2.24 boxes per tree, which represents an increase in comparison to the 756 boxes per hectare and 1.63 boxes per tree harvested in the 2018-2019 crop.

Among citrus belt sectors, the southwest presents the highest yield, with 1,227 boxes per hectare and 2.42 boxes per tree, keeping its rank with above average rates and smaller amplitude between crop seasons, of exact 2.7 % as compared to the yield of the previous crop season. The largest yield increases are seen in the northwest and north sectors, of 128 % and 78 % respectively. The yield grew 47 % in the central sector and 22 % in the south sector.

Bearing trees

Bearing trees total 173.973 million, a 0.74 % decrease as compared to the previous inventory. This decline results

from a larger proportion of area eradicated last year in relation to new plantings in 2016 that start bearing fruit this season. Varieties included in this forecast account for 97 % of trees and also 97 % of the area of orange groves in the citrus belt.

Information about bearing trees was collected from the Tree Inventory of São Paulo and West-Southwest Minas Gerais Citrus Belt: Snapshot of Groves in March 2019, taken from the 2018 primary base – created by mapping groves from September 08, 2017 to January 29, 2018 – and from counting existing trees in 5 % of orange plots, from January 07 to March 08, 2019. Plots for counting were drawn through stratified random sampling.

Fruits per tree

The average number of fruits per tree in April 2019, disregarding the fruit drop along the crop season, is 783. In this season, groves presented a more intense bloom determined both by the low production in the previous crop, with increased nutritional reserves in plants, and the long-term water stress trees were subject to during floral induction.

The average rainfall in the citrus belt from April to June 2018 totaled only 69 millimeters, which is nearly a third of the rain that usually falls in that time period (1981-2010). After the prolonged drought, non-irrigated groves bloomed following rains that fell in early August in the central, south and southwest sectors, and in mid-September, in the north and northwest sectors. Regions where rains fell only in September have the largest concentration of irrigated areas in the citrus belt, except for Altinópolis, located in the north sector. In order to advance flowering, irrigation started in July 2018.

During post-bloom, temperatures remained mild. In some cities, maximum temperatures reached 35 °C (95 °F), although just for few consecutive days. In addition to mild temperatures, spring and summer rains kept the water available, favoring the setting of flowers and fruitlets, which resulted in a more homogeneous production.

The first bloom from July to September 2018, accounts for 84.1 % of the total production. The second bloom, which started in October and November 2018, is estimated at 10.2 %. Together, these blooms correspond to 94.3 % of the production and should be harvested at the same time. The third bloom, in December 2018 and January 2019, corresponds to 3.2 %. The fourth bloom, which started in February 2019, corresponds to 2.5 %. For the forecast, all fruits from first, second and third blooms were fully considered. A fruit set rate of 33 % was applied to fruit from the fourth bloom. In the separation of fruits per bloom, off-season fruits were also identified and resulted from late and sporadic flowers from the previous crop season, not accounted for in the current crop forecast.

The number of fruits per tree is closely related to the characteristics of each variety. In April 2019, when trees were stripped for the group of earlies Hamlin, Westin and Rubi, an average of 1,114 fruits per tree were counted. As already known, varieties of these groups are more productive than the others, therefore their yield is estimated to be 42 % above average in this crop. Next in the sequence are: the late season Natal variety with 853 fruits per tree; the other earlies with 834 fruits per tree; the late season Valencia and Valencia Folha Murcha with 735 fruits per tree; and last, the Pera Rio variety, with 665 fruits per tree.

Approximately 2,200 trees were stripped. Trees to be stripped were distributed proportionally to the total orange trees in the citrus belt and stratified according to their region, variety and age. Plots of trees for stripping were drawn by the method of stratified random sampling. Aiming at the increase of the estimate precision, 360 more trees, of ages lower than those in the age groups of the groves they were part of, were also stripped. These trees correspond to replacements made mainly to offset tree losses caused by greening, citrus canker and other diseases. Trees were stripped from March 14 to April 25, 2019. Fruit harvested was taken to a tree stripping laboratory in Araraquara, where each sample was separated into the different blooms they were from. Fruit was quantified by automatic counting equipment and then weighed.

The average number of fruits per tree may vary plus or minus 17 fruits, which corresponds to 2.1 % of the average number of fruits per tree obtained at stripping. This figure is within the expected error of 2 % to 3 % used in sizing the sample. The yield deviation distribution analysis for each stripped tree in relation to the stratum average shows that sample data is randomly distributed according to a normal distribution.

Drop rate – fruit drop index from tree stripping to final plot harvest

The projected average drop rate is 17.5 %, distributed as follows: 10.5 % for the early Hamlin, Westin and Rubi; 11.0 % for the other early varieties; 17.5 % for the mid-season Pera Rio variety; 21.5 % for the late Valencia and Valencia Folha Murcha varieties; and 22.0 % for the late Natal variety. This rate is applied to the number of fruits in the tree in April 2019, when trees are stripped. The result of this calculation is the estimate of the number of fruits that will be available in the tree at harvest, since part of the oranges in the tree in the beginning of the crop season will fall throughout that period due to physiological drop, mechanized activities, pests and diseases and adverse climatic conditions.

Should this fruit drop rate hold, it will be one of the highest rates since the first crop forecast by Fundecitrus. Major reasons for this projection are the increased greening severity and the rise in the populations of fruit borer and fruit fly during the last crop season, which then became the main cause of fruit drop. Losses caused by these pests are expected to remain large this crop season, due to the availability of fruit in transition between the last and the current crop. This is what likely enabled the continuity of the insect life cycle, since they could have migrated from the fruits produced from the third and fourth blooms of the previous crop, which were atypically produced in a larger proportion, to the fruits from the first and second blooms of this crop. Other reason supporting this projection of a larger drop rate is the highly concentrated fruit production from the first and second blooms, which may result in some operational difficulties.

Monthly and continuous monitoring by Fundecitrus as of May 2019 in 1,200 orange plots visited up to their complete harvest serves as basis to correct the rate projected at the time of this publication and consequently to correct the production estimate as well. This year, fruit collection nets were added to 300 plots to be monitored with the aim of both obtaining a more precise drop rate and identifying fruit drop causes. Counting of fruits on branches of monitored trees in all 1,200 sample plots will also be part of the test.

Fruits per box – fruit size, that is, number of oranges to reach the weight of 40.8 kg box (90 lb) at harvest

The final fruit size projection is 260 fruits per 40.8 kg box, that is 296 fruits per box for the group of early varieties made up by Hamlin, Westin and Rubi; 270 fruits per box for the group of other early varieties; 266 fruits per box for the mid-season variety Pera Rio; and 235 fruits per box for the late varieties Valencia and Valencia Folha Murcha; and 242 fruits per box for the late variety Natal.

Table 1: Data for the 2008-2009 crop to the 2018-2019 crop and data used to estimate the final fruit size in the 2019-2020 crop

Crop	Fruits per tree at stripping	Initial fruit size at stripping	Sum of productions from first and second blooms	Accumulated rainfall from May to July	Final fruit size observed at harvest	Final fruit size estimated by the model	Error	Absolute error
	(number)	(fruits/box)	(%)	(millimeters)	(fruits/box)	(fruits/box)	(%)	(%)
2008-2009	659	421	79	80	255	256	1	1
2009-2010	624	431	77	143	250	242	-3	3
2010-2011	532	457	97	64	271	257	-5	5
2011-2012	859	401	96	116	269	270	0	0
2012-2013	764	439	95	268	250	244	-2	2
2013-2014	515	338	87	247	224	215	-4	4
2014-2015	646	373	92	102	256	252	-2	2
2015-2016	498	391	90	204	226	235	4	4
2016-2017	430	358	90	214	222	224	1	1
2017-2018	753	393	91	184	246	251	2	2
2018-2019	564	446	82	36	259	264	2	2
2019-2020	783	411	94	133^e	(X)	263	(X)	(X)

Source: Fundecitrus (2015-2016 crop to 2019-2020 crop), CitrusBr (2008-2009 crop to 2014-2015 crop), Somar Meteorologia and Climatempo.
(X) Not applicable; ^e Estimated

Table 2: 2019-2020 orange crop forecast and its components by variety group

Variety group	Mature groves area	Average density ¹ of mature groves	Components of May 2019 forecast				2019/2020 Orange crop forecast		
			Bearing trees	Fruit per tree at stripping ²	Fruit estimated per box	Estimated drop rate	Per tree	Per hectare	Total
	(hectares)	(trees/hectare)	(1,000 trees)	(number)	(number)	(%)	(boxes/tree)	(boxes/hectare)	(1,000,000 boxes)
Early season:									
Hamlin, Westin and Rubi ...	57,807	455	25,482	1,114	296	10.50	3.02	1,331	76.97
Other early season:									
Valencia Americana, Seleta, Pineapple ...	17,692	469	8,016	834	270	11.00	2.88	1,269	19.75
Mid Season:									
Pera Rio ...	125,453	514	62,869	665	266	17.50	1.85	926	116.20
Late:									
Valencia and V.Folha Murcha ³	126,023	472	58,269	735	235	21.50	2.20	1,018	128.30
Natal ...	43,073	460	19,337	853	242	22.00	2.47	1,107	47.67
Average ...	(X)	482	(X)	783	260	17.50	2.24	1,051	(X)
Total ...	370,048	(X)	173,973	(X)	(X)	(X)	(X)	(X)	388.89

(X) Not applicable;

¹ Calculation considers the total number of trees in the plot, that is, bearing and non-bearing trees (2017 or 2018 resets);

² Weighted average per total stratum fruit;

³ V.Folha Murcha – Valencia Folha Murcha

The average size of 260 fruits per box is equivalent to oranges weighing 157 grams at harvest. The high number of fruits per tree is one of the factors that should limit the development of fruits in this crop season, due to increased competition for plant reserves, since number of fruits and fruit size at harvest are inversely proportional.

The final fruit size was estimated by a regression model that considered the final fruit size (fruits per box at harvest) as the dependent variable and the number of fruits per tree counted at stripping, the initial fruit size (fruits per box at stripping), the sum of the production from the first and second blooms in relation to the total production and the rainfall accumulated from May to July as independent variables. Data from the last eleven crops, 2008-2009 to 2018-2019, was used in the regression and is presented in Table 1. Results obtained show an adjusted R^2 of 0.92. That means the four independent variables together explain 92 % of the variation in the final fruit size (fruits per box at harvest), at a coefficient that can vary from 0 to 100 %, which shows how important these variables are for the final fruit size. The comparison between the final fruit size estimated by this model and the final fruit size observed in the last eleven crops presents an average error of ± 2 %.

Data relative to final fruit size (fruits per box at harvest), number of fruit per tree counted at stripping, initial fruit size (fruits per box at stripping) and the sum of the production from the first and second blooms in relation to the total production for the series from 2008-2009 to 2014-2015 was provided by orange juice companies associated to Fundecitrus – Citrosuco, Cutrale and Louis Dreyfus, which separately have estimated the production for the citrus region since 1988, with the use of objective methodology. Data was supplied individually and under a formal confi-

dentiality agreement to an independent consulting firm for the determination of the average. Individual data supplied by each company was kept confidential. Data relative to the crops 2015-2016 to 2018-2019 comes from results of estimates performed by Fundecitrus. Data on rainfall accumulated from May to July was supplied by Somar Meteorologia.

Data used in the model to estimate the final fruit size in this crop comprises figures from the 2019 stripping and the rainfall predicted for May to July 2019 in volumes equivalent to the climatological average (1981-2010) calculated with information from the Climatempo website. Final fruit size estimated by the regression is 263 for the 2019-2020 crop. This size was corrected by the regression that used the observed size as the dependent variable and the estimated size as the independent variable. The size projected by this other regression is 260 fruits per box for the 2019-2020 crop.

The result of the equation used to estimate the crop is corrected by the application of a correction factor. That is necessary because of the variables not considered in the calculations, such as harvested fruits that wind up not being used, diverse planting densities that are not included in the stratification of groves, or losses of trees throughout the crop season caused by eradications, abandonments or deaths. The correction factor of 0.10 applied in this crop is the same used since the 2017-2018 crop and represents the average of the indexes of the 2015-2016 and 2016-2017 crops estimated by Fundecitrus.

2. Objective survey method for the orange crop forecast

In order to perform this estimate, the objective method used in previous crop seasons was maintained, which is



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Table 3: 2019/2020 orange crop forecast by sector

Sector	Mature groves area	Average density ¹ of mature groves	Bearing trees	Fruit per tree at stripping ²	2019/2020 Orange crop forecast		
					Per tree	Per hectare	Total
	(hectares)	(trees/hectare)	(1,000 trees)	(number)	(boxes/tree)	(boxes/hectare)	(1,000,000 boxes)
North	85,662	480	40,297	802	2.29	1,078	92.35
Northwest	38,761	462	17,630	717	2.03	924	35.81
Central	102,613	477	47,762	778	2.23	1,036	106.33
South	73,291	465	33,000	729	2.09	940	68.88
Southwest	69,721	521	35,284	850	2.42	1,227	85.52
Total	370,048	482	173,973	783	2.24	1,051	388.89

¹ Calculation considers the total number of trees in the plot, that is, bearing and non-bearing trees (2017 or 2018 resets)

² Weighted average per total stratum fruit.

based on quantitative data – field measurements, counting and weighing of fruit – applied to the equation represented below.

$$\text{Forecast production} = \frac{\text{Bearing trees} \times \text{Fruit per tree} \times (1 - \text{Drop rate \%}) \times (1 - \text{CF \%})}{\text{Fruit per box}}$$

where CF is the correction factor

Results from the inventory and tree stripping were obtained throughout the survey, then compiled and restricted until the date of this publication to the following professionals: Antonio Juliano Ayres (Fundecitrus General Manager); Fernando Alvarinho Delgado and Roseli Reina (PES Supervisors); Vinícius Gustavo Trombin (Executive Coordinator linked to Markestrat); Marcos Fava Neves (political-institutional and methodological Coordinator linked to FEA-RP/USP and Markestrat), and José Carlos Barbosa (Methodology Analyst linked to the department of Math and Science of FCAV/Unesp). All of them were subject to confidentiality obligations with regard to PES information before its announcement was made public, according to agreements signed between each of them and Fundecitrus. As for antitrust practices, they were

all complied with through the adoption of measures necessary to prevent any communication or sharing of individual information with competitive content among the orange juice companies that collaborate with Fundecitrus in this project or between these and citrus growers.

This team, together with Fundecitrus Vice-President Roberto Hugo Jank Junior, here representing President Lourival Carmo Monaco, who was absent due to commitments abroad, concluded the crop

forecast on May 10, 2019, at 9:30 a.m., in a closed meeting with no external communication channel beyond participants. Following that, at 10 a.m., Fundecitrus Vice-President began the public announcement of the crop forecast at the Fundecitrus auditorium in Araraquara-SP, which was broadcast live on the website www.fundecitrus.com.br. Fundecitrus General Manager Antonio Juliano Ayres presented the detailed data. After the crop forecast announcement, the Executive Summary of the 2019-2020 orange crop forecast was made available on the Fundecitrus website. The complete report including the 2019 tree inventory and the 2019-2020 orange crop forecast is available since May 24, 2019 on www.fundecitrus.com.br.

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Vinícius Gustavo Trombin

Markestrat Research Center, Brazil

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Givaudan to acquire Vietnamese Flavour Company Golden Frog

As part of its 2020 strategy to strengthen its natural capabilities and its presence in the high growth markets of Asia Pacific, Givaudan announced that it has reached an agreement to acquire Golden Frog, a Vietnamese flavour company. Golden Frog manufactures natural flavours, extracts and essential oils for the food and beverage industry. It offers a wide range of natural ingredients including herbs, spices, fruit and vegetable extracts and essential oils from the great biodiversity of Vietnam. With

headquarters and manufacturing facilities in the Ho Chi Minh area, Golden Frog employs 156 people and caters to the needs of the ASEAN markets. While terms of the deal have not been disclosed, Golden Frog's business would have represented approximately CHF 10 million of incremental sales to Givaudan's results in 2018 on a proforma basis. Givaudan plans to fund the transaction from existing resources and is expected to close in the second half of 2019.

Origine Group exclusive Italian partner of the pear "FRED®"

Origine Group and VariCom signed the licence agreement for the innovative pear FRED®

FRED® is the commercial name of pear variety "CH 201" bred after 18 years of work by the researchers of the Swiss Research Centre Agroscope. "FRED® has an attractive blush skin and handy size. The texture is firm, but crispy and juicy. Aromatic and sweet, backed-up by a light acidity in combination with an exceptional shelf-life, gives the consumer a fantastic eating experience," states Michael Weber, Managing Director of VariCom. "Moreover, the tree shows a low susceptibility to Erwinia and has high yield. The cultivation of FRED® has been tested in several areas, and fruits will shortly be available for real-scale commercial tests."

"Origine Group decided to invest in this pear – says the Managing Director Alessandro Zampagna – for its organoleptic and aesthetic characteristics, but also for its shelf-life and high yields. Therefore, FRED® is an interesting pear for all involved in the production and commercial chain, and we think that the pear sector needs new varieties with these characteristics. With VariCom and the French nursery Dali-val, that will supply the plants, there

has been an immediate understanding, and we trust this co-operation will bring very good results."

"We are convinced that Origine Group, thanks to its production base and its strategy, represents the right partner in Italy, where it will be the exclusive producer of variety 'CH 201' and marketer of the brand FRED®," continues Michael Weber. "Italy is the first producing country of pears in Europe, so it will be crucial for the success of FRED®."

"We hope to show some FRED® pears at Origine Group stand in Futurpera, the specialized exposition that will be held in Ferrara from 28 to 30 November," concludes Alessandro Zampagna.



Pear variety "CH 201" called FRED®.
© Origine Group

HangZing launches to fight the after-effects of alcohol consumption

HangZing is an innovative business founded by a British Chemical Engineer and is committed to using ground-breaking technology to create radical food and drink products. It produces a revolutionary range of drinks designed to give a natural pick-me-up for people that work hard and play hard. The drinks are scientifically formulated using a blend of naturally-functional ingredients to fight the after-effects of alcohol consumption and to replenish the nutrients and minerals lost during partying, traveling and exercising.



© HangZing

Available in two innovative varieties, Lychee & Lemongrass and Garden Mint, every convenient 100 ml bottle is made by combining herbs, electrolytes and vitamins. The range is sweetened naturally from pure Canadian maple syrup and is free from added sugar, sweeteners and is suitable for vegans. HangZing helps individuals reboot and get the most

from their day and provides a natural alternative to unhealthy "morning after" remedies, including pain killers and junk food.

Flexible, compact and gentle on resources: KHS now also labels cans

Most decisions to buy are made directly at the point of sale: the significance of product presentation is growing, with an attractive visual appearance becoming ever more important. KHS is therefore now also offering its successful Innoket Neo labeling series for cans to manufacturers of small batches and producers with a high brand variety. The machine opens up new avenues in product marketing and flexibility in production.



The Innoket Neo can label up to 35,000 full or empty cans in all standard sizes per hour. © KHS

Images of production shops filled with pallets of differently printed empty cans will soon be a thing of the past. Says Cornelius Adolf, labeling product manager for KHS, “We’ve expanded our existing portfolio to include can labeling to give the customer more design options and enable these designs to be implemented faster with smaller warehouse capacities.” This is because minimum order quantities and long delivery times for empty cans limit flexibility. It is

now possible to order unprinted cans within a much shorter period and to label them using the KHS Innoket Neo, thus simplifying logistics processes.

Wrap-around labels with optical alignment

The Innoket Neo can be used to apply self-adhesive film or paper labels. Here, the container can be either partly or fully wrapped with a label – including optical alignment. “The look and feel are unique”, is how Adolf explains the results of the self-adhesive labeling method. With this technology beverage producers can also respond much more rapidly and flexibly to the steadily growing variety of products and labels on the market. With this system the design or logo can be changed within a few hours and the cans dressed with suitable motifs. “Customers can even print their own labels. This considerably shortens the time to market. An attractive product is a clear distinguishing criterion at the point of sale,” says Adolf. As no cans with varying motifs have to be ordered, costs are also cut as higher numbers of unprinted containers can be purchased.

The space-saving machine with its 14 can plates driven by servomotors comes from the established Innoket Neo module system and gives manufacturers of small batches and producers with a great variety of brands many benefits. At high machine availability up to 35,000 full or empty cans in all standard sizes can be labeled per hour. The machine can be positioned upstream or downstream of the filler. Format changeovers are quick and do not require any additional tools. The labeler also has a high level of energy efficiency, with a power consumption of just five kilowatts per hour.

JBT launches breakthrough solution for pouch packaging

New system will enable companies to substantially improve capacity and operational performance, dramatically cutting rejection rates in the process

JBT Corporation has announced the launch of a new solution for filling flexible pouches commonly used in the infant nutrition and sports drinks categories, which could spark further market growth for the sector. The JBT AsepFlex™ Linear Pouch Filler has been developed to overcome problems associated with current pouch packaging, including a high rejection rate and low capacity.

The market of flexible packaging is growing, with pouches becoming the preferred option for processors

and consumers thanks to their non-breakable, lightweight, easy to open, and easy to empty (squeezable) characteristics. In the infant nutrition category flexible pouches are expected to grow their market share by 10 % each year.

However, growth in the category has been restricted by limits to current pouch filling technology. The two existing shelf stable pouch solutions both suffer from significant drawbacks. Solutions using an aseptic form fill seal typically have a low capacity and a high Total Cost of Ownership (TCO) due to a high rejection rate. Hot fill with retort sterilization solutions, meanwhile, often have low (120 ppm) capacity and low product quality.

The JBT AsepFlex Linear Pouch Filler has been developed to solve the problems with these existing solutions by substantially improving capacity and operational performance. With a capacity as high as 500 ppm – or 30,000 pouches per hour – the fully aseptic solution is designed in accordance with the FDA guidelines for low acid aseptically filled food products and can achieve an impressive operational performance, with a 95 % efficiency rate and a typical reject rate of only 0.5 %. JBT Product Manager, Bert Krakkers, said: “Apart from capacity and aseptic integrity, the AsepFlex Filler offers flexibility. Pouch formats and sizes can be changed on the fly without the necessity to change parts.”

The filling system, he explained, can fill a wide range of products from water-like liquids through to high viscous products, such as smoothies with particulates. It can also be equipped with a nitrogen dosing system to reduce the oxygen in the headspace of the pouch, which limits the chemical deterioration (oxidation) of the product, helping maximize product shelf life in the process.



The JBT AsepFlex Linear Pouch Filler has a capacity of 500 ppm or 30,000 pouches per hour. © JBT

The JBT AsepFlex Filler has been designed for use with infant nutrition products, such as fruit and vegetable purees, and ready-to-drink baby food, as well as sports and breakfast drinks ‘on-the-go’, and nutraceutical products. A first AsepFlex filling unit in Europe has recently been supplied to a leading specialist in infant nutrition.

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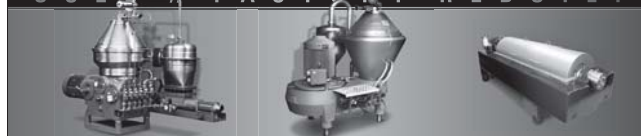
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GELITA #AmazingGelatine and #AmazingCollagen at IFT 2019

GELITA will return to the IFT Food Expo in New Orleans to showcase the amazing properties of collagen peptides and gelatine for the beverage, food and health & nutrition industries. GELITA's pure protein and clean-label ingredients are perfectly suited to meet today's consumer demands.

#AmazingCollagen Supported By Science



Collagen Protein is the Body's Protein and one of the most relevant and versatile ingredients in modern health & nutrition markets.

© Gelita

#AmazingGelatine

Gelatine, a natural and pure protein extracted from collagen, is a dry white powder full of potential. This hydrocolloid swells rapidly in water, dissolves to a viscous solution when heated, then forms a gel when cooled – showcasing

gelatine's many excellent functional properties – as a binding, gelling and whipping agent; emulsifier and stabilizer; and, perfect film and foam former. It creates perfect textures, provides one-of-a-kind mouthfeel and enhances flavor release! These properties, which cannot be mimicked – as well as its irreplaceable thermo-reversible gelling behavior – make gelatine ideal in beloved confectionery, like gummies. And, GELITA® Gelatine is free from carbohydrates, cholesterol, fat, preservatives and purine. This, along with the functional versatility of gelatine and its nutritional value – make GELITA® Gelatine a must-have ingredient for modern beverages and foods.

#AmazingCollagen

Collagen Protein is the Body's Protein – comprising about 30 % of our total body protein – it is a vital component of our whole body – and, one of the most relevant and versatile ingredients in modern health & nutrition markets. Largely known for benefits to the human body, collagen is commonly associated with nutritional supplements. But, collagen peptides also lend themselves beautifully and easily to countless beverage and food applications. This is exciting because of the advances in collagen peptides research as it relates to the body's collagen metabolism and human physiology. Recent scientific evidence confirms that the highest efficacy can be achieved when collagen is ingested orally. So, protein supplementation with collagen protein – generally in the form of collagen peptides – helps us stay strong, mobile, flexible and beautiful – for longer. However, collagen supplementation should not be considered a one size fits all solution. Research shows that GELITA Bioactive Collagen Peptides® are optimized to maximize the stimulatory effects on specific cells in the body ... and, the level of stimulation is different for varying collagen peptide compositions. GELITA offers a diverse and versatile portfolio of Bioactive Collagen Peptides® to support bone, joint, muscle, skin and even ligaments and tendons health – making collagen-fortified beverages and foods the perfect vehicles for delivering natural health benefits for diverse groups of consumers.

New line of Danisco® VEGE cultures delivers clinically proven health benefits for fermented, plant-based beverages

DuPont Nutrition & Biosciences announced a new cultures line that contains its premium HOWARU® probiotics which are specially designed for fermented plant-based products to deliver clinically backed health benefits. The DuPont™ Danisco® VEGE cultures range offers desired taste and texture profiles in non-dairy applications. New additions to this range – HOWARU® Dophilus VG, which contains Lactobacillus acidophilus NCFM® and HOWARU®

Bifido VG, which contains Bifidobacterium lactis HN019™ – have highly documented, positive results in human studies for digestive health and well-being.

Available in single strain form, this range is non-dairy, non-animal, non-allergen, non-GMO, and is suitable for vegan diets. It also is easy to integrate with existing cultures used in plant-based fermented food and beverage

formulations. “Digestive wellness is one of the top global trends for 2019. As consumers continue to make health and wellness part of their daily routines, they’re looking for benefit-focused options,” said Sonia Huppert, Global Product Leader, Plant-Based Products, DuPont. “Digestive health is an area where consumers can feel the benefits immediately. Symptoms like bloating and irregularity are treated with diet changes and with new products. Innovations in fermentation and probiotics can truly deliver solutions in this area.”

DuPont conducted a research study with Global Data Insights to ascertain consumer perception of probiotics. When asked the impact respondents believe that probiotics have on health and wellness, 46 percent of the nearly 12,000 respondents in Europe said probiotics had a



Taste and texture profiles in non-dairy applications.

© Danisco

positive effect, and 65 percent of respondents in the United States responded positively. Validated by robust clinical trials, the HOWARU® brand is a high activity, premium probiotic product with high performance, high stability and high functionality as its hallmark traits.

These cultures not only respond to important wellness trends, but also to the increased demand for plant-based foods and the constant desire for great taste and texture. DuPont™ Danisco® VEGE cultures were developed for a wide-ranging variety of plant-based raw materials, such as soy, peas, coconut, almond, nuts, oat, maize, rice, fruits and vegetables, to satisfy consumer taste and texture expectations – from typical and appealing fresh, clean and mild flavors to new, pleasant unexpected flavors.

Fi Europe and Hi Europe enter a new chapter together

As of 2020, both trade shows will be co-located and alternate between Germany and France

Fi Europe, the leading trade show for food and beverage ingredients, and Hi Europe, its counterpart for health ingredients, will become co-located events, alternating between Germany and France. Fi Europe co-located with Hi Europe will be the most comprehensive food ingredients trade show covering specialty food ingredients from sensory to functional, as well as processing solutions and services across the whole supply chain. On 1 December 2020, Fi Europe and Hi Europe will open the doors as co-located events in Frankfurt for the first time.

The strategic decision to co-locate the two events was based on extensive research conducted amongst visitors and exhibitors. Over 65 percent of exhibitors stated that they would support an annual co-located Fi Europe and Hi Europe, and 75 percent of visitors confirmed that they would visit the show every year. When asked about innovation, more than 80 percent of both visitors and exhibitors stated that they had launched a new product or a new ingredient in the past 12 months – a statement that backs the decision to offer a yearly event at which novelties can be shared with a wide audience while they are still “hot”.

With this new co-located setup, organiser Informa Markets is taking into account the rapid pace with which new trends, consumer demands, and challenges now occur. Group Director Natasha Berrow explains: “We want to offer our exhibitors and visitors a trade show that is unique

not only in its thematic coverage, but also in its innovative and fresh character. It should be a platform for tomorrow’s trends, not only today’s. We want to give our exhibitors and visitors a wider spectrum of alternatives and options. With Germany and France alternating as hosting countries, we will be covering the two most important markets for the European food and beverage industry,” says Berrow. Importantly, both countries are central and accessible hubs in Europe for visitors as well as exhibitors.

Julien Bonvallet, Fi Europe Brand Director, comments: “Clean label, free from, sustainability and functionality are the trends that have moved and advanced the industry in recent years, and they have a common denominator: the health-conscious consumer. With a desire for better, more natural and healthier food and beverages this consumer has brought those issues to the table.” Many food and ingredients manufacturers therefore now offer functional products or specialist foods within their portfolios, in addition to standard solutions – and more and more ingredients’ suppliers already exhibit at both events. As innovation cycles become shorter and shorter, exhibitors and visitors alike expect to be able to attend an event every year. By bringing together the most diverse audience yet, the co-location of the two shows provides the ultimate opportunity to do business face-to-face with top buyers and specialists from across the F&B supply chain.

This year’s Fi Europe & Ni will remain unchanged as a single event, running from 3-5 December in Paris. Following Frankfurt in 2020, Fi Europe, co-located with Hi Europe, will return to Paris in 2021.

NEW PRODUCT LAUNCHES



JIVA POMEGRANATE PROBIOTIC KOMBUCHA BEVERAGE



Iced Tea



April
2019



3.41 USD
3.01 EUR



Australia

Company:	Jiva Essence Of Life
Description:	Pomegranate flavored probiotic kombucha beverage in a 250 ml glass bottle. Jiva Kombucha's mission is to create real great tasting probiotic beverages.
Claims:	Probiotic beverage. Raw and organic kombucha. Natural sugar from real fruit. Full of live cultures. Locally sourced ingredients. Handcrafted in small batches. Unique double fermentation. Low in calories.
Ingredients:	96 % jiva organic kombucha (fermented with reverse osmosis water, green tea, white tea, raw sugar, jiva kombucha live culture), pomegranate juice.
Extra notes:	Keep refrigerated below 4 degrees Celsius. Do not drink if seal is broken. Jiva Kombucha is a living drink and will continue to ferment at room temperature. Contains<0.5% ABV at time of purchase. Made in Australia. HACCP certified.



JOOT FOODS PANAGAM DRINK WITH TULSI LEAVES



Other Soft Drinks



April
2019



0.43 USD
0.38 EUR



India

Company:	Joot Foods
Description:	Panagam drink with tulsi leaves, in a 200 ml plastic bottle.
Claims:	All natural. Freshness sealed. No added sugar. No preservatives. Nothing artificial, just natural. FSSAI certified. Recyclable packaging.
Ingredients:	Jaggery, tamarind juice, holy basil, pepper, dry ginger, fresh ginger, lemon, elaichi.
Extra notes:	Serve chilled and enjoy. Once opened, consume immediately.



SCHWEPPES SPARKLING WATER



Bottled Water
Unflavored



April
2019



1.13 USD
1.00 EUR



Taiwan

Company:	Coca Cola
Description:	Sparkling water in a 500 ml plastic bottle.
Claims:	No calories. Sugar free. Recyclable packaging.
Ingredients:	Carbonated water.
Extra notes:	Product of Taiwan. Shelf life: 9 months. Avoid to keep in high temperature and below 0 degrees Celsius.
Analysis insight:	Stylish pedestrian walking in the snow, to highlight this is a winter limited-edition water.

NEW PRODUCT LAUNCHES



KOOL AID SOUR JAMMERS SHOCKIN BLUEBERRY FLAVORED DRINK



Fruit/Flavored
Still Drinks



April
2019



1.99 USD
1.76 EUR



United States

Company:	Kraft Heinz
Description:	Blue raspberry flavored drink. Comes in 10 plastic pouches, held in a carton box.
Claims:	Artificially flavored drink. 35 calories per pouch. Contains 0 % juice. With fun game at the back.
Ingredients:	Water, high fructose corn syrup, contains less than 2 % of citric acid, sodium citrate, sucralose, natural and artificial flavor, calcium disodium EDTA (preservative), blue 1.
Extra notes:	Do not drink if pouch is leaking, damaged or swollen as fermentation may occur, Best when used by date printed on the side of carton.



PROUD SOURCE PRISTINE ROCKY MOUNTAIN SPRING WATER



Bottled Water
Unflavored



April
2019



2.99 USD
2.64 EUR



United States

Company:	Proud Source Water
Description:	Pristine rocky mountain spring water in a 750 ml aluminum bottle.
Claims:	pH: 8.1. Naturally alkaline plus electrolytes. Non BPA liner. Proud source water. Bottled at source.
Per serving size:	1 liter, Calcium: 42 mg, Potassium: 1 mg, Magnesium: 6.8 mg, Silica: 12 mg, Bicarbonates: 145 mg, Chlorides: 4.6 mg, Total Dissolved Solids (tds): 166.8 mg
Analysis insight:	Aluminum bottle is a sustainable alternative to plastic bottles and can be repurposed after product consumption.



In cooperation with Innova Market Insights we are happy to publish new product launches on a global scale. Innova Market Insights is a world leading provider of knowledge solutions for the food and beverage industries. They serve their clients around the world with a full spectrum of solutions built around the professional needs of their individual roles.

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Your price quotation data, too, is much appreciated.

Please forward your contributing input directly to the editorial team
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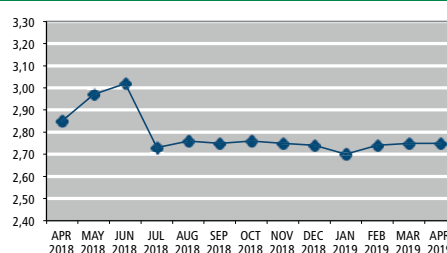
Prices: The price range is calculated for juice or puree of different proveniences, traded in drum or bulk; \$/kg = cif Rotterdam; EUR/kg = DDP

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—◆— This line represents the development of the mean values
(excepted graph 'orange juice concentrate – future markets')

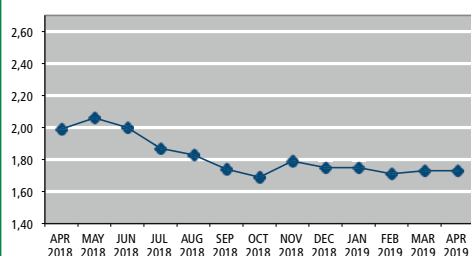
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65 °Brix, \$/kg



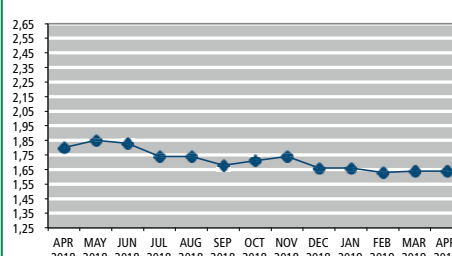
Apple Juice Concentrate

70 °Brix, high acidity, EUR/kg



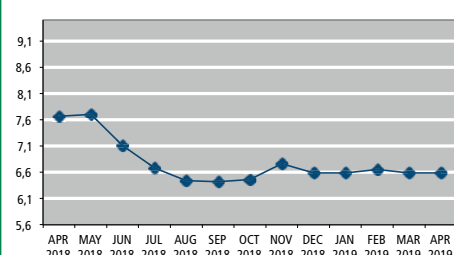
Apple Juice Concentrate

70 °Brix, low acidity, EUR/kg



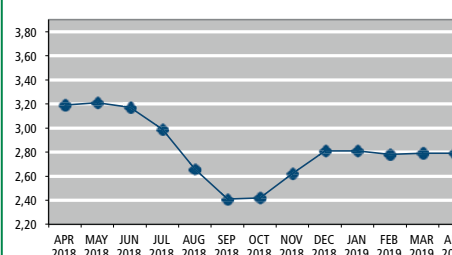
Passion Fruit Juice Concentrate

50 °Brix, \$/kg



Pineapple Juice Concentrate

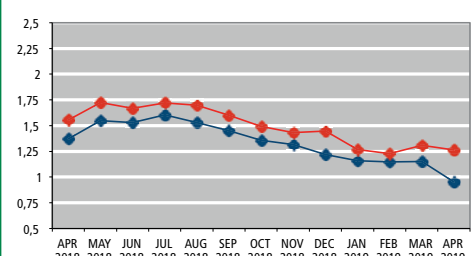
65 °Brix, \$/kg



Orange Juice Concentrate

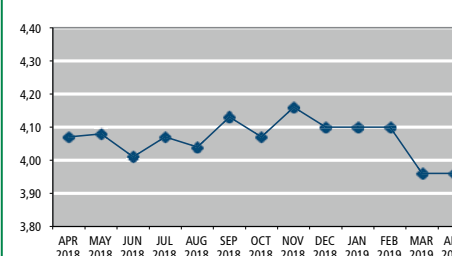
Future Markets \$/lb.

◆ = highest values
◆ = lowest values



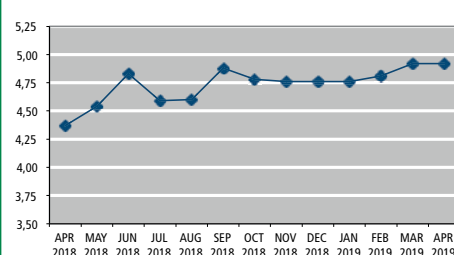
Lemon Juice Concentrate

cloudy, 400 g/l acid, \$/kg



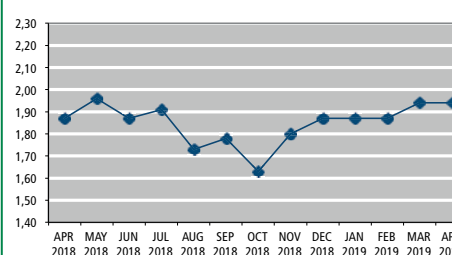
Grapefruit Juice Concentrate

58 °Brix, \$/kg



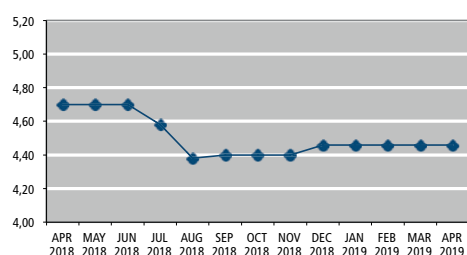
Pear Juice Concentrate

65 °Brix, EUR/kg



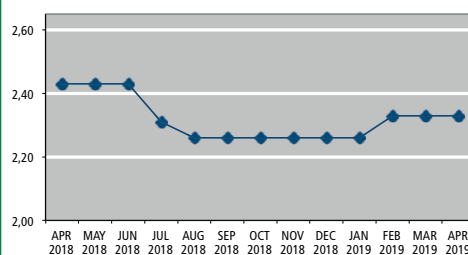
Sour Cherry Juice Concentrate

65 °Brix, EUR/kg



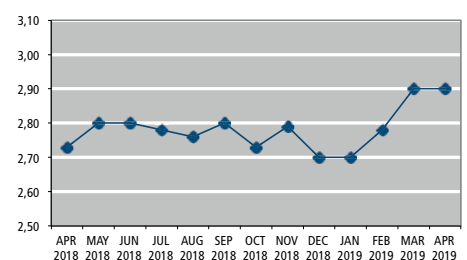
Black Currant Juice Concentrate

black, 65 °Brix, EUR/kg



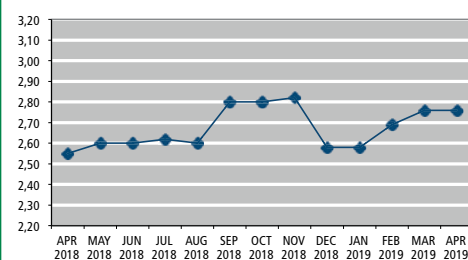
Grape Juice Concentrate

white, 65 °Brix, EUR/kg



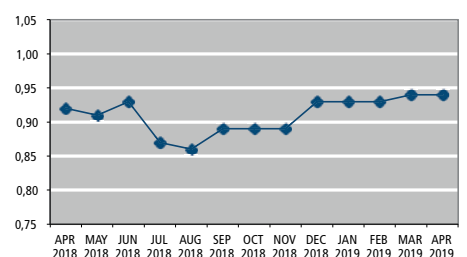
Grape Juice Concentrate

red, 65 °Brix, EUR/kg



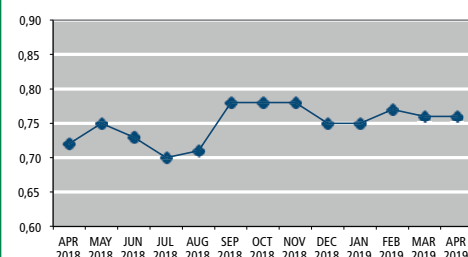
Apricot Puree

EUR/kg



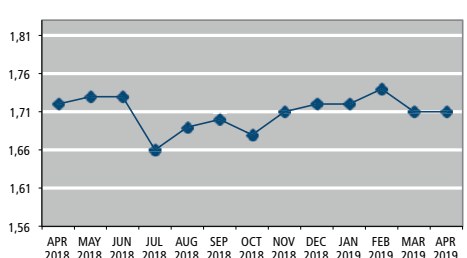
Banana Puree

22-24 °Brix, \$/kg



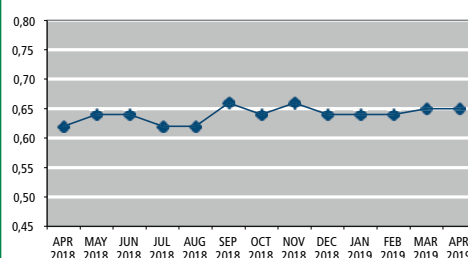
Mango Puree

15 °Brix, \$/kg



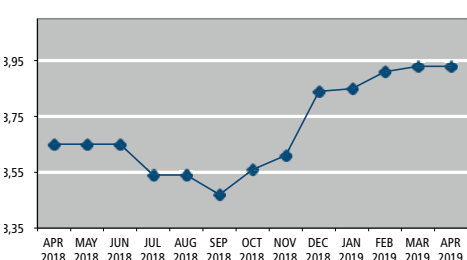
Peach Puree

EUR/kg



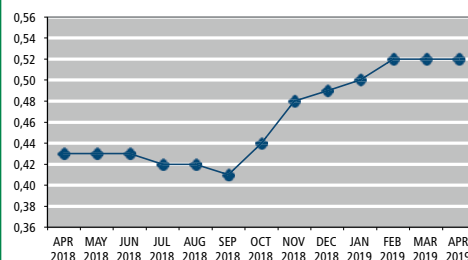
Carrot Juice Concentrate

65 °Brix, EUR/kg



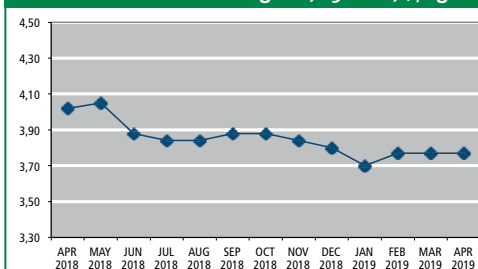
Carrot Juice

EUR/l



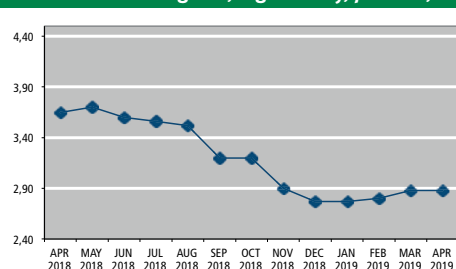
Orange Juice Concentrate

organic, 65 °Brix, \$/kg



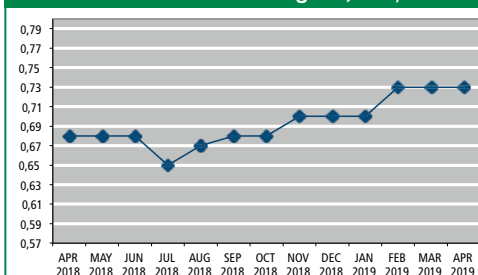
Apple Juice Concentrate

organic, high acidity, 70 °Brix, EUR/kg



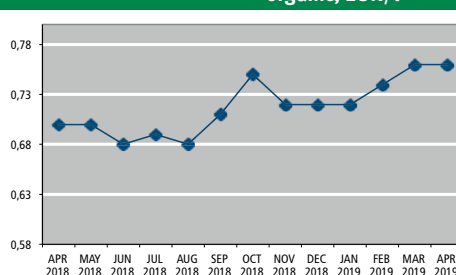
Carrot Juice

organic, EUR/l



Red Beet

organic, EUR/l



EXPERT LITERATURE

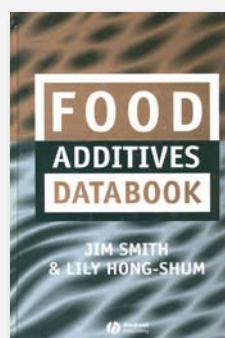


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Steen, David / Ashurst, Philip R.

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