

Extracting all that nature has to offer: How enzymes provide antioxidant-rich berry juice sustainably

The skin and flesh of colorful fruit such as cranberries, blackberries and the super-food acai berries is rich in vitamin C as well as in natural compounds called anthocyanins. As a consequence, the juice extracted from these berries is not just brightly colored, but also has a distinct flavor profile, as well as potent antioxidant properties.

MAKING EVERY BERRY COUNT: INCREASING ANTIOXIDANT YIELD TO MEET CONSUMER DEMANDS

The global fruit juice market is complex. Over the last several years market fluctuations have been observed resulting from innovative product launches capitalizing on the myriad of possibilities that exist with juice-based beverages. In addition, as consumers continue to think more in terms of specific functionality, convenience, affordability, and lifestyle – needs rather than products – juice manufacturers must ensure they are meeting these desires.¹ Consumers have grown more skeptical of the intrinsic health benefits of products like orange juice, which still contain substantial amounts of sugar. At the same time, products able to make specific health claims or offer unusual flavor or nutrient profiles have continued to do well.²

Given these market conditions and the documented health benefits of antioxidants², it is no surprise that there is an increase in the number of consumers wanting fresh, healthy juice made from blue or red berries. However, unknown to most people, when berries are simply squeezed to release their juice, only some of the antioxidants and juices are released. In order to extract more of the color special enzymes designed to breakdown the skin and tissues of these delicate fruits are needed. The added benefit of using these enzymes during juice extraction is that they also enable the release of more vitamins and anthocyanins. If we consider the same amount of berries processed, manufacturers using these enzymes can double the amount of antioxidant made available in the juice, compared to not using enzymes.



INSIGHT: Enzymes help more people benefit from health-giving antioxidants

- Including an enzymatic step during berry juice processing can increase the amount of antioxidant-rich juice produced and importantly, can increase the amount of antioxidant that is made available to consumers. Assuming that all juice producers in North America and Europe used enzymatic processing this would equal an additional 280,000 kgs of antioxidant within the juices produced.

Despite the increase in consumer demand seen for antioxidant-rich acai, goji, and aronia red berry drinks, as noted above, it is not all good news for the more mainstream orange juice manufacturers where 'added sugar' brands dominate. Recent UK consumer media coverage has criticized these fruit juice drinks for their high sugar content and there have been recommendations that fruit juice should not count toward a person's 'five a day'.³ There is therefore a clear opportunity for beverage manufacturers to leverage the rich color and health benefits of red berries to create 100% juices that not only taste great but also support a balanced diet.

¹ Euromonitor International, 2013

² Grosso G, Bei R, Mistretta A, et al. *Front Biosci.* 2013;18:1017–29.

³ <http://www.dailymail.co.uk/health/article-2538328/Fruit-juice-shouldnt-count-5-day-Some-brands-sugar-cola-says-obesity-tsar.html>. Accessed July 2014

ENZYMES: ADD A LITTLE, DO A LOT

As well as making our healthy berry juices richly colored and high in antioxidants, enzymes also help manufacturers to increase the overall amount of juice that can be obtained from their fruit crops – having positive impacts both environmentally and economically.

INSIGHT: Enzymatic processing reduces emissions and saves land

- Greenhouse gas emissions equivalent to 130 million kgs CO₂ are saved every year with the increased yield made possible with fruit juice processing enzymes. This saving alone is equivalent to the carbon footprint of fruit and vegetables thrown away every year by 7 million EU or North American residents, given an average waste per capita of ~60 kg.
- Increasing the yield of the juicing process also impacts the amount of land that is needed each year to create the same amount of juice. With the help of enzymes we can reduce the cultivation area of the berry crop in the EU and North America by 200 km², which is the same area as for 30,000 football fields!



INSIGHT: In spite of their small size, enzymes pack a mighty economic punch

- If colored berry juice was produced in the EU and North America without the help of enzymes, costs for the production of the juice concentrate would be about 20% higher, potentially making it less accessible to consumers seeking the health-giving properties and great taste of berry-containing juice. This means an overall economic benefit of in the EU of €19 million per year and in North America \$50 million per year.



MEETING CONSUMER DEMAND: MORE HIGH-QUALITY FUNCTIONAL INGREDIENTS NEEDED

Taste and health-giving properties are not the only attributes that consumers look for when reaching for fruit juice. Convenience has become an increasingly important consideration when buying food products. Given that 80% British adults admit to struggling to keep up with the recommended 'five a day',⁴ the attraction of a high-quality fruit juice or smoothie that counts towards one or two portions is clear. Market research confirms this, indicating that, while sales of fruit juice remain static at a high level throughout Europe and North America, in Asia, South America, and North Africa they are going from strength to strength.¹ Low-acid and not-from-concentrate juices have recorded the highest growth rates in these regions, with a shift towards high-quality products with antioxidants and other functional ingredients similar to that previously seen in Europe and North America.

Extracting all that nature has to offer is the first paper in DSM's Insight Series into Enzymes – *Add a little, Do a lot*; highlighting DSM's ongoing commitment to help make the food and beverage industry greener, healthier and more prosperous. The data presented are based on calculations using the fruit processing enzyme Rapidase® versus no enzyme being used. Although today the majority of fruit juice manufactures use enzymes to make juice this is the first such report quantifying the true benefits for people, planet and producers.

⁴ <http://www.bbc.co.uk/news/health-18032209>