

# facts



Sugar taxes drive  
beverage reformulation  
– but what about the taste ?

**Jungbunzlauer**

*From nature  
to ingredients®*

## Introduction

Excise taxes on sugary drinks are spreading across all continents. In a bid to cut high sugar diets and related diseases, country governments force beverage producers to reduce the sugar added to their drinks through the means of taxation of the consumer. Only a few years after early attempts and withdrawal of such tax initiatives, they are found in all world regions today and many more countries are preparing similar legislations. Not in every country the introduction was as vocal as in the United Kingdom and Ireland but the lawmakers' target remains the same globally: Get a grip on soaring sugar consumption through beverages.

With taxes in place for some years in the meantime, questions are raised about their impact. But it is obviously too early to find any effect on obesity or diabetes statistics. Any development on these indicators will take more time to reflect changes in consumer behaviour. But an initial effect can be observed in the market. In the UK a major reformulation wave pushed the sugar content of many products right below the lowest tax threshold around the introduction date of the tax. The analysis of the product launches reveals that it is not the big multinationals that lead by example. It appears that the smaller and more local players understood the sugar reduction mandate not only as a service to consumer health and a tax matter, but also as a matter of differentiation. They stepped ahead and successfully pushed the sugar content down significantly <sup>(1)</sup>.

From a composition point of view, the reformulated products do not show surprises. Predictably, sugar has been partially replaced by traditional artificial sweeteners <sup>(1)</sup>. The question is how the consumer will accept these beverages, namely, how the traditional artificial intense sweeteners satisfy the taste expectation of a consumer used to drink the full sugar beverage. Without a convincing taste, the risk for sugar free drinks to fail in the market is high. In addition there is growing awareness that traditional artificial sweeteners are supposedly a risk to health as well. This constitutes a further challenge for the beverage industry, as consumers are now not only becoming wary of and avoiding sugar, but also the common sugar alternatives, namely artificial sweeteners. Stevia based sweeteners do not have this additional burden of consumer's reservation to carry. But their taste profile also need refinement to ensure further and more widespread use in the reduced sugar and sugar free beverage segment. Jungbunzlauer offers a tool that greatly supports this refinement.

**Table 1: Exemplary list of countries with effective excise taxes on beverages products**

Belgium	Finland	Mexico	South Africa
Brunei	France	Norway	United Arab Emirates
Chile	French Polynesia	Portugal	Thailand
Dominica	Hungary	Saudi Arabia	United Kingdom
Estonia	Ireland	Seychelles	USA (several States)

Source: [www.medicalpress.com](http://www.medicalpress.com)

## ERYLITE® – a new type of flavour enhancer

Jungbunzlauer offers a powerful taste enhancer that can easily support any beverage innovation process: ERYLITE® Erythritol.

ERYLITE® is a fermentation-based polyol that was approved in 2016 for use in beverages as a flavour enhancer in the European Union. The maximum allowable amount is 1.6% (w/w) in energy-reduced flavoured drinks or those with no added sugar. The fermentation based production qualifies ERYLITE® to be considered the only natural polyol approved for use in food and beverages. From a physiological point of view, it is a very interesting additive, as it has both a zero caloric value and a zero glycemic index. It therefore does not increase the calorie load and is also safe for diabetics. More importantly, it is a highly effective flavour enhancer. On its own, ERYLITE® imparts a clean, sweet flavour that resembles the taste of sucrose. When used in beverages, ERYLITE® significantly improves the flavour:

1) ERYLITE® significantly improves the taste of sweeteners based on steviol glycosides. Stevia plant extracts always impart a characteristic taste profile even at the highest purity levels. That taste profile is characterised by liquorice, with occasional bitter notes, and a lingering effect that is hard to ignore. Although steviol glycosides have improved in flavour over recent years, ERYLITE® significantly mitigates the remaining unpleasant notes and eliminates the lingering effect. This effect is still observed even on steviol glycosides with the highest concentrations of rebaudioside A. The positive effects of ERYLITE® are not limited to stevia extract, but are also perceptible when used with traditional sweetening alternatives.



2) ERYLITE®, used at the permitted levels of up to 1.6%, exhibits some quantitative synergies on sweetness with common sweeteners, of which steviol glycosides are a great example. When used in combination with stevia extracts rich in rebaudioside A, the sweetness of the combination of stevia extract and ERYLITE® is higher than the sweetness imparted by stevia extract alone. This is partly because ERYLITE® also imparts a mild sweetness itself. But in a sensory test, the total sweetness perceived by the panel for a stevia extract and ERYLITE® combination exceeds even the sum of the individual sweetness contribution of both substances. A higher sweetness is clearly advantageous, as it helps to restrict the dosage and cost of sweeteners.

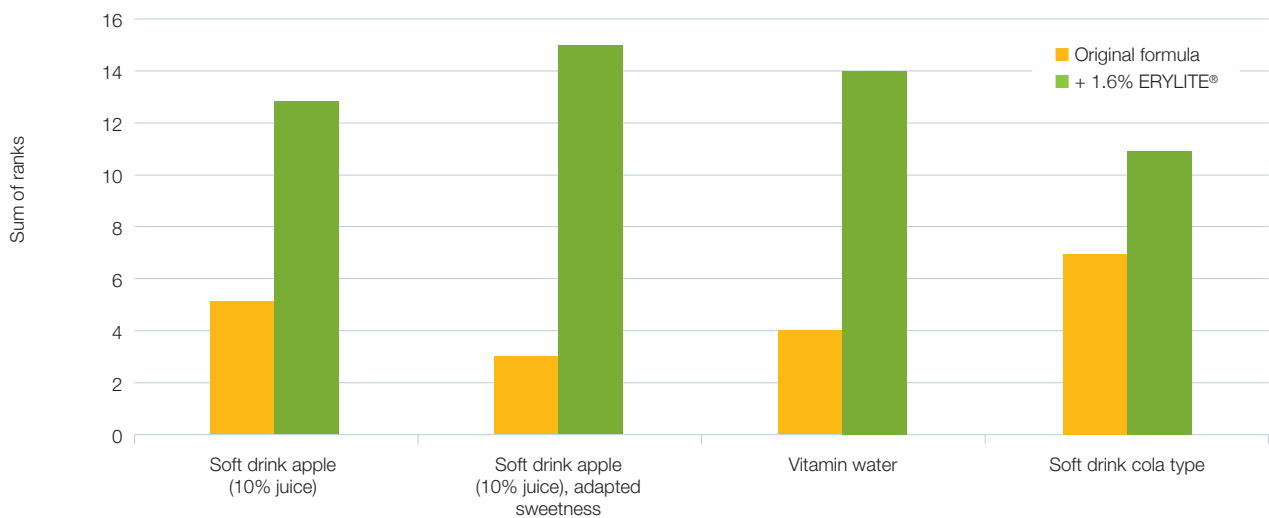
## Sensory tests

The beneficial effects of 1.6% ERYLITE® can be observed in reduced-sugar versions of typical drinks, such as iced tea, cola, vitamin-enriched waters or juice-based drinks. While cola drinks are in the midst of a market crisis (regular full-sugar types but also diet versions), iced teas as well as juices and juice-type drinks are profiting from changing consumer habits and, as a result, are growing in popularity. The following test serves to demonstrate the flavour-enhancing effects of ERYLITE® on some reduced-sugar soft drinks. The various sensory ranking tests for the sensory evaluation of the samples were carried out where the panel tasted four different types of beverages over several tasting sessions in order to determine their preference of the samples.

Four products were tested:

- 1) An apple-flavoured soft drink with no added sugar (10% juice)  
Sweetening system: sucralose + acesulfame K
- 2) An apple-flavoured soft drink with no added sugar (10% juice), adapted sweetness  
Sweetening system: sucralose + acesulfame K
- 3) A low-sugar vitamin water (less than 2.5g sugar per 100ml)  
Sweetening system: sugar + rebaudioside A
- 4) An energy-reduced cola soft drink (30% less energy than the full sugar version)  
Sweetening system: sugar + rebaudioside A

**Figure 1: Results of sensory testing of beverage concept improved with 1.6% ERYLITE®**



The sensory testing of the four different beverage types reveals a general trend towards a better taste and higher flavour intensity upon addition of 1.6% ERYLITE® to energy-reduced drinks. The effect differs in strength for each type. While the improvement on the cola drink is visible but not extraordinary, it is much stronger for the two apple-flavoured soft drinks and the strawberry/pomegranate-flavoured vitamin water. This is because fruity flavours are better enhanced by ERYLITE®.

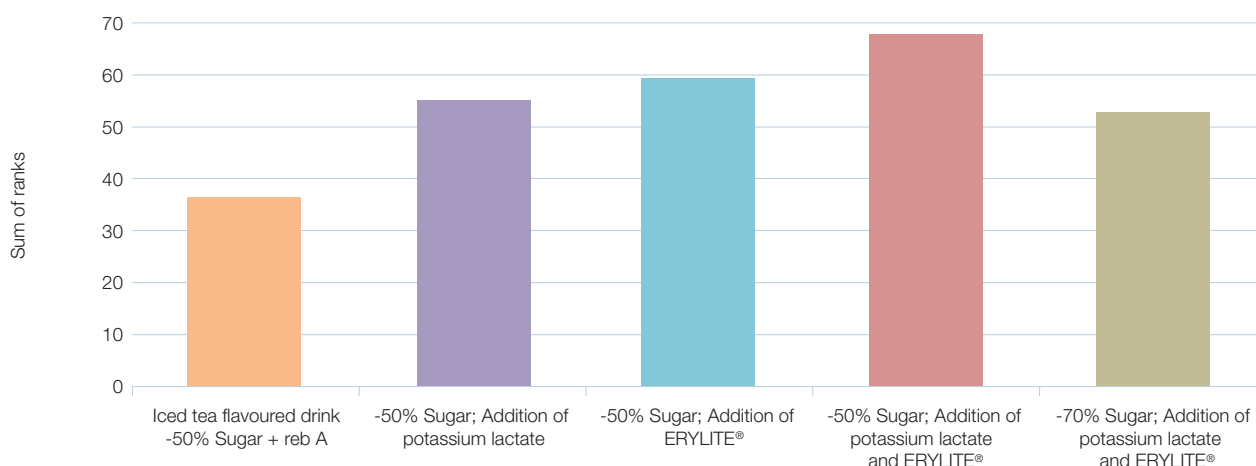
Furthermore, a difference is visible between the two types of the apple-flavoured soft drink. One version has an adapted sweetness, taking into account that ERYLITE® adds to sweetness as well. The sweetness of ERYLITE® is approximately 60% of that of sucrose. This means that just adding 1.6% ERYLITE® on top contributes the additional sweetness of about 1% sucrose. In order to produce a drink of equal sweetness, the other sweeteners must be reduced accordingly. In the present case the additional sweetness of 1.6% ERYLITE® seems to find less acceptance amongst this sensory panel. Although the benefits of ERYLITE® are manifold, including its sweetening effect, EU regulations stipulate clearly that it is solely to be used as a flavour enhancer in beverage production.

Another beverage that amply demonstrates the positive effect of ERYLITE® as a flavour enhancer is an ice tea flavoured drink. A cassis-flavoured iced tea was formulated with 50% less sugar. The sweetness is adjusted to a 100% sucrose level with rebaudioside A 97%. Using the same sensory panel setup, the drink was also tested against an upgraded version containing the maximum allowable amount of ERYLITE® (1.6%). In this setup, another substance from Jungbunzlauer's toolbox was used: potassium lactate. Lactates, neutralisation products of lactic acid, are known not only to heighten the flavour-enhancing effects of sweeteners, but also to mask the off-taste of certain sweeteners and bitterness of substances such as caffeine and minerals. The effect of potassium lactate on improving the taste of stevia extracts rich in rebaudioside A is particularly noticeable. Typically, 0.15 to 0.20% potassium lactate is added.

**Table 2: Recipes of iced tea beverages**

Iced Tea Cassis, Recipes							
	Ingredients	Standard full sugar	Standard -50% sugar	Standard -50% sugar with 0.19% potassium lactate	Standard -50% sugar with 1.6% ERYLITE®	Standard -50% sugar with 0.19% potassium lactate and 1.6% ERYLITE®	Standard -70% sugar with 0.19% potassium lactate and 1.6% ERYLITE®
1	Citric Acid Anhydrous	2.00g	2.00g	2.00g	2.00g	2.00g	2.00g
2	Trisodium Citrate Dihydrate	0.80g	0.80g	0.80g	0.80g	0.80g	0.80g
3	Rebaudioside A	–	0.10g	0.10g	0.10g	0.10g	0.14g
4	Ascorbic acid	0.25g	0.25g	0.25g	0.25g	0.25g	0.25g
5	Tea extract	1.40g	1.40g	1.40g	1.40g	1.40g	1.40g
6	Cassis Flavour	0.50g	0.50g	0.50g	0.50g	0.50g	0.50g
7	Sugar	65.00g	32.50g	32.50g	32.50g	32.50g	19.50g
9	Potassium (L+)-Lactate	–	–	1.90g	–	1.90g	1.90g
10	ERYLITE®	–	–	–	16.0g	16.00g	16.00g
11	Water	930.05g	962.45g	960.55g	946.45g	944.55g	957.51g
Sum		1000.00g	1000.00g	1000.00g	1000.00g	1000.00g	1000.00g

**Figure 2: Sensory evaluation of different sugar reduced iced tea drinks**



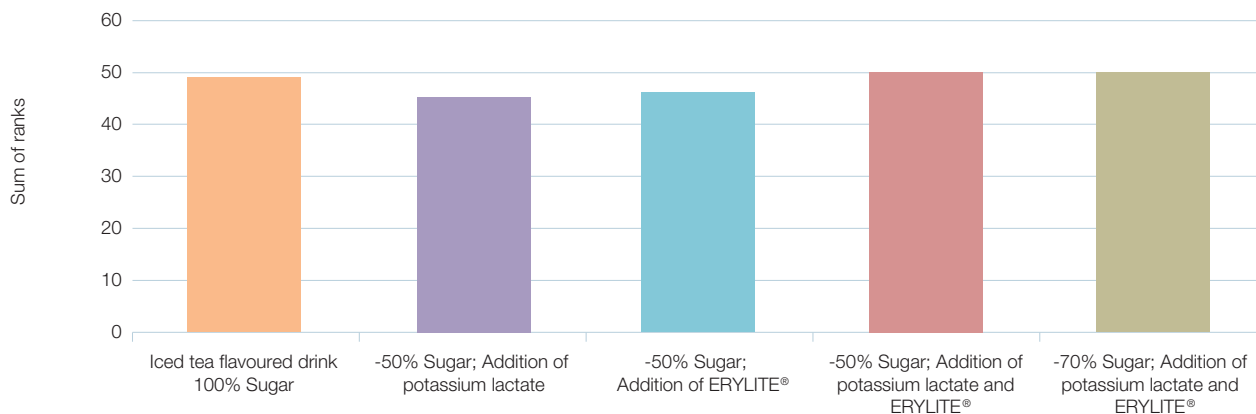


The addition of potassium lactate significantly increased the acceptance level of the reduced-sugar iced tea drink. With 0.19% potassium lactate, the liquorice aftertaste of the stevia is masked very well, which explains the improved sensory results. As expected, the addition of ERYLITE® also improved the acceptance of the drink. The effect is even more pronounced than the effect of potassium lactate. But the improvement goes beyond taste and flavour intensity. Sugar reduction not only changes the sweetness and taste of the product, it is also the mouthfeel that suffers, as the sugar is the main contributor of bulk to the drink. However, 1.6% ERYLITE® creates additional bulk, which accounts for the greater overall preference as well. Using ERYLITE® and potassium lactate together improves the drink's performance further, and clearly sets a new benchmark in terms of flavour as compared with the original formula.

Based on this convincing result, it seemed appropriate to test the combination of ERYLITE® and potassium lactate on a drink with 70% less sugar instead of 50%. The result was just as convincing, as the taste panel showed a preference again substantially higher than the original drink with 50% less sugar.

As mentioned one of the main difficulties in helping consumers switch to healthier reduced-sugar products is the difference in taste. Especially for long-term users of full-sugar products, the full sugar's version taste is the benchmark. The following test was designed to ascertain whether adding ERYLITE® and potassium lactate can close the taste gap between a full-sugar iced tea and the version with 50% less sugar. The result is actually quite surprising.

**Figure 3: Sensory evaluation of sugar reduced iced tea drinks versus a full sugar version**



The sensory results indicate that the addition of both ERYLITE® and potassium lactate improves the flavour of an iced tea flavoured drink with 50% less sugar to such an extent that the panel's preference for this version is only slightly lower than for the full-sugar version. Using both together leads to the desired result: the panel's preference is the same as for the full-sugar version. What is most interesting is that preference for the drink with 70% less sugar is also the same as for the full-sugar drink. Both products, ERYLITE® as well as potassium lactate, are thus excellent tools for improving the taste and flavour intensity and thus the overall preference of sugar reduced iced tea flavoured drinks, particularly when used in combination.

## Summary

The beverage industry is under increasing pressure to introduce new, healthier, reduced-sugar beverage concepts into the market, and ones which are not subject to excise taxes. These innovations will only be accepted by the consumer if they are flawless in taste and if they use alternative sweetening systems, because traditional artificial sweeteners are raising doubts on safety among consumers.

With ERYLITE® and potassium lactate, Jungbunzlauer has two effective ingredients for significantly improving the flavour of sugar reduced beverages. In the concepts tested, they harmonise perfectly with traditional artificial sweeteners but also with rebaudioside A, the most commonly used non-artificial sugar replacer. When added to an iced tea flavoured drink with 50% less sugar, they easily outperform the original version made with sugar and rebaudioside A only. Used in combination, ERYLITE® and potassium lactate raise the performance of the drink with 50% less sugar to the same level as the full-sugar version. This is a powerful flavour enhancement method and a real aid to the innovation efforts of the beverage industry.

## References

[1] Starch & Fermentation Analysis, April 2018, LMC International Ltd

## About Jungbunzlauer

Jungbunzlauer is one of the world's leading producers of biodegradable ingredients of natural origin. We enable our customers to manufacture healthier, safer, tastier and more sustainable products. Due to continuous investments, state-of-the-art manufacturing processes and comprehensive quality management, we are able to assure outstanding product quality. Our mission "From nature to ingredients®" commits us to the protection of people and their environment.

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