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FLAVOR STANDARDS FOR BEER MIX PRODUCTS

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Mixtures of beer and carbonated soft drinks, so-called beer mix products or Radlers, are popular in many parts of Europe. They possess flavor attributes derived both from beer and soft drinks. The American market is seeing a rise in the number of such beverages in both the macro and craft industries.

The capability of brewery tasters to evaluate such products is often limited. Primarily this is because taster training programs and training materials focus on beer, and do not facilitate skills development for products other than beer.

The aims of this work were (i) To develop a set of flavor standards for attributes commonly associated with beer mix products and (ii) To test their efficacy in training of tasters who were, initially, unfamiliar with such products.

Sensory evaluation of commercial beer mix products

Beer mix products

Thirty-two beer mix products (0 – 3.2% abv), made in Belgium, Croatia, Czech Republic, Germany, Holland, Romania, Poland, Serbia, Slovakia and UK, were purchased or obtained directly from the producer.

Sensory profiling

A panel of eight trained assessors (five male, three female) evaluated the products. Free attribute elicitation was used to generate an initial list of the most obvious flavor characteristics. The Repertory Grid Technique was used to identify their distinguishing characteristics. After elimination of duplicate flavor terms, descriptive profiles of the products were generated.

Development of reference flavor standards

Flavor materials were purified prior to nanoencapsulation in cyclodextrins. Reaction conditions, cyclodextrin type, and post-encapsulation treatments were varied to optimize flavor load and product stability.

The concentration of each flavor was adjusted to give a low to moderate flavor intensity (2.5 – 3 on a 0 – 10 scale) in diluted, acidified, pale lager beer. The resulting standardized powders were packaged in gelatin capsules.

Flavor purity, identity, and concentration were assessed by GC-olfactometry, Mass Spectrometry and GC-Mass Spectrometry respectively. The flavor character of natural flavor essences was evaluated by sensory analysis.

Table 1. Flavor standards representing positive and negative flavor attributes in beer mix products

Attribute grouping	Attribute	Flavor standard	Concentration added
Citrus	Lemon	Lemon oil	170 mg* / litre
	Lime	Lime oil	100 mg* / litre
	Grapefruit	Grapefruit oil	100 mg* / litre
	Orange	Limonene |linalool	120 mg* / litre | 50 mg* / litre
Berry	Blackcurrant	Blackcurrant essence	100 mg* / litre
	Raspberry	Raspberry essence	100 mg* / litre
	Redcurrant	β-Damascenone	90 mg* / litre
	Strawberry	Strawberry essence	300 mg* / litre
Orchard	Acetaldehyde	Acetaldehyde	15 mg / litre
	Fresh apple	Ethyl-2-methylbutyrate	90 mg* / litre
Tropical	Green banana	*cis*-3-Hexenyl acetate	50 mg* / litre
Other	Burnt sugar	Furaneol	300 mg* / litre
	Green pepper	2-Isobutyl-3-methoxypyrazine	60 ng / litre
	Vanilla	Vanillin	1.4 mg / litre
Taste and mouthfeel	Astringent	Rutin hydrate	40 mg / litre
	Bitter	Sucrose octaacetate	15 mg / litre
	Sour	Citric acid	1.37 g / litre
	Sweet	Sucralose	17 mg / litre
Off-flavors and taints	H_2S	Hydrogen sulphide	18 µg / litre
	Malty-biscuity	2-Acetyl pyridine	180 µg / litre
	Mercaptan	Methanethiol	4.5 µg / litre
	Metallic	Ferrous sulphate	8.2 mg / litre
	Methional	Methional	17 µg / litre
	Stale fruit	Limonene oxide	150 mg* / litre
	Papery	*trans*-2-Nonenal	730 ng / litre
	Phenolic – 4-VG	4-Vinyl guaiacol	900 µg / litre

Notes

We recommend that these flavor standards are used in a 50:50 blend of pale lager beer and mineral water, acidified by addition of one "sour" beer flavor standard capsule per litre (457 mg citric acid / litre). Tasters should also be familiar with the character of common beer taints, including chlorophenol, bromophenol, and musty characters.

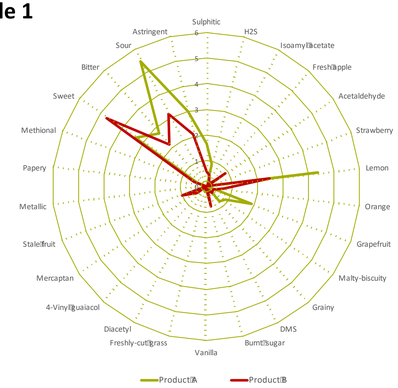
Values marked with * refer to amounts of concentrated flavor complex added to samples. All other values refer to concentrations of individual pure flavor compounds.

Descriptive profiling of beer mix products after training of assessors with these flavor standards

A group of seven assessors, previously unfamiliar with beer mix products, was trained to identify and scale each of the characteristics listed in Table 1. After training, they carried out descriptive profiling on duplicate samples of a set of commercial beer mix products. The average results of two such profiles - both lemon Radlers - are shown in Figure 1.

Product A was more sour than product B, and had a greater intensity of lemon, grapefruit and astringent flavor characteristics. Compared to product A, product B had a greater intensity of orange, burnt sugar and stale fruit flavors. In addition to being less sour than product A, it was more sweet.

Figure 1. Descriptive profiles of two lemon Radlers generated by tasters trained using the flavor standards listed in Table 1



Conclusion

We have identified the key flavor attributes in a wide range of beer mix products and developed stabilized reference flavor standards to represent them. These materials include 18 positive flavor characteristics found in beer mix products, and eight off-flavors and taints. We have successfully used these materials to train professional tasters in breweries which manufacture such products.

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