



FOOD & NUTRITION EUROPE

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INTENSIVE SWEETENERS

Sweetener blends with Neotame

BRENNTAG'S SWEETENER PORTFOLIO

Sweeteners are additives which provide the basic taste of sweetness to a food product. Sweeteners are available in varying sweetness profiles, compared to sugar, and some also provide additional functionality, such as flavour enhancement. Sweeteners are often combined with other sweeteners in order to provide the optimum results within a formulation. Brenntag Food & Nutrition has for many years offered a wide portfolio of intensive sweeteners and since January 2010 this has been extended further to include neotame, which is manufactured by The NutraSweet Company.

In addition to offering single sweeteners, Brenntag develops and markets proprietary sweetener blends. With the recent addition of neotame to the product portfolio, a series of new blends which contain neotame are now available.

This technical bulletin answers the following questions:

- How to formulate with neotame, a versatile new sweetener and flavour enhancer that delivers great taste?
- How to realise cost savings by replacing part of the sweetener system in traditional or sugar free products with neotame?

NEOTAME PROPERTIES

As of January 12th, 2010, The European Union authorizes the use of the new intensive sweetener neotame by the Food and Drink industry (Directive 2009/163/EU). Neotame is a non-nutritive sweetener with a potency ranging from 7000 to 13000 times that of sucrose. Neotame can also be used as a flavour enhancer by modifying, masking or intensifying certain flavours.

Typically neotame will be used in combination with other nutritive and/or non-nutritive sweeteners by providing 20-30 % of the total sweetness in a finished product. Neotame has a very clean sweet taste, close to sucrose, with no undesirable bitter or metallic off-taste. As a dry ingredient, neotame has excellent stability and will function well in finished dry products such as powdered soft drinks and dessert mixes. In systems where moisture is present, the stability of neotame will be influenced by pH, temperature and time. Outside of Europe, neotame has been extensively applied by the beverage industry within a wide range of products, without any negative impact on shelf-life. When used in batch, tunnel, high temperature short time (HTST) pasteurization and aseptic processes there is only a negligible loss of neotame within the finished products. Neotame therefore provides versatility for both processing options and overall product shelf life. Neotame is an excellent sweetener for baking, plus it is very suitable for cultured products, since neotame is not consumed by yogurt cultures, therefore allowing it to be added at any stage of production.

Neotame's high potency allows it to maintain a highly competitive relative cost (cost per sucrose equivalent). Therefore it is possible to achieve a cost reduction in almost any given sweetener blend.

Neotame intensifies certain food and beverages flavours, particularly acidic fruit flavours (such as orange, lemon and grapefruit) and cherry flavour. Subsequent modification of the flavour system and acid level may result in additional cost savings being achieved in the application.

Typical use levels of neotame:

Beverages:	3 – 5 ppm (0,0003 – 0,0005%)
Dairy products:	3 – 12 ppm (0,0007 – 0,0012%)
Jams and fruitpreparations:	10 – 20 ppm (0,001 – 0,002%)
Table top sweeteners:	200 – 1000 ppm (0,02%-0,1%)

Neotame's use levels, which are detailed above, will contribute 20 – 30% of the total sweetness (with the exception of table top products). The remaining sweetness is contributed by other intensive sweeteners or sugar. When using neotame as a flavour enhancer in beverages, dosages are as low as 1 – 3 ppm.



5,000 kg Sugar = 25 kg of Aspartame = 0.6 kg of Neotame

NEOTAME IN SWEETENER BLENDS

Neotame can substitute up to 30% of sweetness in most formulations. The addition of neotame in sweetener blends can significantly reduce bitter tastes of sweeteners like acesulfame K and sodium saccharinate. Additionally, neotame can be used to mask bitter tastes in fortified products. Therefore using neotame in blends not only provides cost savings, but also has the potential to improve the taste profiles of foods which have reduced sugar content or are sugar free.

Sweetener Blends with Neotame	Neotame Sweetness Contribution (in % of sweetness)
a) Neotame + Sucralose	25 %
b) Na-Cyclamate + Neotame + Na-Saccharinate	25 %
c) Acesulfame-K + Aspartame + Neotame	30 %
d) Acesulfame-K + Aspartame + Na-Cyclamate + Neotame	30 %

The following example of a Acesulfame-K + Aspartame + Neotame Blend, shows clearly the high potency sweetness of neotame.

Sweetener in Blend	Sweetness Contribution (in % of sweetness)	Dosage intensive sweetener in application (mg per liter)
Aspartame	55 %	275,0
Acesulfame K	17 %	85,0
Neotame	28 %	3,5
TOTAL	100 %	363,5

In the above example it can be seen that, although neotame contributes almost 30% of the total sweetness, the neotame dosage in weight is less than 1% of the sweetener blend. Therefore, depending upon the accuracy of the weighing equipment available at the food or drink manufacturer, working with pre-mixed blends may be more consistent and reliable, than working with single intensive sweeteners.

Synergistic effects with other intensive sweeteners and certain flavours influence the optimal dosage of neotame or blends with neotame. Depending on the specific food composition, the dosage should be correctly calculated and optimized for every application.

BRENTAG'S SWEETENER BLENDS

Brenntag Food & Nutrition can provide customers with the single ingredient neotame or sweetener blends that contain neotame. These sweetener blends are manufactured in the dedicated Brenntag facility located in Austria*. Brenntag can offer a variety of standardised blends with neotame dosage optimised for typical food and beverage applications, such as those listed in the below tables. In addition to these standardised blends, Brenntag food technologists and nutritionists can work together with customers to develop tailor-made sweetener blends for specific needs.

NeTaSweet SWEETENER BLENDS – COMPOSITION AND APPLICATIONS

NeTaSweet Blend	Relative Sweetness	Intensive Sweetener in Blend						
		Acesulfame K	Aspartame	Na-Cyclamate	Neotame	Na-Saccharinate	Sucralose	Sucrose
MIX	610	#			#		#	
II	750				#		#	
III	185	#		#	#			
IV	110	#	#	#	#			
V	120	#	#	#	#	#		
SILVER	250			#	#	#		#
GOLD	430	#	#		#			

The sweetener blends can be used in the following applications.

NeTaSweet Product	MIX	II	III	IV	V	SILVER	GOLD
Beverages			#	#	#	#	#
Bakery	#	#					
Jams/Fruit preparations			#				#
Dessert mixes							#
Sport Nutrition	#	#					

In addition to the above blends, our team of food specialists continue to develop intensive sweetener blends for other applications, for example, dairy products.

* Brenntag's sweetener blends are manufactured by Brenntag CEE GmbH.
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INTENSIVE SWEETENERS OVERVIEW

As neotame is used in combination with other sweeteners, a table showing a summary of intensive sweetener properties is added below.

Sweetener	E nr	Relative Sweetness	Taste Profile	Application Stability	Regulatory	Relative Cost in application
Acesulfame K	E 950	130 – 200	Rapidly perceptible sweet taste, bitter/metallic aftertaste. Enhances and intensifies flavours.	Good shelf life, stable. Heat resistant (cooking and baking)	Sweetener Directive 94/35/EC *	€ €
Aspartame	E 951	160 – 220	Tastes like sugar, clean taste with no aftertaste. Enhances citrus fruit and other fruit flavours.	Not heat stable	Sweetener Directive 94/35/EC *	€ € €
Sodium Cyclamate	E 952	30 – 50	Pleasant taste profile, can enhance flavours and mask bitterness.	Good shelf life, stable in high and low temperatures	Sweetener Directive 94/35/EC *	€ € €
Sodium Saccharinate	E 954	300 – 500	Slightly bitter/metallic aftertaste.	Good shelf life, highly stable (cooking and baking)	Sweetener Directive 94/35/EC *	€
Sucralose	E 955	500 – 600	Made from sugar, sugar like taste, clean lingering sweetness.	Good stability	Directive 2003/115 includes E 955 in Sweetener Directive 94/35/EC *	€ € € € €
Neotame	E 961	7000 – 13000	Clean sweet taste like sugar. Enhances fruit and citrus flavours, vanilla, mint and chocolate.	Heat stable	Directive 2009/163/EU	€ €
Aspartame-Acesulfame Salt (TwinSweet)	E 962	300 – 400	Sugar like taste with clean full round sweetness profile.	Very suitable for chewing gum where it provides long lasting sweetness.	Directive 2003/115 includes E 962 in Sweetener Directive 94/35/EC *	€ € € € €
Stevia, Reb A 98%	n.a.	200 – 400	Licorice aftertaste	Heat stable	Not EU approved. National approval in France and Switzerland	€ € € € € € € € € €

* Directive 94/35 will be replaced by Regulation 1333/2008 on Food Additives, but will remain in force during transition period to allow time to prepare Annexes. For access to complete text of the Regulations and Directives: <http://eur-lex.europa.eu/nl/index.htm>

** relative cost relates to cost in use.

Information sources:

- Directive 2009/163/EU
- Claude Nofre & Jean Marie Tinti: Neotame: discovery, properties, utility, Food Chemistry 69 (2000), 245-257
- Irene Mansberger: Sensorische Untersuchungen an Süsstoff- neotame formulierungen in Wasser und in Cola Getränke, Masterwork, University of Natural Sciences and Applied Life Sciences Vienna, Dezember (2009)
- Neotame documentation, The NutraSweet Company.

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