

Steviol Glycosides a sweetener from a natural source

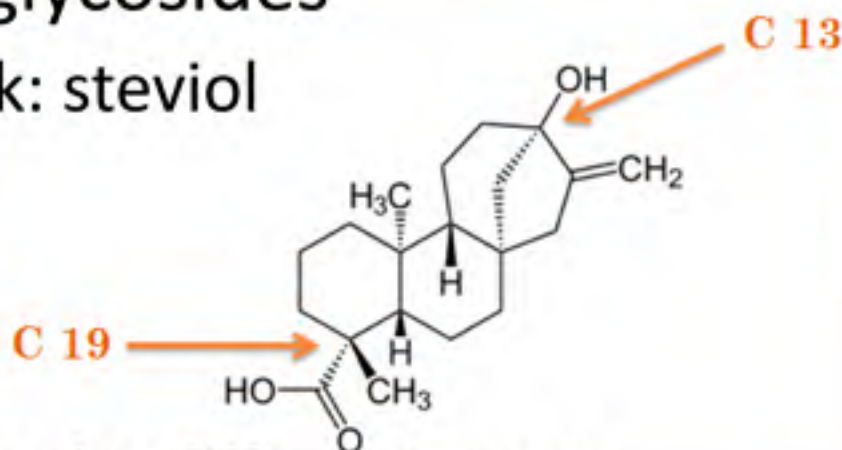
EPC Natural Products Co., Ltd.



STEVIOL GLYCOSIDES INTRODUCTION

- Structure of steviol glycosides

- a. basic building block: steviol



- b. Individual structures by different sugar substitution at C13 and C19

Rebaudioside A

Stevioside

Rebaudioside B

Rebaudioside C

Rebaudioside D

Rebaudioside E

Rebaudioside F

Dulcoside A

Steviolbioside

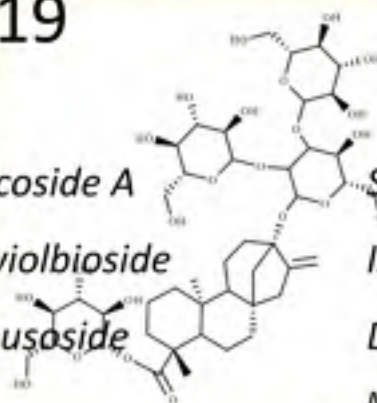
Rebusoside

Steviol-Aglycone

Isosteviol-Aglycone

Details: FAO JECFA

Monographs 10 (2010)



STEVIOL GLYCOSIDES INTRODUCTION

- EU Regulation
 - a. Steviol glycosides are approved as food additive E 960 since 2011 („Sweetener: Steviol glycosides“)
 - b. Commission Regulation (EU) No 1131/2011: the maximum allowed level is fixed for each food category and given as „**Steviol-equivalents**“
 - c. Commission Regulation (EU) No 231/2012 (specified criteria for bulk material): not less than 95 % stevioside, rebaudiosides A, B, C, D, E and F, steviolbioside, rubusoside and dulcoside on dried basis **and** thereof at least 75 % stevioside and/or rebaudioside A.



STEVIOL GLYCOSIDES INTRODUCTION

- 1 mg steviol-equivalent converts to:

Compound	mg
Rebaudioside A	3.04
Rebaudioside B	2.53
Rebaudioside C	2.99
Rebaudioside D	3.55
Rebaudioside E	3.04
Rebaudioside F	2.95
Stevioside	2.53
Steviolbioside	2.02
Rubusoside	2.02
Dulcoside A	2.48

- Differences due to different molecular mass

- For example

- Flavoured drinks:

Maximum level:

80 mg steviol equivalents/l

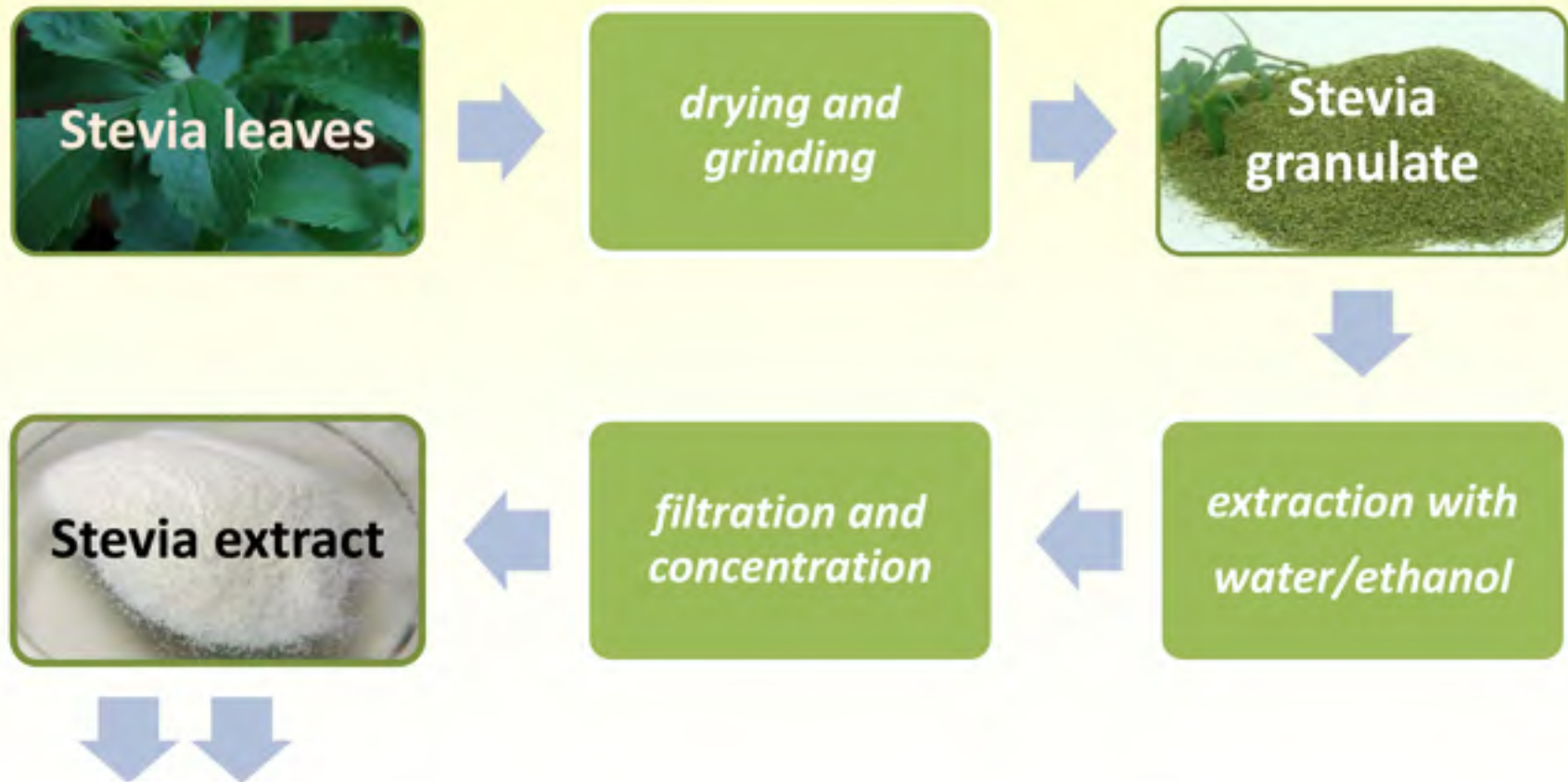
convert to



243.2 mg Rebaudioside A/liter

SWEETENER FROM “NATURAL SOURCE”

- Production process



SWEETENER FROM “NATURAL SOURCE”

- Steviol glycosides are as processed product at best „sweeteners from a natural source“ but not a “natural sweetener”.
- Although „Natural“ is legally not a defined term, only products processed with kitchen methods are accepted as “natural products”.
- Extraction with alcohol/water and concentration is a borderline kitchen method.
- The higher the purity of steviol glycosides, the less “sweetener from a natural source“ is applicable (i.e. Reb-A 95-99 %, Reb-B, Reb-D).



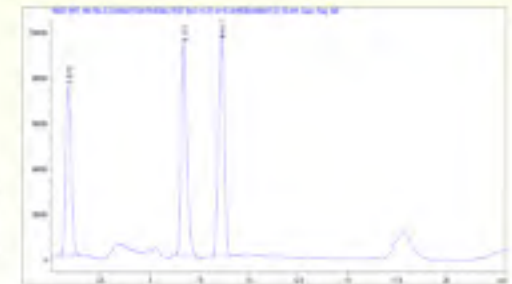
COMPOSITION OF PRODUCTS

- 
- ????/SG 95 (acc. to No 231/2012)
 - Reb-A 60-70/SG 95
 - High Grade: Reb-A (95-99 %)
 - Innovative second generation developments
 - Reb-A 100
 - Reb-A/Reb-D (specified mixture)
 - Reb-A/Reb-D/Reb-B (specified mixture)

Increasing quality and taste properties

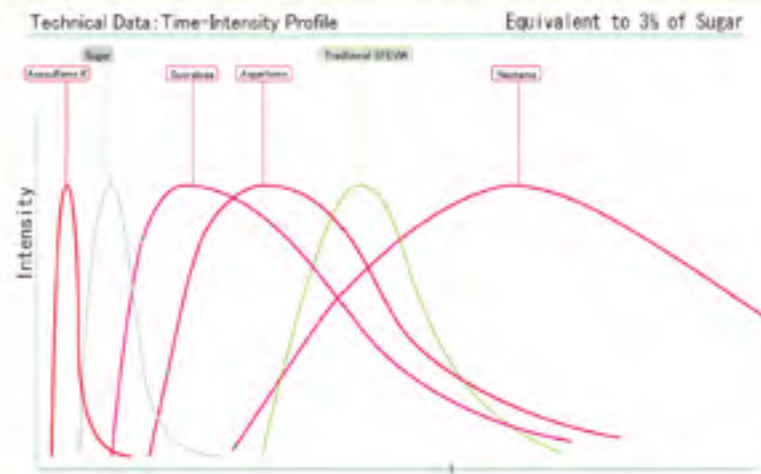
COMPOSITION OF PRODUCTS

- Important for taste perception is the remaining non-specified part of the material
 - Minor steviol-glycoside composition
 - Plant debris
 - Residual solvents
 - Contaminants
- Batch-to-Batch variation in taste!
- Analytical challenge to test composition



SENSORY EVALUATION

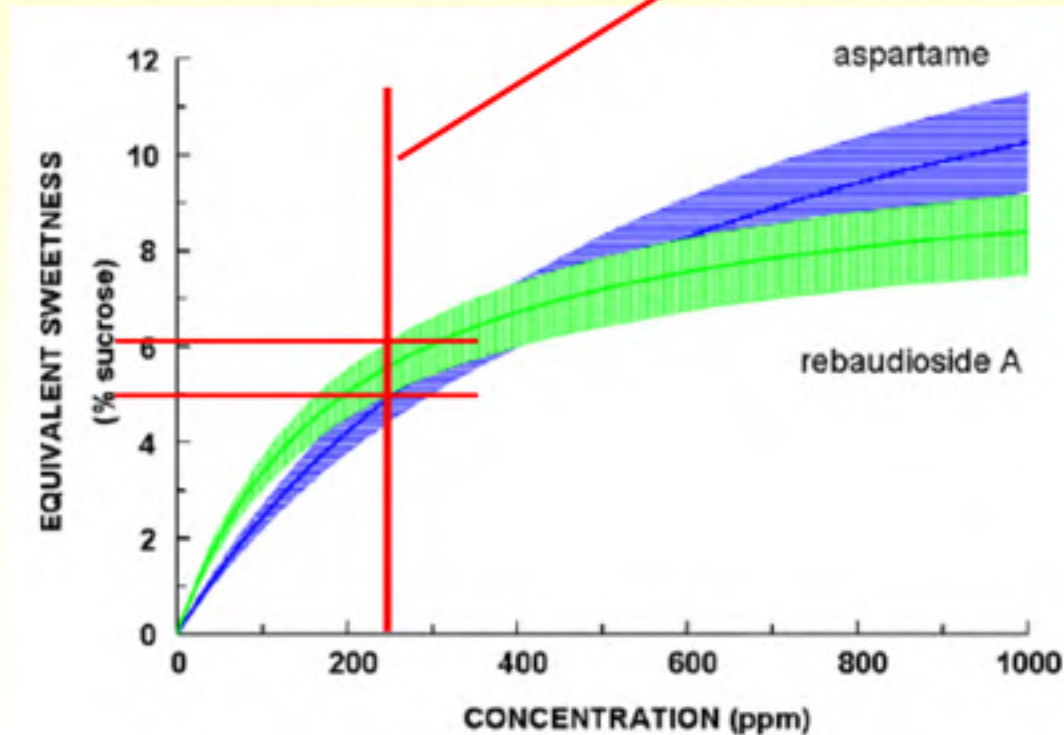
- **Basic taste profile for mixed steviol glycosides compared to sugar.**
 - Steviol glycosides suffer from a slow onset of sweetness.
 - The sweetness is long-lasting, lingering.
 - At high concentrations bitter/medicinal/liquorice notes occur.
 - Steviol glycosides suffer from a ceiling sweetness effect.
 - Individual rebaudiosides contribute differently to the taste.



SENSORY EVALUATION

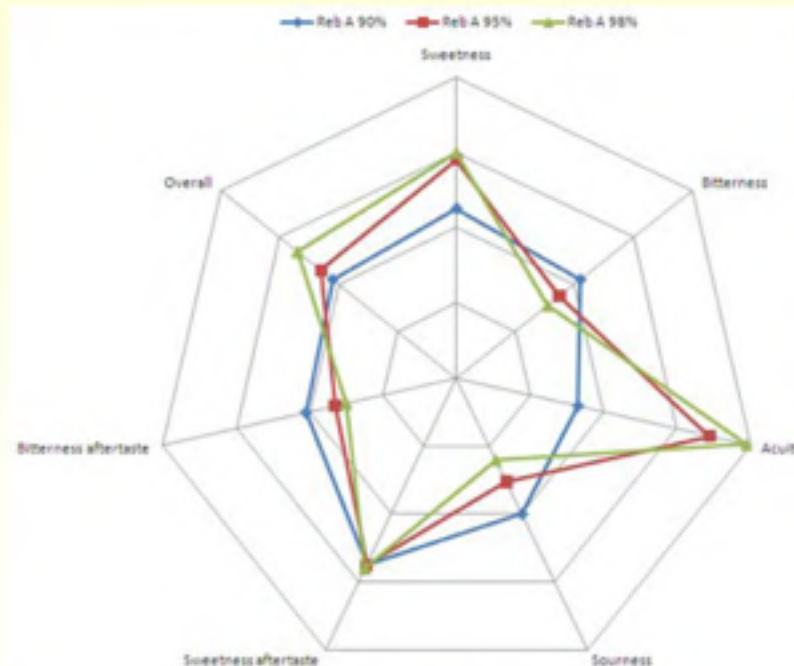
- Ceiling effect of Reb-A

~240 mg Reb-A/l
(beverage limit)



SENSORY EVALUATION

- Purity and sensory profile are correlated

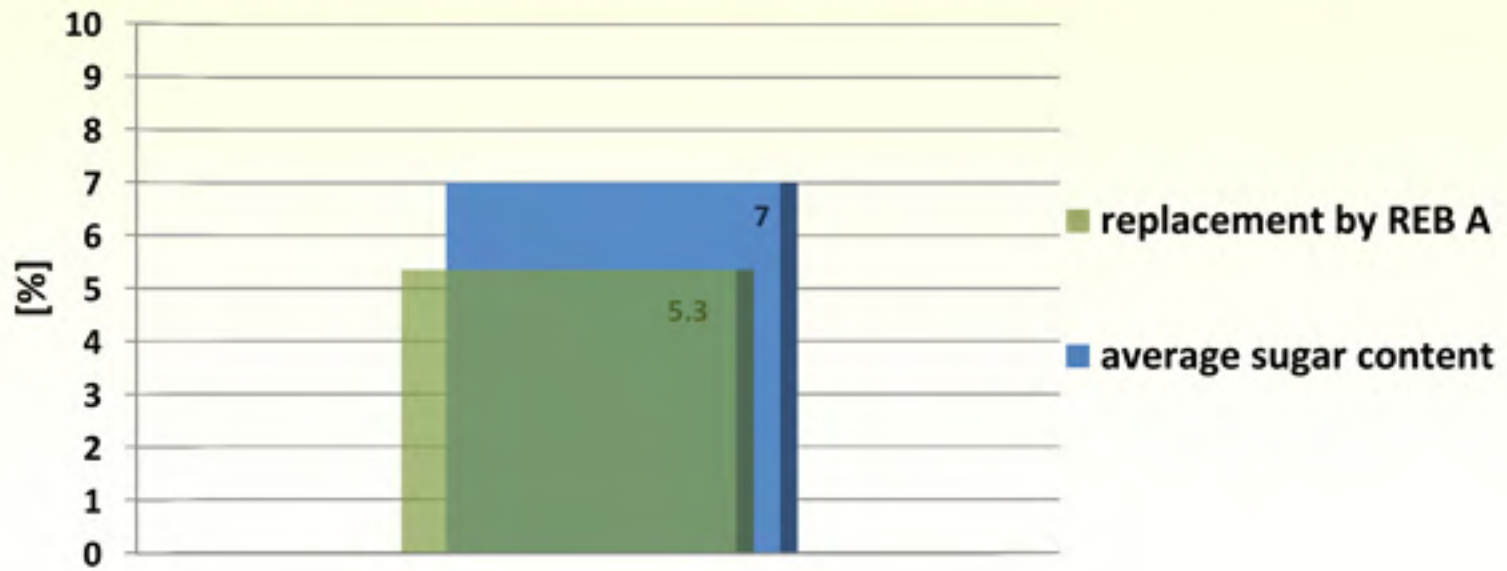


REB A 90 - REB A 95 - REB A 98

PRODUCT DEVELOPMENT

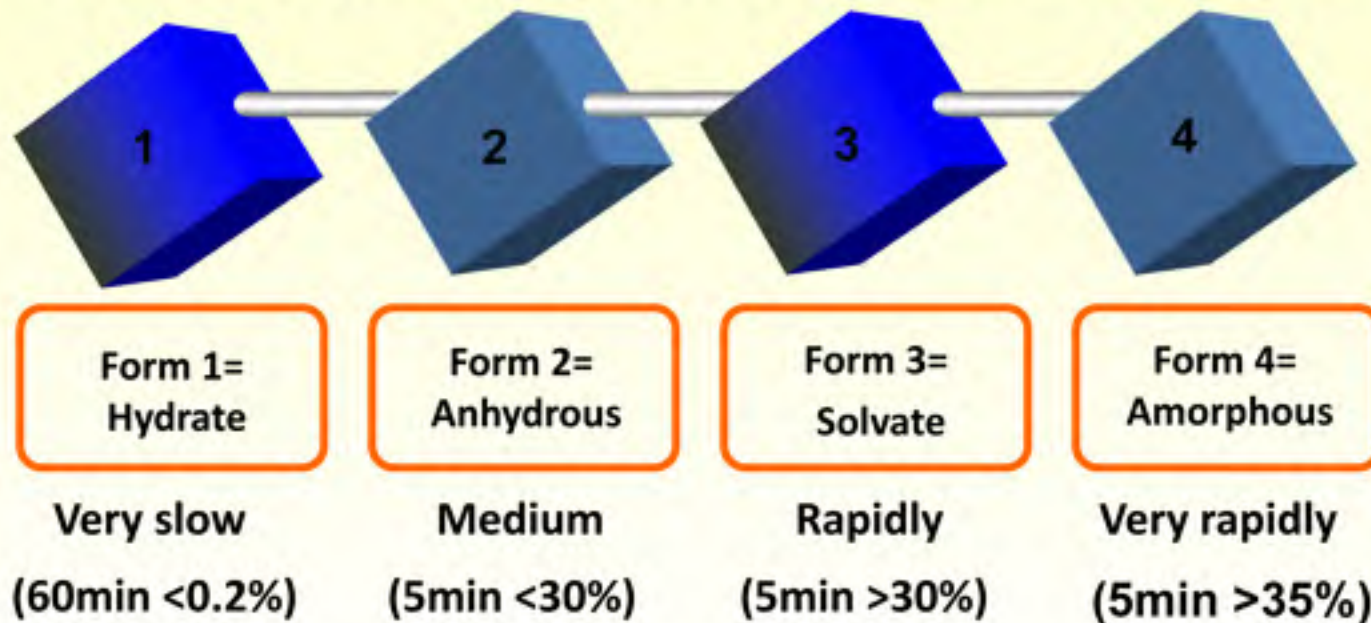
- With the current EU regulations, in most applications full sugar reduction is not possible

sugar replacement in iced tea with rebaudioside A 100



PRODUCT DEVELOPMENT

- Solubility depends on crystal structure



- Steviol glycosides are chemically rather stable

PRODUCT DEVELOPMENT

- Different additives influence the taste:

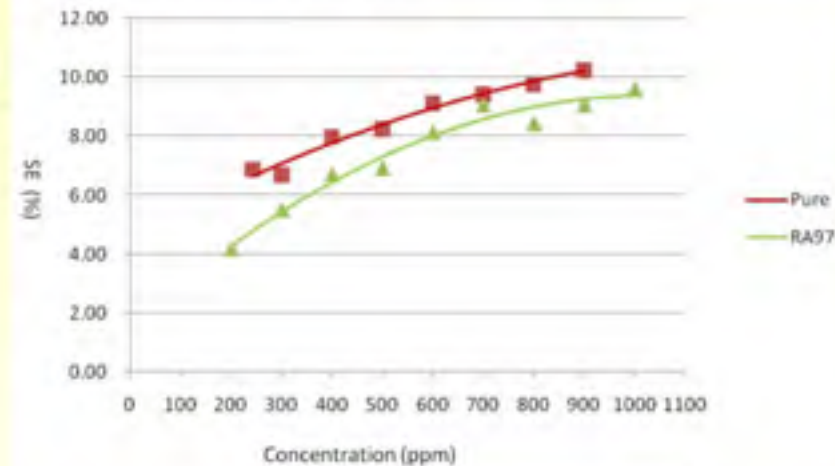
FLAVOURS	
METAL IONS	<i>bitter aftertaste</i>
ACIDIFIERS	<i>lingering</i>
PECTIN, XANTHAN	<i>mouthfeeling</i>
SWEETNESS ENHANCER	<i>sweetness</i>

- Combination with sweeteners or sugars
- Within additive classes further playgrounds are found
(Na^+ , K^+ , Ca^{++} , Mg^{++} - citric, malic, tartaric acid)

PRODUCT DEVELOPMENT

- **REB-A 100 (EPCevia pure)**

- Applications with high SE
- Exceptionally clean taste
- Lingering & Onset to be corrected



- **REB-A/D (EPCevia Dual)**

- Applications areas with fruity taste
- Exceptionally clean taste
- Quicker onset of sweetness
- Lingering to be corrected

