

## Newsletter „Analysis of Agave Syrup“

We kindly want to inform you, that QSI Bremen also is offering analytical services for testing of Agave Syrup (“Agave Nectar”). We have more than 65 years experience in authenticity testing for honey analysis and recently developed methods can also be applied to agave syrup.

### 1) Analyses according to NOM

The basis for the analyses is the official Mexican norm “NOM-003-SAGARPA-2016” which describes specifications of Agave Syrup and required analyses for export from Mexico.

#### Package A: Basic Physico-Chemical-Parameters (as required by NOM)

Parameter	Min	Max	Method and Description	List price
Water content	20 g/100g	28 g/100g	Karl-Fischer-Titration → High water content leads to fermentation of the product	65 €*
pH-value	4,0	6,0	Measurement of pH-value → defined parameter for Agave Syrup	10 €*
Ash content	-	0,60	Combustion of the sample → defined parameter, high values indicates adulteration by material which contains high number of ions (like acid hydrolyzed syrups)	14 €*

#### Package B: Microbiological Analysis (as required by NOM)

The Norm also requires testing for microbiological quality, which indicates good hygiene practice in production.

Parameter	Max	List price
Total count	100 CFE/g	79 €*
Mold	< 10 CFE/g	
Yeast	< 10 CFE/g	
Coliforms	<3 CFE/g	
Salmonella spp	negative in 25 g	
E. Coli	<3 CFE/g	

#### Package C: HPLC-ECD (as required by NOM)

Besides testing for specification nowadays food authenticity is a big issue for vendors, buyers and costumers. Various techniques are available, all are focused on possible adding of foreign syrups to the agave syrup. Especially corn syrup (“HFCS”) is easy available, cheap and in the physico-chemical properties close to agave syrup. A test is also is required by the Norm, which bases mostly on the assumption, that foreign syrups contain residues from the individual production process which can be analytically visualized.

---

\* The prices enclosed are list prices excluding value added tax for single analysis. We offer attractive discounts for higher volumes than single, depending on the parameter and the number of samples we will receive. Please do not hesitate to contact us!

Parameter	Min	Max	Description
Sucrose/Difuctose	0,015 g/100g	1,00 g/100g	defined sucrose content for agave syrup, higher concentration indicates adulteration with e.g. white refined sugar
Glucose	3,00 g/100g	12,0 g/100g	defined glucose content for agave syrup, higher concentration indicates adulteration with e.g. Glucose syrup from corn
Fructose	60 g/100g	75 g/100g	major component of agave syrup, deviation shows either dilution by other sugars or adding of high fructose corn syrup
Fructanes from Agave - full hydrolyzed syrup - partially hydrolyzed syrup	positive 12 g/100g	5 g/100g -	Agave plants contain sugars in the form of Polysaccharides (mainly Fructose "Inulin" or "Fructans", less Glucose). By hydrolysing the Polysaccharide Fructose and Glucose is generated. The hydrolysis process is never complete, which leads to natural traces of (partially hydrolyzed) fructans in the product.
Mannitol	0,005 g/100g	1 g/100g	small mannitol content is natural for agave syrup, high concentration indicates adulteration with e.g. artificial sweeteners
other sugars from Agave	-	0,1 g/100g	as the agave polysaccharide contains only Fructose and Glucose any other type of sugar indicates adulteration
foreign sugars	not detectable		
Hydroxymethylfurfurale	-	7000 mg/kg	indicator for excessive heating of the product, raises with temperature and heating time
List price: 185 €*			

This test is in implementation phase in QSI and can be offered in June 2017. It will be fully accredited according to ISO 17025 after method validation.

## 2) Additional recommended Analysis

As we know from our expert knowledge regarding honey adulteration, today sugar syrups are produced tailor made and nearly free of any marker substances or traces from the production or cleaning process. For this reason we developed further methods which are more sophisticated in detecting possible adulteration which cannot be seen via HPLC-ECD in the NOM.

### 2.1 Analysis by LC-IRMS

In this analysis the main 3 sugar fractions of the Agave Syrup (Fructose, Glucose, Fructanes) are separated and the  $^{13}\text{C}$ -isotopic value is measured per fraction. The  $^{13}\text{C}$ -isotope value depends on the photosynthesis pathway of the plant source of the syrup. The sugar fractions are expected to have the same  $^{13}\text{C}$ -value as the original Fructans. Adding syrups with different isotope values can be seen in a shift of fractions and difference between the fractions will increase. Comparable methods are used in honey since 1998.

Following acceptance values were figured out by experiments:

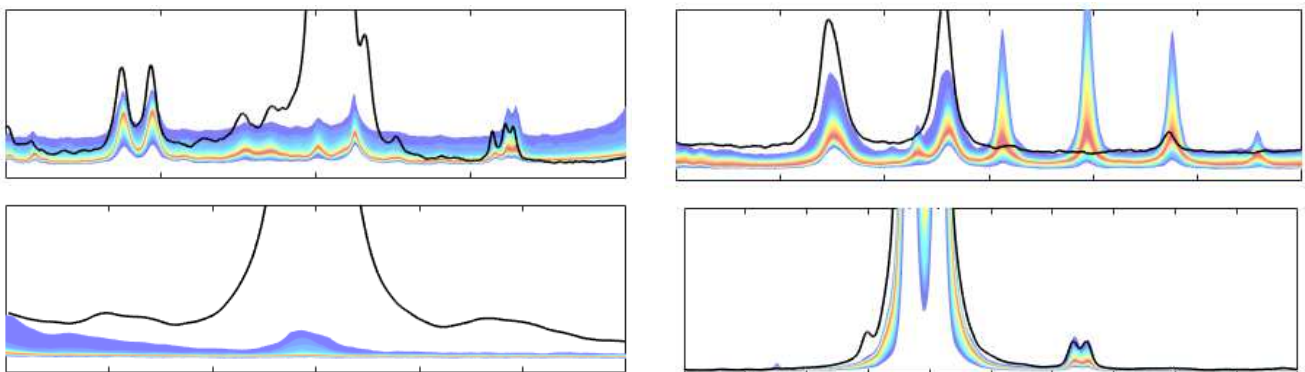
$\delta^{13}\text{C}$ total sample	-10,8 to -13,5 ‰	List price: 90 €*
$\delta^{13}\text{C}$ Fructose and d $^{13}\text{C}$ Glucose	-10,8 to -13,5 ‰	
Difference $\delta^{13}\text{C}$ Fructose – $\delta^{13}\text{C}$ Glucose:	+0,8 and -1,0 ‰	

*\* The prices enclosed are list prices excluding value added tax for single analysis. We offer attractive discounts for higher volumes than single, depending on the parameter and the number of samples we will receive. Please do not hesitate to contact us!*

## 2.2 Analysis by NMR

This analysis is the most powerful tool in the field of adulteration analysis because any organic substance shows a typical signal. The signal of agave syrup leads to a fingerprint with a large amount of signals from all components like sugars, amino acids, organic acids, phenolic compounds. Any deviation from a "normal" spectrum is noticeable. Due to longtime experience (in this relatively new technique of food analysis) of more than 3 years and full accreditation by the German Accreditation Body since May 2016 for all types of food, we are able to deliver reliable results.

To illustrate the power of this analysis find below some examples of agave syrups, which deviate from the majority of measured samples in our database. The colored area is the range of authentic agave syrup. Any major deviation from this zone indicates a difference to the database. The black spectrum is an example for an adulterated sample, four selected chemical shift regions are shown here:



The database currently consists of more than 200 samples, which have been verified for authenticity.

The price for this analysis will be 150 €\* and can be offered to you starting from 24<sup>th</sup> April 2017.

**We are pleased to make you an individual offer meeting your demands.**

**Please feel free to contact us!**

---

*\* The prices enclosed are list prices excluding value added tax for single analysis. We offer attractive discounts for higher volumes than single, depending on the parameter and the number of samples we will receive. Please do not hesitate to contact us!*