



NMR Based Fruit Juice Quality Control

- Bruker JuiceScreener™ for SGF Profiling™



The JuiceScreener combined with its SGF Profiling technique can deliver huge amounts of information derived from one single experiment, instead of multiple individual analysis steps. This provides higher throughput and reliability than conventional techniques leading to a significant reduction of cost per sample. This enables up to 5 times more sample investigations with no change in budget, resulting in an improved and more comprehensive quality control screening.

Features

- Fully automated push-button NMR solution including evaluation and reporting
- Simultaneous absolute quantification of all relevant organic ingredients for juice assessment
- High throughput with minimal sample preparation
- Reduced cost per sample
- Reliable screening method providing targeted and non-targeted multi-marker analyses
- Enables the detection of unexpected fraud
- Screening is based on an extensive NMR spectroscopic database of more than 3000 reference juices, obtained from production sites all over the world
- Complex statistical models allow the analysis of: origin authenticity, species purity, fruit content, false labeling, production process control and sample similarity

Push-Button Routine

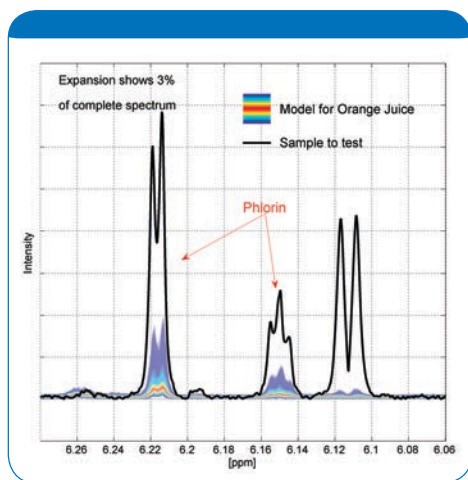
SGF Profiling is a fully automated push-button routine that needs no interaction by the operator. From sample bar code registration, preparation and handling, to data acquisition and statistical evaluation, all steps are under the control of SampleTrack™, Bruker's laboratory information system.

Targeted and Non-Targeted Multi Marker Analysis

SGF Profiling delivers a standard targeted multi-marker analysis incorporating absolute quantification of:

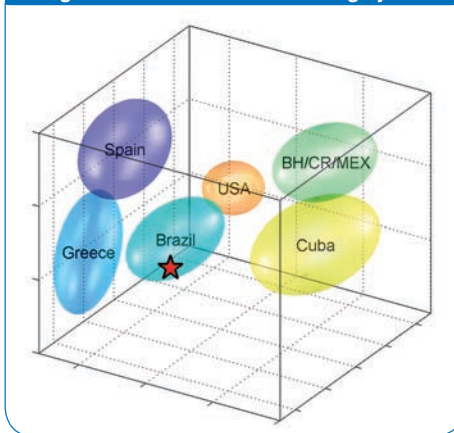
- Sugars (glucose, fructose, sucrose)
- Main fruit acids (citric acid, malic acid, isocitric acid, quinic acid)
- Perishable indicators (ethanol, fumaric acid, lactate, HMF)
- Process control parameters (galacturonic acid, phlorin)

In addition the technique allows a non-targeted multi marker approach that is based on the simultaneous assessment of concentration deviations of hundreds of compounds. In contrast to targeted standard analytical routines, it can detect the appearance of unexpected ingredients to enable the detection of unknown fraud.



Verification of a sample (black trace): unusual high amount of phlorin indicates the usage of orange peel. The model set is drawn as colored quantile-plot.

Origin authentication of orange juice



Spectroscopic Database

The screening is based on an extensive spectroscopic database that includes thousands of NMR spectra from mainly authentic juices. Currently the data base includes about 40 different fruit types from more than 50 production sites worldwide. In addition, the database also provides access to over hundreds of small molecule compounds for further analysis of unknown ingredients.



Routine quality control using the JuiceScreener

SGF Profiling

Quantification

SGF Profiling delivers the absolute concentrations of more than 25 ingredients that are critical for juice assessment. The values are compared to reference standards and deviations indicate characteristic quality issues, such as the addition of sugar.

Sample Classification

Sample classification helps to further differentiate between similar fruit types such as orange, blood-orange and mandarin. More specialized models can even distinguish between direct juice and rediluted juice, and enable to origin determination.

Verification

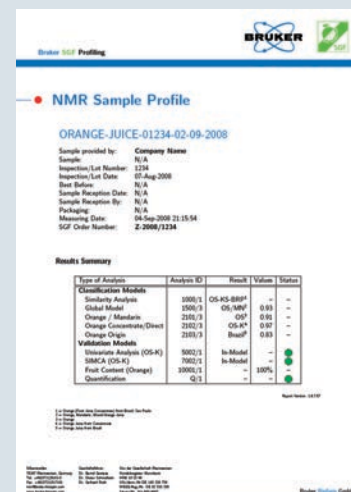
After sample classification the uni- and multi-variate verification delivers even more information, such as unexpected deviation from the reference group.

Regression Analyses

The regression analysis, based on training data sets, evaluates additional parameters such as titratable acids.

Estimation of Fruit Content

Included in the final report is also an estimation of the fruit content.



SGF Profiling archives all results in the form of a standardized sample quality report