

Analysis Report Honey-Profiling™

Sample ID: PI2011230364

Information/Declaration provided by customer:

Type of Sample: Honey
 Type of Honey: Blossom
 Botanical Variety: undefined
 Geographical Origin: India

Disclaimer: this information will affect the applicability and validity of analyses and results.

Measuring Date: 26-Nov-2020 16:48:11
 Reporting Date: 27-Nov-2020 07:39:39, 10 pages, Version 2.0.5

Results Summary

Type of Analysis	Result	Status
Analysis of declared information		
Origin India	Consistent	●
Detection of Sugar Syrups	No	●
Codex Alimentarius and EU-Directive 2001/110/EC	Compliant	●
Quantitative Analysis	Interpretation required	●
Non-Targeted Analysis		
Univariate Verification	Not Consistent	●
Multivariate Verification	Consistent	●

The data analysis is performed at Bruker BioSpin GmbH (Rheinstetten, Germany) according to testing method AA-72-03-05 (Honey-Profiling 2.0.5), released on 18-Sep-2020 (DIN EN ISO/IEC 17025:2005 Accreditation Certificate D-PL-19229-01-00). All results solely refer to the tested sample as provided by the customer.

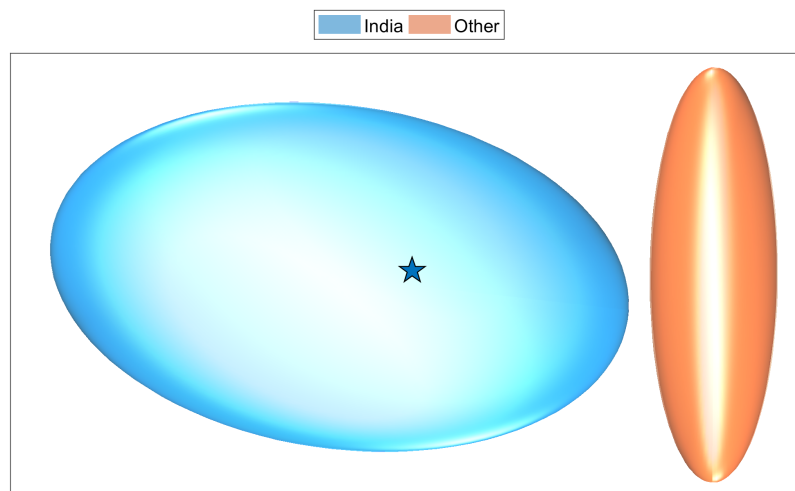
Analysis of declared Information

Statistical Model: Origin India

(Analysis-ID: HO-1111-01/0025)

This model is based on 15946 samples, thereof 216 samples of reference group *India*.

Result: Consistent with declared country *India*. The probability of consistency is 100.0%.



Detection of Sugar Syrups

(Analysis-ID: HO-2000-02/0167)

Following tests have been applied in order to detect sugar syrups:

Nr	Type	Description	Result	Value	Limit	Out
1	Intensity/Ratio	3.263 (absolute quantitative)	passed	641	<1279	-
2	Intensity/Ratio	5.077 (absolute quantitative)	passed	203	>39	-
3	Intensity/Ratio	3.636 (absolute quantitative)	passed	2629	<4674	-
4	Intensity/Ratio	4.262 (absolute quantitative)	passed	103	>29	-
5	Intensity/Ratio	4.195 (absolute quantitative)	passed	150	<1200	-
6	Intensity/Ratio	5.271 (absolute quantitative)	passed	32.8	>5.6	-
7	Intensity/Ratio	4.280 (absolute quantitative)	passed	60	>20	-
8	Intensity/Ratio	5.113/(3.270-3.310)	passed	0.005	<0.036	-
9	Intensity/Ratio	4.496/(3.270-3.310)	passed	0.042	>0.012	-
10	Intensity/Ratio	5.334/(5.270-5.300)	passed	0.08	<0.13	-
11	Intensity/Ratio	3.546/(5.270-5.300)	passed	0.98	>0.62	-
12	Intensity/Ratio	3.740/(5.270-5.300)	passed	2.8	>1.2	-
13	Intensity/Ratio	3.857/(5.200-5.260)	passed	0.0144	>0.0037	-
14	Intensity/Ratio	4.150 (absolute quantitative)	passed	337	>115	-
15	Intensity/Ratio	5.181 (absolute quantitative)	passed	43	>24	-
16	Intensity/Ratio	4.055/(5.030-5.070)	passed	3	<46	-
17	Intensity/Ratio	1.809/(5.030-5.070)	passed	0.3	<1.0	-
18	Intensity/Ratio	3.708/(5.030-5.070)	passed	291	<872	-
19	Intensity/Ratio	6.765/(5.250-5.270)	passed	0.007	<0.046	-
20	Intensity/Ratio	2.200/(5.305-5.315)	passed	0.125	>0.019	-
21	Intensity/Ratio	3.326/(3.270-3.310)	passed	0.142	>0.034	-
22	Intensity/Ratio	4.037/(3.270-3.310)	passed	1.30	>0.73	-
23	Intensity/Ratio	4.006/(5.270-5.300)	passed	0.97	>0.70	-
24	Intensity/Ratio	3.564/(5.270-5.300)	passed	18.9	>10.0	-
25	Intensity/Ratio	5.388/(5.370-5.400)	passed	0.20	>0.13	-
26	Intensity/Ratio	3.524/(4.075-4.110)	passed	0.063	<0.070	-
27	Intensity/Ratio	3.182/(4.075-4.110)	passed	0.0020	<0.0045	-
28	Intensity/Ratio	3.785/(4.075-4.110)	passed	0.060	>0.036	-
29	Intensity/Ratio	3.857/(4.075-4.110)	passed	0.0086	>0.0021	-
30	Intensity/Ratio	4.267/(4.970-4.990)	passed	2.7	<4.7	-
31	Intensity/Ratio	4.276/(4.970-4.990)	passed	0.5	<5.4	-
32	Intensity/Ratio	4.204/(5.090-5.110)	passed	0.9	<5.7	-
33	Intensity/Ratio	4.249 (absolute quantitative)	passed	118	<380	-
34	Intensity/Ratio	4.460/(5.030-5.070)	passed	0.06	<0.77	-
35	Intensity/Ratio	3.524/(5.250-5.270)	passed	36	<97	-
36	Intensity/Ratio	5.113/(5.250-5.270)	passed	0.03	<0.19	-
37	Intensity/Ratio	5.091/(5.090-5.110)	passed	0.37	<0.48	-
49	Quantification	Fructose/Glucose	passed	1.23	>0.85 and <1.95	-
50	Quantification	Fructose+Glucose	passed	71.7	>40	-
51	Quantification	Turanose	passed	1.73	>0.3	-
52	Quantification	DHA(D) and Mannose(M)	passed	1 / 0.000	D<30 or M<0.05	-

Nr	Type	Description	Result	Value	Limit	Out
53	Quantification	Sucrose	passed	0.1	<15	-

Result: There are no indications for the presence of sugar syrups.

Codex Alimentarius and EU-Directive 2001/110/EC:

Following parameters are required according to Codex Alimentarius and EU-Directive 2001/110/EC. The concentrations are obtained by direct quantification. Parameters labelled with * are calculated parameters.

Compound	Value	Unit	LOQ	Official Reference		
				min	max	Flag
glucose + fructose *	71.7	g/100g	20.0	60	-	●
sucrose	<LOQ	g/100g	0.5	-	15	●
5-hydroxymethylfurfural (HMF)	18	mg/kg	5	-	80	●

Following flags are used according to Codex Alimentarius and EU-Directive 2001/110/EC:



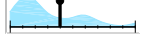













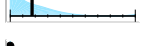



Compound	Flag	Concentration	Declaration	Interpretation
glucose + fructose	●	< 45 g/100g	All	Not compliant
		< 60 g/100g	Blossom	Not compliant for blossom honey
	●	≥ 60 g/100g	All	Compliant
	●	≥ 45 g/100g	Honeydew	Compliant for honeydew honey
sucrose	●	≥ 45 g/100g, < 60 g/100g	Unknown	Compliant for honeydew honey and blends of honeydew honey with blossom honey. Not compliant for blossom honey.
	●	> 15 g/100g	All	Not compliant
		10-15 g/100g	Acacia, Eucalyptus	Not compliant for false acacia (<i>Robinia pseudoacacia</i>), and red gum (<i>Eucalyptus camadulensis</i>)
	●	≤ 5 g/100g ≤ 10 g/100g	All Acacia, Eucalyptus	Compliant Compliant for false acacia (<i>Robinia pseudoacacia</i>), and red gum (<i>Eucalyptus camadulensis</i>)
HMF	●	≤ 15 g/100g 5-10 g/100g	Lavender All, except Acacia, Eucalyptus, Lavender	Compliant for <i>Lavandula</i> spp. If ≤ 15g/100g: compliant for lavender (<i>Lavandula</i> spp.) and borage (<i>Borago officinalis</i>). If ≤ 10g/100g: compliant for false acacia (<i>Robinia pseudoacacia</i>), alfalfa (<i>Medicago sativa</i>), Menzies Banksia (<i>Banksia menziesii</i>), French honeysuckle (<i>Hedysarum</i>), red gum (<i>Eucalyptus camadulensis</i>), leatherwood (<i>Eucryphia lucida</i> , <i>Eucryphia milliganii</i>) and <i>Citrus</i> spp
	●	> 80 mg/kg	All, except Industrial honey	Not compliant, except for baker's honey
HMF	●	≤ 40 mg/kg	All	Compliant
		> 80 mg/kg	Industrial honey	Compliant for baker's honey
	●	40-80 mg/kg	All	Not compliant, except for baker's honey and honeys of declared origin from regions with tropical climate and blends of these honeys

Quantitative Analysis

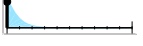




(Analysis-ID: HO-Q/1363)

In the following table the results of the quantitative analysis are given. The concentrations are obtained by direct quantification. Parameters labelled with * are calculated parameters. The reference range is derived from the *India Blossom* samples in the Honey-Profiling Database. The reference range bases on 105 samples.

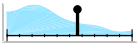

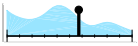



Sugars:

Compound	Value	Unit	LOQ	Reference Range	Flag
glucose + fructose *	71.7	g/100g	20.0	64.7  80.1	
fructose / glucose *	1.23	-	-	0.95  1.67	
fructose	39.6	g/100g	10.0	34.2  44.1	
glucose	32.1	g/100g	10.0	24.8  40.0	
sucrose	<LOQ	g/100g	0.5	<0.5 g/100g in reference dataset	
turanose	1.7	g/100g	0.2	0.3  2.3	
maltose	1.9	g/100g	0.5	<0.5  2.1	
melezitose	<LOQ	g/100g	1.0	<1.0 g/100g in reference dataset	
maltotriose	<LOQ	g/100g	1.0	<1.0 g/100g in reference dataset	
gentiobiose	<LOQ	g/100g	0.3	<0.3 g/100g in reference dataset	
raffinose	0.1	g/100g	0.1	0.1  0.3	
mannose	<LOQ	g/100g	0.05	<0.05  0.06	

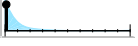
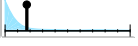
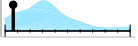

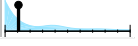
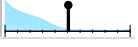
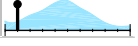


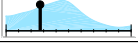
Acids:

Compound	Value	Unit	LOQ	Reference Range	Flag
citric acid	<LOQ	mg/kg	50	<50  370	
malic acid	<LOQ	mg/kg	100	<100  114	
quinic acid	<LOQ	mg/kg	300	<300 mg/kg in reference dataset	


Amino Acids:

Compound	Value	Unit	LOQ	Reference Range	Flag
alanine	16	mg/kg	5	<5  24	●
aspartic acid	<LOQ	mg/kg	150	<150 mg/kg in reference dataset	●
glutamine	<LOQ	mg/kg	200	<200 mg/kg in reference dataset	●
leucine	<LOQ	mg/kg	40	<40  132	●
proline	612	mg/kg	150	237  891	●
valine	10	mg/kg	10	<10  13	●
tyrosine	153	mg/kg	50	<50  150	●
phenylalanine	266	mg/kg	100	<100  763	●

Indicators for Fermentation, Processing and Origin:

Compound	Value	Unit	LOQ	Reference Range	Flag
2,3-butanediol	21	mg/kg	20	<20  89	●
5-hydroxymethylfurfural (HMF)	18	mg/kg	5	<5  81	●
acetic acid	16	mg/kg	10	11  84	●
acetoin	25	mg/kg	20	<20  166	●
ethanol	44	mg/kg	5	<5  365	●
lactic acid	82	mg/kg	10	<10  153	●
formic acid	40	mg/kg	5	30  132	●
fumaric acid	<LOQ	mg/kg	5	<5  7	●
pyruvic acid	19	mg/kg	10	<10  28	●
succinic acid	16	mg/kg	5	<5  45	●

Markers:

Compound	Value	Unit	LOQ	Reference Range	Flag
3-phenyllactic acid	<LOQ	mg/kg	300	<300 mg/kg in reference dataset	●
dihydroxyacetone (DHA)	<LOQ	mg/kg	20	<20  22	●
methylglyoxal (MGO)	<LOQ	mg/kg	30	<30 mg/kg in reference dataset	●
kynurenic acid	<LOQ	mg/kg	60	<60 mg/kg in reference dataset	●
shikimic acid	<LOQ	mg/kg	80	<80 mg/kg in reference dataset	●

Guidelines for Interpretation

- Mannose is a mono saccharide not typical for honey but that is regularly found in industrial syrups. In rare cases, however, the presence of mannose cannot be excluded for certain geographic and/or botanical origins, e.g. for honey containing also honeydew. For blossom honey, a concentration of mannose exceeding 0.05 g/100g could indicate addition of syrup or types of industrial processing which are not suitable for honey. Expert interpretation is suggested in case the presence of mannose.
- Dihydroxyacetone and/or methylglyoxal are only typical for Manuka honeys from Ozeania. Occurrence exceeding 30 mg/kg in other types of honey is not typical and could indicate addition of syrup or types of industrial processing which are not suitable for honey; expert interpretation is needed in such cases.
- For monofloral Manuka honey, the concentration of 3-phenyllactic acid should exceed 400 mg/kg.
- Low concentration values of proline (less than 180 mg/kg) could indicate addition of syrup or usage of unripe honey.
- Concentration of ethanol exceeding 400 mg/kg indicates fermentation.
- The presence of kynurenic acid is common for chestnut honey.
- The presence of gentiobiose is common for Linden Tree honey.
- The presence of shikimic acid is common for honeydew.
- The presence of quinic acid is common for honeydew.

Non-Targeted Verification Analysis

Univariate Verification

(Analysis-ID: HO-2113-01/0031)

Applied Model: India Blossom

Result: Deviating signals were found at following chemical shifts:

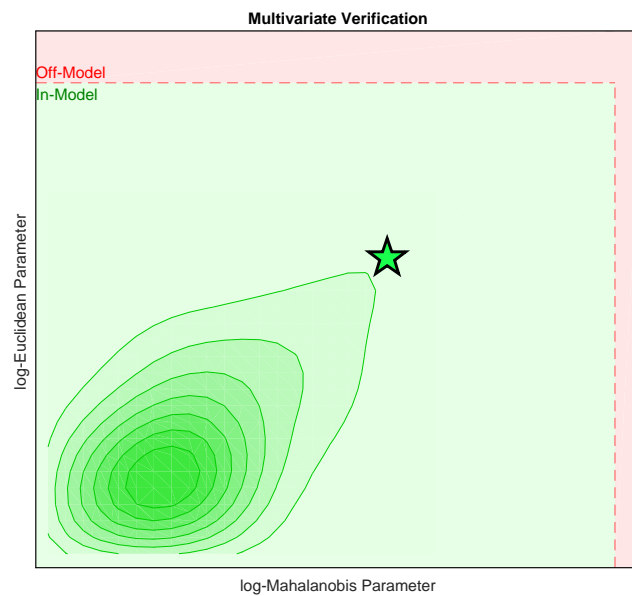
2.133^{high} 2.524^{high} 5.788^{high}

Multivariate Verification

(Analysis-ID: HO-2113-01/0031)

Applied Model: India Blossom

Result: No deviation was detected in multivariate verification (In-Model).



General Remarks

Analysis of declared Information

The test applied is a classification analysis with the aim to check the consistency of the declared meta-information of the sample (geographical origin or botanical variety). The consistency with a group is expressed as posterior probability in the range from 0% to 100%. A posterior probability exceeding 50% is being regarded as consistent with the respective group. The underlying statistical models are based on Linear Discriminant Analysis for dimension reduction followed by a Linear (or Quadratic) Discriminant Analysis for final classification.

Within the discrimination space figure, the ellipsoids are representing the modeling samples and the star represents the actual sample under investigation.

Expert interpretation is necessary before deducing any conclusions.

Quantitative Analysis

Quantitative values are compared to the reference honey database (visualised by distribution). Deviations to the reference distributions do not necessarily indicate an adulteration. Fermentation or specific botanical varieties can also create deviations. Therefore, expert interpretation is necessary before deducing any conclusions.

Non-Targeted Verification Analysis

Verification models are non-targeted analyses comparing the whole NMR-Profile of a specific sample with one corresponding group of reference spectra (database). All spectra data points are taken into account irrespective of whether the signals are caused by already identified molecules or not.

There are different possible reasons for any deviation from the group of reference spectra. If there are detected deviations, this does not automatically mean, that the sample is adulterated. Expert interpretation is necessary before deducing any conclusions.

In the univariate analysis, the NMR spectrum is checked for any unusual low or high signal intensities for a given sample, while taking into account the natural variability of a respective reference group. Multivariate models also take into account the relation between different signals in the NMR spectrum.