

# Honey fraud



One third of the international honey trade is not produced by bees from flowers

...but in factories

**That is a food crime**



# Honey fraud in major importers

Evidence and only solution

Federico Berrón



# Country profiles for honey supply and consumption

## 1. **Production < total consumption:**

a) Strong oversight as Germany with legislation, consumer tests and strong labs.

b) With **no oversight** as Japan and UK only Codex legislation, no surveillance, weak and expensive laboratories.

2. **Production = table consumption but < total consumption:** USA, Spain, Australia, France. Little or spurious oversight. Knowledgeable consumer market gets authentic honey, cheap markets and industry get honey fraud

3. **Production > total consumption:** México, Argentina. Strong oversight as Germany is main market

4. **Production, consumption & exports: No Oversight,** China, Vietnam, India, Thailand

# Food crime modality 1

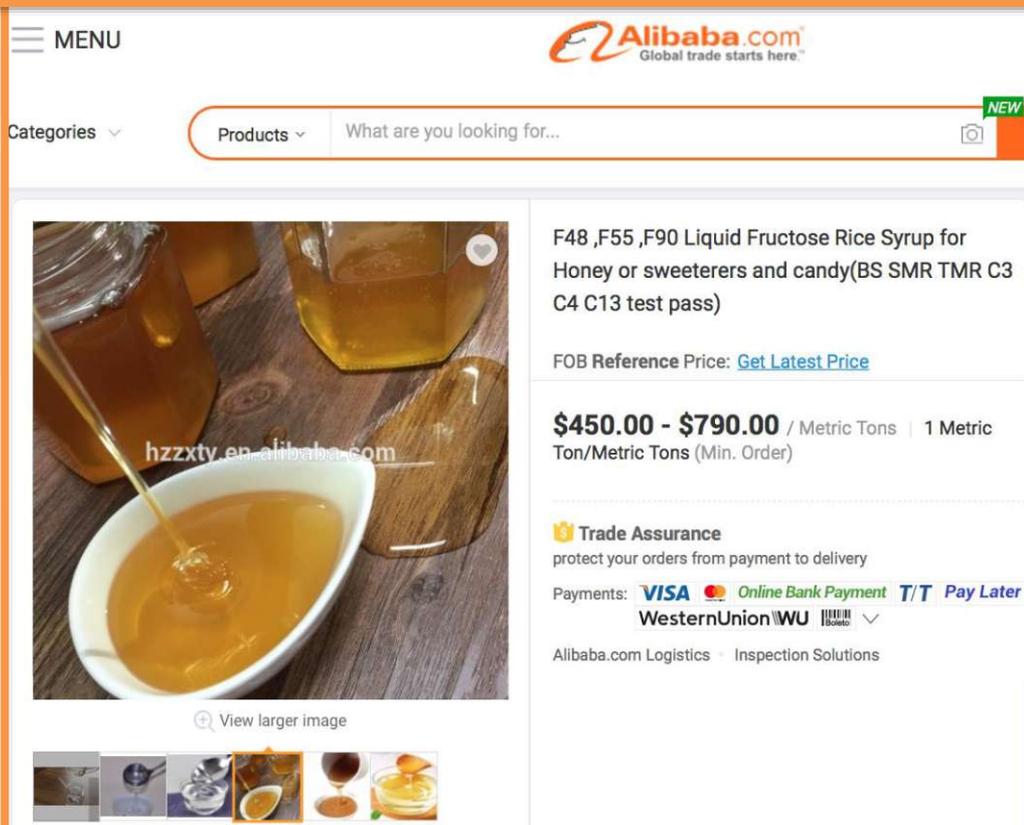
## 1. LC IRMS C3/C4 fake passport or cover up analysis

Bremen German labs neglect to inform the failures of the analysis: fails to detect up to 50% beet invert syrup addition and 100% failure for enzymatic hydrolysis syrups of C3 plants like Rice, Beet, Cassava, Potato, Rice and Wheat. C3 plants have isotopic values in the range of honey.

## 2. Detectable with general tests like NMR, HRMS, IR and psicose

Nil or low levels of diastase, invertase enzymes and proline.

## 3. The UK is No. 1 in this modality



The screenshot shows an Alibaba.com product listing for 'F48 ,F55 ,F90 Liquid Fructose Rice Syrup for Honey or sweeteners and candy(BS SMR TMR C3 C4 C13 test pass)'. The product is priced at \$450.00 - \$790.00 per metric ton. The listing includes a main image of the syrup being poured into a white bowl, a 'View larger image' link, and a row of smaller thumbnail images. The page also features a 'MENU' button, a search bar with the text 'What are you looking for...', and various payment and trade assurance options.

MENU

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F48 ,F55 ,F90 Liquid Fructose Rice Syrup for Honey or sweeteners and candy(BS SMR TMR C3 C4 C13 test pass)

FOB Reference Price: [Get Latest Price](#)

**\$450.00 - \$790.00** / Metric Tons | 1 Metric Ton/Metric Tons (Min. Order)

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## Food crime modality 2

1. Nectar not ripened by bees wing fanning nectar. Honey not capped in the hive.

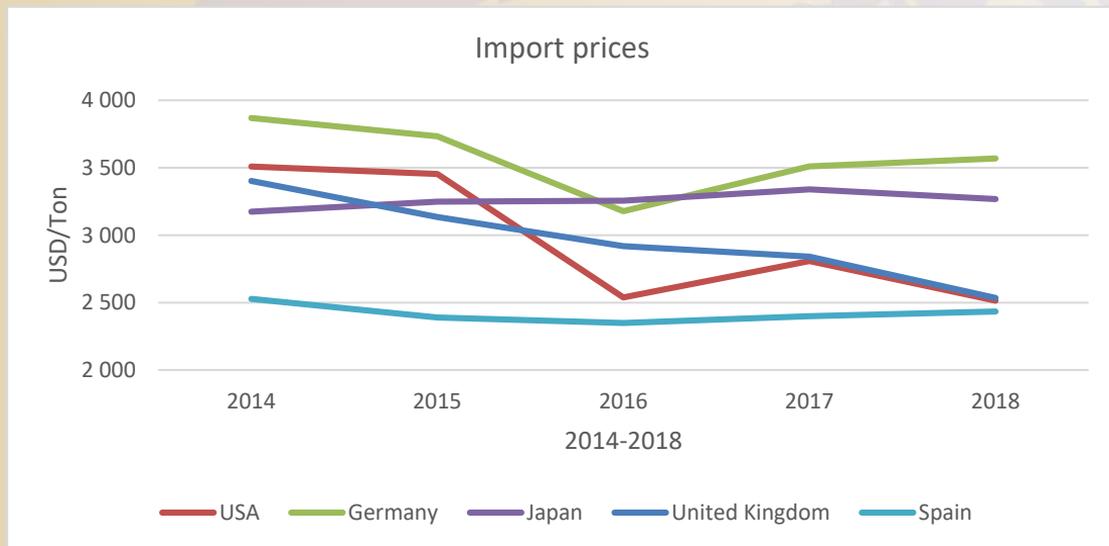
Every day beekeeper retires the incoming nectar with up to 40% water content.

It will be taken to plants for vacuum dehydration. This practice doubles capacity.

2. Detectable with glycerine and ethanol tests



# The main indicator of honey fraud: price





# United Kingdom Analysis

BROAD SPECTRUM ANALYSIS		Unit	Values Typical for Honey	SAMPLES											% faults of total
Analysis category	Analysis			(1) The Coop clear Honey	(2) ASDA Set pure Honey	(3) Rowse Honey	(4) ALDI Grandessa Honey Squeezy Clear	(5) Morrisons Pure clear	(6) Tesco Set Honey	(7) Morrisons Savers Clear Honey	(8) LIDL Hayre clear Honey	(9) Essential Waitrose pure clear	(10) Sweet & Mild by Sainsburys	(11) Poundland Clear Blossom Honey	
Biological Properties:	HMF	mg/kg	max 40	34.4	29.6	41.4	34.2	44.1	50.8	26.2	56.4	58.2	39.8	25.6	45.5%
	Diastase	DZ	min 8	3.1	n.d.	6.0	2.5	3.3	2.7	5	6.6	9.6	4.6	5.7	90.9%
	Saccharase	U/kg	min >20	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100.0%
Composition of Honey and Physical Characteristics	Moisture	%	max 20.0%	17.0	18.8	18.1	18.5	18.4	18.7	18.1	19.1	17.9	18.5	18.4	0%
	Electrical Conductivity	mS/cm	0.09 - 1.99	0.13	0.15	0.12	0.12	0.111	0.13	0.06	0.13	0.25	0.1	0.09	0%
	pH		3.4 - 6.1	4.4	4.41	3.94	4.34	4.3	4.15	4.25	4.13	4.06	4.03	4.43	0%
	F/G	ratio	1.0 - 1.7	1	1.03	1.02	1.05	1.08	0.97	1.05	1.01	1.06	1.02	1.07	9.1%
	Fructose	g/100g	27.25 - 44.26	39.2	40.1	38.8	38.2	39.6	35.4	39.2	37.1	37.7	36.4	39.9	0.0%
Glucose	g/100g	21.78 - 40.75	39.3	38.8	38	36.3	36.7	36.3	37.3	36.8	35.5	35.8	37.2	0.0%	
Bee Activity Markers:	Proline	mg/kg	min 200	64	89	105	52	62	47	140	50	136	60	21	100.0%
Geo-Botanical Markers:	Pollen: botanical origin	Region	EU and non EU	Vietnam/c China	Asia	Asia/ South America	Asia	Asia	Asia	Asia	maybe China, Asia	Asia and South America	China, Central South America	Asia	100.0%
Generic Fraud Markers:	ROSC 776/12 C4 Sugars (SCIRA & ISCPA)	Pos/Neg % C4 sugar	negative 7.00%	Negative 0.031	Negative 0	Negative 0.3	Negative 0	Negative 0.1	Negative 0	Negative 5.3	Negative 1	Negative 1.3	Negative 0	Negative 3.5	0%
	EA/LC-IRMS C3/C4	dC13/C12	<2.5 dC13/C12	Negative 0.15%	Negative 0.42%	Negative 0.17%	Negative 0.39%	Negative 0.26%	Negative 0.32%	Negative 0.13%	Negative 0.06%	Negative 0.05%	Negative 0.19%	Negative 0.41%	100.0%
	Psicose	%	n.d.	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Negative	Positive	Positive
	NMR	Adulteration	negative	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Negative	Positive	Positive
Targeted Fraud Markers:	Color E150c	mg/kg	n.d.	366	n.d.	125	n.d.	n.d.	n.d.	154	n.d.	n.d.	n.d.	32	36.4%
	Color E150d	mg/kg	n.d.	314	n.d.	109	n.d.	n.d.	n.d.	144	n.d.	n.d.	n.d.	20	36.4%
	Honey Foreign alpha-amylase	Positive/Negative	negative	Positive	Positive	Positive	Negative	Positive	Negative	Positive	Positive	Negative	Negative	Negative	54.5%
	RSM- Rice Syrup Marker.- Glucosylisomaltol	mg/kg	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	0%
	B-fructofuranosidase.- Marker for some invert syrups	Positive/Negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	0%
	gamma-Amylase	Positive/Negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	0%
	Honey Foreign Oligosaccharides	Positive/Negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	0%
	beta-Amylase	Positive/Negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	0%
thermostable amylases	DZ	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0%	
Glycerol	mg/kg	max 300	744	801	295	588	478	475	462	426	303	381	421	90.9%	
Organoleptic	Test	sensorial	comply	not comply	not comply	not comply	not comply	not comply	not comply	not comply	not comply	not comply	not comply	not comply	100.0%
Faults to best regulation				11	9	11	8	10	10	12	10	7	8	10	106
PRODUCTION LOT #s				unreadable	8263C	8294D	8283D	8282D	8292C	8283A	8262C	S268C	S281 B	N.A.	100.0%

- All have Psicose a generic fraud marker.
- Over 50% have honey foreign substances.
- Glycerol, develops when fraud impedes honey ripening in the hive, byproduct of fermented nectar dehydrated in factories.
- Only one brand demonstrated legal diastase biological activity.
- All EA/LC-IRMS C3/C4 results negative to adulteration, point this test as the fraud industry choice for cover-up. This explains why manufacturers of Fructose "Honey Syrup" advertise "passes C3/C4 analysis".
- Laboratories collaborate with fraud while performing this method without a warning statement in their analysis reports.
- To grasp the UK fraud size, the exactly comparable experiment in 10 Spanish Retailers shelves yielded 4 authenticity test faults, whilst 72 for the UK jars.

# Japan Analysis

Analysis	Units	Typical values	Samples			Average Origin China	Marietsu Not China
			Sumit Store	Selyu	Okiwa		
Ethanol			424	227	266	305.7	37
Diastase	DZ	min 8	9.5	8.2	7	8.2	10.8
Saccharase	U/kg	>20	9.6	9.5	5.3	8.1	16.3
Proline	mg/kg	200	247	218	213	226.0	426
HMF	mg/kg	40	21.8	38.7	43.7	34.7	27.1
Polen			ok	ok	ok	ok	ok
Organoleptic			complies	complies	complies	complies	complies
ph		3.4 - 6.1	3.84	3.98	3.92	3.9	4.08
Electrical Conductivity	mS/cm	.09 - 1.99	0.18	0.17	0.2	0.18	0.45
Psicose			Negative	Negative	Negative	Negative	Negative

## Low Import price theory:

Japan imports substantial amounts of Dehydrated Watery Nectar, better values on bee hive procedence but very bad numbers for glicerine and alcohol

Japanese honey average retail price, 2018 (USD/kg): **\$35.00**

Honey average price imported into Japan, 2018 (USD/ton):

- Myanmar: **\$1,918.00**
- Viet Nam: **\$2,081.00**
- Thailand: **\$2,244.00**
- China: **\$2,314.00**
- **México: \$4,314.00**

Data from: ITC, 2018

# United States of America Sampling



Brand	Price USD/Kg	Retailer	Origin
Clover / Kroger	10.71	Smiths	USA, CANADA
Don Amusan	11.74	Smiths	USA, CANADA, ARGENTINA, MEXICO, UKRAINE & INDIA
Burlinson	11.41	Walmart	USA, CANADA, ARGENTINA and UKRAINE
Miller's Honey	11.59	Walmart	USA
Clover/Great Value	10.65	Walmart	ARGENTINA, CANADA AND USA
Market Pantry	10.56	Target	No Origin Declaration, only True Source
Nice 100% PURE	12.62	Walgreens	No Declaration
Signature Kitchen	11.15	Albertsons	USA
Signature Select	11.15	Albertsons	USA
<b>AVERAGE</b>	<b>11.28</b>		
Honey Tree	7		Imitation Honey

**Average price:  
USD \$ 11.28 / kg**



# Spain

## Samples and analysis

Average price:  
USD \$ 7.70 / kg



Samples (10) ----> Taken from 9 SPAIN retailers	Unit	Values Typical for Honey	Samples										% out of specs	Promedio España	
			AUCHAN	HACENDADO	Marlene	DIAMIR	Alipende	Allada	Biovillage	Granja San Francisco	El Corte Inglés	Dia			
<b>Analysis</b>															
HMF	mg/kg	40	14.5	19.9	10.5	13.1	28.4	32.7	25.7	11.9	6.5	11	0.00%	17.42	
Diastase	DZ	8	16.4	10.2	17.2	19.6	23.1	23.4	5.1	8.6	32.5	13	10.00%	16.91	
Saccharase	U/kg	>20											0.00%		
Moisture	%	max 20.0%	17.3	17.2	18		17.4	17.3	18.1	17.9	18.5	18.2	0	15.99	
Proline	mg/kg	200	423	551	400	427	723	640	663	246	667	355	0.00%	509.5	
Colour	mm	1 to 140	55	62	66	80	80	75	68	62	75	44	ok	66.7	
Electrical Conductivity	mS/cm		0.3	0.23	0.4	0.43	0.36	0.31	0.34	0.21	0.34	0.27	ok	0.319	
pH			4.11	3.96	3.93	4.27	3.86	3.87	3.67	4.24	3.74	3.85	ok	3.95	
F/G	ratio		1.28	1.27	1.29	1.26	1.22	1.27	1.09	1.22	1.29	1.13	0	1.232	
Fructose	%		40.8	40.3	40.4	40.3	38.1	38.1	38.1	39.4	37.8	38.9	ok	39.22	
Glucose	%		31.9	31.9	31.3	32	31.1	30	34.8	32.1	29.3	34.5	OK	31.89	
Polen	yes-no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	0		
Organoleptic	sensorial		complied	complied	complied	complied	complied	complied	complied	complied	complied	complied	0.00%		
Color E150c	mg/kg	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.00%		
Color E150d	mg/kg	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.00%		
Honey Foreign alpl	Positive/Negative	n.d.	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	0.00%		
Glicerol	mg/kg	max 300	163	132	174	112	124	89	142	98	113	97	0.00%	124.4	
C4	Positive/Negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	negative	0		
C4 sugars	%	7.00%	n.d.	2.1	n.d.	n.d.	0.9	2.8	n.d.	0.8	n.d	n.d	0	0.66	
Psicose	%	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.00%		
Number of faults			0	0	0	0	0	0	1	0	0	0	1		
Polen geographical origin			Southamerica possibly Argentina	Southamerica and Eastern Europe	Central-South America	South America Southern Europe (Spain)	Southern Europe	South America Southern Europe (Spain)	Southamerica Brasil	Southern Europe	Southern Europe	Eastern Europe, possibly Ukraine			
BEST BEFORE			03-20	28.11.19	17.01.20	11.2021	FEB.2020	21.09.20	16.05.20	11/2021	11/2020				
PRODUCTION LOTS AND MHD			L-3598	M-18102	L-3454	L-32018001	L20118002	L-8223	1022661	16-05-20	L-183351	L-516			

# Comparative Spain, USA, UK and Japan Analysis

Analysis	Units	Typical Values	Average Spain	Average USA	Average UK	Japan origin China	Japan not China
HMF	mg/kg	40	17.42	37	40.1	34.7	27.1
Diastase	DZ	min 8	16.91	9.7	4.5	8.2	10.8
Saccharase	U/kg	>20	n.a.	n,d.	0.0	8.1	16.3
Proline	mg/kg	200	509.5	313.3	75.1	226	426
Colour	mm	1 to 140	66.7	54.6			
Electrical Conductivity	mS/cm	.09 - 1.99	0.319	0.25	0.13	0.18	0.45
Ethanol	ppm					305.7	27.1
Price	USD/Kg		7.7	11.28	5.7		

# Australia honey fraud scandal

Robert Costa, a fruit and vegetable magnate commissioned a study to detect how far was adulteration dominating the Australian Retail Market. “No bees, no crops: The problem with 'adulterated' honey”  
The analysis he commissioned turned out 12 of 28 honey samples fake

## Fake honey scandal widens to Australian-sourced brands

By Adele Ferguson & Chris Gillett  
October 3, 2018 – 12:00am

153 View all comments

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1 hour ago

One in five samples of local honey sourced along the eastern seaboard of Australia, including boutique brands, has been found to be fake, deepening the global scandal over the impurity of honey.

The study, which tested five raw samples of honey and 95 local and global-branded honey, found 27 per cent were adulterated. But the big shock was Australian honey. Of the 38 honey samples sourced from supermarkets and markets, 18 per cent, or almost one in five, detected adulteration. The states implicated in the scandal include Victoria, Queensland, NSW and Tasmania.



Professor Mark Taylor (right) and student Xiaoteng Zhou at Macquarie University have completed a survey of 100 samples of honey that shows Australia has adulterated honey. WOLTER PEETERS



Nearly nothing came out of the scandal as no apiculture body was invited. To the contrary capilano sued Brian Mulvaney the beekeeper that told the press imported honey could bring varroa to Australia

## Capilano off the hook after 'fake honey' claims

MARKETING  ADAM ZUCCHETTI  19 November 2018 — 2 minute read



Australian honey maker Capilano has been cleared of claims its Allowrie honey brand was not 100 per cent honey, but the competition watchdog has raised concerns about the industry's product testing methods.

# Steps forward since 2017

- EU Parliament Resolution March.1.2018
- Apimondia Statement on Honey Adulteration 2019
- FILAPI Statement, 2019, CLAC Statement, 2019
- HRMS uncover of Ukraine fraud
- Australia, UK, Spain, India and Canada media scandals
- NMR Canada, Genuhoney®, Blockchain World Bee Project

**Yet prices continue a downward trend**

# Only solution

1. Apimondia Supported Honey Traceability System based on Smartphone Technology and Blockchain
2. Apimondia Supported Honey Authenticity Comprehensive Testing independent of Commercial Labs

Finance: Appeal to World Crowdfunding

1. Mandatory Sampling and Analysis to Imported containers in countries and cases where abnormal low price is the food crime fingerprint
2. Stop labs issuing fake passport LC-IRMS C3/C4 unless they fully report its failures

Go to Courts for Class Actions in USA, UK and affected countries with this Food Crime. Including Bremen Laboratories if necessary



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