



# Honey Regulations in the World, Rules Applied by Authorities and Their Effects on World Honey Trade

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## Altıparmak Food Cooperation (Balparmak Brand)



GIDA TURKISH FOOD  
GÜVENLİĞİ SAFETY  
DERNEĞİ ASSOCIATION

- ◆ It was established in 1980 as a family business for the purpose of processing, packaging and marketing bee products.
- ◆ Balparmak brand was born in 1984.

Dr. Emel Damarlı  
04.11.2022

# 7

## Uluslararası

### Gıda Güvenliği Kongresi

3-4 Kasım 2022 İstanbul-TÜRKİYE

Grand Cevahir Otel Ve Kongre Merkezi

“

Bugün ve gelecekte güvenli gıda

”



## Altıparmak Food Cooperation

*Since 1980*

*One Of The World's Leading  
Honey Packaging Companies  
With;*

*Over 350 Employees*

*91% of Total Brand Awareness*

*57% of Brand Loyalty*

*55% Value Share*

*4th Honey Packaging Company  
in The World*

*6th Honey Brand in The World*





## Balparmak R&D Center



Our company's first quality control laboratory was established in 1986.



State Approved R&D Center  
Around 1.400 m<sup>2</sup> R&D facility  
Honey & Other Bee Products Analysis Laboratory  
Around 10.000 samples per year

## Regulation Definition

In general, regulation can be defined as the state's orders and prohibition of things that private sector units

**Must do**                      &                      **Can not do.**



## Regulation in Turkey

Legal requirements to be complied with in Turkey in the honey category;

TSE 3036

In 2000 (Official Gazette 22.10.2000)

**In 2005 (Official Gazette 17.12.2005)**

In 2012 (Official Gazette 27.07.2012)

In 2020 (Official Gazette 22.04.2020)

until 2000

2000/39 Turkish Food Codex Honey Communiqué

**2005/49 Turkish Food Codex Honey Communiqué**

2012/58 Turkish Food Codex Honey Communiqué

2020/07 Turkish Food Codex Honey Communiqué

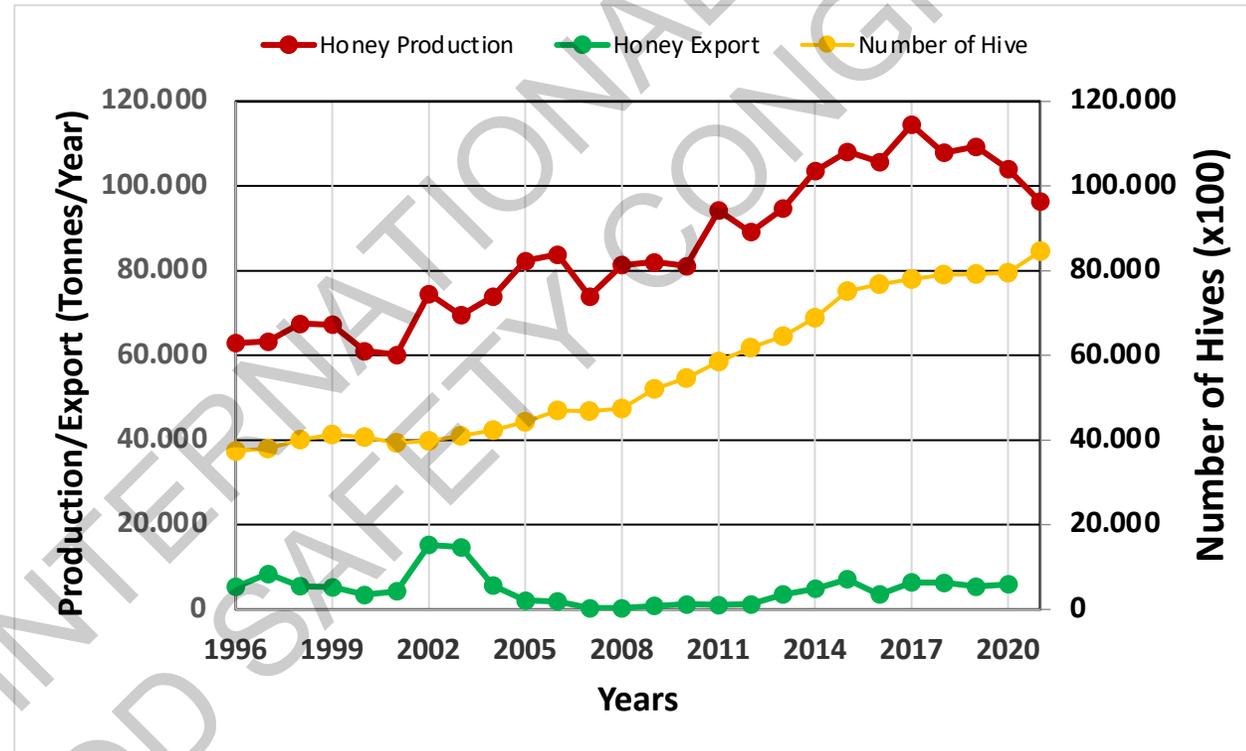
Within the framework of the «National Programme for the Adoption of the Acquis" between Turkey and the European Union, the communiqués and regulations in practice in the food sector were matched with those applied in the European Union.

**20 December 2001 2001/110/EC Honey regulation**



## Honey Statistics

According to the data from United Nations Food and Agriculture Organization (FAO) and Turkish Statistical Institute (TUIK), Turkey ranks second after China in World honey production.



The beekeeping sector in Turkey is developing more and more each year with the incentives and supports given by the Ministry of Agriculture and Forestry.

## Honey Statistics

When the 2020 statistics of the Turkish Statistical Institute (TUIK) are examined, it is reported that a total of 1.77 million tons of honey is produced in the world.

More than 50% of the world's total honey export (385.000 tonnes) was done by five countries.

<b>China</b>	<b>18,4%</b>
<b>Ukraine</b>	<b>11,2%</b>
<b>Argentina</b>	<b>9,9%</b>
<b>India</b>	<b>7,6%</b>
<b>Brasil</b>	<b>6,3%</b>



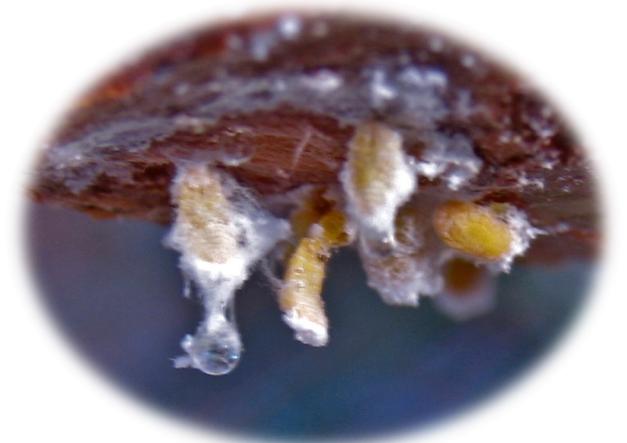
## Turkish Honey Export

It is stated that total export of honey from Turkey increased twice in the last five years.

Years	Production (tonnes)	Export (tonnes)	Percentage (%)
2017	114.471	6.448	5,6%
2018	107.920	6.413	5,9%
2019	109.330	5.543	5,1%
2020	104.077	6.011	5,8%
2021	96.344	9.976	10,4%

## Turkish Honey Export

- Turkey, which ranks second after China in honey production in the world, is not among the first 15 countries in honey export.
- The main reason for this is thought to be due to the fact that world honey prices are lower than in our country.
- However, about 90% of the world's pine honey is produced in Turkey and it has some advantages over blossom honey.
- Late crystallization, which is one of its important advantages, and being unique to our country increase the export potential of this product.





## Differences Between Turkey & EU Honey Regulation

Parameter	Turkey		European Union	
	Flower honey	Honeydew honey	Flower honey	Honeydew honey
Humidity	< % 20	< % 20	< % 20	< % 20
Sucrose	< 5 g/100 g	< 5 g/100 g	5 g/100g	5 g/100g
Fructose + Glucose	> 60 g/100g	> 45 g/100g	> 60 g/100g	> 45 g/100g
Fructose / Glucose	0,9-1,4	1,0-1,4	-	-
Maltose	< 4 g/100 g	< 4 g/100 g	-	-
Water Insoluble Substance	< 0,1 g/100g	< 0,1 g/100g	< 0,1 g/100g	< 0,1 g/100g
Free Acidity	< 50 meq/kg	< 50 meq/kg	< 50 meq/kg	< 50 meq/kg
Electrical Conductivity	< 0,8 mS/cm	> 0,8 mS/cm	< 0,8 mS/cm	> 0,8 mS/cm
Diastase Number	> 8 DN	> 8 DN	> 8 DN	> 8 DN
HMF	< 40 mg/kg	< 40 mg/kg	< 40 mg/kg	< 40 mg/kg
Honey d <sup>13</sup> C	<-23,0‰	<-23,0‰*	-	-
Protein d <sup>13</sup> C - Honey d <sup>13</sup> C	>-1,0‰	>-1,0‰**	-	-
C4 Plant Sugars Ratio	<7,0%	<7,0%**	-	-
Proline	> 300 mg/kg	> 300 mg/kg	-	-
Naphtalene	< 10 mg/kg	< 10 mg/kg	-	-
Color	> 60 mm	> 60 mm	-	-

\*<-22,5‰ for Turkish pine honey

\*\*Th,s value is not sought in pine honey

## Turkish Food Codex Honey Communiqué

For products within the scope of TFC Honey Communiqué, published in the Official Gazette dated 22.04.2020 and numbered 31107, Turkish Food Codex Classification of Pharmacologically Active Substances in Animal Foods and Maximum Residue Limits Regulation provisions are applied.

**For the Pharmacologic Active Substance regulated for honey there are only 5 of them and for 3 of them no MRL's are required.**

Pharmacologic Active Substance	Limit Values
Amitrase	200 mg/kg
Coumaphos	100 mg/kg
Flumethrin	MRL not required
Tau-Fluvalinate	MRL not required
Oxalic Acid	MRL not required

## Turkish Food Codex Honey Communiqué

According to the Turkish Food Codex Honey Communiqué, no veterinary drugs can be used in beekeeping, including the following veterinary drugs.

- Sulfonamide group
- Tetracycline group
- Streptomycin group
- Quinolone group
- Macrolides group
- Nitroimidazole group
- Nitrofurantoin group
- Amphenicol group



## HONEY REGULATIONS



**When the regulations of other countries which are active in world honey trade are examined**



## Far East Countries Honey Regulations

In the regulations of Far East countries such as China and Japan, it is requested that the Fructose + Glucose sum to be min. 60 %, without the distinction between honeydew and blossom honey.

### Fructose + Glucose values of 1620 Turkish Pine Honey samples analyzed in the year 2015

Min. (Fructose + Glucose)	45,2%
Max. (Fructose + Glucose)	69,6%
Average. (Fructose + Glucose)	59,5%

This is the main barrier for exporting of the Turkish Pine Honey and other Honeydew honeys.

## Middle East Countries Honey Regulations

Analysis of parameters that are not likely to be found (or which do not possess food safety problems) in honey is requested in Egyptian honey regulations.

### Requested Parameters for Honey Analysis

- 1- *Paenibacillus larvae* (American foulbrood)
- 2- *Melissococcus plutonius* (European foulbrood)
- 3- *Varroa destructor* (Varroa mite)
- 4- *Acarapis woodi* (Acarina)
- 5- *Nosema apis* (Nosema)
- 6- *Galleria mellonella* (Wax moth)



## Honey Regulation in Turkish Republic of Northern Cyprus

- Turkish Republic of Northern Cyprus regulations require low levels of Lead residue even lower from what they demand on meat and vegetables.
- Zinc, a useful mineral, is defined as a heavy metal and a low limit is sought.

Residue	Maximum Residue Limits
Lead	0,05 mg/kg
Zinc	20 mg/kg



## European Union Regulation

Parameters within the scope of legislation

Parameters based on scientific data and  
enforced by authorities



## European Union Regulation

- Turkish Honey Regulation has been harmonized with the European Union.
- Products exported to the European Union are analyzed in detail.
  - Detection limits go lower with new technologies being used
    - ❖ From ppm to ppb
    - ❖ From ppb to ppt
  - Veterinary drug degradation products (metabolites).

## European Union Regulation

### Veterinary drug degradation products (metabolites).

#### ANALYSIS REQUESTED: Macrolides by LC-MS/MS

Parameter	Result	Unit	Method
Tylosin A	n.d.	µg/kg	PM DE01_059 (a) <sup>1</sup>
Erythromycin A	n.d.	µg/kg	PM DE01_059 (a) <sup>1</sup>
Clindamycin	n.d.	µg/kg	PM DE01_059 (a) <sup>1</sup>
Josamycin	n.d.	µg/kg	PM DE01_059 (a) <sup>1</sup>
Leucomycin (Kitasamycin)	n.d.	µg/kg	PM DE01_059 (a) <sup>1</sup>
Lincomycin	n.d.	µg/kg	PM DE01_059 (a) <sup>1</sup>
Spiramycin	n.d.	µg/kg	PM DE01_059 (a) <sup>1</sup>

# the sample corresponds

Regarding the examined parameters and the mentioned limit of quantification the sample corresponds to the legal regulations (German ordinance about maximum residue levels RHMV dated 21/10/1999 in connection with Regulation (EC) 470/2009 in conjunction with regulation (EU) 37/2010 (dated Feb. 9th 2010). The result for tylosin A includes the identified metabolite tylosin B.

**Although the metabolite value was found to be 65 ppb in the attachment to the report, the report was interpreted as in accordance with the legal regulations.**

#### ANALYSIS REQUESTED: Macrolides by LC-MS/MS (11010420)

Parameter	Result	Unit	Method
Erythromycin A	6	µg/kg	
Erythromycin A Metabolite	65	µg/kg	

## European Union Regulation

### Veterinary drug degradation products (metabolites).

#### ANALYSIS REQUESTED: Macrolides-2 by LC-MS/MS

Parameter	Result	Unit	Method
Tylosin A	n.d.	µg/kg	PM DE01_059 (a) <sup>1</sup>
Sum Erythromycin A	38	µg/kg	PM DE01_059 (a) <sup>1</sup>
Clindamycin	n.d.	µg/kg	PM DE01_059 (a) <sup>1</sup>

**the sample does not corresponds**

Tilmicosin	n.d.	µg/kg	PM DE01_059 (a) <sup>1</sup>
Oleandomycin	n.d.	µg/kg	PM DE01_059 (a) <sup>1</sup>
n.d. - not detected < limit of quantification 10 µg/kg			
(a) : accredited under terms of DIN EN ISO/IEC 17025. (na) : not accredited method. (1) Inhouse procedure This document may only be reproduced in full. The results given herein apply to the submitted sample only.			

#### Interpretation:

Regarding the examined parameters and the mentioned limit of quantification the sample does not correspond to the legal regulations (German ordinance about maximum residue levels RHmV dated 21/10/1999 in connection with Regulation (EC) 470/2009 in conjunction with regulation (EU) 37/2010 (dated Feb. 9th 2010). The result for tylosin A includes the identified metabolite tylosin B.  
The result for sum erythromycin A includes the identified metabolite anhydroerythromycin A.

**Erythromycin residue is now reported as a total together with its metabolite and the product is rejected on the grounds that it does not comply with the regulations.**



## European Union Regulation

### Newly developed adulteration detection methods

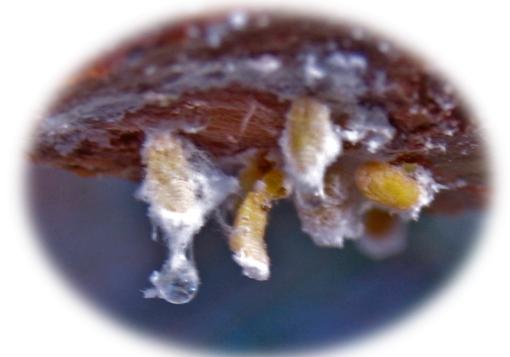
New methods are being developed by contract laboratories to detect adulteration methods in honey.

- Foreign enzymes
- LC-IRMS isotopic profiling
- Fingerprinting of honey (NMR and HRMS techniques)

Since the properties of Turkish pine honey were not taken into account while developing these methods, pine honey stays not qualified for the newly developed parameters.

## Foreign Enzymes (beta/gamma amylase )

- According to the beta/gamma amylase enzyme activity analysis developed recently, the limit value in honey is recognized as max. 5 units/kg.
- The fact that these enzyme values are equal to or greater than 5 units/kg is accepted as the use of invert sugar syrup produced using these enzymes in bee feeding or added to honey, and these honeys are considered adulterated.
- For Italian Metcalfa honey, which is a honeydew honey like Turkish pine honey, and Chilean Quillay honey this value is accepted as maximum of 10 units/kg by private laboratories in Europe.



## Foreign Enzymes (beta/gamma amylase )

Pine honey has exceeded the limit value determined in 80% of the tests carried out in our export products to date, and even if this value was = 5,0 units/kg, it has been rejected on the grounds that it does not comply with the pure honey specifications.

### **ANALYSIS REQUESTED: Determination of beta-/gamma-amylase activities by enzyme test**

Parameter	Result	Unit	Method
beta/gamma amylase activity	5.0	units/kg	PM DE01_115 (a) <sup>1</sup>
n.a.: not analyzed; n.d.: not detected < 1 units/kg honey reference value: < 5 units/kg honey			
(a) : accredited under terms of DIN EN ISO/IEC 17025. (na) : not accredited method. (1) Inhouse procedure This document may only be reproduced in full. The results given herein apply to the submitted sample only.			

### **Interpretation:**

The sample does not meet the specifications of pure honey. The activity of the foreign amylases is outside the naturally occurring range and indicates an addition of foreign amylases or inverted sugar syrup produced with these enzymes. This does not apply in case of Metcalfa honey. The result is close to the action limit.



## Foreign Enzymes (beta/gamma amylase )

- So that it is important for our exports to determine the natural detection range of the beta/gamma amylase in Turkish pine honey, which is analyzed as an indicator of the sugar syrup used.
- For this purpose, a joint study was carried out with the leadership of **Balparmak Research Center** between 2015 and 2018 in collaboration with laboratories in Europe, which are the primary choice of the industry for honey analysis.
- 80 authentic Turkish pine honey samples were examined in terms of beta/gamma amylase value.
- As a result of these collaborative scientific studies we determined that 65% of these samples had **Beta/Gamma Amylase** values **between 5 and 10 units/kg**



## Foreign Enzymes (beta/gamma amylase )

After these intensive studies, the first report correction came from one of the project partners, and they stated in their report that it may be natural for the beta/gamma amylase enzyme activity value to be greater than 5 units/kg for Turkish pine honey.

**In Pine Honey the natural activity might be > 5 U/kg.**

Arrival Date:	08-Nov-2017	Start / End of Analysis:	08-Nov-2017 / 14-Nov-2017
Kind:		Packaging:	Plastik 50 ml
Seal:	ohne/without	Temp.:	RT

### VA40286 - Adulteration, foreign $\beta$ - and g-amylase, HPLC-UV, Honey

Parameter	Method	Unit	Result
$\beta$ - and g-Amylase-Activity	HPLC-UV	Unit/kg	4,6

n.n. = no Activity determinable; Activities <5 U/kg may be of natural origin and are not a clear evidence of adulteration

**In Pine Honey the natural activity might be > 5 U/kg.**

## LC-IRMS

Liquid Chromatography coupled with Isotope Ratio Mass Spectrometry (LC-IRMS) is a chromatographic and mass spectrometric analysis method that provides information about the isotope ratio of organic molecules.

It is used with the AOAC method to detect C4 sugar adulteration based on EA-IRMS.

In 2020 JRC (joint Research Center of the European Commission) published a technical report\*. And now it is being discussed about the possible use of this method for future authenticity controls.



## NMR

Nuclear Magnetic Resonance (NMR) is a spectroscopic analysis method that provides information about the structures and chemical properties of organic molecules.

Using NMR

- ✓ Structure of products
- ✓ Connecting features
- ✓ Molecule formula

is determined.

NMR technique usage specific to honey;

- ✓ Determination of Geographical Origin,
- ✓ Determination of Botanical Origin,
- ✓ It has started to be used in determining whether syrups obtained from sugar cane, sugar beet or corn are used in feeding during nectar flow.



## LC-HRMS

Liquid Chromatography coupled with High Resolution Mass Spectrometry (LC-HRMS) is a chromatographic and mass spectrometric analysis method that provides information about the molecular weights and chemical properties of organic molecules.

Using LC-HRMS

- ✓ All compounds in a mixture
- ✓ Possible closed formula

is determined.

LC-HRMS technique usage specific to honey;

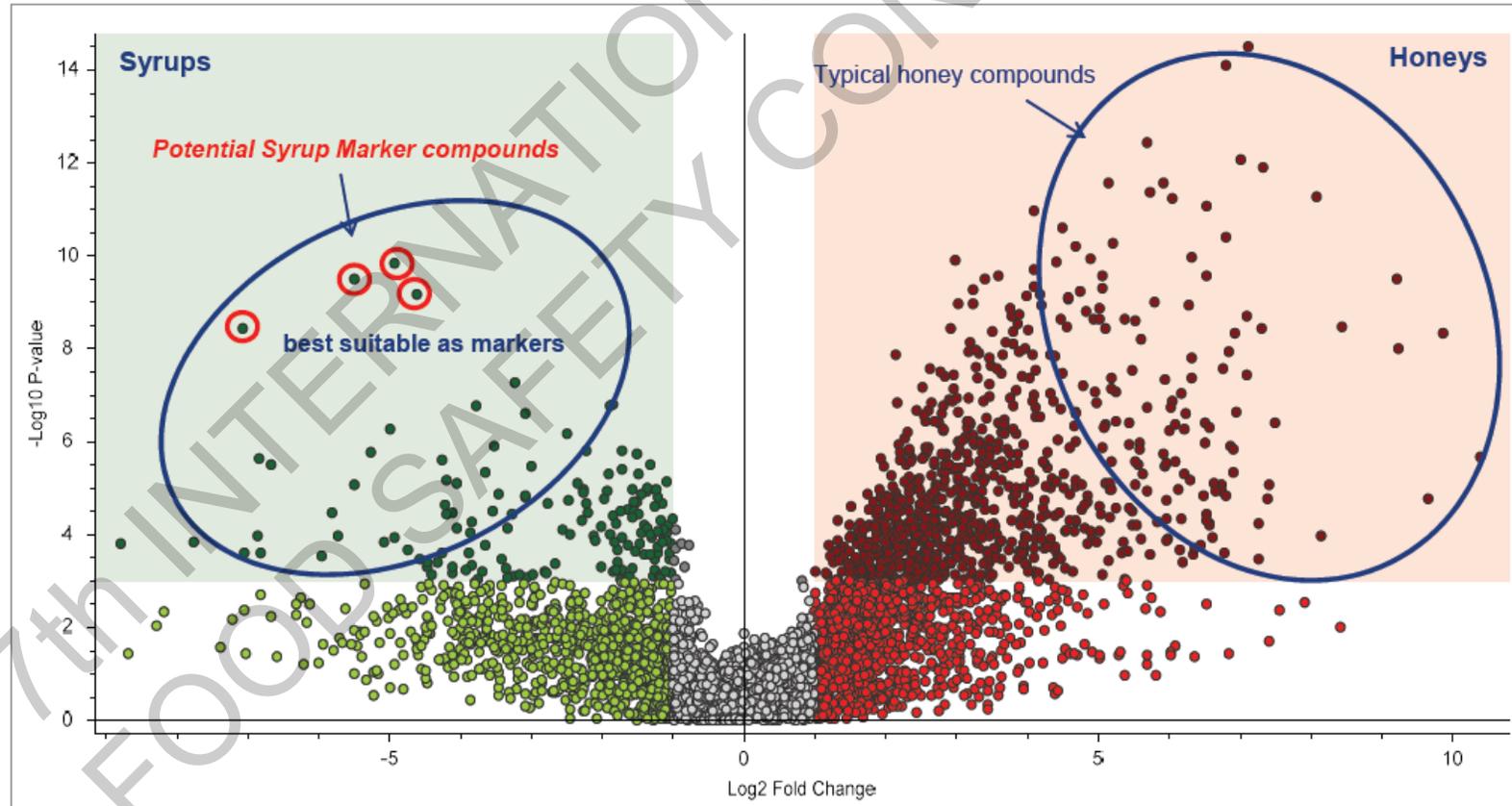
- ✓ Determination of Geographical Origin,
- ✓ Determination of Botanical Origin,
- ✓ Determination of Sugar Syrup Markers.





## LC-HRMS

With very precise mass detection Honey and Syrup specific markers can be detected. Based on these markers using state-of-the-art statistics softwares adulteration type and botanic or geographic origin of the analysed samples can be detected.





# Our Recent Method Developments for Figthing Against Food Fraud

## Our Recent Method Developments

Recently, along with beet and corn syrup, white and brown rice syrup has also been used in honey adulteration. In addition to the AFGP marker used in the detection of white rice syrup, **Balparmak Research Center** also determined a novel marker for brown rice syrup and published it scientifically.

LWT - Food Science and Technology 154 (2022) 112618



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

LWT

journal homepage: [www.elsevier.com/locate/lwt](http://www.elsevier.com/locate/lwt)



Identification of the rice syrup adulterated honey by introducing a candidate marker compound for Brown rice syrups

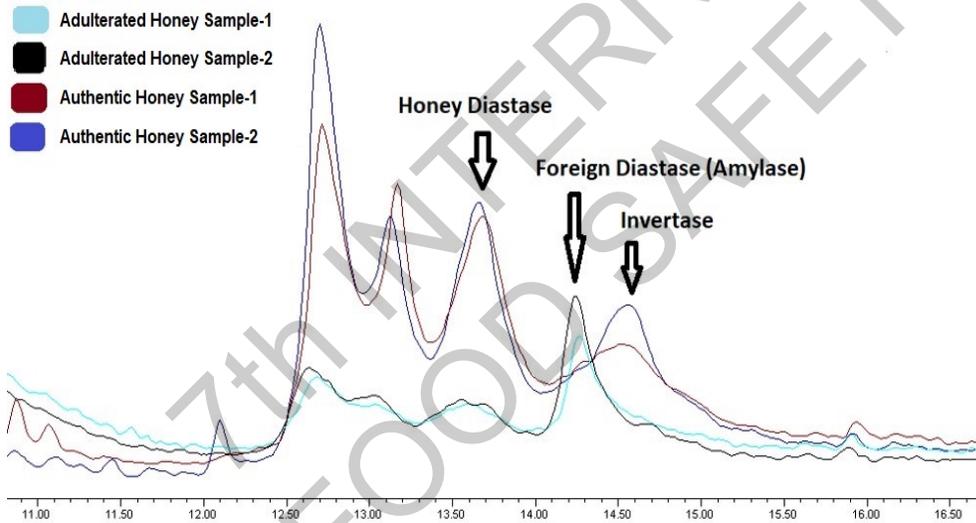
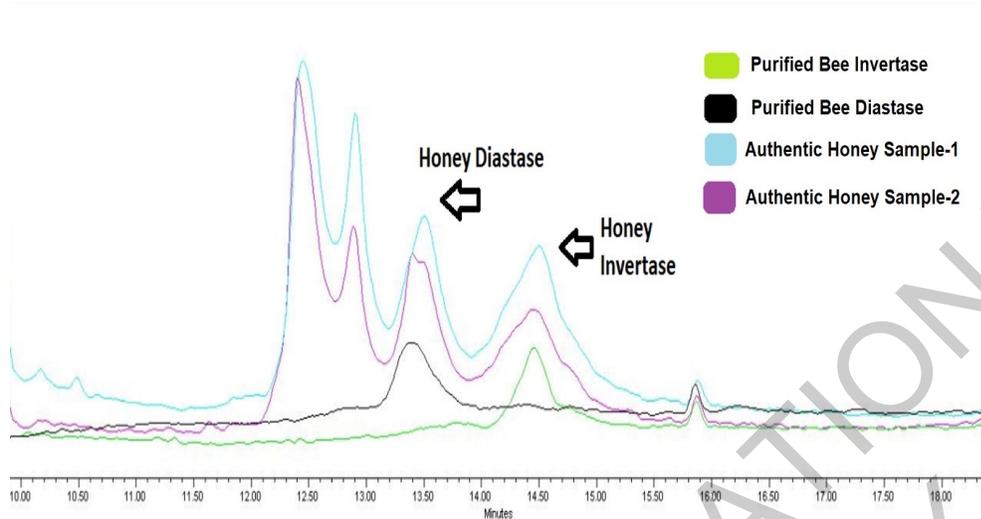
İsmail Emir Akyıldız<sup>a,b,\*</sup>, Dilek Uzunöner<sup>b</sup>, Sinem Raday<sup>b</sup>, Sezer Acar<sup>b</sup>, Özge Erdem<sup>b</sup>, Emel Damarlı<sup>b</sup>

<sup>a</sup> Chemistry Department, Marmara University, Istanbul, Turkey

<sup>b</sup> Department of R&D, Altıparmak Food Industry and Trade Inc., Istanbul, Turkey



## Our Recent Method Developments



Adding diastase to honey is one of the adulterations made recently. **Balparmak Research Center** can also detect foreign diastases in honey with the chromatographic in-house method developed based on the purification of enzymes in honey.

Springer Link

Original Paper | Published: 29 March 2022

Development of a novel pretreatment protocol for the efficient isolation and enrichment of honey proteome using pine honey and the hypopharyngeal glands of *Apis mellifera* L.

[İsmail Emir Akıldız](#), [Ece Kök Yetimoğlu](#), [Sinem Raday](#), [Özge Erdem](#), [Sezer Acar](#), [Özlem Yılmaz](#), [Dilek Uzunöner](#), [Gamze Düz](#) & [Emel Damarlı](#)

*Journal of Food Measurement and Characterization* **16**, 2616–2629 (2022) | [Cite this article](#)

Dr. Emel Damarlı  
04.11.2022



## Our Recent Method Developments

Within our beta-gamma amylase project that we carried out with the European leading laboratories we also analyzed authentic Turkish pine honeys for C4 sugar analysis. And we observed that C4 sugar values of the majority of the Turkish pine honey samples, which have been proven to be authentic, were above 7 %.

As this is an adulteration related parameter, we searched deeper into the cause of this false positive findings. We figured out that they were caused by the wax wools produced by *Marchalina hellenica* and because of that, the standard AOAC method was giving false positive results.

**Balparmak Research Center** developed a new methodology based on pure protein extraction as an alternative to the standard AOAC method.

## Our Recent Method Developments

Journal of Food Composition and Analysis 114 (2022) 104787

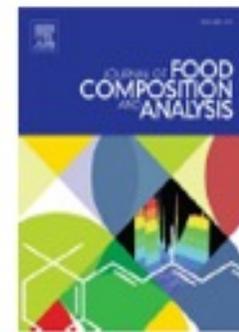


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Journal of Food Composition and Analysis

journal homepage: [www.elsevier.com/locate/jfca](http://www.elsevier.com/locate/jfca)



Elucidating the false positive tendency at AOAC 998.12 C-4 sugar test for pine honey samples: Modified sample preparation method for accurate  $\delta^{13}\text{C}$  measurement of honey proteome

İsmail Emir Akyıldız<sup>a,b,\*,\*\*</sup>, Özge Erdem<sup>b,2</sup>, Sinem Raday<sup>b,3</sup>, Tuğçe Daştan<sup>b,4</sup>, Sezer Acar<sup>b,5</sup>, Dilek Uzunöner<sup>b,6</sup>, Gamze Düz<sup>b,7</sup>, Emel Damarlı<sup>b,8</sup>

<sup>a</sup> Chemistry Department, Marmara University, Istanbul, Turkey

<sup>b</sup> Department of R&D, Altıparmak Food Industry and Trade Inc., Istanbul, Turkey



Dr. Emel Damarlı  
04.11.2022

## Our Recent Method Developments

**Based on your publication,  
we will now change our  
assessment of pine honey.**

**We have now possibility to  
exclude the protein from  
assessment and can refer  
to your investigation**

### Assessment of pine honey

← Yanıtla

← Tümünü yanıtla

→ İlet

**From:** Ulrike Burmester  
**Sent:** Wednesday, September 28, 2022 12:31 PM  
**To:** Emel Damarlı <Emel.Damarli@balparmak.com.tr>  
**Subject:** Assessment of pine honey

Dear Emel,

I hope, this finds you well. Thank you for publishing your research on pine honey. Based on your publication, we will now change our assessment of pine honey. In case the  $^{13}C/^{12}C$  isotope ratio of the protein is more negative than the value of honey, we have now the possibility to exclude the protein from assessment and can refer to your investigations. Unfortunately, we did not have the technical possibilities and capacities to carry out these investigations ourselves in the depth described.

Best wishes from Bremen

Ulrike

**Ulrike Burmester**  
**Senior Lab Supervisor for Authenticity**  
**Food Services**

Dr. Emel Damarlı  
04.11.2022

7th INTERNATIONAL CONGRESS  
FOOD SAFETY



# Our Standardization and Codex Contributions



## Our Standardization And Codex Contributions

Our activities on the inclusion of the Honeydew Honey Quality Parameters in the Chinese Honey Communiqué





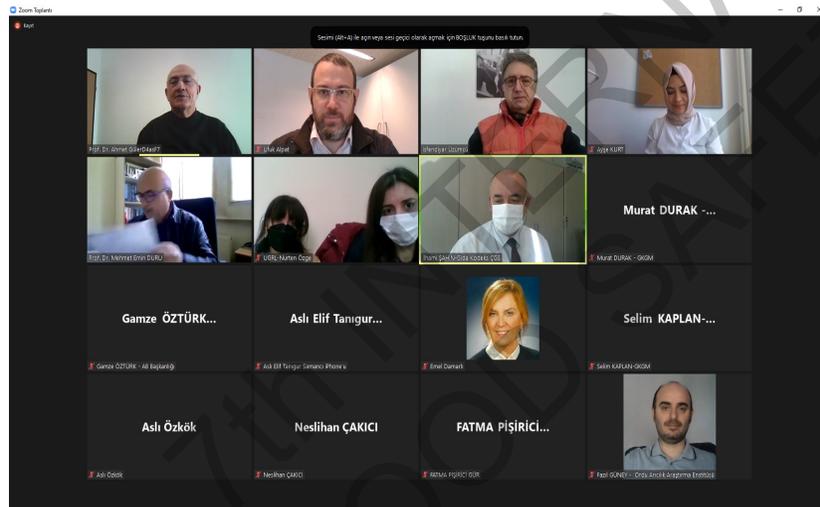
# Our Standardization And Codex Contributions



## TSE MTC 172 Bee Products



## Turkish Pine Honey GI Work Group



## Turkish Food Codex Subcommittee

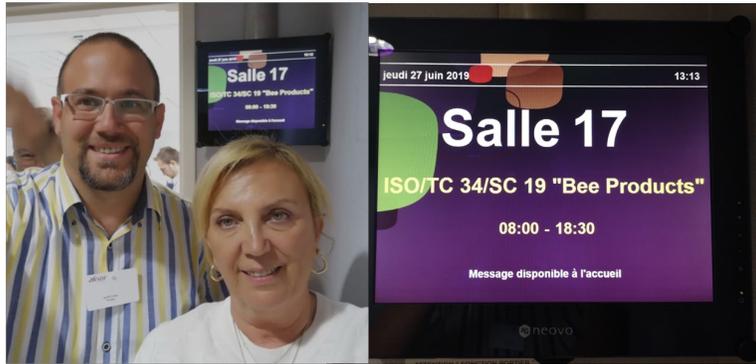


## International Propolis Research Group

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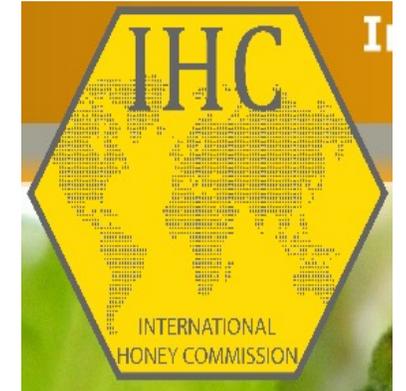
# Our Standardization And Codex Contributions



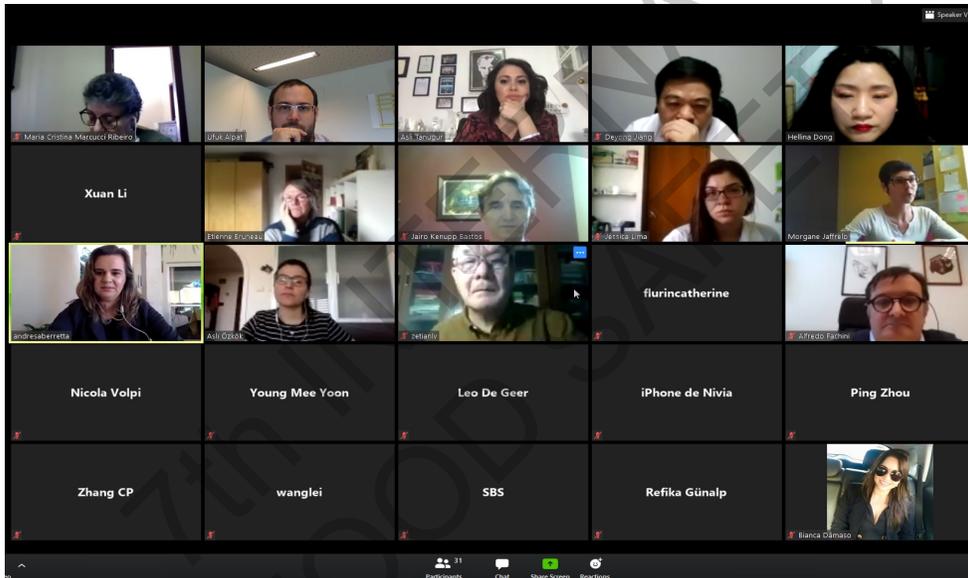
ISO / TC 34 / SC 19



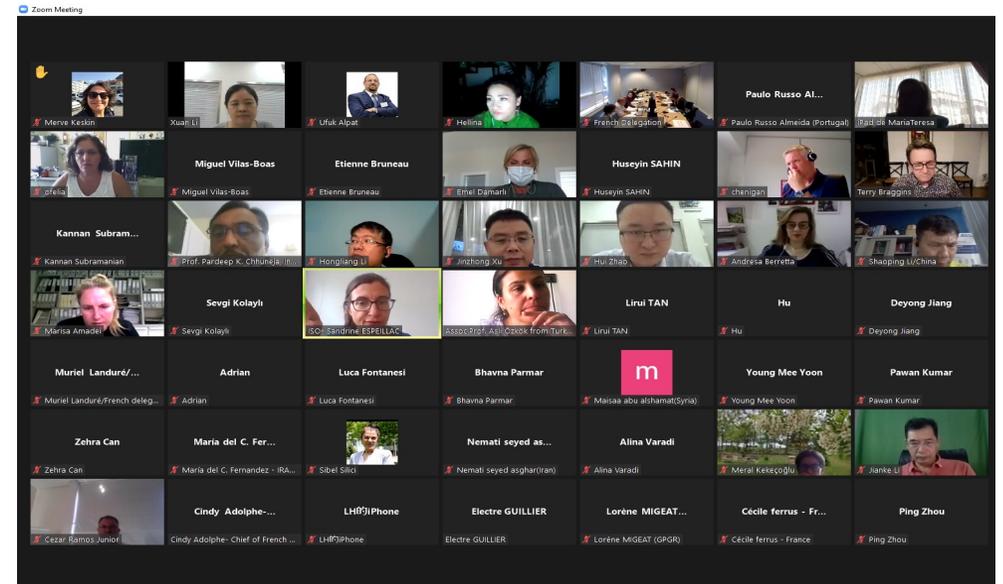
ISO WG 1 (Honey)



International Honey Commission



ISO WG 2 (Propolis)



ISO WG 3 (Pollen)

Dr. Emel Damarlı  
04.11.2022

# Conclusion



## Conclusion

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- ✓ In the world honey trade, different regulations are taken into account in countries.
- ✓ There are also changes in the quality parameters and limit values controlled in different countries.
- ✓ The most critical point in world trade is the use of quality parameters by reference laboratories that are not in the regulations. For example, beta/gamma amylase, C4 sugar percentage, markers for syrups such as brown rice syrup, white rice syrup, starch-based syrup
- ✓ Lack of consensus among laboratories that apply profile analysis-based methods (such as NMR, and LC-HRMS).
- ✓ It is also an important problem in the world trade that the detection limits for residues that should not be found differ between laboratories depending on the technologies used.



**Thank You For Your Attention**

**[emel.damarli@balparmak.com.tr](mailto:emel.damarli@balparmak.com.tr)**