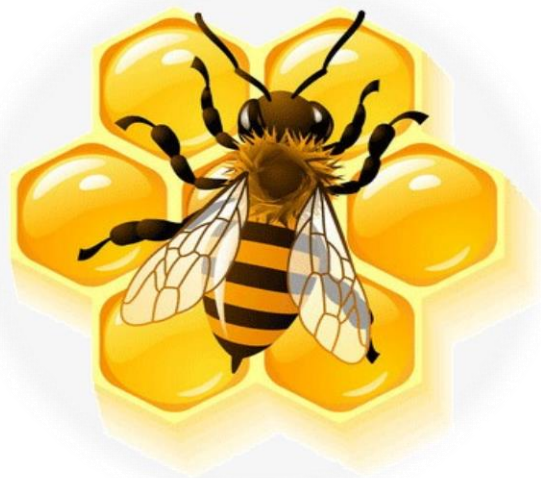




## FSSAI SPECIFICATION OF HONEY



**AATMANIRBHAR BHARAT**

**PM Formalisation of Micro Food Processing  
Enterprises Scheme (PM FME Scheme)**



## HONEY PRODUCTION IN INDIA

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**India: One of the top 10 honey producing countries.**

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European Union- 17 Million beehives, 600,000 beekeepers, 2,50,000 MT honey

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India- 3.5 Million Bee Colonies

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India- 1.05 Lakh Metric Tonnes honey production

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More than 2 lakh bee keepers in India

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Per capita consumption of honey: 250g-300g (India) and 2000 g in Germany



**HONEY  
 STANDARDS**

International level

- **Codex Alimentarius Commission** (framed in 1981, revised in 1987 and 2001)
- **EU council directive** (2001/110/EC and amended in 2014 as 2014/63/EU )

National level

- **FSSAI** [Food Safety and Standards (Food Product Standards and Food Additive) Amendment Regulations, 2019]





## **STANDARDS FORMING AGENCIES CODEX, EU COUNCIL DIRECTIVES AND FSSAI (INDIA)**

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The Codex standard for revised in 1987 and 2001, has voluntary application and serves in many cases as a basis for national legislation (Codex, 2001).

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The European Council issued Directive laid down the production and trading parameters of honey within the Member States of EU.

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Countries like Bulgaria, Cyprus, England, France, Malta, Slovenia, Spain and Switzerland have been fully harmonized with EU legislation without different National decisions.

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In India, through a notification dated 1 July 2020, the FSSAI has issued directions for the operationalisation of the revised standards for honey in accordance with the Food Safety and Standards (Food Product Standards and Food Additive) Amendment Regulations, 2019.



## DEFINITION OF HONEY AS PER CODEX, EU DIRECTIVE AND FSSAI

**Codex** - Natural sweet product produced by bees from the nectar plants (blossom honey) or from secretions of living parts of plants or secretion of insects (honeydew honey) Bees collect, deposit, dehydrate, store and leave in the honey comb to ripen and mature.



**EU Directive** - The natural sweet substance produced by *Apis mellifera*.  
 EU definition states that honey is honey only when it is produced by *Apis mellifera* honeybees





## Honey is the natural sweet substance produced by honey bees from

- nectar of plants or
- secretions of living parts of plants or excretions of plant sucking insects on living parts of plants,
- which the bees collect, transform by combining with specific substances of their own, deposit, dehydrate, store and leave in the honeycomb to ripen and mature.

a) Blossom Honey or Nectar Honey is the honey which comes from nectars of plants.

b) Honeydew Honey is the honey which comes mainly from excretions of plant sucking insects (*Hemiptera*) on the living parts of plants or secretions of living parts of plants.

## FSSAI HONEY PARAMETERS

S. No	Parameters	Limits
1.	Specific gravity at 27° C, Min.	1.35
2.	Moisture percent by mass, Max.	20
3.	Total reducing sugars, per cent. by mass, Min. (a) For the Honey not listed below (b) Carviacallosa and Honeydew honey (c) Blends of Honeydew honey with blossom honey	65 60 45
4.	Sucrose, per cent, by mass, Max. (a) For the Honey not listed below (b) Carviacallosa and Honeydew honey, Max.	5.0 10
5.	Fructose to Glucose ratio (F/G Ratio)	0.95-1.50
6.	Total Ash, per cent. by mass, Max.	0.50
7.	(a) Acidity expressed as formic acid, per cent. by mass, Max (b) Free Acidity milliequivalents acid/ 1000 g, Max.	0.20 50.0
8.	Hydroxymethylfurfural (HMF) mg/kg, Max.	80.0
9.	Diastase activity, Schade units per gram, Min.	3
10.	Water insoluble matters, per cent. by mass, Max. (a) For the Honey not listed below (b) For Pressed honey	0.10 0.5
11.	C4 Sugar, per cent. by mass, Max.	7.0
12.	Pollen count and plant element/g, Min.	5000
13.	2-Acetylfuran-3-Glucopyranoside (2-AFGP) as Marker for Rice Syrup	Absent**
14.	Foreign oligosaccharides (Max. Percent Peak]	0.7
15.	Proline, mg/kg, Min.	180
16.	Electrical Conductivity: (a) Honeys not listed under Honeydew, Max. (b) Honeys listed under Honeydew, Min.	0.8 mS/cm 0.8 mS cm
17.	(a) $\Delta\delta^{13}C$ Max*. (Maximum difference between all measured values $\delta^{13}C$ ); per mil (b) $\Delta\delta^{13}C$ Fru - Glu (The difference in $^{13}C/^{12}C$ ratio between fructose and glucose); per mil (c) $\Delta\delta^{13}C$ Protein - Honey (The difference in $^{13}C/^{12}C$ between honey and its associated protein extract); per mil	$\pm 2.1$ $\pm 1.0$ $\geq - 1.0$

\* $\Delta\delta^{13}C$  Max. is the maximum difference observed between all possible isotopic ratios measured ( $\Delta\delta^{13}C$  fructose-disaccharides /  $\Delta\delta^{13}C$  fructose-trisaccharides /  $\Delta\delta^{13}C$  fructose-protein  $\Delta\delta^{13}C$  glucose disaccharides /  $\Delta\delta^{13}C$  glucose-trisaccharides /  $\Delta\delta^{13}C$  glucose-protein/ $\Delta\delta^{13}C$  disaccharides-trisaccharides/  $\Delta\delta^{13}C$  disaccharides-proteins  $\Delta\delta^{13}C$  trisaccharides-protein).

\*\*Minimum Required Performance Level- 1m7/kg



## REINSTATING THE HONEY STANDARDS

- Based on the approval of Food Authority on the method of detection of 2-Acetylfuran-3-Glucopyranoside (2-AFGP)/3-0-Alpha-D-Glucosyl Isomaltol, the specific marker for Rice Syrup (SMR), LC-MS the parameter specific marker for Rice Syrup (SMR) was reinstated through a notification dated 5 June 2020.
- The Scientific Panel on Methods of Sampling and analysis in its 28th Meeting held on 18 June, 2020 has recommended the method for determination of Foreign Oligosaccharides in Honey.





# FOOD SAFETY AND STANDARDS (PACKAGING AND LABELLING) REGULATIONS, 2011



## Honey labelling

(a)

(b)

Honeydew Honey – If the product complies with the definitions given by FSSAI.

Blend of Honeydew Honey and Blossom Honey – If the product is mixture of Blossom or Nectar Honey and Honeydew honey.

*Carvia Callosa* Honey – It is derived from flower of *Carvia callosa* plant which is thixotropic and is gel like extremely viscous when standing still and turns into liquid when agitated or stirred.

Pressed Honey - Honey is obtained by pressing brood-less combs

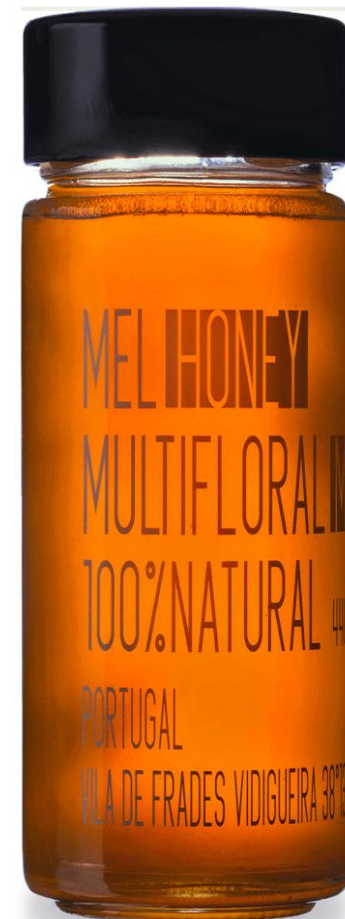


# HONEY LABELLING

According to floral or plant source:

**Mono-floral Honey** – If the minimum pollen content of the plant species concerned is not less than 45% of total pollen content.

**Multi-floral Honey** – If the pollen content of any of the plant species does not exceed 45% of total pollen content.



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Important parameters for monofloral honey trade are not given either by Codex, Directive or by FSSAI.

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Botanical origin ~~→~~ Pollen analysis ~~→~~ Several limitations

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Five European countries (Croatia, Greece, Germany, Italy and Serbia) established the minimum percentage of pollen required for the characterization of monofloral honey .



# MONOFLORAL HONEY LEGISLATION IN EUROPEAN COUNTRIES

Greece has national limits regarding the characteristics of eight monofloral types of honey (AXS, 2004).

Germany has legislation of organoleptic, microscopical and physicochemical characteristics of ten floral and three Honeydew honeys (Leita"tze, 2011).

Serbia has legislated the pollen limits of eight Monofloral honeys (Serbia Ordinance, 2003).

Turkey provides physicochemical characteristics of almost all the monofloral honey (Turkish Food Codex, 2012).

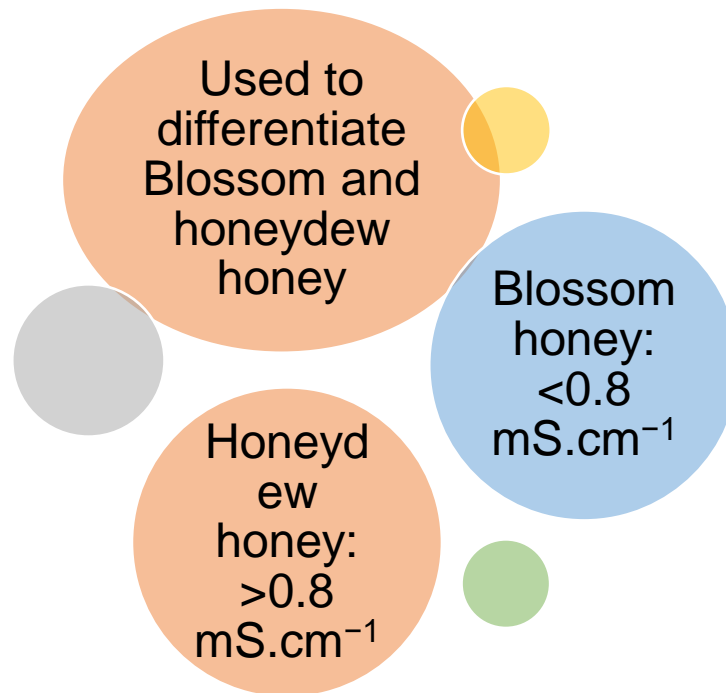


# STANDARDS SET BY CODEX, EUROPEAN DIRECTIVE AND FSSAI

Parameters	Codex	EU Directive	FSSAI
Moisture content	<20% (except heather honey ( <i>Calluna vulgaris</i> ) - up to 23%)		< 20% without any exception
Fructose & glucose content	Sum of fructose & glucose content for blossom honey to exceed 60% and for honeydew honey and blends of honeydew honey with blossom honey to exceed 45%.		Reducing sugars content for blossom honey to exceed 65% and for blends of honeydew honey with blossom honey to exceed 45%.
F/G ratio (crystallization indicator): 0.95-1.50			
Sucrose content	< 5% with certain exception		< 5% without any exception
Diastase activity	>8		>3
HMF content	<40 mg/kg		<80 mg/kg



- Diastase is inactivated and HMF is formed on heating honey for processing and blending and also during storage.
- When the diastase drops  $<8$  DN or HMF exceeds  $40 \text{ mg.kg}^{-1}$ , the honey quality is considered as degraded.



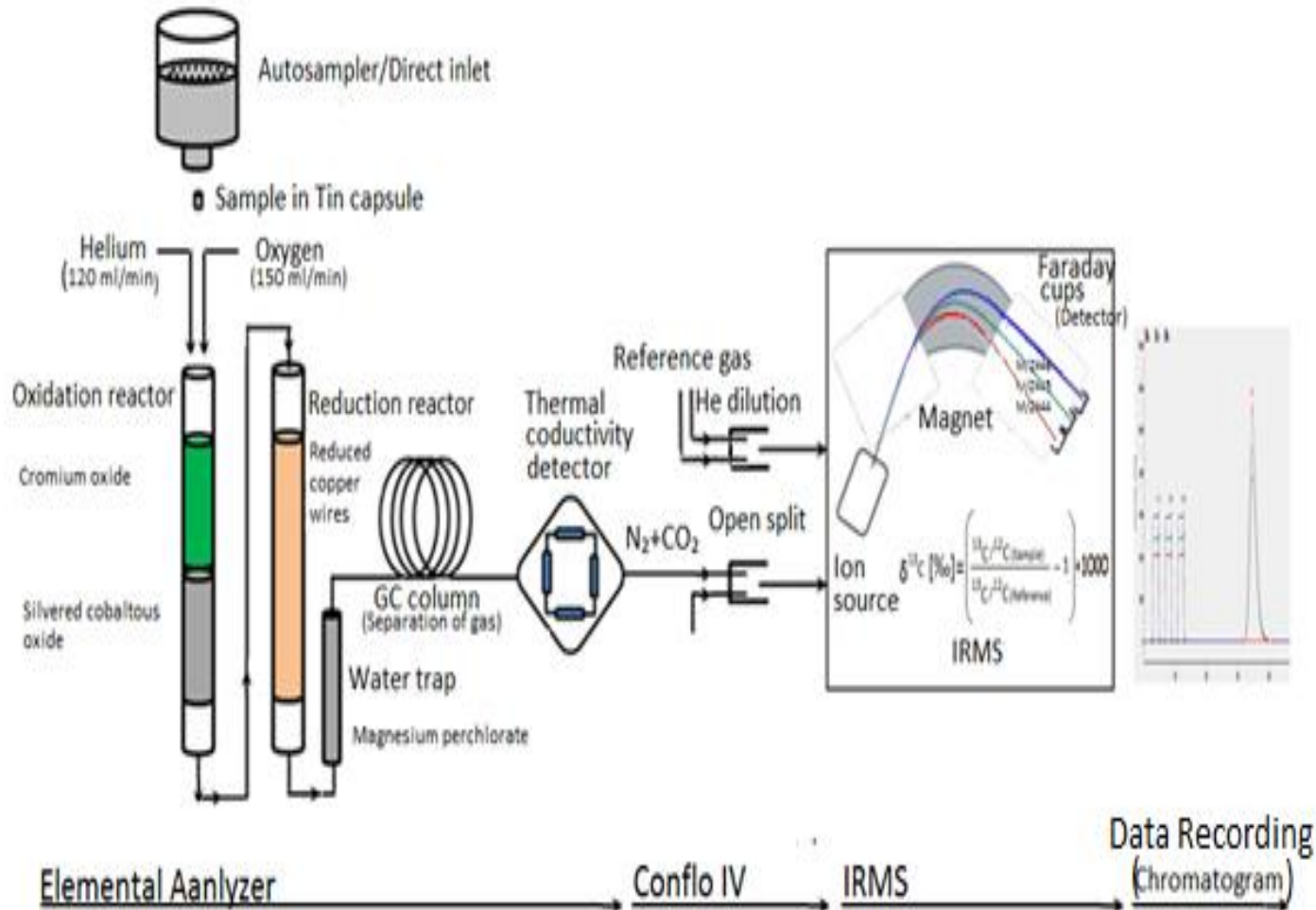
**Electrical conductivity**



## AUTHENTICITY CONTROL OF HONEY

- **Elemental Analyzer-Isotope Ratio Mass Spectrometer (EA-IRMS): Adulteration with Cane Syrup/Corn Syrup (C-4 Sugars)**
- **LC-IRMS : Rice Syrup /Beet syrup/ other (C-3 Sugars)**
- **Specific Marker Rice (2-Acetylfuran-3-glucoopyranoside (AFGP; 32 – 152 mg/kg)**
- **Trace Marker Rice (As;15 ppb) and Heavy Metals**

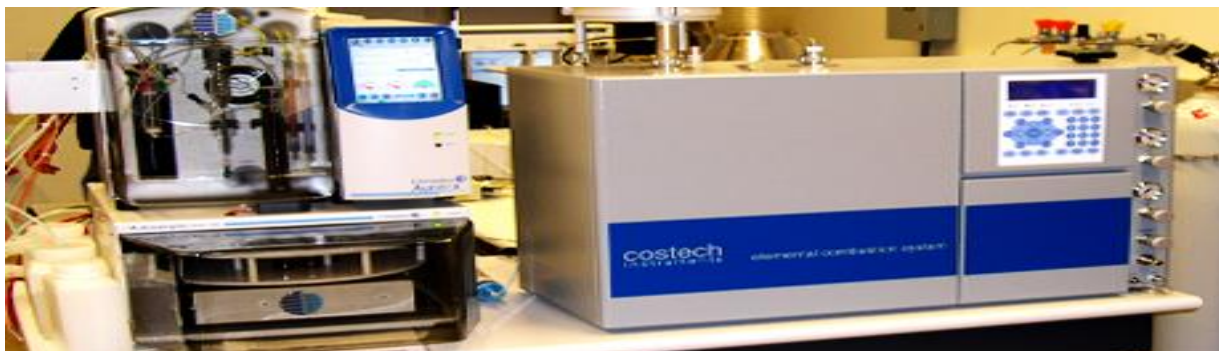
# SCHEMATIC DIAGRAM OF ELEMENTAL ANALYZER- ISOTOPE RATIO MASS SPECTROMETER FOR STABLE CARBON ISOTOPE ANALYSIS





## ELEMENTAL ANALYZER-ISOTOPE RATIO MASS SPECTROMETER (EA-IRMS)

- Isotope tests maize and sugarcane metabolised by C4 metabolic pathway. As a result, sugar syrups derived from them exhibited a  $^{13}\text{C}/^{12}\text{C}$  ratio, expressed as a  $\delta$  value, different from that of honey the sugar of which is derived via a C3 pathway.
- The  $\delta$  value of C4 syrups is close to  $-10\text{‰}$  while the average value for honey is  $-25.4\text{‰}$ .
- The original method for measuring the  $^{13}\text{C}/^{12}\text{C}$  ratio has been improved with the introduction of a protein internal standard. The method currently used, with or without an internal standard, allows the detection of 7-10 % adulteration with cane sugar or maize syrups.





## LC-IRMS : RICE SYRUP /BEET SYRUP/ OTHER (C-3 SUGARS)

- **C3 sugars: Plants like wheat, sugar beet, rice or tapioca.**
- Absolute  $\delta^{13}\text{C}$  isotopic values can not be used to differentiate honeys and C3 sugars in this case, because the isotopic values of nectar and honeydew from which the honey is produced is also derived from C3 plants.
- A specific feature of honey can be utilized: the  $\delta^{13}\text{C}$  values of honey protein and individual sugars are almost identical in authentic honeys.
- By comparing the individual deviations between  $\delta^{13}\text{C}$  values of different honey fractions, the authenticity of honey can be evaluated.
- The proper technical solution for this analytical problem is the online hyphenation of liquid chromatography (LC) with IRMS (LC-IRMS),

# SPECIFIC MARKER SUBSTANCES

Detection methods for specific marker substances : GC-MS, LC-MS or LC-ELSD.



Eg. Honey foreign oligosaccharides (oligosaccharide  $\geq$  DP4) are a remainder of enzymatic starch degradation and do not occur naturally in flower or honeydew honey.

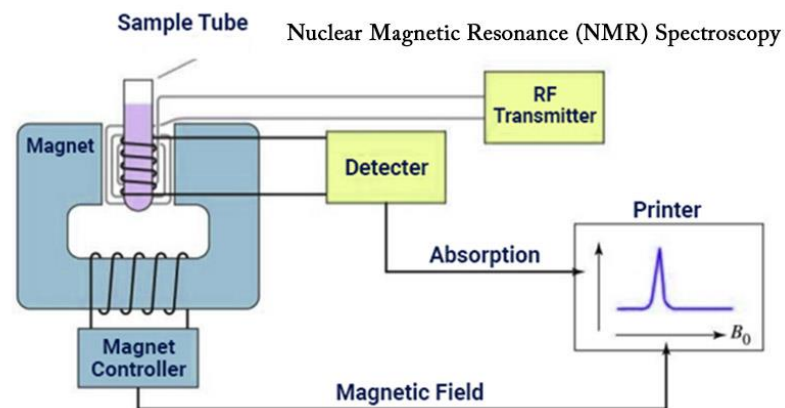


Disadvantage of these methods: Detection of one certain type of adulteration only

## NMR AND



- Allows the quantification of compounds and retrieving information molecular structure information
- A variety of information with just one measurement
- Quantification of 36 parameters
- High reproducibility and comparability
- Short measurement times
- Determination of Adulteration, Geographical/Botanical origin, & Processing steps
- Building up worldwide reference database





## NMR AND HONEY AUTHENTICITY

- An untargeted profiling of all substances present in honey & their concentration levels is performed and compared with respective compound spectra of authentic honeys using chemometrics.
- Honeys with an 'untypical'  $^1\text{H-NMR}$  profile are automatically referred non-authentic or adulterated, respectively.



## OTHER PARAMETERS DETECTED BY NMR

- There is quantification of 36 compounds including HMF.
- Sugars- Fructose, glucose, sucrose, turanose, maltose, melezitose etc.
- Markers- 3 phenylacetic acid, dihydroxyacetone, methylglyoxal
- Amino acids- Alanine, aspartic acid, glutamine, leucine, proline, valine, tyrosine, phenylalanine.
- Additional parameters- 2,3- butanediol, 5- hydroxymethylfurfural, acetic acid, acetoin, ethanol, lactic acid, formic acid, fumaric acid, pyruvic acid, & succinic acid.
- Up to 60 markers are applied per sample.

To build up very comprehensive and representative reference databases which fully reflect the natural variability of honey composition as per botanical and geographical origin



Feasibility to detect relevant adulteration markers despite the fact that NMR is not suitable method for trace substances (i.e. the marker substances, occurring in low amount)

To consider possible compositional variations due to seasonal, productional or climatic factors



## ANTIBIOTICS IN HONEY

FSSAI published amendments to the **Food Safety and Standards (Contaminants, Toxins, and Residues) Regulations 2011** to ensure the presence of antibiotics in honey within permissible limit on 5<sup>th</sup> December 2014.

All honey produced, packaged or sold in India will be tested according to the new standards.

Minimum required performance limit (MRPL) means minimum content of an analyte in a sample, which at least has to be detected (screening methods) and confirmed (confirmatory methods). It is intended to harmonise the analytical performance of methods for substances for which no permitted limit has been established.





## ANTIBIOTICS IN HONEY

Honey is not included in “tissues” (foods) stated in Annex I of Regulation (EEC) No 2377/90 and related Regulations world over. Hence, as per Article 14 of same Regulation, the use of antibiotics in honey bees is not permitted and cannot be authorized.

➤ **Antibiotics in honey are therefore considered “unauthorized substances” and “ZERO” tolerance applies.**

➤ **As per FSSAI, the use of any antibiotic is not permitted during honey production.**

➤ To test the misuse of antibiotics, the antibiotics specified in column (2) shall not exceed the Maximum Residue Performance Level (MRPL) specified in column (3) of the Table in next slide.





# ANTIBIOTICS IN HONEY

<b>S. No. (1)</b>	<b>Name of Antibiotics (2)</b>	<b>Maximum Residue Performance Level (MRPL) (ug/kg) (3)</b>
1	Chloramphenicol	0.3*
2	Nitrofurans and its metabolites	1
3	Sulphonamides and its metabolites	10 either individually or collectively
4	Streptomycin	10 either individually or collectively
5	Tetracycline	10
6	(a) Oxytetracycline	10
	(b) Chlortetracycline	10
7	Ampicillin	10
8	Enrofloxacin	10
9	Ciprofloxacin	10
10	Erythromycin	10
11	Tylosin	10

# ANALYTICAL TECHNIQUES FOR ANTIBIOTICS

**Mass Spectrometry Methods (Quantitative)**

LC-MS/MS (QQQ; TOF)

GC-MS/MS

**Other Methods (Qualitative)**

ELISA : Manual/Auto (Chemwell)

Biochip Technology (Multi Drugs Residue by Randox)

**Others**



# PM FORMALISATION OF MICRO FOOD PROCESSING ENTERPRISES SCHEME (PMFME)

## TOTAL OUTLAY: **RS. 10,000 CRORE**

- **2,00,000** FPOs/SHGs/Cooperatives and working micro enterprises to be directly benefitted
- Expected to generate **9 lakh** skilled and semi-skilled jobs
- To be implemented over a **5-yr period from 2020-21 to 2024-25**
- Cluster approach
- Focus on Perishables.

**Helpline Number**

+91 1302281089



For More details Contact:

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Ministry of Food Processing Industries

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