



# Honey

## Purity not guaranteed in these 10 brands

Like it or not, there is more to honey than its tempting colour and flavour. There is no denying that honey in its pure form is a powerhouse of health benefits – from fighting ulcers to treating coughs and cuts. But not all honey sold in the market is pure. Honey is often adulterated, which means it is mixed with glucose solutions, sweet syrups, or low-quality honey with high water content. The following report will clarify whether the various brands of honey available in the market meet the basic requirements, in particular those concerning purity.

*A Consumer Voice Report*

**A**dulteration of honey means it is impure, artificial or adulterated. Glucose, dextrose, molasses, sugar syrup, invert sugar, corn syrup, or any other similar product may have been added to it.

We conducted authenticity tests, including for C4 sugars, on 10 leading brands of honey to be sure if they are pure at all. The results may come as a revelation.

The test programme was developed as per parameters listed in the national standards – that is, FSS Regulations (new notification 31/07/ 2018), Indian Standard and Agmark. Food business operators have to comply with the requirements of the revised standard from 01/01/2019. It may be noted that as per Bureau of Indian Standards (BIS) and Agmark, honey has been categorized into three grades: Special, Grade A and Standard.

Additionally, we carried out tests on a range of quality, safety and acceptability parameters. These included fructose–glucose ratio, total reducing sugars, hydroxymethylfurfural (HMF), total energy value, moisture, total plate count, antibiotics, acidity, specific gravity, optical density, water-insoluble matter and ash. The tests were conducted at an NABL-accredited laboratory.



## BRANDS TESTED

Sl No.	Brand	MRP (Rs)	Net Weight (gm)	Price per 100 gm (Rs)	Best before (months)	Manufactured/Marketed by
1	24 Mantra	130	250	52	12	Sresta Natural Bioproducts Pvt. Ltd
2	Dabur	122	250 gm (75 gm free)	38	18	Dabur India Ltd
3	Fresh & Pure	149	500 gm	30	18	Future Consumer Ltd
4	Hitkary	111	250 gm (250 gm extra free)	44	18	Hitkary Pharmacy India Pvt. Ltd
5	Khadi (Agmarked)	140	250	56	18	Paras Dukh Bhanjan
6	Himalaya	115	225 gm (buy 1, get 1 free)	51	24	Apis India Pvt. Ltd
7	Reliance	199 (offer price 164)	500	40	24	Reliance Retail Ltd
8	Patanjali	135	500	27	12	Patanjali Ayurved Ltd
9	Zandu	165	250	66	18	Kejriwal Bee Care Pvt. Ltd
10	Baidyanath	201	500	40	18	Shree Baidyanath Ayurved Bhawan Pvt. Ltd

## Key Findings

- Except Zandu, none of the tested brands of honey conform to C4 sugars requirement.
- None of the brands, including Zandu, conform to the other test parameters for purity and authenticity as per requirements of new notification by FSSAI.
- None of the brands is pure honey.

As per the World Health Organization (WHO) Codex Alimentarius (CA) for honey, "Honey is the natural sweet substance produced by honeybees from the nectar of plants or from secretions of living parts of plants or excretions of plant-sucking insects on the living parts of plants, which the bees collect, transform by combining with specific substances of their own, deposit, dehydrate, store and leave in honeycombs to ripen and mature."



Honey is comprised of 17%–20% water, 76%–80% glucose, and fructose, pollen, wax and mineral salts. Its composition and colour are dependent upon the type of flower that supplies the nectar.

### TEST RESULTS FOR AUTHENTICITY OF HONEY

Cheapest commercially available sugar produced from cane sugar, high-fructose corn syrups, and potato syrups are among the most commonly used sweet syrups in honey. This is a serious economic and regulatory problem. As usual, the losers are the consumers. Sugar cane and maize/corn are tropical plants and they produce sugars via a slightly different biochemical pathway than that used by nectar-bearing plants.

FSSAI vide their notification dated 31/07/2018 has stated that “honey sold as such shall not have added to it any food ingredient, including food additives, nor

Parameter	Requirements
C4 sugars, % by mass	<7% (not more than 7%)
$\Delta\delta$ 13C F-G, permill	NMT $\pm 1$ permill
$\Delta\delta$ 13C, maximum (absolute), permill	NMT 2.1 permill
$\Delta\delta$ 13C P-H, permill	$\geq -1$ permill

*P-protein, F-fructose, G-glucose*  
NMT – not more than

shall any other additions be made other than honey.” FSSAI also introduced the following parameters for finding out whether the honey is pure or not.

#### ◆ C4 Sugars

These shall not be more than seven per cent as per notification of FSSAI. The test for C4 sugars is used to detect whether honey has been adulterated by adding sugar (for example, cane sugar or corn sugar).

- *Except one brand, Zandu, all others were found to be non-conforming to the requirement of C4 sugars. C4 sugar percentage in 24 Mantra was above the specified limit.*
- *Protein was not detected in any brand except Zandu and 24 Mantra.*

Protein is found naturally in honey and formed by bees through enzymatic breakdown of pollen and nectar. The carbon isotope values of the honey and protein must be virtually identical if there are no added sugars. If any sugar is added to the honey, then the carbon isotope value of honey will be changed, while the protein value is unchanged.



Brand →	24 Mantra	Dabur	Fresh & Pure	Hitkary	Khadi	Himalaya	Reliance	Patanjali	Zandu	Baidyanath
C4 sugars (%)	12.27	ND	ND	ND	ND	ND	ND	ND	2.19	ND
Remarks	NC	NC	NC	NC	NC	NC	NC	NC	C	NC

ND – protein not detected; C – conforming; NC – not conforming

### ◆ Other Tests

It may be noted that none of the brands conform to the other parameters relating to purity/authenticity of honey. The test results reveal that none of the brands is pure honey.

	$\Delta\delta$ 13C F-G, permill	$\Delta\delta$ 13C, max. (absolute), permill	$\Delta\delta$ 13C P-H, permill
Requirement →	NMT $\pm 1$ permill	NMT 2.1 permill	$\geq -1$ permill
24 Mantra	C	C	NC
Dabur	NC	C	NC
Fresh & Pure	NC	NC	NC
Hitkary	C	C	NC
Khadi	C	NC	NC
Himalaya	NC	C	NC
Reliance	NC	NC	NC
Patanjali	C	C	NC
Zandu	NC	NC	C
Baidyanath	NC	NC	NC

C – conforming; NC – not conforming

### Read the Label

The first thing you should do before buying a jar of honey is read the label and check that the ingredient list does not contain ‘high-fructose corn syrup’ or commercial glucose, two additives that are frequently used to ‘stretch’ the honey and keep it from solidifying.

All honey is liquid, but with time they tend to solidify, or ‘crystallize’ into a substance resembling grains of sugar. Addition of artificial sugars allows honey to stay in a liquid state for a long duration of time.

If you buy a jar of honey that is already crystallized, it is pure. If your honey is liquid, you can wait a few days to see if it solidifies or throw it in the fridge to accelerate the process. If the honey never crystallizes, there is a high probability that it is adulterated honey.

## Comparative Test

### FOR PHYSICOCHEMICAL PARAMETERS

**Fructose–Glucose Ratio | Total Reducing Sugars | Hydroxymethylfurfural | Total Energy Value | Moisture | Total Plate Count | Antibiotics**

#### ◆ Fructose–Glucose Ratio

Fructose-to-glucose ratio should be a minimum 0.95–1.5 as per FSS notification. This ratio indicates the ability of honey to crystallize. When the fructose/glucose ratio is high, honey remains liquid.

- *All the brands met the minimum requirement mandated by FSSAI.*

#### ◆ Total Reducing Sugars

Reducing sugars are capable of reducing other compounds. The most common reducing sugars are glucose and fructose.

As per FSSAI notification, reducing sugars shall be a minimum 65 per cent.

- *All the brands contained reducing sugars above the minimum requirement of 65 per cent.*

#### ◆ Hydroxymethylfurfural (HMF)

Hydroxymethylfurfural is often used as an indicator of the quality of honey. It occurs naturally in most honeys; however, high levels of HMF may be the result of inadequate storage, adulteration with sugar additives, or severe heat treatment. HMF in honey shall be a maximum 80 mg/kg.

- *All brands passed the test.*

#### ◆ Total Energy Value

Honey contributes a good amount of energy in our daily requirement.

- *Energy was found highest in Reliance and lowest in Fresh & Pure.*

#### ◆ Moisture

Higher moisture content can lead to undesirable fermentation of the honey during storage. FSSAI has set the permissible limit for moisture at 20 per cent as per the new standard.

- *All the brands were within the specified limit.*

All brands were within the specified limit with regard to these parameters: ash (not more than 0.5 per cent by mass), acidity (maximum 0.2 per cent by weight), specific gravity (not less than 1.35 at 27 degrees Celsius), water-insoluble matter (to check for presence of impurities), and optical density (maximum 0.3 per cent).

#### Total Plate Count

At present, the national standards have not specified any limit for microbiological contamination. For our report, we conducted the 'total plate count/gm' test on the 10 brands of honey to check if these were prone to microbial spoilage.

- *TPC in the samples was found up to 2,000 cfu/gm, which is not considered to be high*





### Antibiotics

Conventional bees are given large doses of antibiotics to protect them from diseases, but in the process the honey also becomes contaminated with these antibiotics. We checked the samples for presence of seven antibiotics – namely oxytetracycline, chloramphenicol, ampicillin, enrofloxacin, ciprofloxacin, chlortetracycline and erythromycin.

- *None of the seven antibiotics was detected in any of the brands.*



### Packing

The honey shall be packed in hygienically clean, wide-mouthed glass containers or in acid-resistant, lacquered tin containers, or in other suitable containers. With glass-bottle packing, one does not have to worry about harmful substances from plastic leaching into the honey, or the plastic not being food-grade. The screwed caps for the glass containers shall be of non-corrosive and non-reactive material and shall be provided with washers to avoid spilling.

- *Three brands – 24 Mantra, Dabur and Zandu – were packed in glass bottles. The rest were in plastic bottles.*

### Marking

Each container should be legibly and indelibly marked with these details: a) name of the material and grade designation; b) name of the packer; c) batch or code number; d) date of packing; e) net weight; f) standard mark (Agmark), if any; g) best-before date; h) storage instruction; i) nutritional information (optional); j) green dot; k) MRP; and l) Customer-care details.

- *All brands carried the required information on their labels.*
- *Except Khadi, none of the brands had Agmark and none declared their grades.*

## Comparative Test

### Responses of Manufacturers

As a matter of policy, before publication the test results of the brands are shared with their respective

manufacturers/marketers inviting their views/comments. We reproduce here the responses in brief:

Brand	Manufacturer's Comment	CV's Response
<b>Patanjali</b>	As per our report, the test parameters are well within the specifications and the sample meets the specifications of pure honey. Foreign sugars were not detected.	Our independent laboratory has reconfirmed the test results.
<b>24 Mantra</b>	All our products are sent for testing in accredited labs and the lab results indicate that our honey is not adulterated.	Our laboratory has double-checked the results and reconfirmed the same.
<b>Dabur</b>	1) C4 sugars cannot be evaluated without the evaluation of the protein. The protein evaluation data is missing. 2) For C3, the methods mentioned/used in your study are not in vogue in our country. We completely differ with your results and recommend that a joint evaluation be carried out by our scientists and your scientists.	1) The test report shared with you mentioned protein result as NA (the component [protein] was not detected). 2) IRMS analysis is based on AOAC method and HPLC is used only for separation of sugar, which was verified by retention time. Our test lab is NABL-accredited and has the requisite expertise for testing of honey. The lab has reconfirmed the test results.
<b>Baidyanath</b>	Limits of C3 and C4 sugars have not yet been implemented by FSSAI and moreover, the technology for checking these has only recently been introduced in India.	Testing of C3 and C4 sugars was conducted in an NABL-accredited government laboratory to check the purity of the honey. FSSAI has finalized standards for honey and notified the same on 31/07/2018.
<b>Himalaya</b>	Regarding C4 test results showing NC, we have in-house testing facility and the results show that our product complies with international norms. Additional parameters mentioned in the report are part of the draft notification by FSSAI for review and suggestions.	Our laboratory has double-checked and reconfirmed the results. FSSAI has finalized standards for honey and notified the same on 31/07/2018.





### How to check the purity of honey

- Take a tablespoon of honey and put it in a glass of water. If the honey dissolves, then it is not pure. Pure honey should stay together as a solid when submerged in water.
- Take a bit of honey and mix it with water. Then place four or five drops of vinegar into the solution. If it turns foamy, the honey might have been adulterated with gypsum.
- Scoop a bit of honey into a spoon and let it fall from the spoon. Honey with high water content will fall quickly. Mature honey of good quality will stay on the spoon or fall very slowly.
- Light a match and try to burn some of the honey. If it lights and burns, then it is pure. Impure or low-quality honey often contains extra water that keeps it from burning.
- If you have iodine at home, take some honey, mix it with water, and add a few drops of iodine. If the solution turns blue, then the honey has been adulterated with some sort of starch or flour.
- Take a small piece of old, hard bread and submerge it in the honey. If, when you remove it 10 minutes later, the bread is still hard, then the honey is pure. If there is a lot of water in the honey, the bread will soften.

### What makes honey organic?

Honey is considered organic when it is locally grown and not processed. Organic honey, also known as 'raw' honey, does not contain any pesticides or environmental pollutants. Since it does not go through the traditional process for safety, these standards are upheld for honey to be considered organic.

Also, non-organic sugar or antibiotics are not used at any point in organic honey. Organic honey is a natural, healthier and environment-friendly form of honey. There is no handling of pesticides or bioengineered synthetic products in organic honey. This honey is extracted from beehives that are situated in natural locations and the owners have to meet a set of standards that include bees' management, a proper extraction process and regulated processing temperature. Organic honey does not contain any residues of pesticides or other toxins found in a factory-produced bottled honey easily available in the market. Also, organic honey undergoes a rigorous process of chemical testing so that there is no deposit in it.



### Honey's Health Benefits

Honey has anti-viral, anti-microbial and anti-parasitic effects. Its capacity to inhibit the growth of microorganisms and fungi is well-documented.

Honey contains a number of minerals and vitamins, including vitamin A, vitamin C, iron and calcium. There are also important antioxidants, such as flavonoids and alkaloids. There are trace amounts of more than 15 amino acids found in honey.

Among other things, honey –

- Strengthens the immune system
- Heals wounds and burns
- Soothes coughs
- Helps in relieving seasonal allergies
- Nourishes the skin

Overall, while there are numerous health benefits that can be gained from honey, the extent of such benefits greatly depends on its quality. Not all honey is created equally and hence the various types do not necessarily provide the same benefits.

### Storing Your Honey

Store honey at room temperature – your kitchen counter or pantry shelf is ideal. If you keep it in the fridge it will become too thick and it is then likely to crystallize. However, even at room temperature the honey can crystallize over time. It has a tendency to absorb moisture, which contributes to crystallization. Always close the lid tightly. (Crystallization is the natural process of glucose sugar molecules aligning into orderly arrangements known as crystals. It is not an indicator of spoilage, impurity, age or quality.)

If your honey crystallizes and if you don't like its rather gritty mouth feel, simply place the honey jar in warm water and stir until the crystals dissolve.

Alternately, place the honey container into near boiling water that has been removed from the heat. Here are the steps:

1. Bring a pan of water to a boil.
2. Turn off the heat.
3. Place the honey container in the water with cap open.
4. Leave until both have cooled.
5. Repeat as needed.

Source: National Honey Board, United States

