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Assessment of Purity and Adulteration in Selected Honey Samples from the Latur Region

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Abstract

Honey adulteration has a significant concern in the food industry, compromising the quality, safety, and authenticity of this valuable commodity. Honey is also adulterated in the market which is not good for health. It have impure honey and sugar in large amount. This study was aimed to develop a reliable method for detecting honey adulteration using advanced analytical techniques. The total 10 honey samples were selected for analysis, Simple and chemical tests and chromatographic methods were used including pH, moisture content, conductivity,. The results showed that 20% of the samples were adulterated with sugar syrups or other sweeteners. The standard/developed method demonstrated high sensitivity and specificity in detecting honey adulteration. The findings of this study highlighted the importance of regular testing and monitoring to ensure the quality and authenticity of honey. This work contributes the development of effective methods for detecting honey adulteration, ultimately protecting consumers and promoting fair trade practices in the honey industry.

Keywords: Honey, selected samples, adulteration, sugar adulterants, toxicity and Latur region.

1. Introduction

The organic substance in the form of food which serves for easy metabolism and creating the source of energy is the Honey. Food adulteration refers to the process through which the quality of food is lowered [1, 2]. Broadly, food adulteration is a category of food fraud which is accomplished deliberately by human beings for financial gain [1, 2, 3, 4, 5] Honey is a valuable food product valued for its nutritional & medicinal properties. Ensuring the quality & authenticity of honey food is crucial for ingest health food Safety. The reputation of the honey Industry is important for the public health as in Ayurveda it is having the central position for any treatment. Honey may be adulterated by following methods to fool the consumer and assume as it is original Honey is sometimes adulterated by the addition of other sugars, syrups, or compounds to change its flavour or viscosity, reduce cost, or increase the fructose content to inhibit crystallization. Honey has been adulterated since ancient times, when honey was sometimes blended with plant syrups such as maple, birch, or sorghum and sold to customers as pure honey. Sometimes crystallized honey was mixed with flour or other fillers, hiding the adulteration from buyers until the honey was liquefied. In recent times, the most common adulterant became clear, almost-flavourless corn syrup; the adulterated mixture can be very difficult to distinguish from pure honey. According to the Codex Aliment Arius of the United Nations, any product labelled as "honey" or "pure honey" must be a wholly natural product, although labelling laws differ between countries.

In India FDA-Food and drugs administration, FSSAI-food safety and standard authority of India. Khadi and village industries commission monitor's the honey quality. Over the past half century, a number of honey testing methods have been developed to detect food fraud. To date, there is no single universal analytical method available which is capable of honey" must be a wholly natural product, although labelling laws differ between countries. The fundamental aspects to check the adulteration status around local markets of Latur region feels to check out hence present attempt have been made to investigate.

2. Material and Methods

The different methods used are as-

i). **Description of Sampling Methods:** During this work the collection the 10 honey samples in a Latur region was done after this one by one samples were tested for their purity and impurities if any.

ii). **The Honey Sample Name:** Sample no.1., Sample no.2, Sample no.3, Sample no.4, Sample no.5, Sample no.6, Sample no.7, Sample no.8 Local honey, Sample no.9 Local honey 2, Sample no.10 Local honey 3.Explanation of Analytical Techniques Used:-Here are some common methods of honey adulteration:

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iii). **Sugar Syrup Addition:** Adding sugar syrups, such as high fructose corn syrup (HFCS), cane sugar syrup, or beet sugar syrup, to honey. Molasses Addition: Adding molasses, a thick, dark liquid derived from refining sugar cane or sugar beets, to honey. Invert Sugar Addition: Adding invert sugar, a mixture of glucose and fructose, to honey.

iv). **Indirect Adulteration Methods: Feeding Bees Sugar Syrups:** Feeding bees sugar syrups instead of nectar to increase honey production. Blending with Other Sweeteners: Blending honey with other sweeteners, such as maple syrup or agave nectar, to increase volume and reduce cost.

v). **Sophisticated Adulteration Methods: Ultrafiltration:** Using ultrafiltration to remove impurities and improve the appearance and texture of honey. Ion Exchange: Using ion exchange resins to remove impurities and improve the colour and flavour of honey. Enzymatic Treatment: Using enzymes to break down complex sugars and improve the texture and appearance of honey.

vi). **Other Adulteration Methods: "Dilution with Water:** Diluting honey with water to increase volume and reduce cost. Addition of Flavourings or Colourings: Adding flavourings or colourings to honey to improve its appearance and taste. Mislabelling or Misbranding: Mislabelling or misbranding honey to make it appear as if it is of higher quality or from a specific region.

3. Result and Discussion

The different types of honey samples (total 10) collected from the Latur region were analysed for their quality and purity through simple tests and chemical methods. This was done to assess the market status (pure, impure, branded, local, etc.) and to raise awareness among the local population about honey adulteration and its health impacts.

Based on the various tests conducted, the following observations were made:

Table 1: Summary of Honey Adulteration Detection Tests

Sr. No.	Test Name	Pure Honey Observation	Adulterated Honey Observation	Interpretation
1	Flame Test	Black flame color	White flame Colour	Preliminary test; not fool proof
2	Water Test	Settles at bottom; no quick dissolving	Dissolves quickly in water	Quick and easy detection
3	Thumb Test	Thin, even layer; no dripping	Thick, uneven layer; drips/spreads	Indicates viscosity and purity
4	Blot (Bolt) Test	Compact, crystalline structure; no dripping	Loose, amorphous structure; drips easily	Sensitive to temperature and humidity
5	Potassium Iodide (KI) Test	No color change or slight yellow	Brown/reddish-brown Colour change; precipitation	Detects chemical adulteration
6	Saccharine Test	Litmus paper remains blue	Litmus paper turns red/pink	Detects artificial sweeteners
7	Fehling's Test	Presence of reducing sugars	-	Confirms natural sugar content
8	Molisch's Test	Presence of soluble carbohydrates	-	Confirms carbohydrate presence
9	Seliwanoff's Test	Presence of ketose sugars	-	Confirms natural honey composition

i). **Flame Test**

- **Black Flame Color:** Indicated the presence of pure honey.
- **White Flame Color:** Indicated adulterated honey (presence of added sugar syrups).
- **Interpretation**: Although the flame test is simple and rapid, it is not fool proof and needs to be supported by other chemical tests for confirmation.

ii). **Water Test**

- **Pure Honey:** Settled at the bottom of the glass without dissolving quickly.
- **Adulterated Honey:** Dissolved in water, indicating the presence of added sugars.
- **Conclusion:** Water test proved effective for preliminary identification of adulterated samples.

iii). **Thumb Test:**

- **Pure Honey:** Formed a thin, even layer on the thumb, did not drip or spread.
- **Adulterated Honey:** Formed a thick, uneven layer, dripped, or spread quickly.
- **Interpretation:** Pure honey maintained its consistency and adhesive properties, while adulterated honey lacked viscosity.

iv). **Blot (Bolt) Test**

- **Pure Honey:** Formed a compact, crystalline structure; did not drip or spread.
- **Adulterated Honey:** Formed a loose, amorphous structure; dripped easily.
- **Limitations:** Subjective interpretation and environmental factors (temperature and humidity) may affect the test's accuracy.

v). **Potassium Iodide (KI) Test:**

- **Pure Honey:** No significant colour change (slight yellowish).
- **Adulterated Honey:** Colour change to brown/reddish-brown with precipitation.
- **Limitations:** Other components like wax or pollen may interfere, requiring careful observation.

vi). **Saccharine Test:**

- **Pure Honey:** Litmus paper remained blue, indicating no added sugars.
- **Adulterated Honey:** Litmus paper turned red/pink, confirming the presence of saccharine or artificial sweeteners.

vii). **Additional Chemical Tests**

- **Fehling's Test:** Confirmed the presence of reducing sugars (glucose and fructose).
- **Molisch's Test:** Confirmed the presence of soluble carbohydrates.
- **Seliwanoff's Test:** Indicated the presence of ketose sugars.

Discussion

According to the results, 20% of the samples showed signs of adulteration. Interestingly, local honey samples (Samples 8, 9, and 10) demonstrated better quality standards compared to some branded products [6, 7].

An important finding from the study was that feeding bees sugar syrups (SS) during production did not significantly alter the basic sugar composition of honey, as bees naturally convert sucrose into fructose and glucose. However, initial hydrolysis of sucrose could still be traced using sensitive chemical tests [8].

The developed simple testing methods such as flame test, water test, thumb test, blot test, and chemical methods (KI and saccharine tests) were found to be useful preliminary tools for honey purity evaluation. Although these methods have some limitations, they provide valuable first-hand information, especially for consumers and local authorities without access to sophisticated lab equipment [9, 10].

4. Conclusion

The study concluded that honey adulteration exists at a noticeable level in the Latur region. Simple preliminary tests are effective in identifying adulterated honey samples, although confirmation may require advanced techniques.

Local honey producers showed higher purity levels compared to some commercially available branded honey. Therefore, encouraging local honey consumption, strengthening monitoring systems, and raising consumer awareness are critical steps toward promoting pure honey usage.

This work highlights the need for regular honey quality surveillance to protect consumer health and maintain the integrity of the honey industry.

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