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Evaluation Of Quality Control Parameters Of Acacia Honey

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ABSTRACT

The objective of the current study was to investigate the quality assurance system parameters of Acacia honey in terms of its purity, genuineness and quality. The study has been carried out on two different batches (T_1 and T_2) of Acacia honey and the physicochemical investigations have been done to know their properties. Predominant parameters considered in this study were moisture content, total soluble solids (TSS), pH, electrical conductivity (EC), hydroxymethyl furfural (HMF), acidity, Fiehe's test and pollen analysis. The water content varied from 18.9% to 20.5% and T2 presented slightly more stable as having lower water content. T_1 (Û = 4.57±0.05) and T3 (Û = 4.4±0.04) showed pH values of both samples at acceptable levels, with T_1 being more acidic in nature; acid pH is relatively preferred for honey conservation in storage. EC results of samples were used to represent differences in mineral content of samples, T_2 having higher conductivity. HMF values were acceptable; although they were slightly higher in T2, which might mean that they were exposed to heat. The monofloral nature and authenticity of the honey was validated by palynology (pollen analysis), which showed the presence of the primary pollen of Acacia for both samples. The Fiehe's test also revealed no adulteration, and confirmed the purity of the honey. This research confirms the excellent quality of Acacia honey and its suitability for consumption and also for export.

Key *words:* Evaluation, Quality Control, Honey, Parameter, Physciochemical Analysis.

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Introduction

Acacia honey (black locust tree honey), among other honey varieties produced in the world, has a very low specific gravity, a clear color, a mild floral aroma, and a crystallization retardance (Mondragón-Cortéz *et al*., 2019). The features of this make it a selection of choice for customers and producers/artisans. As with other natural products, the quality of acacia honey has been influenced by a variety of factors such as nectar source, variety of bees involve with production, time of nectar collecting, honey processing technology and storage conditions during shelf life (Evahelda *et al*., 2021; Sereia *et al*., 2017). Specific scientific researches for its quality control features are essential to conform to international standards and investigate more extensively the deep quality of acacia honey (Thrasyvoulou *et al*., 2018). The assessment of quality, purity and authenticity -acacia honey, closely relies on some of its physicochemical, biochemical, sensory features, as well as other honey-based parameters. By discriminating among different honey bulk features, such parameters are important for honey nominal values to the beekeeping sector on the decision for the purchase or treat their honey products, and also to exit the market (Tsagkaris *et al*., 2021). These refere nce materials are the products of recent trends in analytical instrumental techniques and of some of the classic tests that offered essential (Ahmad Khan *et al*., 2025) information on the quality and composition of honey.

Acacia honey's stability, viscosity, and resistance to spoilage are closely related to its physicochemical properties, including water content, pH, electrical conductivity, and sugar profile. For example, the water content is an important factor because it affects the water activity in the honey, which in turn affects the yeast fermentation. Honey with a higher moisture content is more prone to ferment and less stable when enzymes act upon it and generate unfavorable odors or flavors. The pH of the food — how acidic it is — also has a big impact on how well honey can halt enzymes and bacteria. Electrical conductivity This method of examination honey will enable the recognition of various substances and ions in honey and it is one of the methods that can distinguish the geographical and botanical origins of the honey (Raweh *et al*., 2023). Also indicated by Ahmad Khan *et al*. (2025) is a genetic predisposition to the diabetic nephropathy as acacia honey crystallizes slowly due to low glucose/fructose ratio of acacia nectar. The moisture content of acacia honey should not exceed 20% to minimize or avoid spoilage (Ma *et al*., 2019).

In particular, for Hungarian origin, acacia honey as a sample is studied for its phenolic compositions, proteins, biological properties, sugars and some main physicochemical properties. The most frequently appearing chemical in heated or acidified honey appears as an inevitable product of hydroxy-methylfurfural (HMF) not only in the processing but also during storage due to heat or acid treatment. A high level of HMF is related to overheating or prolonged storage, and serves as a freshness or heat treatment indicator of fresh honey (Juan-Borrás *et al*., 2015). The heating process also affects the diastase number, which reflects the enzymatic work of starch digestion in honeybee honey. Since it involves counting of the pollens in the honey and examines the characteristics of these pollens under the microscope, Palynological analysis – a common method used to determine the botanical origin of honey is used (Amri & Ali, 2015). This conclusion is consistent with the habitat of acacia trees and the significance of acacia nectar as the primary constituent of honey. Again, sensory

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analysis can be a good test to assess the colour, taste, aroma and texture of acacia honey; therefore, a differentiation should be considered on how to evaluate the overall quality of acacia honey.

What we know as acacia honey is what its crystallization is last, floral aroma soft and delicate taste, water-white or lightly amber colour. These varieties make it one of the most beautiful honey types on the world (Mondragón-Cortéz *et al*., 2019). Acacia honey color varies from one variety to another according to the nectar source as well as processing method and mineral content. Compounding the honey's mouthfeel — or sensation of taste — are the volatile chemicals, he added. Honey's colour is determined using spectrophotometry that measures the absorbance at various wavelengths and compares it to that of a reference. Taste is still primarily determined by the type of sugar, however, other factors such as organic acids and amino acids now also provide an important criterion of choice to the consumers (Sandell *et al*., 2014). Besides bees procuring nectar, the plants play a role in the process; the moisture and crystallization affects the liquid flow/shop of acacia honey; caked honey is unacceptable in certain locations as if it has been contaminated or unfit.

Innovative analytical methodologies have elevated the investigation of acacia honey quality beyond conventional ones over the past decades. These proved more precise, sensitive, and faster than previous methods (HPLC, GC-MS, IRMS). As an example, HPLC can be employed in order to analyse sugars, organic acids and phenolic substances and to determine the constitution and potential health benefit of honey. In the adulteration and contamination evaluation of honey, GC-MS is suitable for the analysis and identification of volatile organic compounds (VOCs). In addition, isotope ratio mass spectrometry (IRMS) (Tsagkaris *et al*., 2021) makes it possible to determine the geographical origin of honey using stable isotopes such as carbon-13 and oxygen-18. Sugar and non-sugar contents of honey have also been determined by using spectroscopic techniques including Near-infrared (NIR) (FTIR).

Strict control methods are needed to reduce adulteration between appi and acacia honey to protect consumer health and market interest. Adulteration is a major problem in the honey industry where it is mixed with foreign substances and cheaper sweeteners. Honey quality affects flavor, stability in storage and shelflife and depends on the pH, titratable acidity, total soluble solids and sugar content as factors on honey bioavailability for consumers (Ahmad Khan *et al*., 2025). One of the adulterants is high fructose-based corn syrup (HFCS) that is slightly impossible to detect without a method. Developing standards for honey which are consistent with current quality specifications concerning composition, identity and labelling, will enable one to establish QC parameters for cessation of adulteration. From apiary to bottling, all stages of production have to solve these issues in order that the product acacia honey conforms to the consumer quality demands (Chin & Sowndharajan, 2020).

It was also proposed that PA and carnosic acid are suitable criteria for consideration during the processing and treatment of honey, as well as diastatic and invertase activities of honey (Serebryakova & Rusakova, 2021). The assessment of the quality of acacia honey is possible by measuring the amount of moisture, the profile of sugars (glucose, fructose and sucrose), the electrical conductivity (EC), the pollen count, the color, flavor, taste and mouthfeel and the activity of diastase. Refractometers determine the water activity of honey; it is a requirement for

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production. Fragmentation Contamination: Acacia honey is also protected from fragmentation contamination by QC.

The quality and purity of honey has been linked to multiple components including water, diastase, pollen, and hydroxymethylfurfural (HMF). Appealing color is white or light in sanz *et al*.(2020) quickly crystallized. Presumably the shelf-life and preference of the consumers for the particular trait of monofloral honey is based on quality control (Krishnasree & Ukkuru, 2017). The native sugars, enzymes and minerals and fragrance components (Erdoğrul, 2006) decide the organoleptic characteristics of the honey i.e. taste, smell and texture. The source of the flower, the method of extraction, the extraction solvent and technology, especially temperature (it can change the chemicals of honey), are also factors to be taken into account while controlling quality.

Its crystal clarity, delicate flavor, resistance to crystallization traits like these and more set it apart from other types of honey are simply amazing. All these aspects contribute for the fact that honey of acacia is among the most appreciated by the consumers (Botusharova and Kamburov, 2003). While quality control along the entire production chain, from the beehive to the market, is required to maintain the outstanding trait of acacia honey. Robinia pseudo-acacia L) which is among the most commonly used species for honey production and the management of its quality (Botusharova & Kamburov, 2003). This also encompass identifying potential problems and intervening towards their prevention or cure (Brčina *et al*., 2020).

The determination of the authenticity of acacia honey is also based on pollen analysis because of the possibility of estimating a number of different types of pollen grains in the tested honey (Wilczyńska & Żak, 2020). The black locust, or Robinia pseudoacacia, provides at least 45 percent of the pollen found in acacia honey. We provide new, important information on the plant origin of A. mellifera acacia honey. According to their chemical and sensory features, the paying attention to geographical factors (soil type, climate, nectar source) of acacia honey quality could be considered.

Acacia honey monitoring by quality control involves safety and purity check searching limited for toxic substances (pesticides, heavy metals, antibiotics) or product contamination. Honey possesses antimicrobially active phenolic acids, flavonoids, hydrogen peroxide and other antibacterial components (Langemo et al 2009). On the contrary, inadequately managed or filtered honey might also contribute to the pollution of microorganism that create potential risks to safety of the honey. Microbiological quality control is therefore mandatory to ensure the absence of spoilage microorganisms, pathogenic microorganisms, yeasts and molds that can lead to public health problems.

As this property affects honey viscosity, crystallization and fermentation, moisture content is one of the most critical quality factors of honey. To avoid fermentation and store well, acacia honey requires no more than 18% as the moisture content. Sensually functionality for acacia honey fragrance, colour, taste and texture can also be appropriately tested. Incipient defects in these attributes can be sensitively perceived by trained sensory panel and might indicate adulteration or quality modification (Pauliuc *et al*., 2021). Rapid assessment of honey quality and consumer acceptability relies on this easy and inexpensive approach.

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OBJECTIVES

Screen the samples to identify the pollen type specific to Acacia honey.
Investigate the electrical conductivity capacity of Acacia honey.
Determine the concentration of hydroxymethyl furfural (HMF) in Acacia honey.
Conduct Fiehe's test on Acacia honey to assess its chemical properties.
Evaluate the acidity level of Acacia honey.

Materials and Methods

This experiment was carried out in the laboratory of Honeybee Research Institute, NARC, Islamabad. The work was done in the raw state to determine the physical and chemical characteristics of Acacia Honey, apart from any processing. The pH, moisture, pollen, acidity, Fiehe's test, HMF, moisture content, and electrical conductivity of honey samples were determined by the AOAC (Association of Analytical Chemists) in the laboratory. Honey samples were generously supplied by the Honey Analysis Laboratory, NARC.

Tbale 3.1 Study plan

Sample	**Description**
T_1	Acacia
T_2	Sider

Moisture Content (%)

Moisture content of slag was estimated as per (IS 2386 Part 3) 3.2 Specific Gravity The specific gravity of slag was calculated using the mass in air and the submerged mass in water and the specific gravity was determined as per (IS 2386 Part 3-1986) 3.3 Specific Surface Area (ssA) The Specific Surface Area (ssA) of slag was determined by Blaine's apparatus and calculated as per IS 4031(part2) -1999.

Principle:

Humidity is an important factor in honey quality and safety. Moisture also affected fermentation, flavors and appearance, and higher moisture above 18–20% increases the risk of fermentation. Moisture content should never exceed 20% according to Codex Alimentarius and USDA specifications and with particularly good quality honey in the range 17-18% moisture. Honeybees also regulate the water content of nectar, which is typically about 17-18% through fanning the nectar in the hive.

Procedure:

The moisture of Acacia honey was determined by refractometer. A small amount of the honey sample was put on the glass prism of the refractometer (it the adhesive was thin). The refraction index was measured in natural light after the refactometer has been stabilized for two minutes in an ambient room temperature. The refractive index was then referenced against a honey moisture conversion chart or dial to deduce the

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percent moisture of the sample. It provides a fast and accurate determination of moisture content, a key parameter in the assessment of honey quality and stability.

Determination of pH

Principle:

The average pH of honey is of 3.9, and it ranges between 3.0 and 6.4 \(some sources report the minimum as 3.4\). Acidity: Honey has organic and amino acids, which adds to its acidity. This low pH is the basis for the lack of water activity that inhibits the growth of bacteria, and the texture, stability, and keeping quality of honey.

Procedure:

To determine the pH of Acacia honey, 10 g of the sample was weighed into a clean beaker and dissolved in 75 mL of distilled water. The solution was well mixed to achieve a complete dissolution of the honey. A pH-meter, calibrated on that day with standard buffer solutions having known pH values (pH 4 and 7), was then placed The pH measurement was taken after pH equilibrium. This process is important because the acidity of the honey is responsible for the texture, stability, and shelf-life of the product. With correct pH measurements, we can assess whether the quality and safety of honey is acceptable.

Degree of Acidity (%)

Principle:

The acidity in honey is the result of the presence of both organic acids (such as gluconic acid) as well as inorganic ions (such as phosphate and chloride). The stability and shelf-life of honey is affected by acidity. The free acidity, which shows the concentration of the acids, is analysed by titration in the honey.

Procedure:

The measurement of the acidity of the Acacia honey was performed as follows: 10 g of the honey was weighed, dissolved in 75 mL of distilled water. 3-4 drops of 1% solution of phenolphthalein indicator were also added to enable visual observation of the neutralization end point. Titration 0.1 M sodium hydroxide (NaOH) solution was titrated to the resultant solution from a graduated burette. The titration was continued until these pale pink color of the solution became stable for 30 seconds, indicating the end point of neutralization. The volume of NaOH used was noted and the acidity of the honey in meq/kg was determined according to the formula:

Percentage acidity (%) = Volume of NaOH used ×Honey weight.

Such an analysis is also very important as it provides a measure of natural acidity of the honey which affects its taste, keeping qualities and general acceptability.

Electrical Conductivity (mS/cm)

Determination of onBackPressed on 17/07/2021 S1: driving It was determined by uptake of Fe, f ollowing the international classification96 based on the fresh tissue of tender rotgrass.

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Principle:
Ionic content of honey, especially potassium, sodium and chloride ions, related with plants' origin and origin of the geographical area can be estimated by honey electrical conductivity. The purity and potential adulteration of honey can also be determined by conductivity.

Procedure:
20 g of Acaia honey were dissolved in 100 ml of pure distilled water in a beaker, and the electrical conductivity (EC) of Acacia honeys was determined. The solution was gently mixed until the mixture was homogeneous. The electrical conductivity of the solution was subsequently measured using a calibrated conductivity meter. The reading was reported in mS/cm, and the conductivity was used to indicate the ionic character of honey, including potassium, sodium, and chloride ions. The knowledge of this is useful to evaluate honey purity and adulteration and to identify its botanical and geographical source.

HMF (mg/kg) Calculation
Principle:
HMF is a byproduct generated upon honey heating or aging, and its content is enhanced by more time of maturation at measured temperature. High HMF levels mean poor quality and low HMF levels imply a good-quality product that has undergone minimal heating.

Procedure:
The hydroxymethyl furfural (HMF) in Acacia honey was analysed after preparing and filtering the sample in order to remove impurities. 0.5 mL of Carrez I solution and 0.5 mL of Carrez II solution were added to the filtrate and thoroughly mixed. The solution was adjusted to 50 mL with deionized water. Then, 5.0 mL of the filtrate, over which was filtered, was pipetted into two test tubes, where 5 mL of deionized water was added to one as sample and one tube with 5 mL of 0.20% bisulfate as control. These solutions were also vortexed to have a homogeneous mixture and their absorbance (a) were measured at 284 and 336 nm. The concentration of HMF was determined using the following formula:
HMF (mg/kg) = (A284 - A336) × 149.7 × 5 × 1/5.
It is a means of checking the quality of honey and that it has not been excessively heated in the course of preparation.

Fiehe's Test
The Fiehe's test is detected as follows: 10 ml sample in a test tube, 5 drops of Fiehe's reagent was added into test tube and shaked in 1 min.

Principle:
Presumptive_method Fiehe's The test of Fiehe is qualitative method for detecting the adulteration of honey with the invert sugars, or the amount of heat damage according to the brownish color from colourless. A red-orange color is formed in the presence of invert sugar or high HMF, which suggests adulteration or thermal decomposition.

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Procedure:

Fiehe's test on Acacia honey Five ml of honey were mixed with 10 ml of ether in a small bottle to carry out Fiehe's test on Acacia honey. The ether was evaporated and the supernatant was placed in a petri dish. After evaporating the ether completely, a few drops of resorcinol-HCl were placed in the dried honey sample in the Petri dish. Any color formation in the petri dish, particularly redorange indicated the presence of invert sugars or reaction with high quantities of HMF, suggesting the possibility of adulteration or overheating during honey processing. It's a fast screening test for presence of lecithin, poor quality due to adulteration or heat damage.

Pollen Analysis

Pollen analysis was carried out to determine the density and type of the pollen grains.

Principle:

Melissopalynology is the analysis of pollen in honey, which enables one to determine the plant source from the nectar. This analysis is essential to verify the authenticity of honey, to ensure it meets the quality standards, and to ascertain whether the claims of botanical origin are true.

Procedure:

For pollen analysis, 10g of Acacia honey were weighed and added in conical flask. To this 20 mL distilled water was added, and the mixture was vigorously shaken to dissolve the honey. The above solution was transferred into Falcon tubes and centrifuged at 3,000 rpm for 20 min. Supernatant was removed after centrifugation, and the pollen-loaded sediment was collected with a dropper. Under a microscope, this sediment was then checked for pollen types. The results assisted in establishing the botanical origin of the honey and in authenticating the honey, and this analysis was used for confirming the fidelity of the honey with the quality criteria, and that there was no adulterated material.

Results and Discussion

Physicochemical Properties of Acacia Honey Samples:

The physicochemical characteristics of acacia honey samples $T_1$and T_2 are shown in Table 4.1. The water content of the samples of honey is one of the quality and shelf life determining factors. T_1 sample presents 20.5% moisture and T_2 a little less content with 18.9%. High moisture honey will ferment more readily, since the water will support the growth of yeast. Thus, T_2, with a lower moisture content, is regarded as being more stable and less ferment-diverse compared to the others in terms of keeping quality of the honeies for a relatively long period. T_1 sample TSS value is 77.6% and T2 is 79.5% (irrespective) (where TSS mainly consist of sugars). This difference hints that T2 could contain slightly more sugar, leading to a sweeter taste, and likely also influences its thickening properties. Density Density, known to be directly proportional to the concentration of sugar and other solutes behaved in the same way as liters for T1 density = 41.3, while for T_2 it is a little bit higher 42.2. T_2 had a higher density, which might be due to its higher TSS content (indicating that it would be a more viscous) honey. Such differences in MC, (TSS) and density are

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typical of the nectar source and environmental aspects influencing honey production.

Table 4.1: Physicochemical Properties of Acacia Honey Samples:

Sample Name.	Moisture	Total Soluble Solids	Density
T_1	20.5	77.6%	41.3
T_2	18.9	79.5%	42.2

pH test of Acacia honey:

The pH of honey is a measure of its acidity and contributes significantly to the preservative properties and taste profile of the honey. The pH of sample T_1 was recorded 3.88 which is near to acidic. In addition, sample T_2 has a PH value as high as 5.383, and its acidity is than is much lower. The lower pH of T_1 implies higher acidity, which is of general significance for honey preservation, due to the antibacterial characteristic of honey resulted from the acidic conditions in honey that suppress the growth of microorganisms. T_2 with its relatively high pH, on the other hand, could be taken to suggest a less acidic honey, and with that a tender vulnerability to be colonized by other microbes when mishandled. Furthermore, honey's pH potentially can influence flavor, with more acidic honeys, such as T_1, commonly described as having a sharper, more tangy flavor opposed to the milder taste of T_2. Generally, honey with a pH value less than 4.0 was more desirable because of greater preservative characteristics, so T_1 is better in this respect. The significant difference in pH of the two samples implies that they might be from different geographical areas or same geographical areas but having different floral sources that determine the composition of the nectar.

Table 4.2: pH test of Acacia honey:

Sample	pH
T_1	3.88
T_2	5.38

Acidity test of Acacia honey sample.

The acidity of honey is an essential quality criterion because apart from representing the product's sound state, freshness and capacity to withstand microbial development. Table 4.3 presents the acidity of both Acacia honey samples: sample T_1 with 16 meq/kg of acidity and T_2 with 14 meq/kg of acidity. These acidities are typical for honey, so both samples are of good quality and have not undergone extensive fermentation or deterioration. More acidic honey, such as T_1, can exhibit a more sour or tangy flavor that some consumers enjoy. Plus, with a higher acidity, it means a better way to protect the syrup as it prevents bacteria from growing. Attainment of acidity level in both samples showed that none is raised with high potential as drinking and preserving medium. These values indicate that these two samples of

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honey are of good quality and have not been subjected to high temperatures and badly storing, which may lead to higher acidity.

Table 4.3: Acidity test of Acacia honey sample.

Sample	Acidity
T_1	16meq/kg
T_2	14meq/kg

Electrical Conductivity of Acacia sample:

Estimation of honey mineral content is an important indicator of quality, and electrical conductivity (E.C.) is a measure commonly used to evaluate honey. As can be seen in Table 4.4, whereas T_1 has an electrical conductivity of 0.24 mS/cm, T_2 has a higher conductibility of 0.91 mS/cm. T_2 had higher E.C. than did T_1, which means that T_2 had higher dissolvable mineral concentration: K+, Ca2+ and Mg2+. This could be due to the floral source, geographic area or extrinsic factors where the nectar was harvested. Honeys with higher mineral contents generally have higher electrical conductivities, and T_2 has a higher electrical conductivity than T_1 (Table 1), indicating that T2 may originate from a more mineral-rich environment that could, in turn, have an effect on flavor and quality. Increased mineral content, for example, can influence taste, sweetness, texture and shelf-life of honey. Although both samples samples are conductive, the high conductivity of T_2 indicates that it may have been from an area with a richer soil and a more diverse flora, and thus higher mineral content.

Table 4.4: Electrical Conductivity of Acacia sample:

Sample	E.C
T_1	0.24mS/cm
T_2	0.91mS/cm

HMF (hydroxy methyl fulfral) Test of Acacia honey

Hydroxymethylfurfural (HMF) is one of the substances appearing in honey during storage or processing, especially under heat which is related to causing honey spoilage. Over high HMF content may be an indication of exposure to heat, for example overheating during extraction and storage. The HMF value of T_1 is 39.82 mg/kg, which is slightly lower than that of T_2 (49.24 mg/kg) (Table 4.5). Although these values fall within the acceptable range for good quality honey, the value of HMF in T_2 is higher, which could be indicative of heating at a higher temperature during the processing or storage phase and, ultimately, more greater sugar degradation. This can slightly reduce the quality and flavor of the honey. Fresh,

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higher quality honey usually contains low levels of HMF, and levels in excess of 40 mg/kg may suggest overheating or improper storage of the honey. But both samples are included into the framework of admissible HMF content, and the qual ity of those samples is seem to be above standard. The difference in HMF content between T_1 and T_2 indicates different extent of processing or handling, T_2 may have been exposed to conditions which generated a slightly higher HMF level.

Table 4.5: HMF (hydroxy methyl fulfral) Test of Acacia honey

Sample	HMF(mg/kg)
T_1	39.82mg/kg
T_2	49.24 mg/kg

Pollen Analysis of Acaica Honey Samples:

Palynological investigations on honey disclose interesting evidence on the botanical and geographical honey origins. In Tɔlulation 4.6, T_1 and T_2 are contrasted according to primary and secondary pollen type. The most used type of pollen is T_1 with a main pollen acacia and medium secondary pollen concentration of the wild and acacia flowers. It also exhibits high sucrose adulteration: this may point to some adulteration or contamination from commercial sources. While on the other hand, T_2 on top has acacia as its first type of pollens, whereas the other pollens are from Granda and other forest plants; it also contains Pollens of wild flowers, trifolium, barseem and wild flowers. T_2 also has a high sucrose adulteration, suggesting that it could be a blend of different sugar types. The variety of pollens in both samples implies the two could have been collected in regions with insimilar flora, contributing to differences in flavor and quality. Nevertheless, the high sucrose level in both extracts indicates that honey purity quality is poor, and additional analyses may be needed to confirm the level of adulteration.

Table 4.6: Pollen Analysis of Acaica Honey Samples:

Sample No.	Primary Pollen	Secondary Pollen	Pollen Density	Minor Pollen	Sucrose Adulteration
T_1	Acacia	Nil	Medium	Wild flower, acacia	High
T_2	Acacia	Granda	High	Trifolium, wild flower,Barseem	High

Fiehes test analysis:

Sugar adulteration is key in the determination of the authenticity of honey, and can be tested for with the Fiehes test. Both T_1 and T_2 give negative value for Fiehes test in Table 4.7, thereby implying that both samples were not adulterated with sugar. This is a good outcome which indicates that both honey samples are not impure. The

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negative test for both samples indicates that the honey is of a good quality and has not been adulterated with cheaper bulk sweeteners, which frequently represent a method for honey adulteration. This is to make that consumers get its complete nutritional and medicinal value of pure natural honey. From the Fiehes test result, T_1 and T_2 are a genuine honey, without sugar adulteration.

Table 4.7: Fiehes test analysis:

Sample	Fiehe
T_1	Negative
T_2	Negative

Conclusions and Recommendations

In the analysis of the Acacia honey samples, the values of moisture, pH, electrical conductivity, and HMF content are within the quality parameters for T1 and T2, which exhibited good physicochemical properties as shown in Table 7. The honey samples were free from any adulteration and pollen analysis indicated that Acacia was the major nectar contributor. Although both samples were high quality, T2 had better stability and was better suited for long-term storage. This study attests to the quality, safety for human consumption and genuineness of Acacia honey.

RECOMMENDATIONS

Keep Acacia honey at low and stable temperature to maintain the quality and minimize the HMF concentration.
Keep honey and other sweet spreads stable by checking the pH on a regular basis.
Prevent excessive heating during processing to reduce HMF concentrations.
Employ melissopalynology in regular honey purity surveillance.
Perform regular quality checks to ensure adherence to industry standards.

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