

Physicochemical properties of honey essay sample

[Food & Diet](#)



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Honey is defined as the natural sweet substance produced by *Apis mellifera* bees 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 a sweet, viscous fluid, elaborated by bees from the nectar of plants and stored in their combs as foods [1, 2, 3]. It is a natural substance produced by bees and is a nutritious food of economic importance worldwide [4].

As the only available natural sweetener honey was an important food for *Homo sapiens* from his very beginnings. Indeed, the relation between bees and man started as early as Stone Age. From ancient times, honey was not only used as a natural sweetener but also as a healing agent. In most ancient cultures honey has been used for both nutritional and medical purposes [5] it is used as food an important ingredient in different kinds of manufactured food. It may be a significant source of vitamin and micro-and macro-elements essential for human health [6]the source of honey, made by bees, is the nectar of plants and honeydew.

The composition and quality of honey greatly influenced by geographical and environmental factors.

The quality and properties of honey are related to honey maturity, the production methods, climatic conditions, processing and storage conditions as well as nectar sources of the honey [7] Honey is mainly composed of carbohydrates, water, traces of organic acids, enzymes, amino acids,

pigments, pollen and wax resulting from honey maturation and bees' activity or derived from the plants[8]. It contains a mixture of carbohydrates such as fructose(25-45%w/w), glucose(25-37%w/w), maltose(2-12%w/w), sucrose(0.5-3%w/w) with traces of many other sugars depend on the floral source and water[9]. Honey is a viscous liquid with a greater density(1.5g/cm³) than water(1g/cm³ at 4°C), having a strong hygroscopic character. The relatively low heat conductivity, low surface tension and various colors [10]. It also contains roughly 0.5% proteins, mainly enzymes, and free amino acids. The contribution of that fraction to human protein intake is marginal. Enzymes are the most important and also the most interesting honey components. They are accountable for the conversion of nectar and honeydew to honey [11]

Food safety is a great importance in human health. The food with high quality and safety will protect public health. The accumulation of the toxic metal in human body causing the side effect. The metals that contaminate honey are Cu, Cd, Pb, in...[12] Heavy metals such as Cd, Pb, Cu, and Zn are the most studied due to their effects on human health. Trace elements in the atmosphere can deposit on the body hair of bees and they are transported to the colonies with pollen or they can still be absorbed with the flower nectar or transported by water or honeydew [13].

Therefore, some metals are essential in honey to sustain life such as Ca, K, Mg and Na must be present for normal body function in diets[10]. However, there is not enough data available which can give us information about the level of these essential metals or toxic metals in honey collected from Tenta District/ Wollo zone. And also no study has been conducted on the

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determination of the level of heavy metal in honey consumed intent DistrictS/Wollo zone. For this reason, due emphasis has been given to the determination of the levels of these heavy metals present in honey and some physicochemical properties of honey.

General objective

The main objective of this study is to undertake physicochemical properties, determination of the contents of selected heavy metals (Cu (II), Cd (II), Pb(II) and Zn(II)) in samples of honey collected from four study areas.

The Specific Objectives

1. To determine physicochemical properties such as pH and electrical conductivity of the honey samples collected from the study areas and compare them with national and international standards.
2. To determine the levels of Cu(II), Cd(II) and Pd(II)Zn(II)) in honey collected from selected areas of Tenta District, S/Wollo Zone and compare the results with WHO and other studies.

Scope and benefits of the study

The work concerning the determination of the mineral content of honey is increasing during the last years[14]. Since Honey offer a potential dietary supplement and shows therapeutic features, it is important to know the levels of trace elements that are essential to health. In this research, work objective was to find some relationships among individual groups of honey and to determine the level of toxic metal in the given area of honey.

Statement of the problem

Honey is the most important primary products of beekeeping both from a quantitative and an economic point of view. It was also the first bee product used by humankind in ancient times. Honey is the natural sweet substance produced by honeybees from the nectar of blossoms or from the excretions of plant-sucking insects living on parts of plants, which the honeybees collect, transform by combining with specific substances of their own, store and leave in the honeycomb to ripen and mature. In Ethiopia the largest part of the honey is used to brew tej, a local kind of honey-wine. Also, different kinds of honey-beers can be brewed. For those who prefer non-alcoholic drinks, honey is a tasteful sweetener of juices, cocktails, and teas.

Ethiopians' make a popular soft drink made out of honey is 'birz', which is consumed as a delicacy during religious festivities. The composition and quality of honey also depend on environmental and other factors associated with production, such as weather, humidity inside the beehive, nectar conditions, and treatment of honey during extraction and storage.[15].

Moreover, the level of toxic metals are determined in a different country but, not in Ethiopia especially tenth district. There is not enough data available which can give us information about the level of these essential metals or toxic metals in honey collected from Tenta District S/ Wollo zone. And also no study has been conducted on the determination of the level of heavy metal in honey consumed intent District S/Wollo zone. For this reason, due emphasis has been given to the determination of the levels of these heavy metals present in honey and some physicochemical properties of honey. this study will also design to fill the existing knowledge gap, finding from the <https://assignbuster.com/physicochemical-properties-of-honey-essay-sample/>

study will be use full to determine the toxic metals in honey from the given area and to reflect the quality of honey.

Research question

- What are the concentration of heavy metals in the honey of Tenta district in the given area?
- Is there any variation the level of contaminants of heavy metal in honey in the four areas of Tenta district?

Significance of the study

The result of this study has been helpful for policymakers and development professionals by providing worda level information regarding the quality of honey and wax production and household livelihoods. The findings of the study also have been used for further investigation by various researchers in this area.

2. LITERATURE REVIEW

Zinc is an essential micronutrient for animals, plants and microorganisms. They accumulate considerable amount of Zn in their system without any damaging effect. It is essential to carbohydrate metabolism; protein synthesis and inter nodal elongation (stem growth). Zinc participates in all major biochemical pathways and plays multiple roles in the perpetuation of genetic material, ultimately cell division. When the supply of dietary zinc is insufficient to support these functions, biochemical abnormalities and clinical signs with zinc mal-absorption occurs. Zinc deficiency leads to iron

deficiency causing similar symptoms. Deficiency of zinc causes loss of appetite, growth retardation and immunological abnormalities.[25]

Cadmium

Cadmium is a toxic metal and can cause serious health problems [heavy %20 metal]. Cadmium is one of the few elements that have no constructive propose in human body. This elements and solution of its compound are extremely toxic even in low concentration. One possible reason for its toxicity is that it interferes with the action of zinc containing enzymes. Cadmium may interfere with biological processes contain magnesium and calcium. Its toxicity threatened the health of the body by weakened immune system. Kidney disease and liver damage, effect may include emphysema, cancer and a shortened life span.[27] Cadmium (Cd) accumulates easily in the circulatory system, kidney (especially the renal cortex), lung, and heart, and is toxic to bones and gonads. These risks are recognized by the International Agency for Research on Cancer and the National Toxicology Program, and Cd has been classified as a Group 1 carcinogen [24].

3. MATERIALS AND METHODS

Study Areas and sampling sites

The honey samples will collect from Tenta district S/wollo zone National Regional State of Ethiopia. The capital city of the Zone (Dessie) is located at 401 Km north of AddisAbaba. The TENTA DISTRICT (the town Adjibar) is 128km far from Dessie The samples will collect specifically from Gimba

(South of Adjibar), Chacha (north of Adjibar), yamed (around Adjibar), and Mitgina kebele (east of Adjibar).

Experimental site

All experimental works will be done at gondar University. Digestion of honey samples will be done at gondar University chemistry laboratory, AAS will done at gondar University in chemistry department

Apparatus and Equipment

The laboratory apparatus that will be use during the study include: different sizes of beakers, measuring cylinders, spatula, funnel, filter papers, pipettes and micropipettes for measuring volumes of acids and standard solutions, volumetric flasks of different sizes (50 and 100 mL) to dilute sample solutions and prepare standard solutions, round bottom flasks 250 mL fitted with reflux condenser will be use in apparatus to digest honey samples, spiked honey samples and blank solutions as well as refrigerator the collected samples and digested samples until analysis, digital Analytical Balance with $\pm 0.0001\text{g}$ precision to weigh honey samples, Atomic Absorption Spectrophotometer equipped for analysis of the digested honey samples for the selected metals ions Cu (II), Pb(II), and Cd(II). Zn(II).

Chemical and reagent

Heavy metal determination of honey samples using AAS

Heavy metal analysis of honey samples will be evaluate according to wet combustion method. In the analysis of samples, lead (Pb), cadmium (Cd),

zinc (Zn), copper (Cu) heavy metals determining by Atomic Absorption Spectrophotometer (AAS) instrument. Results of the samples will determine by comparing the results with measurements of heavy metal standards. 5 g of honey sample will mix with 10 ml nitric oxide and heat at 95 °C for a period of 1 hour until the solution gets yellow color. After cooling the mixture, 5 ml concentrated nitric acid (HNO₃) will add and heat to 180 °C. 1 mL of HNO₃ will add if necessary until clear color or pale straw color. After cooling the sample, 1 ml of H₂O₂ (500 g/L) will add and heat to 200 °C. This step will repeat until malodorous brown fumes over. The samples cool again and mix with 10 ml distilled water and 0.5 ml concentrated HNO₃ and slowly heat to 200 °C until the white malodorous gases obtain. After that, the samples cooled again and mixed with 10 ml distilled water and 1 ml H₂O₂ (500 g/L) slowly heat to 240 °C until white malodorous gases obtain. At the end, samples were cool and transferred to 25 mL volumetric flask, and analyze in AAS instruments. The levels of Pb, Cd, Zn, and Cu will be determine by atomic absorption spectrophotometer (AAS) using standard method [6].

Sample Collection and sample Preparation

Sample Collection

Samples will be collected from Tenta district S/wollo zone of Amhara regional state. In this district four different types of honey samples will be collected purposively from different kebeles based on their geographical locations. The sampling areas are: Gimba kebele, Chacha kebele, Yamed kebele and Mitgina kebele and all honey samples will be collected from markets from the

towns from November- December, 2017. The honey samples will be store in glass jars and temporarily keep at adjibar preparatory and high school laboratory in a refrigerator at 40C until it is transporting to the Gondar University laboratory and keep there in refrigerator at 4oCuntil analysis.

Sample preparation

honey samples will allow to be heat at 65 oC in a water bath until liquefy to permit easier handling and decrease viscosity for more uniform distribution. The samples are then cool and weigh for subsequent analysis [20].

Preparation of Stock and Working Standard Solutions

One thousand ppm (1000 $\mu\text{g} / \text{g}$) stock solution of Cu (II) was prepared by dissolving

3. 7980g of $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$ in 250mL of deionized water and diluting to 1L in a volumetricflask by adding more deionized water. Similarly 1000 ppm stock solution of Pb(II) wasprepared by dissolving 1. 5980g of lead nitrate $\text{Pb}(\text{NO}_3)_2$ in 100mL of deionized water anddiluting to 1L in a volumetric flask with deionized water. Likewise 1000 ppm stock standardsolution of Cd (II) was prepared by dissolving 2. 0360 g of $\text{CdCl}_2 \cdot \text{H}_2\text{O}$ in 250 ml deionizedwater and diluting to 1L in a volumetric flask. pH and Electrical conductivity

The pH and electrical conductivity will measure by means of a pH-meter (pH /Ion level2, Germany) and conductivity meter (HANNA Instruments, Portugal), respectively. 70mL of deionized water (pH 7. 0) will be add to 10 g of honey and mix thoroughly. Thenafter instrument calibration, the pH and EC will measure directly [5].

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