

Full Length Research Paper**An Attempt to Determine Percentage Composition of Sucrose in Honey****Massreshaw Assnakew Abebe**

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Abstract

In Ethiopia during the fourth century, (a time of Ezana), intensive bee keeping was practised as honey is required for religious ceremonies and the production of traditional beverages. The chemical composition of honey depends on vast numbers of variables, the most important of which is the type or types of plant that provided the sources of nectar. Honey varies not only in colour and flavour, but also in medicinal properties, with some varieties being much more potent (more advanced) than others. For this study, Honey was purchased from supermarkets, standard sucrose and glucose from store. Honey, sucrose and glucose were dissolved with distilled water to afford a concentration of 10 mg/ml. 100mg of honey and sucrose were weighed in electronic balance and diluted in 10ml of volumetric flask containers with distilled water and transferred into vials, as a stock solution and diluted into 1%, 5%, 7%, and 10% of sucrose and also 99%, 95%, 93% and 90% of honey. Solvent: either developed or sprayed was used. In case of developing: EtOH: H₂O as a ratio of 6:3:1 respectively would be taken as the total amount of solvent 10 ml in volume. TLC was dependent upon a solute between a stationary phase and a moving phase. The stationary solid selected is silica gel. The principal constituents were been a mixture of dextrose and levulose in the same proportion as present in artificial invert sugar and in an amount ranging from 65% to nearly 80%. Sucrose is present in from .5% to .8%. The ash of honey was varied from 0.3% to 0.5% and the water 12% to 33%. In a standard honey the sucrose should not be more than 8%, the water not more than 25%, and the ash over 25%.

Key words: Honey, Water, Ash, Sucrose, Percentage Composition**Introduction**

"Honey is a natural sweet substance produced by honey 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 the honey comb to ripen and mature." (1)

Honey is a very common diet all over the world. It is one of humankind's oldest food products and contains a number of nutritionally important substances that support good health and recovery. It is a characteristic sugary foodstuff; according to current regulations, apart from other forms of honey no other substances or additives can be added to it (8). Chinese ancestors used honey for the processing of many herbs in clinical Chinese medicine in order to alter their efficacy or reduce their toxicity little research has been done concerning the effect of honey on the fate of active herbs constituents from the systems and in animal or humans. Most of the honey sold in the markets is a blend of varieties, to create a consistent flavor and sweetness profile.

However, most of the honey's fructose becomes predominating, thus, it achieves creation of a sweet honey taste. Sugars have been separated by ion exchange and normal phase bonded phase methods (11). Natural remedies have several crucial advantages compared to chemical synthetic drugs that can cite to cases such as having fewer side effects, the use of synthetic drugs in the sensitive individuals, low cost and availability. Honey has antibacterial properties that recently have been used to treat diseases. Therefore, the medical honey has been accepted as an antibacterial agent in the treatment of wounds, burns, superficial infection. Also, honey considers as an antiseptic and has different natural substances with inhibitory properties (18).

Honey consumption has grown significantly during the last few decades due to its high nutritional value and unique flavor (7). The price of natural bee honey is much higher than other sweeteners making it susceptible to adulteration with cheaper sweeteners, primarily sucrose. Besides lower levels of nonsugar ingredients, natural honey primarily consists of glucose and fructose and may contain low levels of sucrose and/or maltose.1, 2. However, according to the international regulations, any commercially available "pure"-labeled honey products that are found to have in excess of 5% by weight of sucrose or maltose are considered to be adulterated. Authentication of pure honey is of primary importance for both consumers and honey processors. Additionally, honey processors do not wish to be subjected to unfair competition from unscrupulous processors who would gain an economic advantage by misrepresenting the honey they are selling (5).

In Ethiopia during the fourth century, (a time of Ezana), intensive bee keeping was practised as honey is required for religious ceremonies and the production of traditional beverages. (19). Ethiopia is the tenth largest producer of honey in the world. It pro-

duces about 21, 000 tonnes per years. Honey in Ethiopia is used in cultural and religious life of the people. No birth/ burials or wedding or social event can be imagined without the production of honey like Teji (local beverage).

Material and Methods

Honey was purchased from supermarkets, standard sucrose and glucose from store. Honey, sucrose and glucose were dissolved with distilled water to afford a concentration of 10 mg/ml .100mg of honey and sucrose were weighed in electronic balance and diluted in 10ml of volumetric flask containers with distilled water and were transfed into vials, as a stocks solution. Sugars were extracted from honey by the method (3). Thereby, facilitating the identification of honey surrogates and of honey adulteration (15) (14) (5) (9).

From the stock, solution were diluted into 1%, 5%, 7%, and 10% of sucrose and also 99%, 95%, 93% and 90% of honey and made the solutions of their mixture ready to apply on the TLC plate. Solvent: either developing or sprayed solvent used, in case of developing: use Etoac: Etoh: H₂O as a ratio of 6:3:1 respectively, the total amount of solvent 10 ml in volume was taken. TLC was depended upon a solute between a stationary phase and a moving phase and the stationary solid part that was silica gel. A sample of honey was placed at the bottom of the plate and the plate was placed in chamber containing an in organic solvent such as ethanol, Ethano acetate with water. Their amounts of these would be seen 6:3:1 in Etoac: Et: H₂O act as the moving phase, which is slightly miscible with water moves across by capillary actions. The honey in sucrose and pure honey and sucrose were partitioned between the two phases. The sucrose and honey were more soluble in water. A series of equilibria were eventually established in which one follows each other. The honey had two major products and small amount of water and sucrose relative to those of glucose and fructose. The lower spot was indicated the sucrose and the top spot were indicated either of glucose and fructose in mixture because they were anomies of one to the others.

Results and Discussion

Honey is one of the common foods all over the world. The sources of honey can be: Apiary honey and Forest honey. Generally, apiary honey is produced in hive. It was used to serve as a transparent and free from foreign materials. Secondly, forest honey is produced within the rock, forests, and other places wild nest of the bee without hive in the forest and other places and collected by the crude method of squeezing the comb. Honey has different properties which can be: honey a part of carbohydrate, which can has a sweet taste and a liquid form. It has different colours like white, dark for pure honey and other colors such as green, yellowish, reddish etc depending upon the plant sources from where the nectar is collected. (13).

Composition of honey

Table 1: Average composition of honey

Component	Average value in%
Water	17
D-Fructose	38
D-Glucose	32
Sucrose	1.3
Maltose	7.3
Oligosaccharides	1.5
Protein	0.3
Minerals	0.2
Vitamins & amino acids	1.0

Some of the components (carbohydrates, water, and traces of organic acids, enzymes, amino acids, pigments, pollen and wax) were due to maturation of honey, some were added by the bees and some were derived by plants. Honey from the same floral source can vary due to seasonal climatic variations or to different geographical origin. "Natural sweet substance produced by honey bees from nectar or blossoms or from secretions of living parts of plants or excretions of plant sucking insects on the living parts of plants, which honey bees collected, transformed and combined with specific substances of their own, store and leave in the honeycomb to ripen and mature". [16]

Honey consists mostly of the monosaccharides glucose and fructose (85-95 % of the total carbohydrate content). The actual proportion of glucose to fructose in any particular honey depends largely on the source of the nectar. The average ratio of fructose to glucose is 1.2: 1 [24]. Sucrose is present in honey about 1% of its dry weight; however this level can be increased if the beekeeper has over-fed the bees with sugar during the spring. The amount of reducing disaccharides is about 6.5 % and that of oligosaccharides about 1.5 % [24]. From different researches it is assumed that the amount of sucrose in the adulterated honey for market during that period in Ethiopia was 1.3 % of out of normal due to this the market honey was mixture of sugar directly because of the amount of sucrose more than the states.

The chemical composition of honey depends on a vast numbers of variables, the most important of which was the type or types of plant that provided the sources of nectar. Honey varied not only in color and flavour, but also in their medicinal properties, with some varieties being much more potent (more advanced) than others. Because it was impossible to regulate, the coming and going of millions of bee, there was also no way to guarantee that honey from any locution (anti-war) will be had chemically the same

from year to year or free of contamination from pollutants may have been found their way into. Honey supplies must be tested thoroughly and regularly (21).

Honey was a super saturated sugar solution with approximately 17.1% of it was water, 38.5% of honey should be predominated sugar or fructose. Followed this glucose was 31%, trisaccharides and oligosaccharides were present in much smaller quacarbohydrates, honey also contained small amount of protein (including enzymes, hormones) and mineral very small amount. Honey yields 64 calories per tablespoon, making it a more concentrated than other common sweeteners while amino acids present in honey was unqiqlora (uninterruptedly) sources of either essential or non-essentials protein.

Detection of Adulteration in honey

The amount of glucose in honey is usually at a supersaturated level at normal temperatures. With reduction in temperature or water content, the glucose can crystallize out. Saccharose (sucrose) is present in honey at approximately 1% of its dry weight. Normally, honey contains 12.4–24.5% moisture. Unless the moisture content is below 17%, no fermentation takes place (2).

Honey is usually warmed to a temperature of 32±40°C to lower its viscosity, which facilitates extraction, straining or filtration. This temperature is similar to that in beehives and does not affect the honey very much during the relatively short processing period. However, some honeys are heated to a higher temperature for liquefaction or pasteurization reasons (23).

All food products targeted for adulteration are high-value commercial products, including honey. The detection of adulteration can pose a technical problem (17). The quality of honey was mainly determined by its sensorial, chemical, physical and microbiological characteristics (20). Analytical methods applied to honey generally deal with different topics: determination of botanical or geographical origin, quality control according to the current standards and detection of adulteration or chemical residues (10).

The market honey has some problem as mixture of sugar as consideration of honey sucrose. From the related research (2013) in HPTLC system as (18) developed and validated a method based on high performance thin layer chromatography (HPTLC) in combination with image analysis for detecting honey adulterated using solutions of glucose, fructose, and sucrose. The optimal mobile phase was ethyl acetate-pyridine-water-acetic acid at a ratio of 6:3:1:0.5. Glucose, fructose, and sucrose were separated on silica gel HPTLC plates. Documentation of the plates was performed using TLC visualization device and the plate images were processed using a digital processor. High performance thin layer chromatography was tested for selectivity, linearity and range, precision, and robustness. The method was successfully applied for the quantitative determination of glucose, fructose and sucrose. Characteristic of the carbohydrate makeup of the inverts which were bee-processed from sucrose solution is anerlose content of several percentage points. The trait is characteristic of "sugar honeys" A significantly higher sucrose content as compared to that of honey was also found in those inverts. The latter, however, exceeded 5% only occasionally. On average, it was 2.48 and 3.94% and in honey 0.68 and 0.69%, accordingly his studied clearly stated the honey had sugar as more sucrose content than others respectively. Echigo and other researcher also used TLC to determine the following composition of basic sugars in bee pollen: fructose 44%, glucose 35%, and sucrose 21% of the total sugar content (12). In general the sucrose content in honey as normal or standard condition was very low and if something happened the amount was more than the normal content the same for my study was occurred.

Moisture Content

Moisture content is one of the most important characteristics of honey as it influences its keeping quality, granulation, and body. Its concentration is a function of the factors involved in ripening, including weather conditions, original moisture of nectar, its rate of secretion, and strength of the bee colony (as the bees use their wings to create a stream of dry air that constitutes the ventilation system of the hive). [24, 22]. The average moisture content of honey is 17.2%, but the range of moisture content varied from 10-30% in different honey samples [24]. A similar survey found that the average moisture content of honeys from the Madrid province of Spain was 16.13% with a range from 13.00-18.30% [6]. Whereas, in Ethiopia in 1998 the moisture content of honey in was 17 percent. So the moisture content of honey in Ethiopia is almost similar and in the same range as of other country honey moisture content from the rage of 10 -30 that were 17 % as measured. According to the adulteration of honey in the food system was their own content of nutrients as follow the table 2

Table 2. Nutritional Amount, Which Can Be Honey, Contained Nutrients

Nutrients	Percentages
Water	17.2
Fructose	38.29
Glucose	31.0
Sucrose	1.31
Carbohydrate	7.21
Protein	.57
Acids	1.54
Minerals	.26
Enzymes	.17
Vitamins	2.21

It is clear from the above table that the amount of sucrose in honey is in very small amount. The nectar taken in by bees was chemically changed by secretions from glands in the head and thorax; to laevulose, dextrose, and, rarely, sucrose. Genuine honey varied somewhat in its composition. The principal constituents were a mixture of dextrose and levulose in the same proportion as present in artificial invert sugar and in an amount ranging from 65% to nearly 80%. Sucrose was present in from .5% to .8%. The ash of honey varied from .3% to .5% and the water was also 12% to 33%. In a standard honey the sucrose should not be more than 8%, the water not over 25%, nor was the ash over 25%, but in this study the sucrose content was 1.3, water content was 17, and the ash was 24%. So the market honey was mixed with sucrose above the standard.

Conclusion

Honey is a supersaturated sugar solution with approximately 17% of it was water, 38.5% of honey should be predominated sugar or fructose. Followed this glucose was 31%, and sucrose was 1.3. The nectar was when taken in by bee was chemically changed by secretions from glands in the head and thorax; levulose, dextrose, and, rarely, sucrose being formed. Genuine honey varied somewhat in its composition. The principal constituents were a mixture of dextrose and levulose in the same proportion as present in artificial invert sugar and in an amount ranging from 65% to nearly 80%. Sucrose was present in from .5% to .8%.

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