

Editorial

Health Benefits of Honey

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Honey is beneficial for health. It is an antioxidant, anti-inflammatory, antimicrobial, help in wound healing especially in burn. It also helps in improving digestive, heart health and supporting gut bacteria. Furthermore, it helps in relieving cough, sore throat and better for many other skin conditions. Honey has also beneficial properties in improving immunity and neuroprotective effect.

It also lower blood pressure and benefit for management of type 2 diabetes. It improves cholesterol and triglyceride level. It contains a variety of nutrients, several vitamins and minerals.

Characteristics and Composition of Honey: A highly perishable, thin sweet liquid is transformed into a stable high density viscous, acidic, high energy food. Because of its low PH, high osmolality and low moisture microorganisms responsible for spoilage do not grow in it. Moisture in honey ranges between 15 to 25% depending upon the origin of nectar and weather conditions. At 17.4% moisture, it is in equilibrium with 58% relative humidity of atmosphere, neither gaining nor losing moisture from the environment.

Major components of honey are sugars, of which monosaccharides, glucose and fructose make up around 70% of the total. Disaccharides including sucrose add 10% and water in which sugars are dissolved, 17 to 20%. So far 181 different substances have been identified in honey and some of these are not known to exist anywhere else. The exact composition of honey depends mainly on the plant source it is derived from, but also on the weather soil and other factors and two honeys are never the same.

Sugar and Sweetness of Honey: Eighty percent (80%) of honey consists of sugars. Some honey taste sweeter than others because sugars differ in their sweetness. Two main sugars are fructose and glucose. Fructose is slightly sweeter than sucrose. Glucose is less sweeter than sucrose. Glucose is less sweeter and Maltose is even lesser. Relative sweetness of different sugars is not the same at all concentrations. Dilute solutions of sucrose (upto 10%) taste sweeter than corresponding solutions of invert sugars (glucose and fructose). But as the concentration increases the sweetness of sucrose lags more and more behind. If sucrose is taken as 100 then equivalent glucose and fructose is 66 and maltose is 30. Many mixtures of sugars taste sweeter than would be expected by adding their separate effects together. Bees like to collect sucrose, glucose, maltose and fructose in that order, but choices also vary with concentrations. Reducing disaccharides (maltose) present in honey increase during storage. The shelf life of honey is 2.5 years, but is wholesome after decades.

Proteins and Amino Acids in Honey: Honey contains traces of proteins derived from honey bees. Amino acids are also present, the most abundant being praline, followed by lysine, glutamic acid and aspartate. Others present are alanine, arginine, cystine, glycine, histidine, isoleucine, methionine, phenyl alanine, serine threonine, tryptophan, tyrosine and valine. These amino acids are also useful in distinguishing one honey from other and can tell if the honey is natural at all. Amino acids are break down products of proteins which are of been origin, but proteins of plant origin are also present. The ash contents range from 0.02 to 1 percent. Dark honey has higher mineral contents Potassium is the highest (100 times as much as IRON), twenty-eight minerals have been found in honey. Hydroxyl methyl furfural is another very important constituent present in honey and the amount of this chemical in honey is an indirect indicator of quality.

While the list of the vitamins is impressive, the quantities are nutritionally insignificant to humans. Vitamin B1, Vitamin B12, B complex, Riboflavin, Nicotinic acid, B6, Pantothenic acid and vitamin C (ascorbic) are present in honey.

Enzymes: There are three important enzymes in honey. Invertase, diastase, (amylase), and glucose oxidase. Catalase and acid phosphatase are also present. Invertase is produced by hypopharyngeal glands of bees, and changes sucrose into glucose and fructose. So if the enzyme is still present in unfinished honey, the process could continue, even if the honey has been extracted from the comb. Invertase is destroyed by heating.

Diastase (amylase) is produced in similar fashion and is also found in plants. It breaks down starch and is involved in digestion of pollens in bees. It is destroyed by heat. Glucose oxidase is produced in the hypopharyngeal glands of bees, and oxidizes glucose in ripened honey. It is virtually inactive in full density honey, but becomes active in diluted honey. Changing glucose into Gluconic acid, and hydrogen peroxide. It is sensitive to sunlight as well as to heat. Substances called INHIBINES thought to be present causing inhibition of growth of bacteria, is actually glucose oxidase. Catalase and Acid phosphatase are also found in honey but are insignificant.

Honey contains acids (average PH 3.9) which contributes to its resistance to damage by microorganism. The tars they produce also enhances its flavor. Main acid is Gluconic acid, and is produced by the action of glucose oxidase on glucose. Formic acid has been found consistently, other acids found are benzoic acid, butyric, citric, isovaleric, lactic, malic, oxalic phenyl acetic, propionic, pyroglutamic, succinic and valeric acids.

Physical Properties of Honey: All honeys are liquid when produced by bees. They are super-saturated solutions. On storage at room temperatures which is 10-20 C lower than the hive temperatures, the first sugar to crystallize out is glucose. The granulation is also affected by the presence of suspended minute particles in the honey that act as nucleus. Flash heating is utilized to dissolve any crystals present in the honey before sale on commercial basis.

Each capped cell of comb provides an environment for honey storage that is protected from moisture, dust and the contaminants. This inhibits granulations of honey in the comb.

Medical Uses of Honey: Honey has been used successfully in the treatment of diarrhea. It has proven capability to kill the causative organisms, provide nutrition, helps absorption of sodium and other electrolytes and water. Substitution of honey on ORS instead of glucose has definitely reduced hospital stay of children with diarrhea.

Honey has been found effective in wound healing. It increases granulation, protects from infections and reduces healing time. It has been used with great success in infected wounds.¹

Honey when used in breakfast for the types II diabetic patients did not cause deterioration effect on the blood glucose level.²

It has also been used in prevention of cornea; and other eye problems, articles are mostly in Russian language and not available for translation.³

Summaries of the original articles are presented.

Honey in the Treatment of Infantile Gastro Enteritis: IE Haffe Jee, A. Moosa. Dept. of Pediatrics, child health. Faculty of medicine, university of Natal, Durban. South Africa.⁴

Honey has been effectively used in infantile diarrhea, because of bacteriostatic activity against entero pathogenic organisms. This study was designed to document this effectiveness.

169 infants and children were given trial. Control group was selected randomly, and treated with the standard regimen, while trial group was treated with the ORS containing honey (50ml/1). Examination of stool was carried out for parasites and cultures were done to isolate the invading organisms, Elisa was used for Rota virus and clinitest for reducing substances.⁴

Recovery time in viral diarrhea was same both in honey treated and controlled. But in bacterial diarrhea the honey treated patients had a shorter recovery time, 58 hours as compared to 93 hours in control. Rehydration time was shorter in honey treated, 18 hours as compared to 23 hours in controls. Reducing substances and plasma sodium concentration showed no difference.

This study has shown that honey shortens the duration of diarrhea in patients with bacterial gastro enteritis caused by organisms such as salmonella, Shigella and E.Coli. In non bacterial gastro enteritis honey had the

same effects as glucose on the duration of diarrhea. Also oral honey may safely be used as substitute for pure glucose in oral rehydration solutions, provided these contain electrolytes in the currently recommended concentration and honey providing III mols of each glucose and fructose per liter, (2Gm/100ml).

Honey could also be used to promote sodium and water absorption from howel as oral rice water or sucrose does because of high osmotic contents. Fructose is absorbed by facilitated diffusion rather by active transport and is not coupled with sodium ions, helping prevention of hyper-natremia. Furthermore honey does not result in osmotic diarrhea, when used in proper dilution in oral rehydration solution (50ml/1).

Oral rehydration solution used by the researchers has a total glucose fructose concentration of 220 mmol/L (4gm/100ml) and even this did not appear to aggravate diarrhea.

Anti Bacterial Action of Honey: Jedda A, Ramsroop KVG, et al. KE Hosp. Durban. South Africa⁵

This study was carried out at King Edward Hospital Durban, to evaluate the anti-bacterial effects of honey in varying dilution on common gram-positive and gram-negative organisms.

Pure honey was found to be a very potent inhibitor of growth of bacteria as Salmonella, Shigella, entero pathogenic E. Coli, and V. Cholera, all of which are known to cause considerable mortality from diarrhoeal diseases in developing countries. Honey also inhibits growth of Pseudomonas aerogenosa, Strepto coccal group B and Strep. Pyogenese, Strep. Fecalis and listeria monocytogens (Major bacteria causing infections in newborn age group. Explains the reason for using honey as the first food in most newborns in our country).

Growth of H. influenza is also inhibited by honey. A common organism in the younger age group causing pneumonia, ear infection and meningitis.

The possible mechanisms of action of honey are following:

1. Shrinkage and disruption of bacterial cell wall because of osmotic effect of hygroscopic sugars in honey.
2. Low pH.
3. Substance called "inhibin" with bacterial properties has been postulated to be present in honey.

Acceleration of Wound Healing by Topical Application of Honey: Aries Bergman, Joseph Yanal, berry Weiss, David Bell, Menachem P. David Tele Aviv (Israel).⁶

Honey helps wound healing was documented by this study. Mice were used, incision were given, treated with local application of honey and definite improved healing was noted.

These researchers used male mouse, and incisions of 10x10mm were made at nape of neck. A thin layer of boiled pure honey was applied before dressing in

experimental groups, whereas saline solution was used in control group: following results were noted:

1. The epithelialization was larger in honey treated animals than in control.
2. The increase from control level that was 58% on day 3 rose to 114% on day 6.
3. Thickness of granulation tissue was greater among honey treated animals than in controls. The increase was 69% by day 6 and remained to that level till day 9.
4. The area of the wound approximately doubled by day 3 from original 100 mm² in both groups. However, the area of the wound remained than in the controls. The reduction in size was 37% on day 6, and 48% on day 9.
5. No clinical infection was noted in both of granulation tissue and accelerated epithelization of healing tissues, by honey.

Additional anti-microbial properties may be due to hypertonicity and low pH, which inhibits bacterial growth. Contribution to the wound healing may also be due to in part to its being an excellent energy source in a catabolic situation. Similarly the mechanism for its hygroscopic effect in reducing edema and its action as viscous barrier to wound invasion and fluid loss are known. Honey contains enzymes such as Catalase which may also affect the healing process.

Honey in the Treatment of Infected Wound: Professor Chirife et al lancet 24, 1982. Professor Chirife and his colleagues documented the inhibition of growth of micro-organisms due to honey.⁷

In developing countries honey has been used successfully for the treatment of infected wounds. In clinical and in vitro studies honey has been found to prevent growth of the common pathogens, including streptococci and coagulase positive staphylococci. However, growth of certain candida species is not inhibited. The low pH (3.7) of honey creates very unfavourable environment for bacterial growth which can not be achieved by granulated sugar. The tissue dehydration is rapid and can cause excessive desiccation and thus interferes with healing. This however can be avoided by application of saline soaks.

Honey for Necrotic Breast Ulcers: D A Mossel lancet Nov, 15, 1980. University of Utrecht Netherlands.⁸

There were reports of isolation of clostridia botulism from some samples of honey. The author opinions that by using honey on open wound we will be exposing a patient to an unnecessary risk,

This is a review of literature, and Dr. Mossel writing this review agrees, that honey soothes the wound protects it from infection and does not allow proliferation of organisms. He thinks that honey is not itself sterile. Midura et al isolated Clostridia botulism type B and A from some samples from Hungary. Although botulism contracted from infected wounds is not a common disease. It is unwise to expose a patient to an extra risk which is medically unacceptable.

Surgery and Honey

Surgery in Western Kenya: Honey has been used as sterile coating of surgical wounds. It helps healing of wound, and protects it from infections. It helps healing of wounds and protects it from infections. This authors spent 2 years in Kenya and used honey post operatively with good results.

Honey was used as a thin layer on open wounds 2 to 3 times daily with excellent results. Honey rendered these wounds not only bacteriologically sterile in 3 to 6 days but also encouraged the formation of healthy granulation.

Honey at Breakfast Have no Additional Acute Hyperglycemic Effect Over Bread in Type II Diabetic Patients: BRONT F, et al, Diabetologia, 1985. 28; 213-217.²

Blood glucose level is highest after breakfast even more than 2 hours post meal or after mid day level. In this study glucose levels were checked after honey meal and compared with post bread levels and found no significant difference.

The researcher concluded after the study that in type II diabetics, in acute condition substitution of part of a meal by a reasonable amount of honey has no deleterious on blood glucose regulation and insulin secretion.

Al-Quran: God ordered honey bee," She should make house in mountains, trees and high places. She ought to eat the juices of fruits, trees and stay clean. There will be drinkable liquid extracted from the abdomen. The liquid multiformed will have healing power."⁹

Table No.1: (Derived from Food and Nutrition Encyclopedia Vol. 1)

Nutrient	Unit Per 100 Gms.	Per Table Spoon (20 gm)
Energy	61 K cal.	310
Proteins	0.1 gm	0.30
CHO	165 gm	823
Calcium	1 mgm	5
Phosphorus	1.2 mgm	6
Sodium	1 mgm	5
Magnesium	0.6 mgm	3
Potassium	10.2 mgm	51
Iron	0.1 mgm	0.50
Zinc	0.02 mgm	0.1
Copper	0.04 mgm	0.20
Vit. C	0.2 mgm	1.0
Riboflavin	0.008 mgm	0.04
Niacin	0.30 mgm	0.30
Pantothenic acid	0.004 mgm	0.02
Folic acid	0.6 mcgm	3

Table No.2: Minerals in Honey:

Minerals	Dark Honey	Light honey
Potassium	1676	205
Chloride	113	52

Sulphur	100	58
Calcium	51	49
Sodium	76	18
Phosphorus	47	35
Magnesium	35	19
Silicon	14	9
Iron	9.4	2.4
Manganese	4.1	0.3
Copper	0.6	0.3

Table No.3: Average (%) of Major Constituents of Honey:

Fructose	21-53.9	38.2
Glucose	22.4-44.4	31.3
Sucrose	0.0-2.4	8.3
F+G+S		70.8
Water	13.4-26.6	17.2
Reduced di saccharides calculated as maltose 7.3%		
Higher sugars	1.5%	
Total acid	0.57%	
Ash	0.17%	
Nitrogen	0.94%	

List of Sugars Present in Honey:

Monosaccharides (70% of honey): Glucose, Fructose, Disaccharides, Sucrose 1-3%

Reducing disaccharides calculated as maltose (7%):

Maltose, Iso maltose, Niogeroose, Turanose, Kojibiose, Netrenhalose, Centibiose, Laminaribiose, Ceucrose

Trisaccharides and higher sugars (1.5%):

Melezitose, Raffinose, Iso panose, Iso mato tetrose, 64 alpha gluco syle sucrose, Are galacto mannose
Elrose, Dextrinose, Matotribose, Iso Maltose pentose, Centose, 1-Kestose, Panose, Panose, Iso maltortriose, 3-Alpha isomaltose, Sylglucose

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