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Honey: Chemistry and Medicinal Uses

Divya G. Nair*

Research Scholar, Department of Chemistry, Bishop Moore College, Mavelikkara Kerala

A B S T R A C T

The use of honey was common among ancient Egyptians, Assyrians, Chinese, Greeks and Romans to treat wounds and a myriad of diseases. The healing property of honey is ascribed to its antibacterial activity, maintenance of moist wound condition, and its high viscosity helps to provide a protective barrier to prevent infection. Honey has commendable immunomodulatory property too. The antimicrobial action of honey is due to the enzymatic production of hydrogen peroxide, its chemical and physical characteristics, but with regional seasonal variations.

Keywords: Honey, Chemistry, Antimicrobial

A R T I C L E I N F O

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***Corresponding Author**
Divya G. Nair
Research Scholar,
Department of Chemistry,
Bishop Moore College,
Mavelikkara, Kerala, India
Manuscript ID: IJCPS2656

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1. Introduction

Natural honey is widely consumed by humans from time immemorial which have unparalleled nutritional and medicinal attributes. Honey is defined as the natural sweet substance collected, transformed by combining with specific substances of their own, deposit, dehydrate, store and leave in the honey comb by the honey bees, from nectar of plants (James *et al*., 2009). Honey was produced by honey bees in order to overcome food scarcity and also during rough weather conditions. The nutritional, medicinal and industrial purports of honey make it a pivotal commodity in international market. Similarly, beekeeping is an ancient tradition among most of the civilizations worldwide which is generally a part of normal agricultural endeavour. Honey is composed of sugars, especially

monosaccharides such as fructose and glucose with small quantities of minerals, proteins (mainly enzymes), amino acids and acids like lactic, formic, acetic and pyruvic acids (Lawal *et al*., 2009).

The acid content of honey not only imparts flavour but also splendid activity against microorganisms. However, various studies demonstrated the variations in honey content with respect to geographical and botanical origin of the nectar (Joseph *et al*., 2007). According to origin, honey can be broadly divided into different classes like blossom honey (obtained from the nectar of flowers), honeydew honey (produced by bees after they collect "honeydew"), monofloral honey (bees forage predominantly on one type of plant) and multifloral honey (has several botanical sources).

Composition

Honey is basically a highly concentrated solution of dextrose and levulose, with small amounts of about 22 other complex sugars. However, the differences in characteristics and behaviour of honey are due to its sugars, and other constituents like flavoring materials, pigments, acids, and minerals. Among different types of honey, the manuka honey has 1,2-dicarbonyl compounds, such as glyoxal (GO), 3-deoxyglucosulose (3-DG) and methyl glyoxal (MGO) as major ingredients. In short, honey is a complex material, made up of at least 181 different ingredients known at present, (Jones, 2001); with some researchers conceiving that the number is about 600 (Bogdanov *et al.*, 2004). It can be noted that honey is a supersaturated sugar solution created by honey bees which also contains acids, minerals, vitamins, and amino acids in motleying quantities (Ball, 2007).

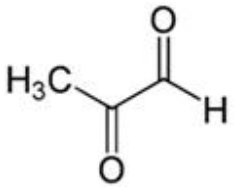


Figure1: Methyl glyoxal (MGO)

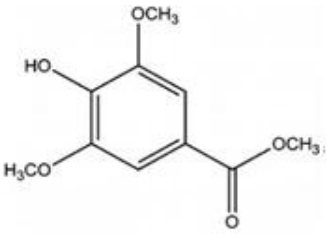


Figure 2: Methyl syringate

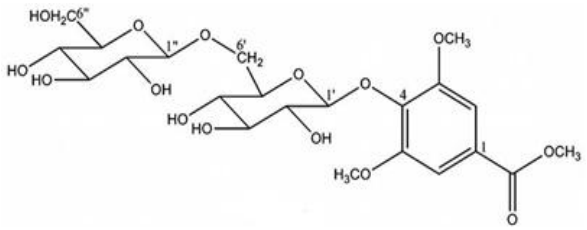


Figure 3: Leptosin

The MGO is called as unique manuka factor (Fig 1) which has profound activity against microorganisms. Methyl syringate (MSYR) (Fig 2) and leptosin (the novel glycoside of MSYR, methyl syringate 4-O-β-D-gentiobiose) (Fig 3) are the other bioactive compounds from manuka honey owing to its myeloperoxidase (MPO)-activity inhibition (Kato *et al*., 2012). It is widely accepted that the polyphenolic composition of honey depends on its floral origin and contributes for antioxidant capacity. The major compounds in honey are given Table 2 while various other factors are presented in Table 1. Each of these minor components has typical nutritional or medicinal attributes and the unique blend accounts for the varied and different applications of natural honey.

Table 1: Average composition of floral honey

Constituent	Average content
Moisture	17.2
Levulose	38.19
Dextrose	31.28
Sucrose	1.31
Maltose	7.31
Higher sugars	1.50
Undetermined	3.1
pH	3.91
Free acidity	22.03
Lactone	7.11
Total acidity	29.12
Lactone ÷ free acid	0.335
Ash	0.169
Nitrogen	0.041
Diastase	20.8

Table 2: Common phenolic, flavanoid and other compounds in honey

Phenolic Acid and Flavonoids	Other Compounds
Caffeic acid	Phenyllactic acid
Isoferulic acid	4-Methoxyphenolactic acid
p-Coumaric acid	Kojic acid
Gallic acid	5-Hydroxymethylfurfural
4-Hydrobenzoic acid	2-Methoxybenzoic acid
Syringin acid	Phenylacetic acid
Quercetin	Methyl syringate
Luteolin	Dehydrovomifoliol
8-Methoxykaempferol	Leptosin
Pinocembrin	Glyoxal
Isorhamnetin	Methylglyoxal
Kaempferol, Chrysin, Galangin, Pinobanksin	3-Deoxyglucosulose

2. Mechanism of action

Honey has a multitude of functions in the body. It is considered as demulcent and laxative. A year old honey is used as astringent, demulcent, pectoral, emollient and laxative. Peristalsis and digestion are stimulated by fatty acids n the honey. Generally honey is considered as an instant energy value product which is valuable for all important most vital muscle and the heart muscle also.

Lime in honey has tremendous role in stimulating the secretions of internal glandular organs. Various studies have corroborated the immunological strengthening potential of honey in both humans and animals (Namdeo *et al*., 2010).

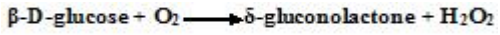
Therapeutic potentials

Honey is largely employed in the formulation of confection and electuaries and as an ancillary to decoction, pills and powder. Honey as a demulcent and warm barley water is given for people with constipation and indigestion in bronchial asthma, chronic cold, and sore throat. A combination of honey, vinegar and lime juice in equal proportion is excellent in treating cough, especially in babies and adults. Marasmus, malnutrition and scurvy are successfully treated with combinations of medicines with honey as major ingredient. In old age honey is particularly useful in rendering energy and heat to body. Honey dries up phlegm and clears the mucous system which reduces discomfort and general body weakness among aged.

The use of honey for diabetes with certain herbal formulations was common among Hindu, Greek and Arabic schools of medicine. Honey with flour in paste form is a popular application to foster maturation of abscesses, ulcer, and buboes and as gargle to cure ulcers in mouth.

3. Antimicrobial action

The osmolarity of is sufficient to prevent growth of bacteria and fungi. The pH of honey is between 3.2 and 4.5, owing principally to its content of gluconolactone/gluconic acid (White, 1975). When honey is mixed with wound fluid or saliva, the acid in honey is neutralized which makes a minor contribution to antibacterial activity. Hydrogen peroxide is the major antimicrobial factor in most honey samples and demonstrated a direct relationship between the hydrogen peroxide produced and the potency of the antibacterial activity of various honeys. The hydrogen peroxide production is assisted by the enzyme glucose oxidase which is secreted into collected nectar from the hypopharyngeal gland of the bees. However, Oxygen needs to be available for the reaction:



The difference in antimicrobial potency among different honeys is diverse, depending on the geographical, seasonal and botanical source as well as harvesting, processing and storage conditions. It can be concluded that the antimicrobial nature of honey is dependent on various factors working singularly or synergistically. However, the non-peroxide antibacterial activity in honey was found to correlate significantly with the acid content of honey, but does not correlate with the pH of honey. The antimicrobial potential of honey can be successfully utilized to combat drug resistance and emerging pathogens across the world.

4. Conclusion

Honey is a globally recognized natural food which with nutritional, medicinal and industrial applications. It can be noted that honey is a supersaturated sugar solution created by honey bees which also contains acids, minerals, vitamins, and amino acids in variegating quantities. However, depending on the geographical, seasonal and botanical sources, variation in the composition and antimicrobial spectrum of honey was noted.

5. References

1. Ball, D.W. The chemical composition of honey. J. Chem. Educ. **2007**, 84(10): 1643.
2. James OO, Mesubi MA, Usman LA, Yeye SO, Ajanaku KO, et al. Physical characteristics of some honey samples from North-Central Nigeria. International Journal of Physical Sciences. **2009**, 4: 464-470.
3. Joseph, T., Awah-Ndukum, J., Fonteh-Florence, A., Delphine, N. D., Jonnas, P. and Ze Antoine, M. Physicochemical & microbiological characteristics of honey from the Sudano-Guinean Zone of west Cameron. African Journal of Biotechnology. **2007**, 6(7): 908-913.
4. Kato, Y., Umeda, N., Maeda, A., Matsumoto, D., Kitamoto, N., Kikuzaki, H. Identification of a novel glycoside, leptosin, as a chemical marker of manuka honey. J. Agric. Food Chem., **2012**, 60: 3418–3423.
5. Lawal, R.A., Lawal A.K.and Adekalu J.B. Physicochemical Studies on Adulteration of Honey in Nigeria. Pakistan J. Bio. Sci., **2009**, 12(15): 1080-1084.
6. Namdeo K.P., Shekhar, V., Bodakhe, S.H., Shrivastava S.K. and Dangi J.S. Chemical investigations of honey: A multiactive component of herbal therapeutic agent. International Journal of Research in Ayurveda & Pharmacy. **2010**, 1(1): 85-89.
7. White, J.W. and Doner, L.W. Honey composition and properties. In: Beekeeping in the United States agriculture handbook number, **1980**, 335: 82-91.