From Hive to Health: Honey's Miraculous Benefits for the Body and Mind

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ABSTRACT

Honey has been used for many purposes in traditional medicine. This article provides a comprehensive overview of honey, its types, and specific varieties like Acacia, Alfalfa, Buckwheat, Clover, Eucalyptus, Jamun, Lavender, Manuka, Rosemary, and Sage honey. The content delves into their respective characteristics, health benefits, and nutritional compositions. Notably, the potential benefits of honey, particularly high-grade types, in addressing various eye conditions such as keratoconjunctivitis, corneal ulcers, blepharitis, dry eyes, bacterial conjunctivitis, and preventive care for wrinkles have been highlighted. The antimicrobial anti-inflammatory and soothing properties of honey is responsible for its therapeutic potential. Numerous antioxidants, such as flavonoids and polyphenols, are found in honey. These antioxidants aid in the body's defense against free radicals, which can cause inflammation and other health problems. Eye drops containing honey are available for application, However, caution is advised, emphasizing the need for further research and professional consultation before applying honey directly to the eyes.

Keywords: honey, Eye Infection, Pharmacological activities

INTRODUCTION

A liquid that is obtained by the nectar from flowers which is made by bees is called honey(1). The color of the honey is graded, with the clear, golden chrome honey often appealing a higher retail amount than unlighted varieties(1). The type of flower from which the nectar was cultivated is surely vary on the taste of particular type of honey. Honey of both pasteurized forms is available. Uncooked honey is abolished from the throng and directly bottled, and as that will carry trace amount of pollen, wax and yeast. Ingesting delimited raw honey is supposed to aid with seasonal hypersenstivity, because of the region where recurrent exposure to the pollen is present. Pasteurized honey has been vehement and processed to abolish impurities. Honey has its sweetness because it has light levels of monosaccharide, fructose and glucose, and it carries 70% to 80% sugar. Antiseptic, antibacterial properties are also included in honey(2).

Use for honey in chronic wound management and preventing infection has also been supervised by the modern medical science(3). Since earlier times, honey has been used for its medicinal sources throughout the world in many countries(4). In more recent times, the uses of honey as a restorative substance have been detonate by the botanical occupation. Both from the assessable and economic point of sight honey is the most significant predominant substance of beekeeping. Honey's scientific name is *Apis Mellifera*(5). There are almost 20 acknowledge races of western honey bee, each corresponding with the particular geographical region, and all of them are related that they can correspond and produce viable offspring(5, 6)

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Classification

Kingdom: Animalia

Phylum: Euarthropoda

Class: Insect

Order: Hymenoptera

Family: Apidae

Sub family: Apinae

Depending on its appearance, honey can either be granulated, liquid, creamed, chunked, or can be of an untreated form (called comb honey).

Depending on the level of processing, honey can be divided into raw and pasteurized form(7)

- Raw honey is the raw, unprocessed variety. It is taken straight out of the comb and not sent to be

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refined at all. It is the most valuable medicinal substance and have high therapeutic value[7].

- Pasteurized honey is obtained after being heated and strained to remove any bacterial and fungal contamination[7].

The source of the nectar is the basis for another classification of honey. Honey produced by bees that consume nectar from a single type of flower is known as **unifloral honey**; honey produced by bees that consume nectar from multiple kinds of flowers is known as **multifloral honey**[8, 9]. These flower-based honey varieties differ from one another and are packed full of active photochemical.

Honeys chemical composition[2]

Compounds	Midpoint (%)	Limit (%)
Water	17.1	12.2 to 22.9
Dextrin	38.5	30.9 to 44.3
Glucose	30	22.9 to 40.7
Sucrose	1.4	0.2 to 7.6
More disaccharides	7.5	2.7 to 16.0
High sugars	1.45	0.1 to 3.8
Gluconic acid	0.58	0.17 to 1.17
Acids	0.45	0.13 to 0.92
Lactones	0.13	0.0 to 0.37
Minerals	0.15	0.02 to 1.03
Nitrogen	0.03	0.0 to 0.13

Honey In Different Types[10]:

1. Acacia Manuka honey
2. Alfalfa honey
3. Buckwheat honey
4. Clover honey
5. Eucalypt honey
6. Jamun honey
7. Lavender honey
8. Rosemary honey
9. Sage honey

Manuka Honey

Bees that suck floweret of the New Zealand manuka bushis a type of honey known as honey manuka. It carries excessive concentration of methylglyoxal (MGO) and dihydroxyacetone, which may account for its antibacterial property[11]. Manuka honey when applied on wound stimulates the formation of new blood cells and encourages the growth of fibroblast and epithelial cells. This honey has protective wound healing activity[11]. It is rich in the amino acid lysine, proline, arginine, and tyrosine as well as the water-soluble vitamins B1, B2, B3, B5, and B6. Additionally, it transports minerals like salt, calcium, magnesium, copper, potassium, and zinc[11].

Constituients of Manuka Honey

Honey has its antibiotic quality and antibacterial quality because of hydrogen peroxide.

Methyglyoxal is the most important antibacterial component which interferes in the growth of bacterias. Methylglyoxal is a compound that is found in small quantities[11].

Methylglyoxal approach from the transformation of another substance, a substance that is found in high concentration in the nectar of manuka flower in case of manuka honey is dihydroxyacetone[12].

The higher the concentration of methylglyoxal indicated the powerful antibiotic effect showing direct relation with antibiotic activity.

For measuring the strength of honey, they have a scale for rating the manuka honey. Thus, this scaling is known as Unique Manuka Factor[12].

The concentration of methylglyoxal is measured by The Unique Manuka Factor To be considered potent enough to be therapeutic, this type of honey require a slightest rating of 10 unique manuka factor[11].

This type of honey is additionally retail for use in many other conditions which may include

- Suppressing cancer
- Curing diabetes
- Minimizing the high cholesterol
- Minimizing inflammation inside the body
- Treating opthalmic, shell like organ ear and sinus infections
- Treating GI related problems

- There is limited evidence that whether manuka honey works for these conditions or not. The honey used to cure

lesion is a medical graded honey. It is amazingly refined and prepare as a dressing[13].

Side Effects:

These may include[14]

- Allergic reaction
- Chance for the increase in blood sugar
- Consequence on some chemotherapy drugs

Alfalfa Honey:

Lucerne honey is also known as Alfalfa honey[15]. Alfalfa honey is primarily used as a high protein feed for livestock and made from the nectar and antigen of *medicago sativa* flowers. The honey is processed from the flower and has different variety of magnificient health and fitness benefits. It has some other properties which may include probiotic microflora action, antibacterial properties, antiseptic and anti-acne benefits, aids maintain normal blood glucose levels, manage low level of blood glucose level and is a great natural rectification for skin problems, persistant cough and sore throat[15, 16].

Despite being used primarily as a source of food for domestic animals, the species can be employed for human consumptions as well. Alfalfa seed sprouts and alfalfa honey are purely destined for human consumption[17]. The sprouts are quite a generous source of crucial nutrients such as calcium, iron, magnesium, phosphorus, potassium, zinc, vitamin K, C and folate as well as vitamin B1, B2, B3 and B5, carotenoids, antioxidants and chlorophyll the color of alfalfa is light, almost pale, with a elegant flavor. It is not as sweet as other types of honey[17]. Alfalfa honey is also heavy as compared to other types of honey. This honey is outstanding ingredient in homemade sauces and salad dressings because to the taste which is somehow mild[17].

Benefits Of Alfalfa Honey:

Following are few benefits[18]

- Reduces fever
- Minimizes pain
- Calm nerves
- Lowers blood cholesterol
- Good for diabetes
- Appetite suppressants

Honey Eucalyptus:

Eucalyptus honey is a honey that is collected from *eucalyptus globules, that is* probably the most well-known greenish tree from the breed of eucalypt[19].

General Characteristics:

Here are some general characteristics of eucalyptus honey[19, 20]

- **Shade:** dark tone of golden, with a medium intensity
- **Precipitation:** it forms medium crystals that has a rapid to medium speed
- **Flavor:** caramel like flavor which is medium -strong
- **Amenability:** medium
- **Tartness:** weak
- **Sharpness:** absent
- **Content of vitamin:** high content of vitamin C and vitamin B9. when differentiate types of honey
- **Content of mineral:** very low
- **Content of enzyme:** a high content of diastase.
- Puzzling enzyme that is found in the honey is Diastase. Its role is to digest starch to somehow a similar compound.
- **Flavanoids identified:**

  Myricetin, Tricetin**,** Quercetin**,** Luteolin**,** Kaempferol

Therapeutic And Anti-Inflammatory Response As A Benefit:

The fitness advantages of the eucalypt honey are many which may include[21];

- Anti-bacterial
- Anti-spasmodic
- Nasal decongestant
- Anti-perspirant
- Disinfectant
- Anti-inflammatory

It is used for mild to moderate cough and colds as an expectorant. As it is the excellent natural treatment for trachial issues, eucalypt honey is a good disinfectant having its antibacterial properties [19, 20]. Ozone is formed which is a well known antiseptic, on the exposure to air. Hence healing injuries, ulcers, blisters, lesion, scarping and sores can be treated by eucalypt honey. It is also much efficacious on insect bites and stings. It is frequently recommended to patients that are suffering from inflammation of joint, pain in the muscle and joint of the lower back, sprained ligaments and tendons, stiffness of muscles, jerks in feet, thickening and scaring of connective tissues and even nerve pain[19, 20]. The pain reliever and anti-inflammatory eucalyptus honey is massaged outside

the skin in circular motion to help relieve muscle spasm and weakness of muscles[19].

Acacia Honey:

Acacia honey is absolutely and splendid "fortfolio". And through it is the necessitate product in the market and is categorized as the "foremost honey" by the massive peoples [22].

It has an unobtrusive taste and without having the toxicity and the sick and irritate feeling of overdosing which can occur after taking one to two spoons of other type of honey it can be consumed in high amounts. It is highly recommended to mix with drinks, as it does not affect the taste and odor of the product[23].

Its shade is based on either it has been harvested from (*robiniapseudaocacia L*) white or acacia yellow (*caragana arborescens Lamp*).

As yellow acacia honey is bright yellow whereas, that obtained from white acacia is light-tone and pale-colored, almost see-through[22].

Benefits:

- By the body it is willingly absorbed. Since when compared to other products it is much richer in fruits sugar, it has a shallow ranking of carbohydrate indicator and it is quite stable for people having diabetes (category II)[24, 25].
- Because to its low level of antigen content, no hypersenstivity feedback are caused
- People that are associated its lesion alleviates properties with cough suppressants and good disinfectant but its activity spectrum is much wider when seen in practice
- Acacia honey normalize blood pressure [24, 25]
- Increases the level of hemoglobin when it is consumed daily and regularly without skipping it [24, 25].
- Improves sleep
- Body is energized by consuming.
- It is used in the treatment of eye disease and in inflammation and swelling of conjunctiva[24, 25]
- Because of its disinfectant effect; it is also applied in conditions like skin that become red, skin problem, sores, itchy patch of skin, disease of the oral space[24, 25]
- It cleanses the liver.
- It is frequently known as organic and pure antibiotic[24, 25]
- It acts as a diuretics and anti-microbial agents
- It is useful in conditions like bronchial asthma[24, 25]
- Used for the treatment of running nose, inflammation of bronchial tubes, inflammation of larynx, inflammation of trachea[24, 25]

Buckwheat Honey:

Extremely nutritive made by bees that collects the nectar from buckwheat flowers is called as buckwheat honey. Bees work extra hard to collect nectar because the buckwheat contain minute flowers[26].

Buckwheat is frequently used as a flour substitute.

Traditional honey is much sweeter than the buckwheat honey. And they are much higher in some antioxidants

Buckwheat is wealth in vitamin and is contemplate a very nutritive food [27].

This type of honey has a shade that can range in color from dark purple to black. Buckwheat honey shade is rich and dark in color because buckwheat flowers are dark tone in color[26-28].

Benefits Of Buckwheat Honey:

Following are few benefits [28].

- The predominant uses of buckwheat honey are that it encourage healing in the body
- Boost antioxidants
- Supports immune function
- It is also useful in sore throat and productive coughs [26-28]
- Use of honey is also good for skin care management
- ***Boosting antioxidants:*** drinking the combination of buckwheat honey with black tea significantly boosted the level of antioxidants in the body [26-28].
- ***Wound care:*** use of honey on lesion is also magnificent because the honey actually dampenes out of lesion and helps the microbes to eradicate out from the lesion which can grow in the lesion [26-28]
- ***Skin care:*** this type of honey is very beneficial for the skin. Most of the people use buckwheat honey as a daily regimen for skin management. Honey is known to aid to screen the epidermis and keep it sooth and smooth.

- ***Stopping DNA mutation:*** some type of honey aids to refashion some of the DNA mutation that causes illness and cancer
- ***Lowering cholesterol:*** helps in heart health and lowers blood pressure by reducing the cholesterol levels in the hemoglobin [26-28]
- ***Soothing cough:*** Some types of honey are useful in management of curing night time cough in children which can be persistent as well because of respiratory infections. Many studies showed that other over the counter cough medicines are less effective than buckwheat honey [26-28]

Clover Honey:

Clover honey does carries carbohydrates in the form of sugar, it also yields several health benefits, in contrast to refined table sugar. Clove honey is the most common type of honey found in grocery stores which can be used to naturally sweeten foods and beverages [29].

Clover Honey's General Characteristics:

- Its color is bright leading towards light amber depend on from where it is harvested and collected [29]
- Its smell is elegant and grateful[30]
- Its taste is mild and very sweet
- Fine grained white solid mass is obtained when it crystallizes rapidly

Benefits Of Clover Honey:

Clover honey foremost health benefits may include[29, 31]:

- minimize chronic disease
- safeguard the immune system
- minimize blood pressure
- manage diabetes.
- ***Prevent stress oxidation:*** aid to minimize chronic disease in the body by preventing oxidative stress and the antipathetic effect of free radicals because it has the number of powerful polyphenomic antioxidant property in this type of honey [32]
- ***Boots immunity:*** clover honey has antibacterial property which is partially obtain from the hydrogenperoxide found in different type of honey, which may help the immune system to boost and fighting foreign matter and possible infection in every part of the body.[32]
- ***Protects heart:*** the specific level of potassium and other minerals and anti-oxidants aid to minimize blood pressure, which can lower the risk of atherosclerosis, heart attack, stroke and coronary heart disease.
- ***treat diabetes:*** has more importance impact on blood glucose levels
- ***Better skeletal durability:*** clover honey helps the body to prevent the loss of bone density and as we age slows osteoporosis symptoms[32]

Sage Honey:

As compared to other type of honey, Sage honey is distinctive because it crystallizes slowly[33]

Properties:

Antibacterial, antifungal, disinfectant, antispasmodic, anticattarrhal, anhidrotic, contracts the skin, cell and tissues, induce perspiration, expectorant, stimulates and increase menstrual flow, reduces fever, nervine, astringent alterative, diuretic carminative are the properties of sage honey[33].

Lavender Honey:

Lavender honey is premium honey. It has a determined sweet taste that increases with the finished product. In some case, it has slightly sore taste[34]. It has extra light amber color to white color. It might have some salty notes if it is dark in the presence of honey dew. An extra ordinary honey, it carries weak acidity without bitterness. Crystallization is very fine[34].

Characteristics of Lavender Honey:

- ***Color:*** light with bright yellow tone[34, 35]
- ***Odor:*** woody, floral-fresh fruit, medium intensity is medium [34, 35]
- ***Amenability:*** average
- ***Sharpness:*** not present
- ***Acidity:*** average [34, 35]
- ***Smell:*** woody
- ***Crystallization rate:*** moderate, into fine crystals
- ***Persistence:*** medium, sometime blackcurrant taste is present [34, 35]

Benefits:

Lavender honey contain high amount of tyrosine

Other amino acid including phenylalanine, tyrosine, isolucine and pronine found in lavender honey[35].

All honey is rich in free amino acid, and because of this it qualifies them to be used in even more for food product in

supplementary minerals, especially for foods for children[35].

Tyrosine and its importance in honey?

Tyrosine is the paramount amino acid in the body used[36]:

- To fabricate neurotransmitters that might prevent and cure in certain condition involving the nervous system
- Our body converts tyrosine into many different and important compound which may include melanin which is a epidermal pigment and a female hormone estrogen by using niacin, folic acid, vitamin C, copper
- To treat mental problems
- To cure unease
- To treat (ADHD) attention deficit hyper-activity disorder
- Impaired alterness caused by insomnia
- Parkinsons problem
- Disease of Alzheimer
- Chronic muscle weakness

Properties Of Lavender Honey:

- ***Antioxidant activity:*** this effect is contemplated because of its flavonoids and phenol compounds that may include naringenin and luteolin, that is found in high amounts in lavender honey, there are also high amount of gallic acid and caffeic acid [34, 35]
  - The ability to killing the cancer cells without destroying the healthy cells is the only responsibility of gallic acid.
  - Supplementes used for the performances of athletic is boosted and treat exercise related muscle fatigue is done by Caffeic acid
- ***Anticonvulsant and antispasmodic:*** From Spanish lavender honey is extracted and variety is used as anticonvulsant and antispasmodic to relieve muscle spasms and weakness [37]
- ***Helps in wound healing[37]***
- ***Lavender honey has antimycotic activity [37]***

Rosemary Honey:

[23] Rosemary honey is stereotypical found in the region of Mediterranean, mainly France and Spain with a special and distinctive taste and because of its taste and appearance it differentiates itself from the other honey[38, 39].

Chahracteristics Of Rosemarry Honey:

- ***Color:*** light white to extra white [38, 39]
- ***Taste:*** mouth watering, very fine
- ***Persistence:*** floral and fruity [38, 39]
- ***Strength of odor:*** weak to average
- ***Amenability:*** average
- ***Sharpness:*** not present
- ***Hyperacidity:*** delicate
- ***Moisture content:*** very low
- ***pH:*** 3.8 – 4 [38, 39]
- ***mineral content:*** low
- ***crystallization:*** rapidly into very fine crystals
- ***enzyme content:*** low

Health Uses Of Rosemarry Honey:

Rosemarry is used in loss of strength with cold as it has stimulant properties

Excellent anti-inflammatory[40, 41].

Roman Consider Rosemary Honey As A Symbol Of Love!

- Cures liver inadequacy and other liver problems [40, 41]
- Help in stomach sickness, especially for those with the decrease assimilation
- Aids gastrointestinal problem
- Substantial refresher suggested to younger and elder patients
- dampens the epidermis

JAMUN HONEY:

Jamun honey is highly nutrient with its mild and sweet flavor, the jamun honey is frequently known to calm the mind and absolutely relax the body[42, 43]

HEALTH BENEFITS OF JAMUN HONEY:

- This honey control heart problems, improve eyesight and body metabolism
- it contain 1:1 fructose and glucose [18]
- Fructose unbolt enzymes required to convert glucose to glycogen which is obligatory fuel for prolong exercise
- It helps in reducing body mass index [42, 43]
- It is preferable to have lukewarm water with honey on an vacant stomach as first thing in the morning
- Natural blood cleanser
- Excellent for eye and skin health [42, 43]

- Treats digestive disorders [42, 43]
- Keeps skin fresh
- Prevention of infection
- Keep gum and teeth healthy
- Prevention of seasonal problem
- Prevention of heart disorders [42, 43]
- Balance blood sugar level
- Treat diabetic conditions and its severeness [42, 43]
- Treat renal disease and its complication
- Treat various disorders

Benefits Of Using Honey On Eye

Honey has anti-inflammatory and anti-microbial properties which is combined with its soothing tendency make it an effective treatment for various eye problems[14].

All of the following home remedies foe eye problems involve mixing especially high grade honey (like locally sourced, honeycomb, manuka honey) with uncontaminated normal saline drops and apply the combination tonically in the eye or on the skin.

Keratoconjuctivitis:

Artificial tears containing honey found to be an effective and excellent treatment for keratoconjunctivitis (inflammation of cornea due to dryness)[14]

This chronic condition tends to appear with in the onset of seasonal infection and allergies [44].

Corneal Ulcers:

Corneal ulcers are sores on the apparent side of the eye. Honey can scrimmage infections that might cause the sores, as well as increase the healing of the ulcers themselves.

The lesion – healing tendency of honey, as well as antimicrobial effects, make it uniquely are useful in treating the sore ulcers[45, 46].

Blepharitis:

Blepharitis is a condition that may cause enlargement and burning sensation around the eyelash line. One study had taken six rabbits with blepharitis to recognize the potential of manuka honey as a treatment for blepharitis [45, 46]

Human trial are still needed for this condition, manuka honey is much more effective than commercial – grade honey or no treatment for getting free from blepharitis

Dry Eyes:

Dry eyes happen with the tear glands that moisturize the eyes are not producing enough tears while it is possible to cure chronic dry eye with artificial tear, there has never been a purposed way to treat it completely[46] [45, 46].

Combination of artificial tear with manuka honey and eye gel with manuka honey is used as a dry eye treatment.

Prevents Wrinkle:

Most of the chemicals and natural anti-aging active ingredients are not safe to use in the area under and around the eyes but on the other hand honey is useful and safe which can be mixed with the saline, water, coconut oil and jojoba oil and applied around the eyes for the prevention of the wrinkles.

Bacterial Conjunctivitis:

Bacterial conjunctivitis is also known as pink eye. Honey has anti microbial properties which can fight a bacterial eye infection, prevents from spreading the infection and reduce redness and causes speady healing [45, 46].

Honey has anti-microbial affect against different kinds of bacteria, and explains how well it works against the conjunctivitis in the particular person in older study held in 2004.

Lightening Of Eye By Using The Honey:

Melanin is the pigment that induces the eye color. More the melanin in the eye, darker will be the eye color [45, 46].

By applying the combination of honey and water can change the eye color after some time but there is no evidence to suggest that this home remedy would work it is unlikely that hone will absorb deeper than the outer layer of the cornea, where there is no pigment.

Side Effects Of Honey:

Raw honey should not be applied directly in the eyes ever[47].

Eye drops of Manuka honey are also available.

Sterilized homemade honey eye drops can also be made by combining honey with artificial tears, saline solution, sterilize water to make homemade mixture[47].

The example below uses water

- Start by boiling the one cup of water five tea spoon of honey
- Stir well
- Let the mixture cool down at room temperature

- Mixture can be used as an eye wash and as to sterilize the eye droper to put into the eyes directly[46]

REFERENCES

1. Meo SA, Al-Asiri SA, Mahesar AL, Ansari MJ. Role of honey in modern medicine. Saudi journal of biological sciences. 2017;24(5):975-8.
2. Tafere DA. Chemical composition and uses of Honey: A Review. Journal of Food Science and Nutrition Research. 2021;4(3):194-201.
3. Scepankova H, Combarros-Fuertes P, Fresno JM, Tornadijo ME, Dias MS, Pinto CA, et al. Role of honey in advanced wound care. Molecules. 2021;26(16):4784.
4. Vogt NA, Vriezen E, Nwosu A, Sargeant JM. A scoping review of the evidence for the medicinal use of natural honey in animals. Frontiers in Veterinary Science. 2021;7:618301.
5. Berenbaum MR, Calla B. Honey as a functional food for Apis mellifera. Annual Review of Entomology. 2021;66:185-208.
6. Ilyasov RA, Lee M-l, Takahashi J-i, Kwon HW, Nikolenko AG. A revision of subspecies structure of western honey bee Apis mellifera. Saudi Journal of Biological Sciences. 2020;27(12):3615-21.
7. Krishnan R, Mohammed T, Kumar GS, Arunima S. Honey crystallization: Mechanism, evaluation and application. J Pharm Innov. 2021;10:222-31.
8. Labsvards KD, Rudovica V, Borisova A, Kokina K, Bertins M, Naumenko J, et al. Multi-Element Profile Characterization of Monofloral and Polyfloral Honey from Latvia. Foods. 2023;12(22):4091.
9. Scripcă LA, Amariei S. The influence of chemical contaminants on the physicochemical properties of unifloral and multifloral honey. Foods. 2021;10(5):1039.
10. Mračević SĐ, Krstić M, Lolić A, Ražić S. Comparative study of the chemical composition and biological potential of honey from different regions of Serbia. Microchemical Journal. 2020;152:104420.
11. El-Senduny FF, Hegazi NM, Abd Elghani GE, Farag MA. Manuka honey, a unique mono-floral honey. A comprehensive review of its bioactives, metabolism, action mechanisms, and therapeutic merits. Food Bioscience. 2021;42:101038.
12. Hegazi NM, Elghani GEA, Farag MA. The super-food Manuka honey, a comprehensive review of its analysis and authenticity approaches. Journal of Food Science and Technology. 2022;59(7):2527-34.
13. Kapoor N, Yadav R. Manuka honey: A promising wound dressing material for the chronic nonhealing discharging wounds: A retrospective study. National journal of maxillofacial surgery. 2021;12(2):233.
14. Hu J, Kong L, Zhu S, Ju M, Zhang Q. Efficacy and safety of manuka honey for dry eye. Clinical and Experimental Optometry. 2023;106(5):455-65.
15. Fratianni F, De Giulio B, d'Acierno A, Amato G, De Feo V, Coppola R, et al. In Vitro Prebiotic Effects and Antibacterial Activity of Five Leguminous Honeys. Foods. 2023;12(18):3338.
16. Ismail M, Abdallah EM, Elsharkawy ER. Physico-chemical properties, antioxidant, and antimicrobial activity of five varieties of honey from Saudi Arabia. Asia Pac J Mol Biol Biotechnol. 2021;29:27-34.
17. Akbari E, Baigbabaei A, Shahidi M. Determination of the floral origin of honey based on its phenolic profile and physicochemical properties coupled with chemometrics. International Journal of Food Properties. 2020;23(1):506-
18. Ranjan A, Pal P, Gupta G. Different flavours of honey, their properties and health benefits. 2022.
19. Bobis O, Moise AR, Ballesteros I, Reyes ES, Durán SS, Sánchez-Sánchez J, et al. Eucalyptus honey: Quality parameters, chemical composition and health-promoting properties. Food chemistry. 2020;325:126870.
20. Villacrés-Granda I, Proaño A, Coello D, Debut A, Vizuete K, Ballesteros I, et al. Effect of thermal liquefaction on quality, chemical composition and antibiofilm activity against multiresistant human pathogens of crystallized eucalyptus honey. Food Chemistry. 2021;365:130519.

21. Assaggaf HM, Naceiri Mrabti H, Rajab BS, Attar AA, Hamed M, Sheikh RA, et al. Singular and combined effects of essential oil and honey of eucalyptus globulus on anti-inflammatory, antioxidant, dermatoprotective, and antimicrobial properties: In vitro and in vivo findings. Molecules. 2022;27(16):5121.
22. Lazarieva L, Postoienko V, Antonenko P, Merzlova H, Pushkar T, Cherniuk S, et al. Assessment of Acacia monofloral honey. Ukrainian Journal of Ecology. 2021;11(2):106-10.
23. Hamadou WS, Bouali N, Badraoui R, Hadj Lajimi R, Hamdi A, Alreshidi M, et al. Chemical composition and the anticancer, antimicrobial, and antioxidant properties of acacia honey from the Hail region: The in vitro and in silico investigation. Evidence-Based Complementary and Alternative Medicine. 2022;2022.
24. Marić A, Jovanov P, Sakač M, Novaković A, Hadnađev M, Pezo L, et al. A comprehensive study of parameters correlated with honey health benefits. RSC advances. 2021;11(20):12434-41.
25. Keskin M, Keskin Ş, Kolaylı S. Health-promoting benefits of honey. Preparation of Phytopharmaceuticals for the Management of Disorders: Elsevier; 2021. p. 303-6.
26. Jiang L, Xie M, Chen G, Qiao J, Zhang H, Zeng X. Phenolics and carbohydrates in buckwheat honey regulate the human intestinal microbiota. Evidence-Based Complementary and Alternative Medicine. 2020;2020.
27. Nešović M, Gašić U, Tosti T, Horvacki N, Šikoparija B, Nedić N, et al. Polyphenol profile of buckwheat honey, nectar and pollen. Royal Society open science. 2020;7(12):201576.
28. Popović V, Burić M, Mihailović A, Aćimić Remiković M, Vukeljić N, Batrićević M, et al. Medicinal properties of buckwheat products and honey in compliance with food safety regulatory requirements. Journal of Agricultural, Food and Environmental Sciences. 2022;76(3):16-24.
29. Sultana S, Foster K, Lim LY, Hammer K, Locher C. A Review of the Phytochemistry and Bioactivity of Clover Honeys (Trifolium spp.). Foods. 2022;11(13):1901.
30. Roby MH, Abdelaliem YF, Esmail A-HM, Mohdaly AA, Ramadan MF. Evaluation of Egyptian honeys and their floral origins: Phenolic compounds, antioxidant activities, and antimicrobial characteristics. Environmental Science and Pollution Research. 2020;27:20748-56.
31. Ghoniemy HA, Esmail AHM, Mahmoud AAE-T, Saleh AM. Evaluation of vitamin C, proline, enzymes and hydroxymethylfurfural levels in clover honey at different storage conditions. Egyptian Journal of Chemistry. 2022;65(13).
32. Harris C, Ratnieks FL. Clover in agriculture: combined benefits for bees, environment, and farmer. Journal of Insect Conservation. 2021:1-19.
33. Flanjak I, KenjeriÄ D, Strelec I, BiliÄ B, Primorac L. Effect of processing and storage on sage (Salvia officinalis L.) Honey quality. Journal of microbiology, biotechnology and food sciences. 2022;11(6):e3375-e.
34. Sakač M, Jovanov P, Marić A, Četojević-Simin D, Novaković A, Plavšić D, et al. Antioxidative, antibacterial and antiproliferative properties of Honey types from the Western Balkans. Antioxidants. 2022;11(6):1120.
35. Balkanska R, Stefanova K, Stoikova–Grigorova R. Main honey botanical components and techniques for identification: A review. Journal of Apicultural Research. 2020;59(5):852-61.
36. Kuś PM. Honey as source of nitrogen compounds: Aromatic amino acids, free nucleosides and their derivatives. Molecules. 2020;25(4):847.
37. Niazi A, Moradi M, Askari VR, Sharifi N. Effect of complementary medicine on pain relief and wound healing after cesarean section: A systematic review. Journal of Pharmacopuncture. 2021;24(2):41.
38. Fuente-Ballesteros A, Brugnerotto P, Costa AC, Nozal MJ, Ares AM, Bernal J. Determination of acaricides in honeys from different botanical origins by gas chromatography-mass spectrometry. Food Chemistry. 2023;408:135245.
39. Mouffok KM. Quality evaluation and biological properties of Algerian commercial honeys labeled

as Rosemary, Tamarisk, Thistle and Multiflora: Instituto Politecnico de Braganca (Portugal); 2020.

40. María EG, Luna AM, Celdrán AC, Muñoz GM, Oates MJ, Ruiz-Canales A. Classification of Monofloral Honeys by Measuring a Low-Cost Electronic Nose Prototype Based on Resistive Metal Oxide Sensors. Agronomy. 2023;13(8):2183.
41. Fiamegos Y, Dumitrascu C, Ghidotti M, De la Calle Guntinas MB. Use of energy-dispersive X-ray fluorescence combined with chemometric modelling to classify honey according to botanical variety and geographical origin. Analytical and bioanalytical chemistry. 2020;412:463-72.
42. Chaudhary A, Bag S, Banerjee P, Chatterjee J. Wound healing efficacy of Jamun honey in diabetic mice model through reepithelialization, collagen deposition and angiogenesis. Journal of traditional and complementary medicine. 2020;10(6):529-43.
43. Madani B, Mirshekari A, Yahia EM, Golding JB, Hajivand S, Dastjerdy AM. Jamun (Syzygium cumini L. Skeels): A promising fruit for the future. Horticultural Reviews. 2021;48:275-306.
44. Abd Rashid N, Mohammed SNF, Syed Abd Halim SA, Ghafar NA, Abdul Jalil NA. Therapeutic Potential of Honey and Propolis on Ocular Disease. Pharmaceuticals. 2022;15(11):1419.
45. Sachdev S, Kumar A, Ansari MI. Health Benefit, Traditional, and Modern Uses of Natural Honey. Non-Timber Forest Products: Food, Healthcare and Industrial Applications. 2021:281-99.
46. Zafar M, Latafat T, Zehra A, Farooqui Y. Therapeutic properties of honey: a review of literature. Res Rev A J Pharmacol. 2020;10:41-9.
47. Frizzera D, Del Fabbro S, Ortis G, Zanni V, Bortolomeazzi R, Nazzi F, et al. Possible side effects of sugar supplementary nutrition on honey bee health. Apidologie. 2020;51:594-608.

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