Review of recent trends about Honey and their varieties

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Abstract:

Honey is produced by honey bees, mostly by the species of *Apis mellifera*. Bees first convert the flower nectar into honey by a process of regurgitation, then store it as a primary food source in wax honeycombs inside the beehive with the clear, golden amber like color. Honey sent will vary based on the types of flower from which the nectar is going to harvest. Honey then will be harvested from the hives in human for oral use. Evidence shows that, from last 10000 years we are using honey in diet. Honey is accepted as a diet source and medicine by both Modern and Ayurveda.

In India honey market value reached to INR 21.1 Billion in 2021 and is suppose to reach INR 38.3 billion by 2027 showing the Annual Growth Rate of 10.31% during 2022 to 2027. Honey can cure various health problems because of its high nutritional value and antioxidant properties. honey can improve reproductive health by decreasing infertility rate also protect the postmenopausal reproductive tract, prevent toxic effects, maintain sperm quality by restoring testosterone levels and treat vaginal Candidiasis infections. Many benefits of honey remain unauthorised by studies, thus providing researchers with the opportunity to investigate the potential of honey and contribute to the society.

In *Ayurved* most of the formulations of *Bhaishajya Kalpana* requires honey. There is a mention about different types of honeys by *Acharya Charak, Acharya Sushrut* and other *Acharyas. Honey is being used as vehicle with other medicines because of its Yogavahi (Catalyst) property.It is being used as vehicle with the medicines used in Raktapitta (Bleeding tendancy) and Pramehabecause of its Stambhan (Styptic) property. It is also being used in Ayurved as best Preservative for the formulations like Avaleha Kalpana.* Depends on the variety they have indicated the use of honey. Now a days also extensive research is going on according to the different types of flower honey. Efforts has been made in this paper about different aspects of honey as well as recent trends. This study, which is a comprehensive review of the current literature, highlights the therapeutic benefits of different flower honey in the management of diseases.

Key Words: Food source, Different types of flower honey, recent trends

Introduction:

Honey is produced by honey bees, mostly by the species of *Apis mellifera*. Bees first convert the flower nectar into honey by a process of re- gurgitation, then store it as a primary food source in wax honeycombs inside the beehive with the clear, golden amber like color. Honey sent will vary based on the types of flower from which the nectar is going to harvest. Honey then will be harvested from the hives in human for oral use. Evidence shows that, from last 10000 years we are using honey in diet. Honey is accepted as a diet source and medicine by both Modern and Ayurveda.[(1)]

In India honey market value reached to INR 21.1 Billion in 2021 and is suppose to reach INR 38.3 billion by 2027 showing the Annual Growth Rate of 10.31% during 2022 to 2027.[(2)]

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Need of Review of recent trends: There is lot of confusion about which type of honey will be better for your health.

Ayurveda already have mentioned different types of honey. *Acharya Charak* elaborated 4 types and *Acharya Sushruta* also discussed in detail about 8 types of honey. Now days in market also we will get different types of honey. This confusion can be solved by doing review of literature.

Methods:

A literature search was conducted to identify recent articles illustrating efficacy of different types of i.e. *Monofloral* and *Polyfloral honey* according to the diseases. Several online database queried including web of science, science direct and pub med. The following criteria to be considered. 1. *Monofloral* and *Multifloral* honey and their effect as an anti-oxidant, anti-bacterial, wound healing, immunomodulatory effect, contaminated honey, anti fungal, anti resistant bacteria etc. The present review covers 20 year period which include publications from 2002 to 2021. Initial searches yielded 100 results. The abstract of these papers were reviewed to confirm applicability. After reviewing only 28 results were found to be useful according to inclusion criteria.

Results:

References of Honey in Holy Books:

According to the holy book Christian, the Bible, King Solomon said — eat honey my son, because it is good. Afterwards, in accordance with the Bible, John the Baptist had a diet including wild honey when he was in the desert area. Islam recommended the use of honey, and was noted in their holy book, Holy Quran for honey. The Buddha considered honey as one of the essential medicines and food in life.[4]

Main countries of honey production all over the world:

Honey is produced in large quantities worldwide. National Honey Month is being celebrated as a promotional event annually during the month of September in the United States. This event is purposefully celebrated to promote American beekeeping industry and to use honey as a natural sweetener. According to Food and Agriculture Organization, among the honey producing countries, Russia is in the top and followed by china, turkey, India, Mexico, Iran, Romania, Republic of Korea, New Zealand, Poland, and Kenya.[5]

Constituents of Honey:

There were a total of 63 compounds detected in the headspace of the honey samples. It is found that from sample to sample volatile compounds are different. The highest were identified in *longan* (***Dimocarpus*** *longan*) honey and the least numbers of volatiles in sunflower honey. The volatile compounds variation in the honey samples lead to uniqueness of fragrances, tastes and useful biomedical properties.

These characteristic depend not only on honeybee species, but also on the nectar-providing plant species. It shows, the volatile compound profiles can be used as chemical markers for tracing the origin of honey.[6]

Honey consists of sugars and water mainly. In the sugars, the largest amount was found to be fructose (~38%), followed by glucose (~31%) and sucrose (~1%). In addition, honey also contains several vitamins like Riboflavin, Niacin, Pantothenic acid, Pyridoxine, Folate, and Vitamin C, Minerals, Proteins, Enzymes like Catalase, Superoxide dismutase, Reduced Glutathione, Flavonoides like Apigenin, Pinocembrin, Kaempferol, Quercetin, Galangin, Chrysin and Hesperetin and Phenolic acids like Ellagic, Caffeic, P-coumaric, and Ferulic acids.Vitamins B2, B4, B5, B6, B11 and vitamin C, and Minerals such as Calcium, Iron, Zinc, Potassium, Phosphorous, Magnesium, Selenium, Chromium, and Manganese. According to the selection of food for feeding to the bees the nutritional values of honey could be . Bee wax secreted by bees to construct their honeycomb. It looks like Solid, Yellowish, Nonglycerine substance having fats and oils in it. Natural base for preparing creams and balms bee vax is being used. Honey is used in most of the preparations in Ayurveda and traditional medicinal treatments and is used as vehicle/ preservative for rapid absorption of the drug. Some herbo mineral medicines and other herbal preparations are taken with bees honey.

4.4. General properties of honey according to *Ayurved* and others:

4.4.1 Types of honey according to Sushrut

According to Susruta Samhita of Ayurveda, there are eight types of honey. Sushruta Samhita is an ancient Sanskrit text on Ayurveda medicine and surgery.

A. Pauttika: Dalhan comments pautik honeybee is Bluish Yellow in colour and its colour is like Ghrut(Butter) It has dry, hot and potency properties. *Pauttika honey* is formed from poisonous flowers and leads to vitiation of *Vata, Pitta and Rakta* (blood)

B. Bhramara: Dalhana **comments it as Blackish in colour**.This type of honey is described as heavy, which means not easily to digest. It contains slimy and excessively sweet properties

C. Kshaudra: Dalhana **comments this type of honey bee is like Bluish yellow in colour but size of it is small.**This type is known as light, which means easily to digest. It has cold and anti-obesity properties

D. Makshika: **Dalhana comments this type of honey bee is like Bluish yellow in colour but size of it is Large.** It is the best honey and especially used for the management of cough and asthma

***E. Chatra: Dalhana* comments these honeybees are YellowishBlue in color and found in Himalayana region**. It has a sweet taste after digestion. *Chatra honey* also heavy, which means not easily to digest. It has cold and slimy properties. It is given as a remedy for bleeding disorders, leukoderma, urethritic discharges, and worm infestations

F. Ardhya: Dalhana comments about theses honeybees are yellow in color having pointed nose. It has a pungent taste after digestion. Ardhya honey is good for eyes, eliminates vitiated Kapha and Pitta Dosha.

G. Auddalaka: Dalhana comments about these honey bee specifically from Ant House. It has bestowed taste and beneficial for voice. It also used as remedy for skin diseases. As Ardhya honey, it has a pungent taste after digestion.

H. Dala: Dalhana comments this honey is acquired from Petals of flowers. It is dry and controls vomiting and diabetes mellitus.[7]

4.4.2. Types of honey according to *Charak*

According to ***Charaka Samhita*** which is an ancient Sanskrit text on Ayurveda medicine there are four different types of honey such as ***1.Makshika, 2.Bhramara, 3.Kshaudra and 4.Paittaka.***

Makshika is the best type of ***honey*** and color is similar to sesame oil. It is produced by reddish variety of honey bees.

Bhramara honey is produced by the ***Bhramara*** type of ***bees***. It is *Guru* and *Shweta* in color.

Kshaudra honey is brown in color and produced by a small type of honey bee.

Paittaka honey is produced by a large type of bees, and the color is similar to Butter.

There are two types of honey according to the ***Ayurveda*** properties which are named as ***Navina madhu*** (Freshly collected honey) and ***Purana madhu*** (1 year old honey).

1. Navina madhu: Honey that is fresh or recently collected is ***Navina madhu.*** It gives nourishment. Newly collected honey from bee hive increases body weight and act as a mild laxative.

2. Purana madhu: When honey gets old (approximately after 1 year of honey collection) is called ***purana madhu.*** It act as a good adsorbent and reduces fat.[8]

4.4.5 General properties of *honey* according to *Ayurved and other system*

In *Ayurvedic* system of medicine, the properties of *honey* are *Madhura* (sweet) and *Kashaya* (astringent) in *Rasa, Madhura* is predominant *taste* and *Kashaya* is less predominant *taste*), *Ruksha* in *Guna* (property), and *Sheetha* in *Veerya* (potency). The functional aspect of the body is governed by these three biological humors i.e. *Tridosha Vata,Pitta and Kapha.*

Honey is very good for eyes and eye sight (vision) if you apply on the eyelids, it reduces thirst, balances *kapha*. It reduces toxicity, stops hiccups. Honey is also useful for bleeding disorders, in urinary tract disorders and diabetes, skin diseases, worm infestations, bronchial asthma, cough, diarrhea and nausea, vomiting, to cleanse the wounds, it heals wounds, helps in quick healing of deep wounds .The ancient Egyptians, Assyrians, Chinese, Greeks and Romans all used honey in combination with other herbs and on its own, to treat wounds and diseases of the gut.

4.4.6 According to the Fundamentals of Chinese Medicine honey is balanced source in diet, which is sweet in taste and having non-toxic effects. It enters the lung, spleen and the large intestine through channels. It moistens the lung. Relieves pain and resolves toxins. Treats cough due to lung dryness; it also treats constipation due to dryness of the intestines; stomach pain; deep source nasal congestion, mouth sores, scalds and burns.

In *Chinese system of medicine showing properties of honey as mentioned in Ayurveda too*.

Honey is used as *Anupana* (as a fluid vehicle taken with or after medicine which assists the action of main ingredient) with principal drug in Ayurveda clinical practice.

4.4.7 Over 4000 years ago, honey was used as a traditional Ayurveda medicine, where it was thought to be effective to balance the *Tridosha* of the body. The ancients of Vedic civilization proved honey as one of nature's most remarkable gifts to mankind. In pre-Ancient Egyptian times, honey was used topically to treat wounds. Honey is known as *Madhu* or *Kshaudra* in Ayurveda scriptures and is one of the most important medicines used in Ayurveda. Synonyms of bee's honey in *Sanskrit* are *Madhu*, *Madvika, Kshaudra, Saradha, Makshika, Vantha, Varati, Bhrungavantha, and Pushparasodbhava*. The ancient Greeks believed that consumption of honey could help one to live longer. Honey is normally added to the prepared decoctions. Bee's honey is beneficial for diabetic patients in two ways. 1. Honey being sweeter than sugar, you may need a much smaller quantity of honey as a sweetener 2. Honey contain lesser calories than sugar.

4.5 Honey and their Pharmaclogical effects

The antibacterial activity of honeys is mainly dut to H2O2 levels present in honeys which is affected mainly by polyphenolic substances and not directly by GOX content.9 The pilot study conducted on honey after oral application of honey might prevent a postoperative pain increase on postoperative day 4 and 5, showing opioid-sparing effect.[10]

Honey find a place in clinical practice as a combination, antimicrobial therapies with systemically administered antibiotics to treat multidrug-resistant bacteria, especially in topical applications. However, the honey used for medical purposes must be guaranteed, in its antibacterial efficacy and its safety for patients.[11]

4.6. Various types of honey and their aspects and research:

The results about mechanisms of antibacterial action of honey from the trees Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*), provide further support for the use of honey in the treatment of infected wounds.[12] one of the study confirms that honey samples from Bangladesh are good sources of phenolic acids and flavonoids, which are having good antioxidant potential.[13]

List about different types of monofloral honey in China researched in the last 10 years.

Z. jujuba-, Protective effects against chronic alcohol-induced liver damage.

Buckwheat (*Fagopyrum esculentum* Moench) Honey High antioxidant capacity, Hepatoprotective effect Protective effect of DNA, Vitex (*Vitex negundo* Linna. Var. *heterophylla* Rehd) Honey High caffeic acid content, Strong antioxidant activity, Hepatoprotection effect, *Macleaya cordata* (Willd.) R. Br. Honey Characteristic compositions of alkaloids, *Prunella Vulgaris* Honey The high content of rosmarinic acid, protective effects against colitis, modulative effect on gut microbial populations,

Honey Volatiles as a Fingerprint for Botanical Origin-A Review on their Occurrence on Monofloral Honeys.[14] High altitude Acacia honey had significantly more effective anticancer activity against HCT116 and MCF7 cells compared with low altitude honey.[15] *Rifampicin-Manuka* Honey Combinations Are Superior to Other Antibiotic-*Manuka* Honey Combinations in eradicating *Staphylococcus aureus* Biofilms.[16] In Thailand, one of the study conducted on various types of honey which are consumed on a large scale; this study aimed to investigate the efficacy of different types of Thai honey on inhibition of pathogenic bacteria on skin. They also found polyphenol, flavonoid, antioxidant and anti-tyrosinase properties of honey.[17] The activity of *manuka* honey is largely due to the presence of methylglyoxal (MGO), which is produced non-enzymatically from dihydroxyacetone (DHA) present in *manuka(*Leptospermum scoparium) nectar. All of this is in favor of a promising use of arid region honey as a therapeutic product for major chronic diseases, especially cancer.[18] The results of statistical analysis obtained with principal component analysis (PCA) showed a major difference between the grassland honey and the other types of honey.[19] *Agastache* (Korean mint) honey was the most effective honey against t*enea mentagrophytes* and *tenea rubrum*, closely followed by Tea tree honey, also *Manuka* honey showing some activity[20]. One of the study found significant differences between urban and rural honeys for some elements (K, Na, P, Ca, B, Cu and Mn), of which, only Mn was lower in urban honeys. There is lot of differences between urban and blended honeys were found for K, Na, P, B, Cu, Mn, Ni and Sr, with Mn and Sr concentrations lower in the urban honeys. Levels of environmental contaminants raises concern about if these honeys are produced by small producers in urban areas in the vicinity of industrial activities. It is important that elemental levels, including toxic heavy metals should be regularly monitored to ensure nutritional quality and safeguard against contaminants. This study emphasized the importance of honey elemental analysis for assessing regional variations. However, there is also a need to identify the specific source of toxic metals such as Pb.[21] **Polish honeys (Tree forest honey is kind of honey in Poland)** were characterized by high antioxidant activity compared to products from other countries. Mostly, dark honeys showed better antioxidant activity as compared to light honeys. The weakest antioxidant activity was exhibited by rape honey, which was 3–6 times lower as compared to buckwheat honey regardless of the applied method. The results obtained by various methods were positively correlated. The most promising tool to differentiate honey variety PCL method was proposed. Using multivariate statistical analysis (PCA and CA method), the possibility to classify the botanical origin of honey based on antioxidant activity was proved.[22] The analysis of *Robina* and *Helianthus* honeys originating from different locations in Romania having polyphenolic profile (phenolic acids and flavonoids) could be used as a complementary method for authenticity together with pollen analysis and other physicochemical analysis.[23]

4.7 Adulteration of honey and a solution:

The significant impact of honey adulteration on market loss, reducing the quality of honey, shows the importance of studies to investigate different honey adulterants, adulteration methods, and detection methods. Moreover, this fraud has an adverse impact on the honey production industry and market by reducing the trust of consumers on this valuable product. There are six studied sugar adulterants. these are cane sugar, corn syrup, palm sugar, invert sugar, rice syrup, and inulin syrup which have health disadvantages toward human health based on their $LD_{(50)}$ value and internal organ toxicology. Consumption of sugar-adulterated honey causes Kidney and Liver dysfunctioning. These diseases have a noticeable impact on human daily life., via

chemometric honey adulteration methods detection of adulterant is possible. More prompt actions must be taken by authorities to prevent the production, trading, and marketing of adulterated honey and discover the other harmful honey adulterants available on the market. The overall result demonstrates that honey adulteration is a threat to food safety, food security, and ecological sustainability of this important and valuable product.[24]

In shorter time Modern techniques enable the results of honey quality testing. These methods are constantly modified, so that the honey that is on sale is a product of high quality. Prospects for devising methods of honey quality assessment include the development of a fast and ac cur a t e a l t ern a t i ve t o t h e melissopalynological (**the study of pollen contained in honey and, in particular, the pollen's source**) method as well as quick tests to detect adulteration. (GC-MS—gas chromatography mass spectrometry, HPLC- MS—high performance liquid chromatography mass spectrometry, LC-DAD—liquid chromatography with diode array detection.)[25]

All samples analyzed had a sucrose content of less than of 5%, the maximum limit regulated by European legislation, which could indicate that the honey was not adulterated with sugar syrup and was properly matured before harvesting.[26]

Phenolic compounds are one of the most widely distributed secondary metabolites in nature. The study of foods that contain *phenolic* compounds has been of great relevance in recent years, due largely to the beneficial effects on human health. Various studies have reported a higher positive correlation between total phenol content and the antioxidant activity of honey, while the color of honey has a stronger correlation with the total *flavonoid* content the darkest honey presents high total *flavonoid* content values. The variations in color are frequently present in *multifloral*, in accordance with the differences in the percentages of nectar used for its production. There is a close relationship between the botanical-geographical origin and the biological characteristics of the honeys, which define its identity and link with the local production and territory. one of the perspective giving opportunity for researchers to link the phenolic compounds, antioxidant activity and other characteristics of the honey, not only with the floral origin, but with the geographical, production, and territorial origins.[27]

Discussion:

As a time immemorial world knows about pharmacotherapeutic as well as pharmacological activities of *honey*. In *Ayurved* types of honey bees as well as given some idea about floral honey too. Now a days also showing trends all over the world about *monofloral* and *multifloral* honey. In this paper first of all literature review and *Ayurvedic* as well as other other nation's aspects of honey has been discussed. Then different types of honey and their therapeutic activity reviewed. The various types of honey and to identify them with some modern techniques also have been discussed. The adulteration part and to avoid what steps have to be considered also has been discussed. Depends upon the Organoleptic properties like smell, taste and color also changes their therapeutic activity also has been discussed.

Conclusion:

This review of literatute will definitely give some clue to new *Ayurved* researcher in *Ayurvedic* as well as modern point of view. This will definitely throw light to do research work on the various aspects of honey.

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