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REVIEW ON PHYSICO-CHEMICAL NUTRITIONAL AND MEDICINAL STATUS OF HONEY

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ABSTRACT: The honey is one of the most valued and appreciated nutritional and medicinal substance known to mankind since ancient times. Honey has a long medicinal history, and honey bees have been closely associated with human beings for a very long time. It is produced by bees from the nectar of flowers, which bees collect, transform and, store in the honey comb to ripen and mature. This review spotlights the physical, biochemical and therapeutic properties of honey, which were discovered by various researchers since last forty years. The review broadly discusses about the ancient history of honey and also composition, nutritional, therapeutic, medicinal properties of honey. Honey was also included along with cosmetic properties. Its effectiveness on human health and safety measures to be followed while using honey showed the path of future research. It is composed mainly from carbohydrates, lesser amounts of water and many minor components. It is rich in enzymes, phenolic acids, flavonoids, ascorbic acid, organic acids, amino acids, proteins and minerals. The knowledge about physicochemical parameters determines nutritional value, microbial safety, acceptability of honey.

Key words: - History, Nutritive sweetener, Traditional uses, Physical properties, Chemical properties, Medicine, Honey, Ayurveda

INTRODUCTION :

Honey is a sweet natural product produced by honey bees that collect the nectar from flowers and convert it into a delicious food product that is known to be a more health beneficial nutritional option than plain sugar (Vanhanen, *et al.* 2011). It is mainly composed of fructose and glucose (65%) as well as water(18%), with minimal protein and lipid contents (Khalil, *et al.*2001; Silva, *et al.* 2009). Honey also contains minerals and heavy metals, which play important roles in determining honey qualities. The mineral content varies, ranging from 0.04% in pale honeys to 0.20% in darker honeys (Bogdanov, *et al.* 2007).The major minerals are mainly derived from the soil and nectar-producing plants, but they may also come from anthropogenic sources, such as environmental pollution. It has been reported that micro- or trace minerals originating from organic or plant sources are important for maintaining human health, while those which originate from inorganic or metallic sources, such as heavy metals, can be toxic (Hernandez,*et al.* 2005; Pohl ,2009).

The physicochemical properties of honey are the quality parameters which include the pH, acidity, moisture, electrical conductivity, ash content, total dissolved solids (TDS), hydroxymethylfurfural (HMF), sugar content (total, glucose, fructose, and sucrose), and enzyme activity (diastase and invertase). The chemical composition of honey refers to the chemical constituents that are responsiblefor the biological activities of bee's honey such as the proteins, phenols, flavonoids, and vitamins.(Alvarez-Suarez, Chouaibi, and others 2018; Khalil, I.; Moniruzzaman, *et al.* 2012; El Sohaimy, S. A.; Masry, S. H. D.; Shehata, 2015)

Honey has been used as a nutrient and a medicine, either alone or combined with herbs, by ancient civilizations such as the Egyptians, Chinese, Greek, Indians, and Romans. (Zumla, A.; Lulat,2015) The use of honey is well known as a remedy for stomach disorders and healing wounds, and is anti-inflammatory, antioxidant, an anti-diabetic and anticancer agent, and is antimicrobial.(Eteraf-Oskouei, T.; Najafi,2013; Arawwawala, L. D. A. M.;2017] The wide range of medical uses is due to its chemical constituents such as phenolics, organic acids, methylglyoxal, hydrogen peroxide, enzymes, peptides, and Maillard reaction products.(Eteraf-Oskouei, T.; Najafi,2013; Johnston, M. *et al*,2018 , Alzahrani, H. *et al.*,2012; Molan, P.; Rhodes, T.,2015)

Honey has various nutritional, medicinal, and prophylactic (pre-ventative) properties contributed by its various chemical constituents. Nevertheless, in order to yield medicinal effects, honey should be free of any contaminants. Due to this fact and honey utility as a natural, effective, and pleasant sweetener, there is an increasing interest in the study of honey (Mckee 2003).

Historical Importance of Honey

The use of honey as an internal and external health agent is much older than the history of medicine itself. Honey was used as a remedy against a variety of illnesses in ancient Egypt, Greece, and Rome. Honey has a long tradition, not only in Western medicine but also in traditional Chinese medicine and Ayurveda. (Andrzej K. Kuropatnickia *et.al,* 2017).

Honey has a long medicinal history, and honey bees have been closely associated with human beings for a very long time. Honey has always been a prized food in all parts of the world used as a natural sweetener. What is more, it has been used traditionally for treatment of a variety of ailments. Honey collection is an ancient activity. Almost 8000 years ago in a rock cave in Bicorp near Valencia in eastern Spain, a Mesolithic artist presented a scene of two brave individuals collecting honey from the nest of wild bees. A post-Mesolithic rock painting in Rajat Prapat in Central India presents honey collection from Apis dorsata (Crane, 1977). The oldest written reference to the use of honey is probably Egyptian of about 5500 BC, the time when Lower Egypt was called Bee Land. Honey bees appear in the temple and tomb art of Egypt as far back as 3100 BC. Since earliest times the gods were associated with the bee and one of the pharaohs' titles was "Bee King"(Crane, 1999).

Various papyrus records have been found and transcribed. In Ebers papyrus from around 1550 BC, honey is included in 147 prescriptions for external use. "Mix honey, red ochre, powdered alabaster to cure spotted baldness." Similar mixtures were used to: dress wounds, burns, abscesses, sores and skin conditions resulting from scurvy. Honey was used after surgery including circumcision, as a suppository, and to reduce inflammation and also to loosen stiff joints (Jones, 2001, 2017). The Egyptian Edwin Smith papyrus lists 48 separate uses of honey in wound healing. One of these case studies describes a gaping eyebrow wound penetrating to the bone.

The ancient Greeks believed that honey taken regularly prolongs the human life. Homer, Pythagoras, Ovid, and Democritus thought that people should consume honey to preserve their health and vigor (Lahanas, 2016). Aristotle (384–322 BC), when discussing different types of honey, refers to "white" (pale) honey as being "good as a salve for sore eyes and wounds" (Aristotle, 2009). Hippocrates of Kos (c. 460 – c. 370 BC), known as the Father of Modern Medicine, recorded many therapeutic properties of honey. According to him, the physical virtues of honey included its ability to "cause heat, clean sores and ulcers, soften hard ulcers of the lips, and heal carbuncles and running sores"

(Chepulis, 2008). Hippocrates often prescribed it for healing ulcers.

Honey had found its way into a good number of therapeutic medicines, candies and preserved compotes very early. Fruits and nuts were regularly preserved in honey or sugar throughout the Middle Ages. In general terms we can say that the main use of honey by the ancients was as a helpful remedy for the ailments and disorders of the stomach and intestines. The ancients were well familiar with the diuretic effect of honey and its antiseptic property made it an effective remedy for sore throat. It was also used for inflammation of the eyes and eyelids. Honey was broadly used in numerous therapeutic treatments (Kuropatnicki, 2003).

Honey known as madhu in Ayurvedic scriptures is one of the most important and effective medicines. In Ayurveda eight types of honey are described: pouttika, bhramara, kshaudra, makshika, chatra, arghya, oudalaka, and dala, depending on the type of bee which collects it (Bose & Acharya, 2015). Honey is used for both internal and external applications. It is mainly used for the treatment of eye diseases, sore throat, cold and cough, stomach ulcers, sleep disturbance, bronchial asthma, arthritis, stress and fatigue, dermatitis, eczema, diabetes mellitus, hypertension, hemiplegia, obesity, leprosy. As a remedy it is used in cases of weakness, bad breath, vomiting, dehydration, hiccups, diarrhea, bed wetting, polyuria, burns, cuts and wounds allergies, morning sickness, as well as to alleviate teething pain (Ediriweera & Premarathna, 2012). Honey is also used as a natural preservative and sweetener in many Ayurvedic preparations and as a vehicle along with some medicines to improve its efficacy or to mitigate the side effects of the other medicines it is mixed with. It mitigates the increased kapha dosha (Bose & Acharya, 2015).

According to Susruta Samhita of Ayurveda, there are eight different types of honey (Bose & Acharya, 2015).Sushruta Samhita is an ancient Sanskrit text on Ayurveda medicine and surgery. It describes ancient theories on human body, etiology, symptoms, and therapeutics for a wide range of diseases.

a. Pauttika: 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: This type of honey is described as heavy, which means not easily to digest. It contains slimy and excessively sweet properties

c. Kshaudra: This type is known as light, which means easily to digest. It has cold and anti-obesive properties

d. Makshika: It is the best honey and especially used for the management of cough and asthma

e. Chatra: 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: It has a pungent taste after digestion. Ardhya honey is good for eyes, eliminates vitiated Kapha and Pitta Dosha

g. Auddalaka: 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: It is dry and controls vomiting and diabetes mellitus.

Physico-Chemical Properties of Honey

Honey as a delicious food; it is especially chosen for old, sick and pregnant people. Honey quality was focused on parameters : moisture contents, reducing sugars (glucose and fructose), sucrose, hydroxymethylfurfural (HMF), diastase (amylase) activity, pH, minerals and water-insoluble materials of honey in East African countries (Ethiopia, Kenya, Uganda, Tanzania and Sudan).

almost all of the mean values of honey quality parameters were within the acceptable range of EU, FAO/WHO which was set as permission limit requirement for general blossom honey quality. However, there were some outliers of the limit set by the Council of the European and Codex regulations for sucrose in Ethiopia and Sudan, for free acidity in Sudan, for HMF and enzyme content in Uganda, and for water-insoluble materials of honey overall in the region. Differences in honey moisture, HMF, free acidity and ash were observed among the East African countries. To maintain, the requirement of honey quality, consecutive training should be given for beekeepers, honey processors and traders on honey harvesting, handling, processing, storing and marketing so that honey quality with respect to standards are achieved for users at the end. (Tsegay Lijalem Mesele ; 2020)

Colour

The colour of honey is a particularly important parameter, possessing a great impact on product price and consumer's choice. It has been stated that the colour of honey is related to its flavour (Belay, A., 2015, Debela, H., 2021), with dark honeys bring more intense in terms of taste. In addition, dark tones of honey have been associated with a higher phenolic and mineral concentration (Solayman, M. *et al* 2016 ,Can, Z.*et al* 2015). With this said, we can easily assume that the dark coloured honeys have a higher antioxidant activity than the light coloured honeys (Karabagias, *et al. 2016*)

Moisture content

Moisture is an important constituent of honey, and it affects various properties like density, specific gravity, refractive index, viscosity and optical properties (Ishraga, *et al.*, 2017). The moisture content of honey is related to its degree of fermentation (Rattanathanalerk *et al.*, 2005). Harvesting period, weather, amount of humidity inside the hive, nectar conditions, method of analysis in the laboratory used and treatment during storage and extraction can influence moisture content of honey. Low moisture content is important to protect honey from the attack of microorganisms, and it increases shelf–life. On the other hand, if the moisture content of honey is high, it is more likely that the honey will ferment upon storage due to high levels of microorganisms (Fredirick, *et al.*, 2013). It would be easily spoiled by microbial fermentation; thus, it becomes off taste and shortens its shelf–life. Such type of honey could be associated with unripe honey harvesting and poor handling management (Fredirick ,*et al.*, 2013;Masoud, 2014).

Organic Acids, Acidity and pH

Even if organic acids are present in honey's composition in small quantities (less than 0.6%), their importance is still critical for some of its physicochemical parameters such as flavour, colour and preservation (Machado De-Melo, 2017; Suto, M.; Kawashima, H.;2020). Depending on the amount of acids contained within it, honey has the ability to prevent microorganisms developing (Bogdanov, S. El Sohaimy, S.A.,2015, Brugnerotto , 2019), and thus the presence of acids as an indicator for honey's authenticity and quality (Bergamo, G.;2018, Ghanavati Nasab, Guzelmeric, E.;2020,). The most common organic acids present in honey's composition are acetic, butyric, citric, formic, fumaric, glyoxylic, propionic, lactic, maleic, malic, gluconic, pyroglutamic, oxalic and succinic acids among others (Machado De-Melo,2017, Miguel, M.G., 2017 ,Santos-Buelga, 2017,). The presence of organic acids in correlation with other compounds such as esters, lactones and inorganic ions, determines the free acidity of honey (Fröschle, M.,2018). This parameter, when determined, can evaluate the freshness of honey and the degree of possible fermentation (Karabagias, I.K. ,2020; Geana, E.I.,2019). pH is

of importance during extraction and storage because it affects texture, taste, stability, and shelf life (Terrab, Diez, & Heredia, 2003).

Ash Content and Electrical Conductivity

The ash content in honey directly correlates with its mineral content, which as seen previously, can be influenced by the same class of determinants that are related to all honey compounds. Its values range is between 0.02 and 0.3%.(Santos-Buelga, 2017) For the time being, the determination of the ash content in honey has been replaced by another physicochemical parameter, namely electrical conductivity, due to its ability to detect smallest changes in mineral levels (Seraglio, S.K.T,2019). Electrical conductivity of honey is closely related to the concentrations of mineral salts, organic acids, and proteins, and it is the parameter that shows the greatest variability according to floral origin, allowing differentiation between blossom honey and honey- dews (Mateo & Bosch-Reig, 1998; Terrab, Diez, & Heredia, 2002; Bogdanov, 2009).

Sugar content

In honey, both sugar and water content is estimated to be 95 - 99%. Sugar types are mainly fructose, glucose, maltose, raffinose and sucrose. The main reducing sugars of honey are glucose and fructose which account 65-75% of the total sugars (Farh, 2016; Terrab *et al.*, 2002). Glucose determines the speed of honey crystal-lization while fructose determines the level of hygroscopic features of honey (Kasenburger, 2006).

Hydroxymethylfurfural content

Hydroxymethylfurfural (HMF) content is only considered in honey as a legal limit food quality parameter (Vorlova *et al.*, 2006). HMF is formed by the decomposition of reducing sugars in honey in the presence of acid with increasing temperature and storage time through Maillard reaction; it can be also created due to poor processing methods and storing conditions. HMF is considered as one quality parameter in evaluating honey freshness and honey deterioration thereby HMF is a suitable indicator of honey quality (Rattanathanalerk *et al.*, 2005; Mahfuza *et al.*, 2018).

Enzyme content

Honey enzymes are typically proteins of complex structure which characterize specific chemical reactions. They could be obtained and introduced into honey by bees either from plants or from their secretions'. The presences of enzymes in honey have an important role in the formation of honey even though their presence do not have any human nutritional value. Of the honey enzymes, diastase is the most responsible for converting starch into dextrins and sugars. Determination of diastase activity is important to detect and predict honey age/freshness, storage time and overheating of honey as it is heat-sensitive (Crane, 1990; Thrasyvoulou & Manikis, 1995).

Mineral content

From a nutritional standpoint, minerals are naturally occurring inorganic solid substances in the biosphere (including all foods) found following the degradation of plant and animal tissues (Belitz, *et al.*2009). They are formed by geological processes (Nickel 1995) and are essential for the regulation of metabolic pathways in the living body (Gopalan, *et al.* 1989). Minerals are divided into 3 groups on the basis of body requirements: (1) major elements, (2) trace elements, and (3) ultra-trace elements. Major elements [sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), phosphorus (P), sulfur (S), chlorine (Cl)] should be present at >50 mg/d, whereas trace elements [iron (Fe), iodine (I), fluorine (F), zinc (Zn), selenium (Se), cupper (Cu), manganese (Mn), chromium (Cr), molybdenum (Mo), cobalt (Co), nickel (Ni)] are required in concentrations of <50 mg/d in human beings (Belitz, *et al.*2009). The calculated dietary requirements for ultra- trace elements

[aluminum (Al), arsenic (As), barium (Ba), bismuth (Bi), boron (B), bromine (Br), cadmium (Cd), cesium (Cs), germanium (Ge), mercury (Hg), lithium (Li), lead (Pb), rubidium (Rb), antimony (Sb), silicon (Si), samarium (Sm), tin (Sn), strontium (Sr), thallium (Tl), titanium (Ti), tungsten (W)] are usually less than 1 µg/g and often present at less than 50 ng/g in the dry matter of the diet (Nielsen 1984; Belitz, *et al.*2009). Micro- or trace minerals are useful for good health, especially if they originate from an organic or plant source. On the other hand, if they originate from an inorganic or metallic source, they will have at least 5 times the specific gravity of water and can become toxic. In this case, they are then known as heavy metals (Ajibola, *et al.* 2012). The scientific literature indicates that Pb, Cd, Hg, Cr, Cu, Mn, Ni, Zn, and Ag are the most important heavy metals (Nielsen 1984). Heavy metals are toxic or poisonous at low concentrations because of their tendency to accumulate in living organisms (Zugravu, *et al* 2009).

Nutritional and Therapeutic Properties of Honey

Energy food

Honey is high energy carbohydrate food. Levulose and dextrose in honey are readily accepted in blood stream, providing immediate source of energy. Improved calcium fixation in bones and curing anemia and anorexia attributed to nutrient stimulations in honey (Abrol DP.2009). The high nutritional profile of honey with wide range of nutrients encourages its use as food (Ajibola A, *et al* 2012)

Food ingredient

Its application potential in bakery, snack foods, confectionery, value added products of fruits and vegetables, and beverages are ever increasing [Aparnaa AR, 1999]. It is also a compulsory ingredient of different heath drinks like decoction, churned drink and fermented alcoholic product of crude drugs or aqueous extract or decoction of drugs [Sethi R,2004]

Honey as medicine

Honey is extensively used in Ayurvedic and Unani system of medicines. It is used as blood purifiers, a preventive agent against cold, coughs and fever and a curative for eye sores, for ulcers of tongue throat and burns [Abrol DP.2009]. The general medicinal and curative properties of honey were mentioned (Sampath Kumar KP *et al.*2010) as:

i) Honey is useful as sedative.

ii) It stimulates digestion and regulates the acidity of the gastric juices.

iii) Honey can be taken either with warm milk or with lemon juice and radish juice as a remedy for cold.

iv) Honey in warm milk or water can give relief to sore throats.

v) Gargling with honey is very useful in gingivitis.

vi) One spoon of fresh honey mixed with the juice of half a lemon in a glass of warm water taken first thing in the morning is very helpful in constipation, hyperacidity and obesity.

vii) A mixture of honey and rose petals when taken in the morning, at the initial stages of tuberculosis produces best outcomes.

Honey in child heath

Honey has been widely used as infant feeding. It cures many deficiencies in infants and older children (Abrol DP, 2009) . According to Charaka samhita granthas (Tripathi B.,2013) , after cutting umbilical cord the infant's birth rites should be performed. On first day of birth, the child should be given first feeding of honey and ghee consecrated with specific mantras (Tripathi B.2013). Honey used after birth provide following benefits: It is Sheeta (cold potency), has sweet and astringent taste, pacifies raktapitta and kapha dosha (disease causing agents) (Tripathi B.2013) . It also acts as source of energy because it contains mainly fructose

(about 38.5%) and glucose (about 31.0%) as well as vitamins and multi-minerals (Jeffrey AE,1996). A daily intake of honey strengthens the immune system in children thus developing their disease resistance capacity (Sampath Kumar KP, 2010)

Digestive

Honey is said to improve food assimilation and to be useful for chronic and infective intestinal problems such as constipation, ulcers and liver disturbance (Abrol DP. 2009). Honey is used to cure gastrointestinal problems. It is used as a remedy for gastritis and stomach and duodenal ulcers (Sampath Kumar KP, 2010)

Honey for diabetics

The consumption of honey can provide beneficial effects on body weight and blood lipids of diabetic patients (Bahrami M*, et al* 2009). Studies have shown that honey consistently produces a lower glycemic effect when compared to glucose and sucrose in normal and type-I diabetics (Abdulrhman, *et al* 2011) , and do not have additional acute hyperglycemic effects over an isoglucidic amount of bread in type II diabetics (Bornet F, *et al* 1985). The commercial clover honey is a clinical and cost-effective dressing for diabetic foot ulcers in developing countries (Moghazya AM, et al 2010) . Wound dressing with honey is an option for managing Wagner grade–II Diabetic Foot Ulcers with the rate of the wound healing comparable with the use of iodine solution (Shukrimi A, *et al* 2008)

Anti-oxidant Effects

The positive therapeutic effects of honey are mainly associated with its antioxidant capacity (De Almeida, 2016). This property is related to the inhibition of free radicals that are responsible for the oxidative reactions inside the human body (Battino, M.,2020) that can damage the cells and cause various disorders (Tong, L.,2015). The chemical compounds found in honey, such as phenolic compounds, organic acids, amino acids, carotenoids, proteins, Maillard reaction products or enzymes (glucose oxidase, catalase) are considered crucial contributors to this property (Machado De-Melo, 2017; Sancho, M.T.,2016). Therefore, these antioxidant elements found in honey are thought to be nutritional supplements against oxidative stress (Talebi, M.M..2020), improving the formation of stable molecules and neutralising the negative mechanism of the reactive oxygen and nitrogen species (Cianciosi, D.,2018). In this regard, several honey varieties, including Buckwheat honey and Manuka honey, have demonstrated strong capacities to prevent oxidative damage(Cheng, N., 2015; Almasaudi, S.B.,2017).

Anti-bacterial Effects

In general, the antibacterial and antimicrobial activity of honey is related to the inhi- bition of microbial growth throughout different processes (Martinotti, S.,2018). One process is associated to the enzymatic action, namely hydrogen peroxide (H2O2), and the other is related to the action of different compounds, such as the high content of sugars, viscosity, osmotic pressure and low pH (Rossi, M.,2021), water activity or protein content (Albaridi, N.A.,2019; Cilia, G.,2020). In addition, polyphenols, phenolic acids, flavonoids, together with antioxidants, lysozyme, methylglyoxal, and bee peptides (especially the peptide Defensin-1) (Dezmirean, D.S.,2015 ; Nolan, V.C.,2019) are other vital components of this property.

Anti-fungal Effects

In addition to its antibacterial properties, honey also exhibits antifungal activity. Fungi are taught to be more pathogenic than bacteria, and therefore their resistance to antifungal drugs is more complex and requires new treatment approaches. Recently, the shift towards natural products and their promising antifungal effects has gained more attention, with honey being considered a viable solution in this regard (Gucwa, K.,2018). Several studies have reported

that the high sugar content can act as an inhibitor of fungi growth through the osmotic pressure (Sayadi, S.A.,2015). Moreover, the variety of other substances contained in honey, namely phenolic compounds, play a key role in its antifungal effects (Phuna, Z.X.,2020). These compounds have the ability to denature proteins and therefore the membranes of cells through the alteration of their stability (Azonwade, F.E.,2018).

Anti-viral Effects

Even if the antiviral activity of honey has not been extensively studied, its mechanism of action is explained by the existence of various compounds (cooper, ascorbic acid, flavonoids, and H2O2) that are able to inhibit the viral growth through the interruption of viral transcription and replication (Ahmed, S.,2018). The antiviral potential of honey can be related to some specific pathways including nitric oxide (NO), which is a molecule that has proved beneficial activities in viral infections (Mehta, D.R.,2012) by both decelerating the spread of viral lesions and arresting their replication (Al-Waili,2003).

Anti-cancer activity

Honey potentiates the anticancer activity range from tissue cultures (Fauzi AN,2011; Jaganathan SK, 2009; Ghashm AA,2010) and animal models (Tomasin R, 2011; Fukuda M, 2011; Orsolic N,2003) to therapeutic trials(Smirnova II,2000) The anti-tumour effect of honey against bladder cancer was examined in vitro and in vivo in mice (Swellam T,2003). Polyphenols in honey are believed as one of the major factor responsible for the anticancer activity of honey (Jaganathan SK,2009) . Honey may have the potential to be anticancer agent through several mechanisms like apoptotic activity, antiproliferative activity, anti-inflammatory and immunomodulatory activities, and estrogenic modulatory activity (Ahmed S,2013). (Hamzaoglu *et al.* 2000) reported that tumor implantation in rats was markedly reduced by the use of honey pre- and post-operatively. However, the full mechanism is yet to be fully understood.

Gastroenterological effects

Pure honey has bactericidal activity against many enteropathogenic organisms, including those of the Salmonella and Shigella species, and enteropathogenic E. coli (Jeddar,1985). Gastritis, gastric and duodenal ulcers are complications resulting from infection with Helicobacter pylori. Conventional treatment for the eradication of H. pylori is far from satisfactory; thus there is search for alternative treatment. Honey derived remedies constitute a potential source of new compounds that may be useful in the management of H. pylori infections (Manyi-Loh et al 2010)

Cardiovascular effects

The consumption of natural honey reduces cardiovascular risk factors such as total cholesterol, LDL-C (low-density lipoprotein cholesterol (LDL-C), HDL-C (high density lipoprotein cholesterol), triacylglycerole, CRP (C-reactive protein), and it does not increase body weight in overweight or obese subject (Yaghoobi et al,2008). (Khalil and Sulaiman,2010)demonstrated that certain honey polyphenols have a promising pharmacological role in preventing cardiovascular diseases.

Skin and wound healing

Several experiments have shown that honey has an anti- inflammatory and antibacterial effect helps in wound healing (Gupta SK,1992; Postures TJ, et al 1997; Molan PC.,1999; Cooper RA,1999; Van den Berg AJJ,2008; Viuda-Martos, 2008) . A broad range of wounds is being treated all over the world with unprocessed honeys from different sources (Al-Waili NS.,2003; Al-Waili NS.,2004) Honey was most effective in reducing ROS levels, it was selected for use in wound-healing products. Indian honeys are potent antibacterial agents

against Staphylococcus aureus obtained from wounds (Deshpande SD, 2010). It is an immunomodulatory agent for various disorders of the skin. Honey is similarly found as an active ingredient in products such as ointments for the treatment of burns and cuts (Subrahmanyam M., 2007; Williams ET, *et al.* 2009)

Honey in panchakarma therapy

Panchakarma therapy is for elimination of disease causing agents out of body i.e. Detoxification of body. Honey is used in combination of drugs used for Panchakarma therapy mostly in Basti therapy (enema therapy with medicated oils and decoctions) and Vamana therapy (Emesis therapy). Here honey helps to reach the medicine easily at each and every minute part of body and thus helps in elimination of toxins out of body (Kasture H.1979; Kumar A,1993)

Cosmetic property of honey

In various cosmetic therapies, honey is used alone or mixed with other substances such as milk, eggs, oats, lemon juice, fruits and oils (Saraf S.,2012). Honey-based cosmetic products include cleansing milks, lip ointments, hydrating creams, body lotions, facial creams shampoos and conditioners, balms, masks and ointments after bathing. In cosmetics, it exerts emollient, soothing, humectants, hair conditioning effects, retains the skin juvenile and hinders wrinkle formation and prevents pathogen infection (Saraf S.2012; Burlando B,2013) . Some honey based lipsticks are created for lip treatments and shampoo with honey is considered as it acts like a moisturizer for hair fiber (Saraf S.,2012; Davis SC,2009). The anti-aging potential of a cream containing herbal oils and honey .(Altuntas E, Yener G ,2015)

CONCLUSION:

Honey, an age-old remedy has been rediscovered in modern times. It is made up of a vast amount of different compounds that can be of nutritional and health benefits**.** Honey consumption, as a nutraceutical agent, is associated with various nutritional benefits and therapeutic potential**.** The physiochemical properties of natural honey depend on four major factor viz., species, floral source, environmental factors and processing factors. The quality and use of processed honey depends on its floral source and its properties. The enormous amount of records concerning honey's therapeutic uses, along with the rapidly rising interest in and examinations into natural health remedies and food or drug supplement, has led to a reappearance in interest in honey's properties. It can be concluded that honey is a precious natural substance with several miscellaneous usages. It strengthens the immunity and helps to maintain the health by preventing various types of diseases but it must be pure and genuine. Physicochemical properties of honey play a crucial role to examine honey quality.

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