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Evaluating the Effect of Honey as a Natural Remedy for the Management of Sore Throat

Muhammad Hamza[1*], Zahin Anjum[2], Rameesha Aftab[1], Ghulam Fatima[3], Memoona Fatima[4], Ayesha Umar Chaudhary[5], Aisha Infall[6], Sadaf Naveed[1]

[1]Department of Nutritional Sciences, Government College University Faisalabad, Punjab, Pakistan.
[2]Department of Food and Nutrition Sciences, CHE, University of Peshawar, KPK, Pakistan.
[3]Department of Zoology, Ghazi University, D.G. Khan, Punjab, Pakistan.
[4]Department of Public Health and Nutrition, University of Haripur, KPK, Pakistan.
[5]Faculty of Nutrition Sciences, The University of Agriculture, Peshawar, KPK, Pakistan.
[6]Institute of Food Science and Nutrition, University of Sargodha, Punjab, Pakistan.

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Corresponding Author: Muhammad Hamza
Department of Nutritional Sciences, Government College University Faisalabad, Punjab, Pakistan.
Email: muhammadhamza6171@gmail.com

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ABSTRACT

Background: Sore throat is the most common condition in patients suffering with tonsillitis, allergies, sinus drainage as well as viral or bacterial infections. Conventional treatments of sore throat include antibiotics, lozenges and pain relievers but now-a-days, there is an increasing trend to use natural remedies, because of the side effects of antibiotics such as antibiotic resistance. This systematic review examines the effectiveness of honey as a natural therapy for the management of sore throat. **Objective:** The main objective of the study was to systematically review the supporting evidence regarding the use, effectiveness and potential mechanism of honey as natural remedy for managing the sore throat.
Methods: A systematic literature review was conducted from databases like, Google Scholar, PubMed, as well as Science Direct, to collect relevant studies regarding the use of honey as a remedy for the management of sore throat. The search was conducted using keywords like "sore throat," "honey," "pharyngitis," "anti-inflammatory," and "antimicrobial." Studies including comparative effectiveness with other natural remedies were also considered.
Results: Studies demonstrates that honey exert a significant impact to relieve symptoms of sore throat such as soothing the tissue irritation as well as pain reduction. Honey has antimicrobial and anti-inflammatory properties that ultimately contributes to its effectiveness in managing the viral and bacterial infections. Many studies also highlight the role of honey in coating the throat as well as promoting the hydration.
Conclusion: Honey is an easily available product in the household, having anti-microbial, anti-inflammatory as well as antioxidant properties. Studies shows that honey is a best remedy to reduce the fever, pain, as well as oropharyngeal congestions. Moreover, there is no resistance of side effects on the intake of honey, thereby considered a safe treatment method. However, the consistency and quality of honey, dosage variations, as well as limited large-scale clinical trials highlights that there is a still need to conduct various researches

INTRODUCTION

Pharyngitis also known as sore throat, is a most common and prevalent condition that is characterized by pain, tissue irritation, inflammation and discomfort in the throat, mainly affecting the pharynx (1). Sore throat is mainly caused by the viral infections that are associated with the influenza, common cold, or COVID-19, but this condition can result from bacterial infections as well, including group A streptococcus (causes strep throat) (2). Some other factors contributing to the sore throats that include environmental irritants allergies, (e.g., pollution, smoke, dry air) excessive voice use, as well as gastroesophageal reflux disease (GERD) (3). Major signs and symptoms of a sore throat include difficulty swallowing, throat pain, dry throat, hoarseness, and, in some cases, swollen lymph nodes, fatigue, or fever, that depends on the root cause (4). Various treatment options ranging from pharmacological interventions, such as antibiotics and pain relievers to various non-pharmacological remedies like warm beverages, throat lozenges, and herbal therapies (5).

Due to a rise in an antibiotic resistance as well as the side effects of conventional medicines have led to increased interest for using natural remedies to manage the common diseases conditions like sore throat (6). Natural remedies, like honey, is often preferred because of their accessibility, safety as well as lower risk of side effects as compared to pharmaceuticals agents. In addition to its soothing properties, it has anti-inflammatory antiviral, antifungal as well as antibiotic effects that makes them a best complementary treatment for the management of sore throat as mentioned in the Figure 1. (7). Other herbal remedies like turmeric, licorice root, and ginger also have anti-inflammatory properties but among all of these, honey has stood out for its soothing effects as well as it has long been used in numerous cultures for the treatment of cough and throat irritation (8).

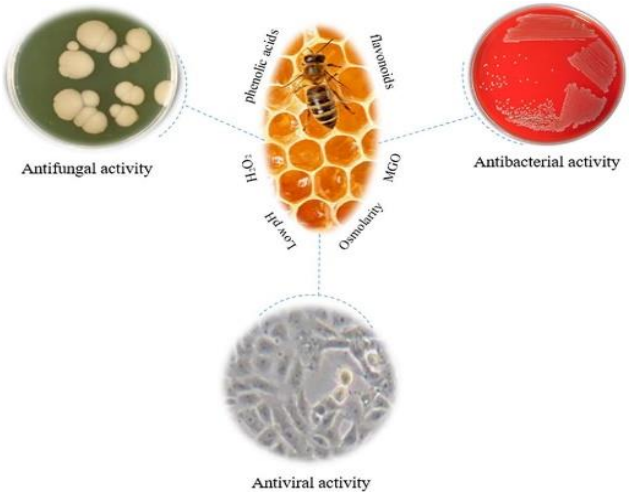

Figure 1. Antimicrobial Properties of Honey (7)

Nutritional Composition of Honey

Honey differs in sensory perception, appearance and composition, because of variations of its botanical origin (9). There are many substances present in the honey, having nutritional importance that support good health and recovery (10). Because of its nutritional composition. Honey has been used for the management of most chronic diseases like respiratory diseases, urinary diseases, wounds, eczema, skin ulcers, psoriasis and gastrointestinal diseases, moreover, it also has an inhibitory effect on aerobic as well as anaerobic bacteria, fungi, yeast, and viruses. Honey has potential to inhibit the growth of Helicobacter pylori, Pseudomonas aeruginosa, Bacteroides spp., and enteropathogen (11). The main nutritional composition of honey is carbohydrates that contributes about 95% of its dry weight. While honey also contain mangy other compounds including polyphenols, vitamins, minerals, amino acids, protein and aroma compounds (9,12). The nutritional composition of honey is mentioned in the Figure 2 (13).

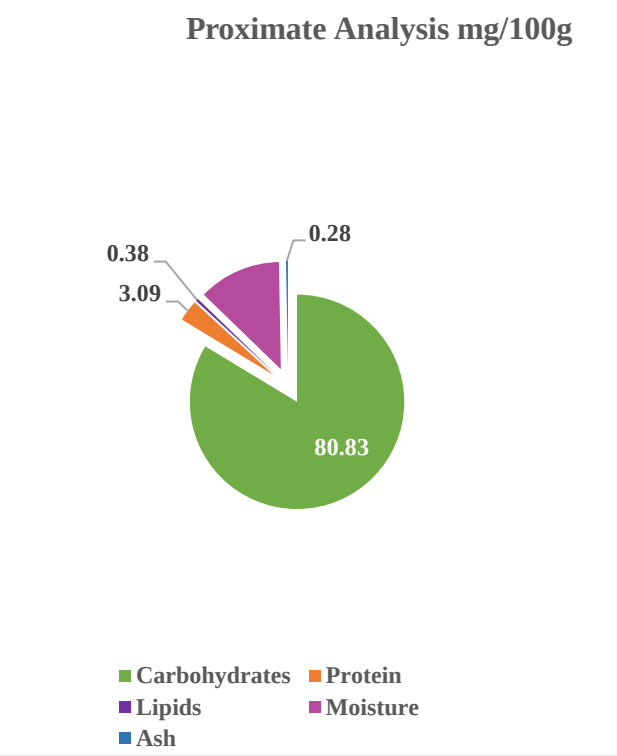

Figure 2. Proximate composition of the honey sample produced by *Apis mellifera* (13).

Therapeutic Effect of Honey for the Management of Sore Throat

Honey has a medicinal importance since ancient times. It

is believed that honey possess anti-inflammatory, antibiotic, antioxidant and wound healing properties. Many studies have suggested that honey is the best complementary treatment option for managing the symptoms of sore throat because of its soothing effect as well as it provides relief from throat infection, pain and irritation (14,15).

Anti-inflammatory Activity of Honey and the Management of Sore Throat

Sore throat is a condition that is characterized by irritation, pain, and swelling in the throat which is caused by an infection that ultimately triggers an inflammatory response. This will result from the activation of immune cells as well as release of pro-inflammatory cytokines that causes swelling, discomfort and redness in the throat (16). Along with this the oxidative stress due to the reactive oxygen species also plays a significant role in the development and severity of symptoms. This interaction between inflammation and oxidative stress in a sore throat is mediated by different signaling pathways, including Extracellular signal-regulated kinase (ERK), Nuclear factor (NF)-κB, and Mitogen-activated protein kinase (MAPK), that regulate the production of cytokines and the cytokines help fight the infection as well as cause swelling, pain, and redness, which characterize the inflammation in the throat (17,18).

Different studies have demonstrated that honey acts as an immune-modulatory agent having double role that make it more beneficial for the management of sore throat. First of all, honey downregulates the inflammatory transcription factors including MAPK and NF-κB that are responsible for the production of pro-inflammatory cytokines like IL-1β and TNF-α. Therefore, through suppressing these pro-inflammatory cytokines, honey helps to reduce the pain, swelling and inflammation associated with a sore throat. Secondly, honey stimulates the production of cyclooxygenase-2 (COX-2) and prostaglandins E2 (PGE2) that play an important role in the natural healing processes of the body. Both of these actions help to manage the symptoms of sore throat as well as help to promote the process of tissue repair, and increasing the faster recovery from the damage and irritation caused by an infection (19).

Anti-bacterial Activity of Honey and the Management of Sore Throat

Now a day upper respiratory tract infections (URTI) are more common, including pharyngitis, tonsillitis, laryngitis, common cold and sinusitis that ultimately lead to inflammation, sore throat and fever (20). Some of the most common bacterial species responsible for URTI are Staphylococcus aureus, Streptococcus pneumoniae, Haemophilus influenza, and Streptococcus pyogenes, etc. These URTI present a significant cause of over-prescription of antibiotics. Most common antibiotics that are prescribed medically include are Amoxicillin, Penicillin, Erythromycin, and Ampicillin, etc. Therefore, the over-use of antibiotics drugs for the treatment of these URTI lead to increase the antibiotic resistance among patients (21). Antimicrobial activity of honey is known since the 19th century. Large number of in vitro studies demonstrated that honey has broad-spectrum antimicrobial activity because of its low pH, high sugar concentration, osmotic effect, presence of bactericidal and bacteriostatic factors like hydrogen peroxide that is produced by an endogenous enzyme glucose oxidase, lysozyme, catalase, phenolic acids, flavonoids as well as an antioxidants activity (22-25).

The antibiotic potential of different varieties of honey was found in degrading the DNA in bacteria that was mediated by combination of the hydrogen peroxide as well as an antioxidant activity (26). While antibacterial property of honey against S. aureus and E. coli was due to the presence methylglyoxal in the honey, that damages the bacterial protein and DNA, as well as interrupts its enzymatic activity, thereby prevents the replication of bacteria (27). Some studies have suggested that honey downregulates the two important proteins in the proteome of *S. aureus* that are crucial for the growth as well as upregulates the stress related protein (cold-shock protein C) that is specially produced by bacteria in response of the environmental stress. This over production of stress related proteins weakens the bacteria and make less viable (28).

Anti-oxidant Activity of Honey and the Management of Sore Throat

Antioxidant activity of the honey possess an important role in reducing the throat infections through neutralizing free radicals that are produced during an inflammatory response as well as due to an infection (29). Increased amount of free radical generation exacerbates the inflammation, damage the throat tissues as well as worsen the symptoms like swelling, pain, and irritation. Honey contains different bioactive compounds like flavonoids, phenolic acids, as well as enzymes like peroxidase and catalase, and all of these exert antioxidant activity (30). Honey helps to limit the production of free radicals thereby protect the mucous membranes lining of throat from damage, reducing the irritation as well as promoting its faster recovery. Moreover, antioxidant activity of honey also helps in modulating the immune response by downregulating inflammatory cytokines including IL-1β and TNF-α that aggravate the infection of throat. Thereby both of these actions helps to get relief from symptoms of throat infections and promotes the healing process (31).

Synergistic Effect of Honey and Ginger for the Management of Sore Throat

Different studies demonstrate the synergistic effect of honey and ginger for the management of sore throat (32). Ginger contains bioactive compounds like zingerone, gingerol and shogaol that exhibit strong antioxidant and anti-inflammatory properties (33). The anti-inflammatory properties of ginger are due to its ability for inhibiting the inflammatory pathways, like MAPK signaling pathways and NF-κB that are involved in producing the

inflammatory mediators that ultimately contribute to the symptoms of sore throat (34). Moreover, the antimicrobial properties of ginger are also effective for killing the pathogens like viruses and bacteria that can cause throat infections.Studies have suggested that both ginger and honey possess strong antibiotic, anti-inflammatory and antioxidant activity that help to combat viral and bacterial infections (35). Gingerol in the ginger inhibits the growth of bacteria while honey, specially its varieties like Manuka honey contains methylglyoxal (MGO) that exert strong antibacterial activity. This synergistic action of antimicrobial effect reduces the load of pathogens in the throat ultimately speed up the recovery thereby preventing the severity of infection (36).

The study conducted by Jaybhaye et al., (37) on 92 pediatric patients suffering UTRI and 90 completing the study. All of these patients were divided into 3 different treatment groups, with Group I received the standard treatment that was consisting of antibiotics (amoxicillin and clavulanic acid), levocetirizine, montelukast, as well as cough syrup. Moreover, the Group II was administered with the same medications as Group I but also added a mixture of ginger juice and honey (0.5-1 ml of ginger juice with 2.5-5 ml of honey) and the results demonstrated that the group II showed faster recovery, and their symptoms resolved in five to six days. While, the Group III, who received antibiotics and the honey-ginger mixture without other cough medications, also experienced the fastest recovery time, with symptoms resolved in 4-5 days. Their overall results demonstrated the strong anti-cough as well as antimicrobial activity of both ginger and honey as seen by the fast recovery of symptoms in Groups II and III (37).

CONCLUSION

Present review conclude that honey possess a strong antioxidant, anti-inflammatory, and antimicrobial properties. It effectively reduces the oxidative stress and inflammation, thereby helps in reducing the symptoms and promotes the healing process. While there is a synergistic relation between the honey and ginger that ultimately shortens the recovery times of patient. Due to the increasing antibiotic resistance, honey presents a valuable alternative to the conventional treatments. Further research is also needed in order to understand and clarify its proper mechanism and its role as a curative food agent.

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