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Review Article

Manuka Honey and its Pharmacological Activity

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Abstract

Manuka honey originates from the New Zealand manuka tree (*Leptospermum scoparium*). It has been recognized for its anti-bacterial and wound-healing activity. Antibacterial activity of manuka honey is due to reactive methylglyoxal (MG) as main constituent. It is a complex mixture of carbohydrates, fatty acids, proteins, vitamins and minerals containing numerous kinds of phytochemicals with high phenolic and flavonoid content. It have also antiulcer property, cancer and skin property. Also used medicinally all over the world. Manuka honey so called unique manuka honey with the presence of methylglyoxal.

Keywords: *Antibacterial Property; Antiulcer; Manuka Honey; Methylglyoxal; Wound Healing*

Introduction

Manuka honey is made from the nectar of the New Zealand manuka tree, which is collected by honey bees (*Apis mellifera*) (*Leptospermum scoparium*). It's a complex blend of carbs, fatty acids, proteins, vitamins, and minerals that's high in phenolic and flavonoid content and contains a variety of phytochemicals [1-4]. Manuka honey is used as a medicinal agent all over the world. The unique manuka factor (UMF) is the presence of MGO (Methylglyoxal) in manuka honey, which adds to its uniqueness [5,6]. Manuka honey has a high osmolarity and sugar content [7-9]. It has also been reported to have a low pH (3.5 - 4.5) [5,9-11]. Manuka honey is a monofloral honey that has a long history of antibacterial powers in New Zealand folklore [12]. Around 60 types of bacteria, including aerobes and anaerobes, gram-positives and gram-negatives, have been reported to be inhibited by *Leptospermum scoparium* (Manuka) honey, the most well-known of the honeys [13]. Manuka honey had modest amounts of MG when it was first produced (139 - 491 mg kg^{1}), but this rose after storage at 37°C [14].

Medicinal (active ingredients)

Hydrogen peroxide

Honey gently releases hydrogen peroxide (manuka). While encouraging fibroblast proliferation and angiogenesis, this hydrogen peroxide was at a concentration high enough to be antibacterial but low enough to be harmless [7-9,15].

Methylglyoxal

Manuka honey contains methylglyoxal, which is toxic. It has antibacterial properties in the form of the Unique Manuka Factor (UMF) [9,16]. Methylglyoxal has recently been shown to be the active ingredient in Manuka honey [11,17] and this chemical is known to have a synergistic impact with antibiotics like piperacillin [15]. The non-enzymatic conversion of dihydroxyacetone, which occurs at high amounts in the nectar, produces MG in manuka honeys [18].

Phenolic compounds

Honey has been found to contain phenolic chemicals that scavenge and eliminate reactive oxygen species (ROS) generated by neutrophils [16].

S.no.	Active Ingredients (main)
1	Hydrogen peroxide
2	Methylglyoxal
3	Phenolic and flavonoids (Syringin acid, Quercetin, 8-Methoxykaempferol, Kaempferol etc.)

Medicinal property

Antibacterial property

Manuka honey has a broad spectrum of antimicrobial activity and can suppress a wide range of bacterial and yeast infections. It is also effective against multidrug-resistant bacteria [19-22]. Manuka honey is sold for therapeutic purposes based on the "Unique Manuka Factor" (UMF), which is based on the *S. aureus* inhibition test and assesses antibacterial activity that is unrelated to hydrogen peroxide levels. It has been demonstrated that manuka honey can impede the growth of bacterial cells, as well as its effect on growth and cellular physiology in several bacterial pathogens, and how these alter when the amounts of the key antibacterial components change.

The differences between MGO and hydrogen peroxide in natural honeys are unknown [18,23]. Manuka honeys have strong antibacterial properties that aren't due to the presence of peroxide [24,25]. The antibacterial effect of manuka honey can be traced back to the methylglyoxal (MG) it contains, according to research [11,26]. Around 60 kinds of bacteria, including aerobes and anaerobes, gram-positives and gram-negatives, have been reported to be inhibited by *Leptospermum scoparium* (*L. scoparium*) honey [13]. Manuka (*L. scoparium*) honey [27] has been shown to be effective against a variety of human infections, including *Escherichia coli* (*E. coli*), *Enterobacter aerogenes, Salmonella typhimurium* and *Staphylococcus aureus* [27,28]. Many studies have been published on the medicinal qualities of manuka honey, both *in vitro* and *in vivo*, confirming its effectiveness against a wide range of medically significant pathogens, including methicillin-resistant *Staphylococcus aureus* (MRSA) [5,6].

Wound healing property

Manuka honey is a medical grade honey that has been found to prevent the growth of a variety of bacteria *in vitro*, including *S. aureus* and *P. aeruginosa* [29,30], as well as to eliminate bacteria from colonised wounds [31]. Honey made from the New Zealand plant *Leptospermum scoparium* (manuka) has a number of characteristics that make it a promising wound-care treatment [17-19,32,33] discovered that this honey prevents the formation of biofilms and can break pre-formed biofilms. Finally, honey can help wound healing by stimulating the immune system [34]. The interaction of wound exudates with the honey's intrinsic glucose oxidase slowly releases hydrogen peroxide from honey applied to a lesion [7-9,11,12].

Antiulcer property

Manuka honey has been shown to have antimicrobial activity against pathogenic bacteria such as *Helicobacter pylori* (*H. pylori*), making it a functional meal for stomach ulcer treatment [35].

Cancer property

According to certain studies, honey (manuka) possesses anti-proliferative properties against cancer cells due to its high content of polyphenols and flavonoids [36-39].

Skin property

Manuka honey's therapeutic capabilities have been confirmed *in vitro* and *in vivo* studies against a wide range of medically significant pathogens, including methicillin-resistant *Staphylococcus aureus* (MRSA) [11,12]. Honey's primary use is as a topical antibiotic to treat surgical site or wound infections [40]. Manuka honey has been demonstrated to have *in vivo* activity and is effective for ulcers, infected wounds and burns [27,41].

Conclusion

It finds that manuka honey has a wide range of medical characteristics, including wound healing, antiulcer, skin, cancer prevention, and antibacterial capabilities. For future application, more research is needed on this honey.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests.

Authors' Contributions

Afshana Bashir Reshi and Mohd Rafi Reshi created the concept and designed the structural of the manuscript and involved in the preparation of the manuscript. Maaz Naqvi and Nafaa Hassan also making some changes and adding some study material.

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