



## Pharmacological and therapeutic effects of propolis: Review article

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Received:4/12/2022. Accepted:27/2/2023. Published:12/9/2023

### Abstract

This work was aimed to highlight on the pharmacological role of propolis in management of different disorders. Propolis defined as (bee glue) is common surname which submit to substance of resinous accumulate through diverse forms of plants by means of bees, the phrase of propolis appearance by Greek refer on security (pro) and settlement, population for “polis”, the bee cell, as new terms. Chemically constituents for it depends on derivation through its bees accumulate foodstuff. Bee glue and its extracts have several medicinal apply, in the arrangement of several healthiness problem due to its effects, prevent the inflammation and oxidative stress, destruction of bacterial and fungi, prevent of ulcer, prevent of cancer, antiseptics, and have strengthens immune system. It is unusual biological behaviors, example anticancer, antiviral, antibacterial, and antihypertensive effect. Bee glue include important substances as flavonoids which responsible mainly on biological activity of propolis. The amount of flavonoid which present in bee glue will determine the quality of it, so the number of flavonoids present in bee glue will be standard for estimate the value of bee glue. It is characterized by biological consequence like prevent the inflammation, prevent the infection with bacteria in addition to prevent disease caused by virus. Propolis is a unique natural remedy, possesses a wide range of pharmacological effects. Propolis has served as a rich source in the different actively constituents especially phenolic compounds so it has potential for treatment in various acute and chronic human diseases.

**Key words:** propolis, bee glue, Antibacterial, Anti-inflammatory, chemical composition

### Introduction

Huge number of studies are concentrated on the direction of pharmacological actions of bee glue, in addition to health benefits for bee products because their values (1). Paint with scent for propolis vary with regions and states dissimilarity. Bee glue is matter include a lot of substances, in addition to it is used in cosmetics, supplements of food in addition to remedy for many cases for the health problems (2).

#### Bee propolis

Utilize of propolis by bee to close up the barrier and split and to demise the space among the beehive. The inside barrier of the

beehive became softer by propolis and this case is one of the propolis functions lead to keep the inside temperature of the hive within 35°C. It too made to secure the hive from predators and it keeps the hive from environmental alteration. An aseptic internal environment is occurred by bee glue. The membrane of the hive is supported or reinforced by bee glue. It also gave hive environment a nice odor (3). Propolis is characterized by greatly clammy, resinous combination for unsolvable or incomplete solvable substance in addition to bitter savor. Several medicinal uses are made by propolis and its extract due to its effects in the



arrangement of unlike healthiness problems "prevent the inflammation, prevent of oxidative stress, prevent ulcer, prevent cancer, destruction of bacteria and fungi, antiseptics, and has beneficial effects on immune system"(4). The lock of avoidable cavities in the beehives to shield from fungi and bacteria is made by propolis which identified as cement matter in beehives (5). It is applied in population remedy in lots of regions of the world. Qualitatively and quantitatively dissimilar of chemical constituents of propolis, refer to plants location via it is accumulate in addition to accumulation interlude (6). propolis for honey bee of stingless bee have been less studied than that resulted by *Apis Mellifera* which have been widely studies (6).

### Structure of propolis

The vast investigates description propolis chemistry permitted studies to grasp that its chemical components are not only multifaceted but too greatly inconsistent (7).

Propolis is consist of an intricate combination prepared by bee liberation plant-derived materials (8). In substance of course, natural propolis constituted from 5% pollen, 10% essential oils, 30% waxes and 50% resins (9). Many ingredient customaries like component for propolis. The vitamins C, B complex, and vitamin E, vitamins are hold in propolis, It is contain essential minerals such as Ca<sup>++</sup>, Ni<sup>++</sup>, Mn<sup>++</sup>, Fe<sup>++</sup>, Cu<sup>++</sup>, Mg<sup>++</sup>, Zn<sup>++</sup> and trace elements (10). However, basic extract of bee glue contains "flavonoids, cinnamic acid, amino acids, terpenes, caffeic acid, phenolic acids and phenolic acids esters " and its composition change resulting from dissimilarity in phytophagous and geographical sources (11). Several readings incorporate characterization and components for propolis have been prepared with no identifying the plants from which the sample was gather, or the locate where bees take the product (12).

Table (1) indicate Chemical composition and applications for propolis:

Activity	Constituents	Reference
Antibacterial	Chrysin, apigenin	(13)
Antiviral	Flavonoids, esters of cinamic acids	(14)
Antimicrobial	Terpenes	(15)
Antioxidant	Caffeic acid, quercetin, Chrysin, Artepillin	(16)
Hepatoprotective	Diterpenes, Chrysin	(17)
Cardioprotective	Quercetin, Chrysin, acacetin	(18)

### Physical properties of Propolis

The expression propolis derive starting by the Greek pro denote (security) and polis (town) security of bee cells. Propolis is a diverse paint with resinous matter and touch build up by *Apis mellifera* bees from special plants supply. (19). Paint with scent for propolis vary with regions and states dissimilarity. Special bee glue from Bulgaria has fulfilling scent (16). Paint of the Chinese

propolis is dark brown in color; although green paint for Brazilian bee glue; and yellowish-brown paint for Taiwanese propolis (20). The dark brown in color and has no odor is characteristics of Chinese sample (21). Pudukkottai bee glue an elegant stability appeared resembling a Jaggery with acceptable odor. thus, the source will identify the value of the product (21).

### Lethal Dose of propolis



Mice exposed to propolis following oral toxicity with LD50 values between 2000 and 7300mg/kg experienced a small order of acute toxicity. The irritation threshold in guinea pigs is not reached by a 20% solution of propolis in acetone (22).

### **Biological actions of propolis**

Action for the captain biological helpful constituent for bee glue is changed by utilize a lot of solvents in addition to change by dose prepared (2). The extraction of bee glue is making by various solvents as water, starch, ethanol, ether, methanol, terpenoids, acetone, lectin, phenones, coumarins and sterol (23). The creation for free radicals is stalled with water extract for propolis (24). Propolis characterized by forceful antioxidant action in opposition to all styles for reactive oxygen species evaluate with the doings for a different product of bee (25). Oil extract for bee glue include phenolic constituent have inhibit action on tumor in addition to bacteria (26). The pharmacological action is stronger with extract for non-ethanolic bee glue than with extract for ethanolic (27). The proliferation with growth for tumor cells is reduced through the propolis water extract and its constituents (28). the bee utilize glue for close the hole which occurred in bee cell due to its waxy form this lead to prevent the pathogen from penetrate the bee cell (29). Bee glue contain important components have benefits for human diet, these components identify as phenolic acid which have pharmacological effects in addition to biological actions. These substances have strong inhibited consequence on tumor in addition to their capability for prevent tissue hurt which resulted by oxidative tension which occur through chronic disease (30). Bee glue include important materials present in its constituents named as flavonoids which caused the biological action for propolis .The amount of flavonoid which present in bee glue will determine the quality of bee glue, so the amount of flavonoids which present in bee

glue will be standard for estimate the value for bee glue (31) .There are many classes for flavonoids like flavanols in addition to isoflavones (32,33). It is characterized by biological consequence like prevent the inflammation process, prevent the infection with bacteria and virus (34). The presence for flavonoid in the constituents for propolis leads to the ability for propolis to prevent the inflammation (35). lipid peroxidation inhibition occurred by flavonoids which lead to various physiological consequence as prevent raise the blood pressure (5). Various types of bee glue as Egyptian bee glue include another many critical constituents like alkanes; monoester; alkatrienes; aromatic esters; steroid in addition to fatty acid (36). There are many type of bee glue contains toxic elements in addition to trace elements, toxic elements like Pb, Hg, Cd in addition to As. Trance elements like Zn, Rb, Sr, Ca, Fe, As, B, Mn, K, Ni, in addition to Br (37).

### **Organic Solvent Suitable for bee glue**

Basic bee glue should not be used right away; instead, it should be filtered through a solvent to remove unnecessary material (38) bee glue take from bee cell acknowledged as basic propolis. Its components diverge with solvents dissimilarly which use for extraction (39). Ethanol in addition to water are used as solvents to extract bee glue. Balsam is another termed for ethanol extract for, it is more healthiness consequences extract for ethanol for bee glue have biological activity better than tincture, bee glue is extorted in addition to discover for its components via many solvents as chloroform (40).

### **Antiulcer activity**

The bacteria that produce gastric and duodenal sore and inflammation of the stomach as *Helicobacter pylori* is repressed by propolis (41) and it is repress *H-pylori* for both prophylactic and cure of gastric ulcer through it able to be utilized as alone or in combination with antibiotics (42) The intestinal wall act potentiate with polyphenol



that is contained in propolis extract by trigger adenosine monophosphate- trigger protein kinase (AMPK) indicate the importance of propolis for gut strength (43)

#### **Protective activity on the liver:**

Propolis has the better antioxidant action as evaluate load pollen and noble preserves (44). The molecular capable of arrest or interruption the oxidation of additional elements and therefore stoppage as mutation is called Antioxidant. The antioxidant act correlate with prevent the inflammatory and protective action of the liver. There is correlation with polyphenol substance, it is diverse from vegetation source (14). the protective consequence of propolis on the liver is associated to antioxidant action (41) Propolis has important role to protective of the liver from acetaminophen effects which induced liver toxicity (45) Enzymes of the liver as glucose-6- phosphatase, adenosine triphosphates, catalase, alkaline phosphatase and acid keep with normal levels with propolis (46)

#### **Protective activity against fungi:**

Propolis extracts in very low concentrations is initiate to be helpful in prevent yeasts related with spoiled fruit juices (47) Propolis extracts prevent growth of candida species and trichosporon species (48).

#### **Protective activity against virus:**

The infection with few pathogenic viruses to human is prevented by propolis (49) as avian influenza (50).

#### **Protective activity on the heart:**

The difficult practice that increases and variation lipoproteins at arterial barrier (51) so staffing or creation the immune cell refer to Atherosclerosis (52). Glucose level increase, fat level increase, plus urea increase are refers to occur atherosclerosis and cardiac system disease (53,54). There are numerous articles have focus on the defensive effect of propolis on the hazard on heart (55). The favorable consequence of bee propolis in heart disease

belong to the molecular mechanisms of bee glue as shrink action of scavenger (51), oxidative stress, and inhibition platelet collection (56).

#### **Antiangiogenic activity**

The various procedures as the development of blood vessels which involve in relocation, creation, and segregation of endothelial cells is called Angiogenesis (56). The amount of novel vessels created and the appearance of metalloproteinases and endothelial cells creation of vascular endothelial growth factor (57) are notably decreased by Green propolis extract which included artemillin C and caffeic acid phenyl ester .

#### **The anti-inflammatory consequence of the bee propolis**

Various studies refer to bee glue ability to antiviral, antibacterial, anti- inflammatory and immunostimulant activities (13,58) Immunomodulatory; antibacterial; anti-inflammatory; antiviral; antiproliferative effects and antioxidant (59) All this action belongs to flavonoid, phenolic acid and its ester which are contained in bee glue. The biological complicate interaction of vascular tissue caused by undesirable factors, as pathogens ;injured cells; irritation and free radicals is called "Inflammation"(60) .A lots of facilities confirmed its anti-inflammatory consequence during prevented cyclooxygenase COX-1 and COX-2 enzyme actions (61).The enzyme activity of NADPH-oxidase ornithine decarboxylase, triosine-proteinkinase, hyaluronidase and myeloperoxidase activity from guinea pig mast cell are suppressed by propolis .The inflammatory prevention properties are certified for charisma for a number of chemical constituent as "cinnamic acid and flavonoids. It is consisting of quercetin, naringenin, in addition to acetin; naringenin consist of caffeic and caffeic acid phenyl ester (19). Bee glue include elements resin, pollen (5%), essential oils (10%), waxes (30%); and



vegetable balsams (50%). Balsamic components restrain central biological elements which comprise, flavonoids "chrysin, catechin, galangin"; fatty acids; stillbene derivatives and polyphenolic compounds. Caffeic acid well repress cytokine, lymphokine production also reduce T-cell creation (61). vegetable balsams contained one of the ingredients and natural ingredient as flavonoids, which have anti-inflammatory and immune system effect in vitro (62).

#### **Antioxidant activity of the bee propolis**

The newer drugs development come from natural compounds which are considered a reassuring source (63). Bioflavonoids are identified as antioxidant particles that has essential roles in free radicals' scavenger, that are created in aging, atherosclerosis and cardiac diseases (64). flavonoids are defined as a metal chelators and possible antioxidant free radical searchers, they repressed special physiological activities included prevent increase in blood pressure and antiarthritic effects and they repressed the peroxidation of the lipid, (5, 63).

#### **Protective activity against bacteria:**

The infection of *staphylococcus aureus* is prevented by bee glue (65). Bee glue has effect as *anti-staphylococcus aureus* which belongs to ethanolic extract of bee glue (66). A very low concentration of ethanol extract of the propolis which taken from diverse locations of turkey have antibacterial activity. A very low concentration of ethanol extract of the propolis is 10 to 100 times stronger for Negative bacteria depending on the states of ethanol extract of the propolis examples (66). Therefore, propolis is produced by *Apis Mellifera* with excellent activity against bacterial action from created through others types of bacteria (7), Bee glue restrain many composites as flavonoids and phenolic acids which have antibacterial action (67) .

#### **Protective activity against platelet:**

Atherosclerosis is occurred as a result of platelets aggregation which is considered a main reason that is lead to atherosclerosis. Antiplatelets activity of propolis belongs to propolis ingredients which have prevented effect on platelets aggregation. collagen-caused platelets aggregation is repressed by Caffeic acid phenyl ester (CAPE) manifestly as Caffeic acid phenethyl ester have different mechanisms for inhibitory the collection of platelets and this lead to activity of propolis as strong antiplatelet(68)

#### **Protective activity on the skin:**

Propolis perform to raise collagen concentration in tissue by positive collagen metabolism in injury tissues through curing process (69) in ulcer of foot which is occurred in diabetic, other studies refer to healing process which occur facility with given the propolis as an alternative cure (70).

#### **Propolis and drug interaction**

The remedy consequences for antitumor medicine is high via bee glue in addition to its flavonoid, bee glue cause decline in undesirable consequences for cytotoxic medicine(69).The antibacterial consequences for some antibiotics medicines are more enhance when add ethanol extract of bee glue with these drugs as gentamicin and ampicillin in addition to its have moderate increase with another types of medicines as ceftriaxone (70) The drug interaction with propolis may be result from propolis contain many substances as complementary flavonoids (69).

#### **Adverse effects of bee glue**

Propolis may cause allergic reactions, many studies for propolis allergy refer to can characterized as mucus membrane inflammation of the mouth, ulcer, bronchospasm and wheezing may occur with headache, urticaria and nausea (71). When utilized for propolis in acute inflammation for nasopharyngeal cavity may cause anaphylactic shock and laryngeal edema (72).

#### **Acknowledgement**



This article was carried by the college of veterinary medicine, university of Mosul, Mosul, Iraq.

**Conflict of interest:**The author proclaims no Conflict of interest

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