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Review Article

Phytochemical Profile and Biological effects of *Pyrus communis* L.: A review**Khaled Rashed***

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Abstract

Pyrus communis (pear) belongs to family Rosaceae (rose) family. It is one of the oldest plants cultured by man. The trees can live for a long period. It contains many secondary compounds and phytochemicals which help to defend us from many diseases. Such secondary compounds are arbutin, quercetin, anthocyanin which help in many ways such as arbutin helps in skin whitening and eating fresh pear daily prevent from uterine cancer especially in women disease. It is also used in cosmetics. It is also helpful in recovering of wound healing. Pear is also rich in dietary supplements it contains vitamins, minerals, lipids, fatty acid and flavonoids. It contains calcium which helps to maintain calcium level in our body which prevents us from osteoporosis. It has many properties like as diuretic, analgesic, antioxidant, anti-inflammatory, sedative, antibacterial, and antidiabetic, hypoallergenic. Pear wood is used to make furniture, musical instruments, and wood carvings. *Pyrus communis* often prescribing for weaning babies because they are low in acid and aren't too effective on a babies digestive system.

Keywords: *Pyrus communis*, chemical compounds, plants, bioactivities.

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1. Introduction

Nature has gifted us with many lovely living things to increase the beauty of nature. Such as high mountains, waterfalls, trees, flowers and many more. One which is most important is trees which provide us with oxygen and provide us with fruits. One of these trees is pear which has many nutritional benefits as well as many medicinal uses. Pear is a sweet fruit that contains a lot of calcium, vitamins and minerals [1]. The pear tree (*Pyrus communis* L.) belongs to the botanical family Rosaceae which comprises more than twenty species, all from Europe and Asia. According to the Food and Agriculture Organization of the United Nations, in 2013, the main producing countries of this fruit were China (17,300.751 t), the United States (795,557 t) and Italy (743,029 t), with Brazil ranking 46th place in the world with an annual production of only 22,078 t. This production does not meet Brazilian domestic consumption, making the pear the most

imported fresh fruit in the country [1]. According to Pasa et al [2] these data allow us to perceive that pear orchard represents a promising opportunity for Brazilian producers. Pears contain special phytonutrients including anti-inflammatory flavonoids, anticancer, polyphenols and anti-ageing flavonoids; pear is also helpful in diseases like a kidney stone, decreasing cholesterol level and even diabetes [3]. Pear has many varieties which are spread all over the world due to its sweet taste and texture some of them are soft and some are stiff and different in shape and size. According to origin and cultivation pear classified into three categories which are European pear, Japanese pear and Chinese [4]. Every part of the pear tree has its importance due to its multiple tasks such as many medicinal as well as nutritional values. The bark of the pear help reduces pain produced by blows, twists. Pear leaves also reduce the inflammations of the prostate. Pear wood is used

to make furniture, musical instruments, and wood carvings. It is also used to make wooden kitchen utensils because it doesn't ever pass any colour or odour to the food [5]. This review gave some important information on phytochemical content and bioactivities of pear.

2. Phytochemicals

Different parts of pear such as flowers, leaves, bark and roots use as anti-inflammatory agents against disorders. The leaves contain many active compounds such as arbutin, sorbitol, isoquercitrin, ursolic acid, tannin and astragalol [6]. The bark is source of bioactive compounds like epifriedelanol, friedelin and beta-sitosterol [6]. The fruit is a good source of phytonutrients like carotenoids, glycosides, flavonoids, carbohydrates, sterols and phenolic compounds such as epicatechin, arbutin, hydroxyl-phenolic acids and health promoting nutrients such as minerals, vitamin C, A, organic acid, dietary fiber etc [7]. Its fruits help in maintaining balance of desirable acid in the body because they are excellent source of pectin (8). Fruit also contains some essential element enough to meet with the allowances of recommended daily like phosphorus, calcium, sodium and magnesium [9]. The juice of *Pyrus communis* contains vitamins and carotenoids that have neuroprotective and antioxidant property that prevent the apoptosis of neurons (10).

Flavonoid glycosides have been detected like kaempferol 3-O- β -D (6''-O- α -L-rhamnopyranosyl)-glucopyranoside, quercetin 3-O- β -D glucopyranoside and quercetin 3-O- β -D-(6''-O- α -L-rhamnopyranosyl)-glucopyranoside, Triterpenes and sterols (α -amyrin and β -sitosterol). Coumarins and phenolics are present in the flowers of *Pyrus communis* L. Chlorogenic acid is also identified in the flowers of *Pyrus communis* L. In the stem bark of *Pyrus communis*, triterpenoids are identified [11]. Quercetin considered as a major flavonoid in *Pyrus communis* juice, having antithrombotic, antitumor, anti-inflammatory, antioxidant, and anti-apoptotic effects. Quercetin was reported to be effective in decreasing ischemia related brain swelling and brain injury and also neuroprotective in a zebra fish model [12]. *Pyrus communis* (L) contains 2-Furan methanol, act as an ingredient in the preparation of several chemical products like adhesives, foundry resins, and wetting agents. The furfural derivatives reported to have strong bactericidal property [6]. Gas chromatography-mass spectrometry (GC-MS) analysis of methanol fruit extract of *Pyrus communis* detected the presence of compounds possessing different applications such as squalene, isosorbide, 1-octadecanol (stearyl alcohol) and octadecanoic acid (stearic acid). The identified compounds have potent antioxidant and antimicrobial properties along with therapeutic effect and play an

efficient role in development of drug and health supplements [6].

3. Biological activities

3.1 The hyperlipidemic and hypoglycemic activity

The ethanol and ethyl acetate extracts of *Pyrus communis* fruits were investigated by dexamethasone-induced diabetic rats. Glucocorticoid-induced hyperglycemia is attributed to increase insulin resistance of peripheral tissues and hepatic glucose production. Diabetic rats have high levels of blood sugar, lower body weight as compared to normal rats. The oral administration of ethanol and ethyl acetate extracts of *Pyrus communis* significantly reduced the level of blood glucose due to potentiating of the plasma insulin effect by increasing its release from bound insulin or the pancreatic insulin secretion from existing cells of Langerhans islets. The hypoglycemic effect of extract produced by independent mechanism from the insulin secretion, it may be by inhibit absorption of intestinal glucose or by inhibit production of endogenous glucose or may also be due to enhanced utilization of glucose by peripheral tissues [13].

3.2 Anti-microbial effect

Aqueous extract of leaves and fresh juice of *P. communis* exhibit antibacterial effect versus *E.coli* and *Staphylococcus* due to the presence of arbutin. Arbutin converted in body into hydroquinone [14] that have antimicrobial effect, operates defense mechanisms versus bacteria invasion and promote biochemical processes. Also aqueous extract of Pear young shoots exhibited antimicrobial effect due to the presence of hydroquinone [15].

3.3 Anti-arthritis Activity

The anti-arthritis effect of the ethanol extract of fruits of *Pyrus communis* L. was investigated by Complete Freund's Adjuvant (CFA) induced rheumatoid arthritis in rats, dried and inactivated Mycobacterium tuberculosis [16]. The oral administration of *P. communis* fruit extract for rat producing anti-arthritis activity that show increasing in locomotor activity but reducing in body weight and paw edema volume of animals. The anti-arthritis activity is demonstrated by inhibition of protease, a reduction in percentage of protein denaturation and total protein. *Pyrus communis* extract has exhibited significant protection versus bony destruction by show less narrowing of joint spaces and less soft tissue swelling as compared with the negative control [16].

3.4 Anxiolytic activity

The hydroalcoholic extract of *Pyrus communis* fruit was investigated for the anxiolytic effect by using the animal model (forced swim test (FST) and open field test (OFT)). The administration of *P. communis* fruit extract for

rat orally exhibited anxiolytic activity. The frequency of rearing, the number of sectional crossings, center square entries and duration were higher between the control group and the treated groups in the OFT while in the FST, treatment with either fruit extract of *P. communis* or escitalopram decreased depressive like behavior. When compared with escitalopram, the fruit extract show the good anxiolytic activity in OFT and FST [7].

3.5 Antiradical effect

Ethanol, methanol (Bark/Leaves/Fruit) and ethyl acetate leaves extract of *Pyrus communis* was tested for radical scavenging activity by using 2, 2-diphenyl-1-picrylhydrazyl (DPPH) assay. Antioxidant activity reported to be better in ethanol extract than methanol and ethyl acetate extracts produce strongest radical scavenging activity. *Pyrus communis* exhibited potent antiradical effect as compare to the drugs used i.e. quercetin, ascorbic Acid, vitamin E and butylated hydroxytoulene [17].

3.6 Wound healing activity

The wound healing effect of ethanol and ethyl acetate extracts of *Pyrus communis* fruits was evaluated by different models of wound healing in normal rats like incision, dead space and excision wound model. This study showed that ethanol and ethyl acetate extracts of *Pyrus communis* fruits was efficient in all wound healing activity models. In excision model, the study showed that *Pyrus communis* L. reduced scar area and epithelization, and increased the wound contraction. The elevated collagen levels via increased cross linking of collagen fibers causing increase in skin breaking strength. Also, elevate in the weight of dry and wet granulation tissue proved the presence of higher content of protein (hydroxyproline) [18].

3.7 Hepatoprotective activity

Treatment with methanol seed extract of *Pyrus communis* L. improved haptoglobin synthesis and other proteins in both rats that are administered with *Pyrus communis* L. extract alone and pre-treated rats. The significant decrease in total albumin and protein levels and significant elevation of same in the serum seen in rat treated with cadmium may be as a result of oxidative damage by reactive oxygen species (ROS) on the membrane components of cells of liver and causing intracellular contents escaping into the circulation. Cadmium enhances ROS production in liver cells which attack intracellular constituents such as lipids, nucleic acids and proteins, and also attack membrane [19]. In rats treated with cadmium, the significant increase in serum AST and ALT activities and significant reduce in liver activities of these enzymes is an indication of release of the enzymes into the circulation and loss of functions and structure of hepatocyte membrane [19].

3.8 Anti-obsessive compulsive activity

The anti-OCD activity of fruit of *Pyrus communis* L. investigated by used marble-burying behavior and flickering light induced OCD model in mice. The results shown that oral administration of fresh juice of *Pyrus communis* L. to mice decreased the marble burying behaviour. The effect of fresh juice of *Pyrus communis* was found to be identical to effect of fluoxetine [20].

4. Conclusion

This review proved the presence of several bioactive compounds in pear (*Pyrus communis* L.), which could be responsible for different medicinal, pharmacological and nutritional uses of pear. In addition to the phytoconstituents report in pear, this review has also revealed the biological activities of various parts of this plant. In order to explore other potential pharmacological properties and proved its medical uses, other studies need to be happen on pear (*Pyrus communis*). This plant could consider as excellent source of active compounds for drug development and future pharmacological studies.

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