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Review Paper

An Overview on Phytoconstituent and Activities of Phyrus Pashia

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ABSTRACT

Buch-Ham is a Pyrus pashia. Ex D. Don, which includes about 38 species in temperate regions of the North Hemisphere, is found in the Himalayan region with higher ethnic uses. One significant medicinal plant is Pyrus Pashia. The purpose of this study is to examine the pharmacological active chemicals found in Pyrus pashia fruit and their potential to prevent diabetes. Following their dissolution in distilled water, methanolic extracts of fruit, bark, and leaves were separated using four organic solvents in ascending order of increasing polarity as n-hexane, chloroform, ethyl acetate, and n-butanol. Notably, important phenolic compounds with anti-inflammatory and antioxidant qualities, including gallic acid, catechin, caffeic acid, coumaric acid, and ellagic acid, were found by high-performance liquid chromatography (HPLC) examination. The existence of primary and secondary metabolites such as alkaloids, glycosides, flavonoids, steroids, saponins, and tannins was discovered by phytochemical and pharmacological analysis of the plant.

INTRODUCTION

Pyrus pashia commonly known as wild pear or Himalayan pear and belonging to family Rosaceae. The fruit is employed frequently in the traditional medicine as supplementary food, minerals, vitamins, polyunsaturated fatty acids, certain phytochemical, and dietary fibres [1]. The quality of fruits is generally recognized by parameters such as color, shape, texture, total soluble solids (TSS), acidity, sugar content, organic acids, and volatile compounds. Several bioactive and phenolic components present in P. passia flowers make them beneficial in the treatment of heart disease and cancer The fruit is employed frequently in the traditional medicine as supplementary food, minerals, vitamins, polyunsaturated fatty acids, certain phytochemical, and dietary fibres.[2]

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With its attractive flowers and edible fruits, Phyrus pashia serves not only as a source of food but also plays a role in local ecosystems, providing habitat for various wildlife. It is generally known as Kainth and goes by several other names such as Batangi, Molu, Tangai, Sohjhur and Mehal [3-4]. Mainly pyrus pashia is known as kainth, shegal. The early fruit is mostly of light green color but at maturity, its color turns blackish brown with numerous yellow and white dots on its skin surface.[5] The shape of fruit is often described as oblate, ovoid, obovoid, oval or quince. On average the fruit diameter ranges from 1 to 4 cm and the height ranges from 2 to 5 cm Pyrus pashia is used in traditional medicine with various parts of tree employed for their health benefits. The plants are best grown in the height range of 750 to 2600 m. The immature fruits are usually willow green in colour with light brown spots on the outer surface, the fruits turn black and soft when they mature or ripe [6]. The fruits are rich in nutrients, containing several essential vitamins including vitamins A, B1, B2, B3 and C. n. The leaves of P. pashia are rich in polyphenolic compounds like chlorogenic acids, flavan-3-ols and arbutin exhibit a wide range of physiological activities and are used for the development of several therapeutic agents. f P. pashia fruit, however, there has been limited research on the value addition of P. pashia fruit. Fruits have a very short shelf life, and it can be extended with the help of food processing techniques

Fig.1. Phyrus pashia

Habitat: Phyrus pashia is a deciduous tree that typically reaches heights of 5 to 10 meters. It features broad, ovate leaves and white to pink flowers that bloom in spring [7]. The fruit is a pome, resembling a small pear, with a sweet and tangy flavour profile. The tree thrives in well-drained soils and is often found in hilly regions. is primarily found in mountain region of South Asia, including parts of India, Nepal, Bhutan. *Pyrus pashia* is a tolerant tree that grows on sandy loamy soil that is well drained [8-9]. It is adapted to a precipitation zone that ranges from 750 to 1500mm/yr or more, and a temperature that ranges from -10 to 35 C [10]

Geographical distribution: is primarily found in mountain region of South Asia, including parts of India, Nepal, Bhutan, Punjab, Himachal

Table 1

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopside
Order	Rosales
Family	Rossaceae
Subfamily	Maloideae
Genus	Pyrus
Species	p. pasia

Chemical constituent

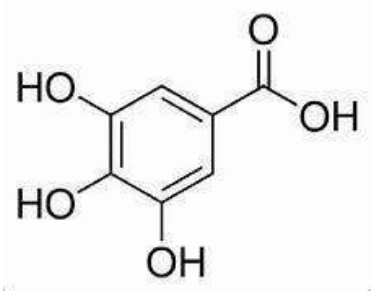
Some other constituents are phenolic compounds, terpenoids, glycosides, alkaloids, fatty acids, steroids. previous study demonstrated that the *P. pashia* fruit comprised of major phenolics, such as gallic acid, catechin, caffeic acid, coumaric acid, ellagic acid and several other phytochemicals [11] the chemical constituents of *P. pashia* flower and isolated 28 compounds. They also reported a novel glycosidic phenolic compound, namely 4-*O*-*Z*-coumaroyl-arbutin, Among the 28 compounds, hydroquinone exhibited the highest content. In the branches and leaves, 20 terpenoids and two new terpenoids have been reported. Gallic acid, catechin, caffeic acid, coumaric acid, ellagic acid,

and several other phytochemicals are among the main phenolics found in P. pashia fruit.

Table 2

S.no.	Plant part	Chemical constituent
1	Fruit	Gallic acid, sterols, terpenes, Catechin, tannins, alkaloids. phenols
2.	Flowers	Arbutin, hydroquinone, 4methoxy benzoic acid, apegenin
3.	Bark	Steroids, tannins, flavones, beta sitosterol
4	Branches and leaves	Caffeic acid, picein, 3,4-dihydroxyacetophenone

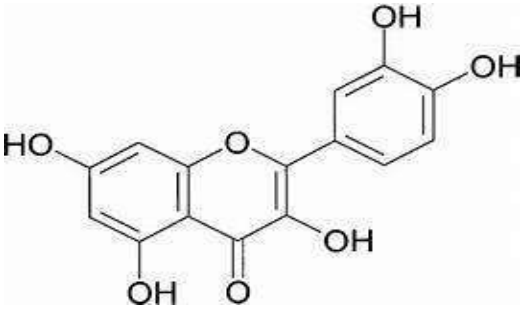
Phenolic compounds are primarily driven by the need to understand their influence on sensory qualities such as color, antioxidant potential and nutritional value in foods. It has been reported that the flowers of Pyrus genus contain a certain amount of phenolics such as arbutin, chlorogenic acid, and flavonoids [12]. Phenolic compounds play vital functions in plant reproduction and development, act as important defense mechanisms against pathogens, and parasites contribute significantly to the vibrant colors displayed by various plant species. The phenolic content of plant materials and their antioxidant activity highlight the significant role in stabilizing lipid oxidation. their antioxidant properties, these compounds offer a diverse array of medicinal benefits, including anti-inflammatory, anti-microbial, anti-allergic, anti-thrombotic, and vasodilator effects, thus attributing the control of various diseases to the constituents of medicinal plants.



Gallic acid

Flavonoids

Flavonoids, such as flavones, flavanols and condensed tannins are the secondary metabolites that exhibit antioxidant properties primarily due to the presence of unbound hydroxyl groups. These compounds not only demonstrate antioxidant efficacy in vitro but also function as antioxidants within living organisms [13-14]. In various plants, flavonoids are also contained in high amounts. The predominant flavonoids in ten pears include B-ring dihydroxylated flavonol derivatives, including quercetin and isorhamnetin, and monomeric and polymeric flavan 3-ols, like epicatechin and proanthocyanidins. [15 17] It is thought that these substances help to determine colour, fruit quality, and durability. Total flavonoid contents in the 80% ethanol extracts of pear fruits were measured using the colorimetric method with aluminum chloride. Their presence in food such as wine, tea, soybeans, and liquor ice has explored their potential health benefits due to their notable antioxidant properties and the ability to delay or mitigate various conditions believed to be associated with oxidative stress, including atherosclerosis, cancer, Parkinson's disease, and diabetes.



quercetin

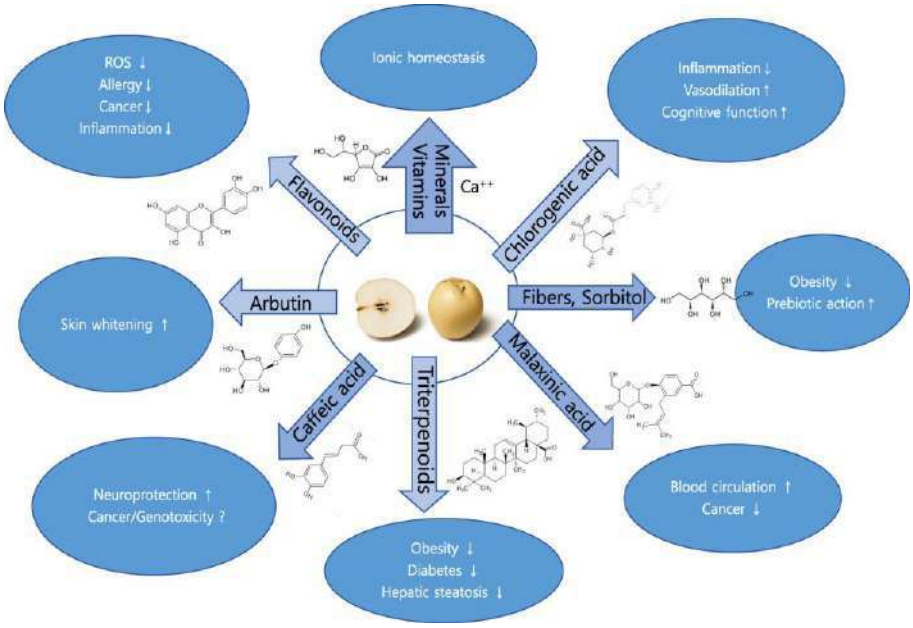
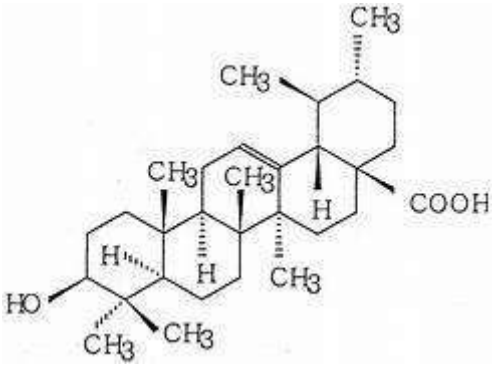


Fig.2.chemical constituent

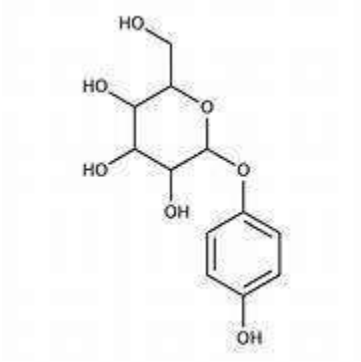
Triterpenoids

Among triterpenoids, particularly urosolic (Fig. 2), oleanolic, and betulinic acids have been identified in European pear cultivars (P. communis), more than 17-fold higher in the peels than flesh. Its isomer, oleanolic acid, has been speculated to have anti-oxidative, antitumor, anti-inflammatory, anti-diabetic, and antimicrobial effects, it increases energy expenditure[18] and suppresses aromatase activity, an enzyme responsible for converting androgens to estrogens.



Arbutin

Arbutin, hydroquinone-β-D-glucopyranoside (Fig. 2), is a well-known antibiotic, and skin whitening compound [19]. It is degraded into hydroquinone, a skin bleaching agent, and is used in cosmetics as a fragrance, reducing agent, and melanin polymerization inhibitor.[20] A Chinese group reported the peel of imported Korean pears (Chinese name, Youran) contained approx. 1.5–20-fold higher amounts of arbutin (6982.0 μg/g dry weight) than other 9 different pear varieties cultivated (323.3–4395.8 μg/g dry weight) in China and South Africa.



Pharmacological properties

Recent studies highlight the medicinal potential of Phyrus pashia. Its fruits and leaves are rich in phenolic compounds, flavonoids, and antioxidants, which are linked to various health benefits, including anti-inflammatory,

antimicrobial, and anti-diabetic properties [21]. Traditional medicine practices in regions where it is indigenous often utilize these parts for treating ailments.

1.Antimicrobial activity

Medicinal plants, rich in various phytochemicals, may serve as potent antimicrobials. In several countries, wildly grown plants are used for medicinal purposes The various extracts from *P. pashia* plant parts have exhibited antimicrobial activities against pathogenic bacteria and fungi. [22-23] . Particularly, the ethanolic extract of the fruit skin displayed remarkable antibacterial activity against Klebsiella pneumonia, Shigella flexneri, and Escherichia coli while the chloroform and ethanolic extracts from the fruits exhibited strong antifungal activity against Candida albicans, Aspergillus flavus, and Aspergillus parasiticus.

2.Antioxidant activity

Zbigniew *et al*. investigated the antioxidant properties of various extracts, including methanol, aqueous, and ethyl acetate obtained from dried leaves of *Pyrus pyrifolia* var. [24]"Shinseiki" Antioxidant activity was performed using ABTS assay (2,2′-azino-bis-3-ethylbenzothiazoline-6-sulphonic acid,) resulting in fruit extracts possessing antiradical activity. P. pashia extracts, operating through the reduction of by the antioxidants present. P. pashia extracts, operating through the reduction of by the antioxidants present. P. pashia by using different solvents including methanol, hexane, chloroform, ethyl acetate, n-butanol, and aqueous extracts [25-27]. The difference in the antioxidant level within the fruit, influenced by factors such as solvent type, phenolic concentration, and interactions among extract components, contribute to its exceptional potential as a natural source of health-enhancing antioxidants

3. **Antidiabetic activity**

Results revealed that the extract 50 % reduced the glucose levels; the ethanolic extract has high flavonoid contents. Recent studies have shown that pears possess antihyperglycemic effects.[28] Combined apple or other fruits, such as acai, cherry and pear also inhibited diabetic parameters. [29] Preliminary studies suggest that *Pyrus pashia* has potential hypoglycemic properties. Flavonoids present in the plant help regulate blood sugar levels by improving insulin sensitivity and enhancing glucose uptake.

4.Anticancer activity

Pears showed some anti-mutagenic and anti-cancer activities by several mechanisms. Firstly, pears can inhibit carcinogenesis of polycyclic aromatic hydrocarbons (PAHs), such as benzo(a)pyrene, which have two main carcinogenic mechanisms, formation of DNA-adducts and production of ROS [30] excretion of PAHs.

5. Anti-inflammatory activity

The anti-inflammatory effects of different pear species were compared to those of dexamethasone in carrageenan-induced mice hind paw edema and xylene-induced mice ear edema models. Excessive inflammatory responses are a leading cause of non-communicable diseases [31]. However, dietary ingestion of pears, apple, red wine, and strawberries showed inverse associations with inflammation scores (IS) in food-based analyses Inflammation usually develops when infectious microorganisms, such as bacteria or viruses, enter the body and are present in certain tissues or circulate through the blood. Eating a diet rich in fruits and vegetables lowers the risk of cancer due

to the presence of natural polyphenol in fruits and vegetables. The regular intake of phenolic-rich fruits and various plant components not only associates with anti-inflammatory properties but also correlates with a lowered susceptibility to the specific forms of cancer and cardiovascular conditions.

6. **Cardio-protective**

Cardiovascular diseases are the leading global cause of death with 17.9 million mortality events per year. Concerning active compounds in pear, chlorogenic acid showed to improve ex vivo vessel function and protect endothelial cells against HOCl. [32] Cardioprotective functions of pears via ACE inhibition were confirmed in vivo systems.

7 **Hepatoprotective activity**

The aqueous extract of *P. pashia* leaves have been shown to exhibit hepatoprotective activity against carbon tetrachloride (CCl_4)-induced liver damage.

Uses

The Ayurvedic, Unani, Siddha, and tribal medicines use >400 plants, and 75% of plants are obtained from tropical forest areas and the remaining 25% from temperate forests

In the Himalayan region, *P. pashia* is distributed with immense ethnic benefits and has been widely used by several local communities in the treatment of gastrointestinal, respiratory, and vascular complications. The fruit contains various health-promoting components such as phytochemicals, bioactive compounds, minerals, and vitamins, therefore it has tremendous potential for the development of value-added and novel food products with therapeutic benefits. The fruits are edible, and have religious and cultural significance. Other diverse uses include the preparing of fencing, ropes, brooms, decorative articles, and other household purposes by the inhabitants of the Lesser Himalayas.

Table 3

S. no.	Plant part	Uses
1	Flower	Treatment of cough, emesis and diarrhea. Used as a health food to lower blood lipid in the Yunnan province of China
2.	Fruit	Useful in the treatment of dyspepsia and dysmenorrhea Digestive disorders, sore throat, irritability. Abdominal pain, anemia. Fruit juice is astringent and diuretic
3.	Bark	Possesses astringent and tonic properties. Used in the management of sore throat, fever, and peptic and gastric ulcers.
4.	Leaves	Serve as fodder for goats and sheep. Tonic for hair loss Improve cosmetic appearance

CONCLUSION

The fruit is palatable and a valuable source of nutrients. Numerous phytochemicals have been identified in the plant's fruit, flower, leaves, and bark. The many phytochemicals found in fruit, flowers, bark, and leaves have the potential to be utilized in the development of a unique medication that treats a variety of illnesses through the application of reverse pharmacology. It is clear from scientists' ongoing research on Pyrus species

that traditional usage has been validated by contemporary findings, which could lead to the development of new therapeutics and dietary supplements. To learn more about their mechanisms of action, improve extraction techniques, and explore the potential therapeutic applications of these substances, additional research is necessary.

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