

A Review on *Potentilla fulgens* (Wall. Ex Hook) and its pharmacological efficacy

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Abstract

Potentilla fulgens (Wall.) ex Hook (Rosaceae) is an alpine medicinal plant that is found in the Western Himalayas region and its whole parts are consumed all over the world as a potent source of therapeutic constituents. Traditionally this plant is frequently used by tribals and their various products are also used by common peoples for caring for various diseases especially in pyorrhea. The various parts of *P. fulgens* and their different extracts have a variety of active phytochemicals such as polyphenol, triterpenoids, flavonoids, triterpenes, potentene-A (30-methyl-17 α -hypan-12-ene-3 one), Potentene-B (3-O- β -D-gluconopyranosyl-(1,2)- β -D-gluconopyranosyl hopan-12-eno-11-oxo-28oic acid, novel bioflavonoid potifulgene (Epiatzelchin-6-0-8" epiatzelchin), and epicatechin compound. Pharmacologically the whole parts of *P. fulgens* are used in the control of various critical and infectious diseases. This review of literature revealed that *P. fulgens* can be used as a potent source of antioxidants, anthelmintic, anticancerous, antihyperglycemic or hypoglycemic, antitumor, and molluscicides. It also propagates an approach towards new researches that how the various phytochemical of *P. fulgens* act at the molecular level in the organisms.

Keywords: *Potentilla fulgens*; Antioxidants; Anthelmintic; Anticancerous; Antihyperglycemic; Molluscicides

1. Introduction

Potentilla is an important therapeutic medicinal plant that is commonly found at high altitudes of Himalayan range. More than three hundred species of the genus *Potentilla* are used in Unani, Ayurvedic, Chinese, and Tibetan system in the form of medicine [1-5]. *Potentilla fulgens* L (Family: Rosaceae) is an important local medicinal plant the root extract of this plant are widely used in caring several human diseases [6]. *Potentilla fulgens* is commonly called Bajradanti in Hindi, Himalayan Cinquefoil in English, [7], Bajradanti, Ganephus and Dentamanjan in Nepali [7, 8], and Lyngniangbru in Meghalaya [7]. This plant has several important phytochemical constituents such as polyphenols, triterpenoids, and flavonoids therapeutic and commercial importance [5]. *Potentilla fulgens* always grow in the natural habitat, but the first time it was cultivated outside its natural habitat at Palampur, Himanchal Pradesh, India [9]. The whole parts of *P. fulgens* and root-stock are utilized as astringent and tonic for caring for gum, and tooth ailments (Pyorrhea, toothache and caries), diarrhea, stomach problems, cough, cold, diabetes mellitus, and cancer disease [5]. Therefore, the present reviews were taken up to investigate several phytochemical constituents and pharmaceutical properties of the *P. fulgens*.

2. Phytochemistry

All groups of plants have specific phytochemicals which are used in caring for several diseases. The plant species *Potentilla* contain a high amount of tannins, and a lesser extent of polyphenol, triterpenoids, and flavonoids phytochemical constituents [10]. The various investigation of the aerial part of *P. fulgens* yield two new triterpenes, Potentene-A (30-methyl-17 α -hypan-12-ene-3 one) and Potentene-B (3-O- β -D-gluconopyranosyl- (1,2)- β -D-gluconopyranosyl hopan-

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12-eno-11-oxo-28oic acid, along with three known compounds, such as afzelchin-4 α →8" catechin, epiafelchin, and rutin [11]. The investigation of the root part of *P. fulgens* led to the isolation of a novel bioflavonoid potifulgene (Epiafelchin-6-O-8" epiafelchin) along with epicatechin compound [12].

3. Pharmacological properties

The World Health Organization (WHO) has been reported that 80% of the world's population depends on plants for primary health care [13]. In the form of traditional medicine, the root extract of *P. fulgens* is used for the treatment of bacterial disease diabetes, cancer, and parasitic infections [14, 15]. The various studies have been confirmed that the traditional use of *Potentilla* and their aerial and underground part of the extract are therapeutically used in several diseases due to high amounts of condensed, and hydrolysable tannin [10]. All parts of *P. fulgens* are used in various forms for the curing of tooth problems (pyorrhea), stomach problems (diarrhea), cold, cough, diabetes, and cancer [5, 16, 17]. In Bhutan and Nepal, the juices of whole parts of *P. fulgens* are taken for the curing of respiratory complications like cough, cold, and stomach problems [5, 8]. The masticated leaves of *P. fulgens* are used in the treatment of pyorrhea [8]. The leaf, stem, and root of the *P. fulgens* are frequently used for the treatment of stomatitis and aphthae in Uttarakhand, India [18]. At commercial levels, the whole plant of *P. fulgens* is utilized by Vicoo Laboratories in India for the production of Vicoo Vajradanti tooth powder and pest [7, 19]. Therefore, any part of the *P. fulgens* can be used in pharmaceuticals, in which some pharmaceutical activities are as follow.

3.1. Antioxidant activity

The components of antioxidants play an important role in the removal of toxic components from the vital system. These components are present in the various parts of the plant groups in the form of active phytochemical components. Their chemical constituents and amounts may be variable according to plant species. The medicinal plant *Potentilla* species are also having several antioxidant components in the aerial and ground parts [14, 16, 17, 20-23]. The aqueous methanolic, ethyl acetate, butanol, and water extract of the *P. fulgens* root have antioxidant activity [11]. Syiem et al., [16] have been reported that *in vitro* system *P. fulgens* is widely used in the form of antioxidant components. Jaitak et al., [11] have been reported that the antioxidant compounds epicatechin and biflavanoid (Potifulgene) are present in the various parts of the *P. fulgens*. The methanolic root extract of *P. fulgens* reduces free radical-mediated oxidative stress in diabetic mice [24]. This medicinal plant showed good antioxidant activity and it can be a potent and useful source of natural antioxidants [25].

3.2. Anthelmintic activity

Helminthiasis is one of the most important problems in the productivity of grazing livestock as well as the health of human beings throughout the world [26]. To control the helminthes infection, a variety of anthelmintic commercial are available; however, due to the increasing development of anthelmintic resistance in the host body, the limited availability of anthelmintic drugs for the rural people as well as the high cost of such synthetic anthelmintic medicines, a growing interest in the plant products to examine the various anthelmintic properties of which traditional used by the local peoples in different parts of the world's [27-29]. The traditional uses of the medicinal plant *P. fulgens* are exhibited cestocidal and trematocidal infections [30-32]. The ethanolic extracts of *P. fulgens* have potential anthelmintic activity against the cestode parasite [6]. The organic extract ether, chloroform, methanol, acetone, ethanol, and column purified fractions of root powder of the *P. fulgens in vivo* and *in vitro* have anthelmintic larvicidal activities against trematode larva (sporocyst, redia, and cercaria) of *Fasciola gigantica* [32, 33]. The aqueous root extract of the *P. fulgens* is used in the treatment of intestinal parasitic infection [14]. The root powder of *P. fulgens* is an effective anthelmintic and is used for toothache and stomach disorders [5]. The root juice of this plant is taken for the treatment of dysuria and peptic ulcers [8], whereas, root paste is used for controlling of tooth infections [34]. The leaves of *P. fulgens*, when masticated in the mouth are beneficial for the treatment of pyorrhea protozoan [8].

3.3. Anticancerous activity

The synthetic drugs are frequently used in the treatment of cancerous disease which has a side effect among surrounding cells and it also developing resistance. Therefore, the vision of the human drawn towards the uses of phytochemicals and trial it's as an alternative source of synthetic drugs. Phytochemicals may be an important source for the treatment of cancerous disease. The methanolic, butanolic, and dichloromethane root extracts of *P. fulgens in vitro* have cytotoxic activity against various human cancer cell lines such as liver, ovary, lung, prostate, neuroblastoma, and leukemia [35]. The methanolic root extract of *P. fulgens* was found to increase the *in vivo* survival of mice bearing Ehrlich ascites cells and also showed a dose-dependent inhibitory effect on the growth of MCF-7 cells through clonogenic assay [36]. The root of *P. fulgens* is used in the treatment of various ailments, including neoplastic disease

[15]. The aqueous root extract of *P. fulgens* is active against neoplastic tumours murine ascites Dalton's lymphoma, depending on the method of administration [37].

3.4. Antihyperglycemic or Hypoglycemic

The developing countries are the focus on the utilization of natural gradients for caring for various diseases. Previously the native plant species are frequently used by common peoples for the treatment of critical diseases. The medicinal plant *P. fulgens* was found successful in reducing the serum cholesterol (72%) triglyceride levels (80%) and improved HDL cholesterol to normal level using inter peritoneal mode [17]. The roots of *P. fulgens* have hypoglycemic and antihyperglycemic properties in the mice [14]. The methanolic root extract of *P. fulgens* has hypoglycemic and antihyperglycemic activities in normal and allaxan-induced diabetic mice [14]. It's also has effect on lipid profiles in alloxan-induced diabetic mice [17]. Syiem and Majaw [38] have been studies that the methanolic extract of the *P. fulgens* is inhibiting sorbitol dehydrogenase, the second enzyme in the polyol pathway, responsible for the conversion of sorbitol to fructose.

3.5. Antitumor activity

In animals, the growth of the tumor is very harmful which produces by the infection of various microorganisms, cellular coordination and various organic/inorganic components in the body. Various researches have been reported that plant-derived phytochemicals are a potent source as an antitumor in various animals [39]. Therefore, the growth of the tumors can be control by the use of plant products. The whole plant of the *P. fulgens* is active against the neoplastic tumours murine ascites Dalton's lymphoma [15]. The methanolic root extract of the *P. fulgens* has potent dose-dependent antitumor activity on Dalton's lymphoma cells [37]. Laloo et al., [40] have been reported that ethanolic root extract of *P. fulgens* is significantly inhibits pyloric ligation-induced gastric ulcers due to its anti-secretary properties.

3.6. Molluscicidal activity

The species of snail and slugs are harmful to domestic animals and livestock keepers as a carrier of trematode parasites and destruction of agricultural fields [41]. Synthetic chemicals frequently can be used for the control of snails and slugs but these chemicals cause an adverse impact on the other aquatic and terrestrial organisms. The phytochemicals are important and suitable as natural products which can be used as molluscicides without any adverse impact on the ecosystem and non-target organisms. The organic root extract (ether, chloroform, methanol, acetone, and ethanol) of *P. fulgens* have potent molluscicidal components and it can be used as effective molluscicides in the control of intermediate host snails *Lymnaea acuminata* and *Indoplanorbis exustus* [42-44].

4. Conclusion

The various pharmacological studies of medicinal plant *P. fulgens* conform that the whole part of this plant have specialized phytochemical constituents which have a specific characteristic and it can be used as products of antioxidants, anthelmintic, anticancerous, antihyperglycemic or hypoglycemic and antitumor in the traditional to modern therapeutics. The various organic root extract of *P. fulgens* are the potent source which has potent molluscicidal components and it can use for the control of harmful snails. The review of literature revealed the further need for various studies that the products of *P. fulgens* how to perform the mode of action at the molecular level in the vital systems at various steps and action in the therapeutics of various diseases and effective against organisms.

Compliance with ethical standards

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