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Pharmacological Activities of Pea (*Pisum Sativum*): A Review

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ABSTRACT

Pisum sativum, a member of the Fabaceae family and the genus Pisum, was first domesticated in Afghanistan about the year 2000 BC and used in Harappan culture in western and northwestern India between 2250 and 1750 BC. Everywhere in India can find it. Its edible aerial component has historically been used to treat diabetes, heart conditions, and to purify the blood. Moreover, it has been demonstrated to have anti-bacterial, anti-diabetic, anti-fungal, anti-inflammatory, anti-hypercholesterolemia, antioxidant, and anticancer properties. Due to the existence of several bioactive chemicals such as alkaloids, flavonoids, glycosides, isoflavones, phenols, phytosterols, phytic acid, protease inhibitors, saponins, and tannins, medicinal plants can be used as a source of innovative therapeutic agents. The fact that many medicinal plants contain different phytoconstituents with therapeutic effect is what makes them used as medicine. The medicinal and pharmacological advantages of pea in disease prevention and therapy are the main topics of this review. The data was gathered from online and in-print papers that were published in a variety of journals.

Keyword: *Pisum sativum, Medicinal plant,* phytoconstituents, diabetes, heart diseases and as blood purifier.

INTRODUCTION

Legume, also known as a pulse, is one of the traditional remedies used throughout the world since it has a lot of nutritional components and is effective for treating medical conditions. Beans, grains, and peas are considered legumes. Other plants in the Fabaceae family include alfalfa, carob, clover, copaifera, fenugreek, indigo, lentil, licorice, lupin, mesquite, natto, soybean, peanut, rosewood, and tamarind. Next to soybean, peanut, and dry bean, the pea is one of the major food legumes that can be grown in a variety of climates and ranks fourth in terms of global production.

People are eating more seeds and pea sprouts because they want to improve their health by modifying their eating habits (Rungruangmaitree and Jiraungkoorskul, 2017). *P. sativum* L. (Fabaceae), locally known as matar, is an annual or perennial herb. It is cultivated throughout the India. It contains one to five species, depending on taxonomic interpretation. The International Legume Database (ILDIS) has three species, one with two subspecies: *Pisum abyssinicum, P. fulvum,* and *P. sativum* (Kumari and Deka, 2021). Traditionally seeds are used as nutrient, appetizer, refrigerant, laxative, astringent and also used in treating wrinkled skin, diabetes, acne, phlegm and intestinal inflammation. Its edible aerial component has historically been used to treat diabetes, heart conditions, and to purify the blood. (Yusuf and Chawdhary 2009).

According to the literature that is currently available, there have been very few studies on the biological function or chemical composition of the edible aerial parts of *P. sativum*. In order to evaluate the effectiveness of *P. sativum* extract in the treatment of various diseases, the current investigation was carried out as part of our ongoing research on the bioactivity screening of edible medicinal herbs (Zilani et al 2017).

NUTRITIONAL IMPORTANCE:

Peas are a wonderful source of zinc, antioxidants like vitamin C and E, and other nutrients that support a healthy immune system. A and B vitamins, cholesterol, and other nutrients also help to prevent inflammation and lessen your chance of developing chronic diseases including diabetes, heart disease, and arthritis. The content and characteristics of starch, protein, fibre, vitamins, minerals, and phytochemicals in peas are primarily responsible for these health advantages. Fiber from the seed coat and the cotyledon's cell walls promotes gastrointestinal health and function and lessens the starch in peas' digestion. Peas include a number of phytochemicals that were previously exclusively considered to be antinutritive. These include galactose oligosaccharides, which may have advantageous prebiotic effects in the large intestine, polyphenolics, in particular types of coloured seed coats, which may exhibit antioxidant and anticarcinogenic activity, and saponins, which may exhibit hypocholesterolaemic and anticarcinogenic activity.

Pharmacological Activity:

1. ANTI-OXIDANT ACTIVITY:

DPPH and ABTS assays for measuring antioxidant activity. For all of the studied concentrations, it can be seen that the methanol and ethyl acetate fractions had a better capacity for scavenging. The methanol fraction displayed a somewhat reduced capacity for scavenging. The scavenging was weak in the water percentage. In actuality, the IC50 for ethyl acetate and methanol extracts was 350 g/ml and 650 g/ml, respectively. BHT had the best capacity for scavenging. One of the radicals commonly employed to assess a compound's or a plant extract's potential radical scavenging capacity is ABTS. The ABTS is offered as a great instrument for assessing the antioxidant activity of hydrogen-donating anti-oxidants (scavengers of aqueous phase radicals), which are produced when ABTS is oxidised by potassium persulfate (Rungruangmaitree and Jiraungkoorskul, 2017).

2. ANTI-BACTERIAL ACTIVITY:

Several studies have demonstrated the antibacterial and antifungal properties of pea protein. The body of literature firmly establishes the existence of antibacterial capabilities in plants with high poly-phenol and flavonoid contents. Peel pea extracts were examined for their antibacterial efficacy against both Gram-positive (S. aureus) and Gram-negative (E. coli, P. aeruginosa, and S. entertica) bacteria. The methanol extract was found to be less efficient than the ethyl acetate extract, which showed varying degrees of antibacterial activity against the majority of the Gram-positive and Gram-negative bacteria tested. P. aeruginosa was the bacterium that responded to the ethyl acetate extract the best, with MIC values of 350 g/ml. Yet, when utilizing ethyl acetate extract, E. coli had the highest MIC value (850 g/ml) (Rehman and Khanum, 2011).

3. FOR ANTI-FUNGAL ACTIVITY

The antifungal properties of the chosen plant extracts were examined in tests using C. albicans, which represents the yeast form, and A. niger, which represents the filamentous fungus. The ethyl acetate and methanol extracts from the solvent extracts studied shown inhibition action against C. albicans with MIC values of 450 and 750 g/ml, respectively. Yet only the ethyl acetate extract had any effect on A. niger. In this instance, pathogenic fungi are more

resistant to plant extracts than pathogenic bacteria, according to Heisey and Gorham's research (Rehman and Khanum, 2011).

4. EVALUATION OF PEA EXTRACT FOR SKIN CARE:

The following in vitro and ex vivo experiments were carried out, followed by a clinical trial to corroborate the results. Tyrosinase activity on common human fibroblasts was assessed to determine the impact of Pisum sativum extract on melanocytes (B16 cell line) (dosage of IL-1 by ELISA). The therapy was administered once for 24 hours at two different concentrations (0.5% and 1.5% Pisum sativum extract) in the culture medium. Without a correspondingly considerable rise in tyrosinase activity, it was found that the levels of IL1 beta had significantly decreased, by 31% and 39%, respectively. Evaluations of mela nin production were also done. A 10% increase in melanin synthesis was found in the in vitro evaluation results. Fresh human skin biopsies were used for ex vivo research after the in vitro experiments. During the course of the study, photographs, customer self-evaluations, and measurements of the melanin index were taken. A dermatologist compared the side treated with the active component to the side treated with a placebo at the start and conclusion of the study to assess how the skin tone changed (Imbert *et al.* 2009).

5. Acute oral toxicity study (AOT)

AOT test was performed according to OECD (Organization of Economic Co-operation & Development) guideline 420 for testing of chemicals. Mice of both sexes (aged 6–8 weeks) were split into two groups, each with six mice (n = 3 ♂ and 3 ♀). The 1st group served as normal control group and received orally 5 mL/kg dist. water containing 1% dimethyl sulfoxide (DMSO) as a vehicle. The 2nd group received orally a single dosage of 5000 mg/kg of *P. sativum* extract (only once). Mice were studied for general behavioral changes, toxicological symptoms, and mortality after receiving *P. sativum* extract for 24 h, with specific focus on the first 4 h (critical) and once daily for 14 days. Based on the findings of the AOT study, two dosages of *P. sativum* were selected as 250 (1/20th) and 500 (1/10th) mg/kg of max. tolerance dose (5000 mg/kg; respectively) for further studies (Eman *et al.*, 2021)

6. DOX-induced oxidative myocardial injury

The next 49 mice were divided into 7 groups (n = 7) at random. Group 1 served as the control group and was given a placebo for three weeks. Animals in groups 2 and 3 received *P. sativum* orally and daily for three weeks at doses of 250 and 500 mg/kg, respectively, as control groups. The DOX model group was Group 4. During a continuous two weeks, 2.5 mg/kg of DOX was administered three times a week alternately to cause myocardial injury. The total cumulative dose was 15 mg/kg over the two weeks. Animals in group 5 got Vit-E (100 mg/kg) orally and daily for three weeks as a pretreatment; following this, they received DOX injections according to the same methodology as groups 4 on days 10, 12, 14, 16, 18, and 20. Animals in groups 6 and 7 received *P. sativum* (250 and 500 mg/kg, respectively) orally and daily for three weeks before receiving DOX injections according to the same methodology as groups 4 on the following days: 10, 12, 14, 16, 18, and 20. Mice were sedated with an intraperitoneal injection of ketamine hydrochloric acid (75 mg/kg) twenty-four hours after the previous dosage before being beheaded.

According to these findings, *P. sativum* peels may have significant preventive properties against heart damage brought on by the chemotherapeutic agent DOX in rats. As a result of suppressing Bax proapoptotic transcriptional activity and increasing Bcl-2 antiapoptotic gene expression, *P. sativum* peel extract increased antioxidant status, reduced lipid peroxidation, stabilised the cardiac cell membrane, and decreased inflammatory reactions. The cardioprotective activity of the pea peel's antioxidant flavonoid glycosides (quercetin, kaempferol, apigenin, and phenolics) may be attributed to these (Xiao *et al.*, 2012).

7. Anti-Cancer Activity

Investigations into the *P. sativum* extracts have revealed that they are generating antitumor activity through pharmaceutical action. Clemente et al. (2005) contrasted the effects of rTl1B and rTl2B, protease inhibitors derived from *P. sativum* seed from the United Kingdom, with those of the Bowman-Birk trypsin-chymotrypsin inhibitor, a possible cancer chemopreventive drug. They looked at the growth-inhibiting effects on the HT-29 human colorectal cancer. The rTl1B displayed an effective IC50 of 46 M.

The lectins from *P. sativum* that were recovered from Egypt and showed antiproliferative properties to liver cancer cell lines were examined by El-Aassar *et al.* (2014). In Saudi Arabia, Patel (2014) isolated lectin from the leaves and buds of *P. sativum* and investigated its cytotoxicity against a variety of cancer cell lines, including MCF7 (breast), HepG2 (liver), HEP2 (larynx), and HCT116 (colon).

Recently, Stanisavljevic *et al.* (2016) determined the quantity of phenolic compounds from Croatian pea seeds of various colours. They noted that the overall phenolic content in the form of gallic acid, epigallocatechin, naringenin, and apigenin was higher in seeds with darker seed colours. On cancerous cell lines such LS174 (colon), MDA-MB-453 (breast), A594 (lung), and K562 (blood), the seed extracts also demonstrated cytotoxic effects.

Because of its high concentration and unique qualities of starch, protein, fibre, vitamins, minerals, and phytochemicals, *P. sativum* has been cited in numerous review publications as having positive health effects. Additionally, plants belonging to the same Fabaceae family, including lucerne (Medicago sativa), carob (Ceratonia siliqua), lentil (Lens culinaris), and soybean (Glycine max), also exhibit anticancer properties (Clemente *et al.*, 2005).

8. Anti-Microbial Activity

Pea peel extracts' antimicrobial properties were evaluated against four types of bacteria: Escherichia coli (ATCC 25922), Staphylococcus aureus (ATCC 25923), Salmonella enterica (ATCC 13883) and Pseudomonas aeruginosa (ATCC 27853). Using *Candida albicans* and *Aspergillus niger*, antifungal activities were examined. These strains were made available by the Centre of Biotechnology of Sfax, Tunisia, from the Tunisian Microorganisms Collection (CTM). The approach previously described was used to carry out antimicrobial activity. In 100% dimethyl sulfoxide (DMSO), the pea peel extracts were dissolved at a concentration of 100 mg/ml. The studied microorganisms' culture suspensions (200 l) were applied to PDA medium and Muller-Hinton agar, respectively. The surface of the inoculated agar plates was covered with sterile filter paper discs (Oxoid, England, 6 mm diameter) that had been impregnated with 50 l of the extracts (100 mg/ml) and allowed to dry. Chloramphenicol and gentamycin were utilised as positive references for bacteria and fungi, respectively, while DMSO served as the negative control. The Petri dishes were incubated at 37°C for 24 hours after being kept in the refrigerator for the first 2 hours to allow prediffusion of the extracts into the agar. There was found to be antibacterial action (Berghe *et al.*, 1991).

CONCLUSION

Our research showed that pea peel extracts are a source of active chemicals, primarily phenols and flavonoids with antioxidant activity. The had antifungal antimicrobial anticancer and antibacterial properties. They also show acute oral toxicity study positive. Purification of the active chemicals needs to be done by additional research. The current study thus provides a foundation for the potential use of pea peel extracts as a traditional folk remedy.

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