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A Versatile Unani Drug: Isabgol (*Plantago ovata*)

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ABSTRACT

Unani system of medicine is one of the Indian systems of medicine. The drug *Isabgol aur Bazar-e-qatuna*, botanically named as *Plantago ovata* (PO), belongs to family *Plantaginaceae* cultivated for their seed husk used in pharmaceutical and cosmetic industry. The word '*Isabgol* comes from the Persian lexicon '*asap*' and '*ghol*' meaning horse ear, owing to the shape of the seed. The mucilage of seeds is neutral in reaction, and neither it is altered by adding or precipitated by boiling with alcohol, nor it is changed by iodine, borax or perchloride of iron. This drug has been used extensively for its various therapeutic purposes such that laxative, astringent, carminative, lubricant, diuretic, anti-inflammatory, antimicrobial and analgesic. In this review, an effort has been made to provide information on medicinal properties of *Isabgol* mentioned in Unani classical literature as well as in recent scientific studies.

INTRODUCTION

The drug *Isabgol,* botanically named as PO, belongs to family *Plantaginaceae.* Out of the 281 species of *Plantago*, only two(2) species, namely *Plantago Ovata* (PO) and *Plantago psyllium* are cultivated for their seed husk used in pharmaceutical and cosmetic industry. The word '*Asapghol*' comes from the persian lexicon '*asap*' and '*ghol*' which mean horse ear, owing to the shape of the seed. Its seeds are widely used in medicine. The seeds when soaked in water become enormously swollen with an abundant coating of adhering mucilage which is free from odor. The mucilage of seeds is neutral in reaction and neither is altered by adding or precipitated by boiling with alcohol, nor is it changed by iodine, borax or perchloride of iron. It is only sparingly soluble in water. Its plant was used in the ancient Greek and Roman medicine. Its preparations are given after colostomy to assist the production of smooth solid fecal mass. The seeds are considered cooling and diuretic, used in febrile conditions, and the affections of the kidneys, bladder, and urethra. The plant is considered to be useful by tribals (*Santhals*) for pain and bronchitis [1-3].

Asapghol is used as a folk medicine in the northern part of Anatolia in Turkey. It is widely used as wounds healing agent and gastric disorders. Seed mucilage is used in cosmetics and as a basic stabilizer in the ice-cream industry. The World Health Organization (WHO) has approved the use of *Plantago* as a laxative agent, to treat hypercholesterolemia and to reduce the blood glucose [4, 5].

DESCRIPTION ACCORDING TO UNANI CLASSICAL LITERATURE

Isabgol is also called *Bazr-e-qatuna*. Its plant is about one(1) meter in height. Leaves are like *dhan* (paddy) and branches are thin, small and long. Three (3) types of *Isabgol* are based on color, such as white, red and black. Among them, white is presumed to be the best, and black is the worst of its use. The seeds are swollen up after placing into the mouth or in water. Covering layer of its seeds is famously known as *saboos-e-Asapghol*. The taste of seeds is insipid and mucilaginous [6-8].

It is famously known as *Asfiyoos* in the Persian language, and in Unani it is known as *Qasliyoos* and *Barghosh.* Ibn Baitar quoted Dioscorides regarding seeds that they have best results [9].

In *Zakhira Khwarzam Shahi*, it is mentioned that *Isabgol* is effective in female diseases, such as *waram-e-rahem* and *quruh-e-rahem*[10].

The plant of *Isabgol* is indigenous to the Mediterranean region and West Asia. It is introduced into India and cultivated in North Gujarat, Rajasthan, Punjab, Uttar Pradesh, Haryana and to a small extent in West Bengal, Karnataka and Coromandal coast, Sidhpur in Baroda state. It is widely distributed in Punjab, Sind, and Persia [3, 5, 11, 12].

The parts of *Isabgol* used are seeds and husk mentioned in Unani classical literature [2, 3, 5, 6, 8, 9, 12, 13-14].

The *Mizaj* of this plant is cold in the third degree and wet in second degree [2, 8, 6, 16].

ETHNO-BOTANICAL DESCRIPTION

It is a stemless and softly hairy or woolly annual. Its leaves are 7.5-23 cm long, scarcely reaching 6mm.broad, narrowly linear or filiform, finely acuminate, entire or distantly toothed, attenuated at the base, usually 3-nerved and flowers in ovoid or cylindric spikes 1.3-3.8 cm. long; bracts 4 mm. long and about as broad as long, broadly ovate or sub-orbicular, concave, membranous except the narrow midrib, glabrous. Calyx 3mm. long, usually glabrous; sepals elliptic, obtuse, concave, scacious, except the midrib which is as broad (or nearly so) in the inner as in the outer sepal. Corolla lobes rounded, 3mm. long, concave, obtuse, apiculate, glabrous. Capsules 8mm long, ellipsoid, obtuse, the upper half coming off as a blunt conical lid, membranous, glabrous. Seeds 3mm. long, ovoid-oblong, boat-shaped, smooth, yellowish brown [2, 13]. Seeds of the *Isabgol* are shown in Figure 1.

Figure 1: Seeds of *Isabgol*

MICROSCOPIC DESCRIPTION

The transverse section (TS) of seed is oval in outline while the longitudinal section is oblong, elliptical. The transverse section cut through one end of the seed shows a central core of radical surrounded by endosperm while the other end of the seed shows two fleshy cotyledons. The structure of the seed coat is simple. The epidermis of the test is composed of polyhedral cells, the walls of which are thickened by a secondary deposit, the source of mucilage. A thin brownish layer is found in between the epidermis and the albumin. The albumin is formed of thick-walled cells which are rich in a matter like the fixed oil and proteins. The cells of the embryo are parenchymatous and packed with aleurone grain [2, 13].

VARIOUS ACTIONS& CLINICAL INDICATIONS

Various actions and clinical indications of *Isabgol* are given below:

Mubarrid (Refrigerant)[5, 7,9,12, 13, 15, 17, 18],*Mujaffif* (Desiccant) [15],*Mulatiff* (Demulcent) [2, 3,5, 12, 13, 17],*Mugharri*(Emollient) [15],*Mushil*(Purgative) [12, 15, 19], *Muhallil-e-Auram*(Antiinflammatory), *Iltehab*(Inflammation)[2, 3,5- 7,12, 13, 15,17, 18, 20], *Qabiz* (Astringent), *Is'hal* (Diarrhoea), *Zaheer*(Dysentery) [2, 3,5- 7, 8,12, 13, 15-17, 18, 20], *Mumallis*(Lubricant) [2, 9,12, 13,16, 17, 19], *Muddir-e-Baul* (Diuretic) [2, 3, 5,7, 13,15], *Naffakh*(Flatulent) [15], *Munawwim*(Hypnotic) [2, 17], *Mulayyin* (Laxative), *Qabz* (Constipation) [2, 3,5- 7, 8,12, 13, 15-17, 18, 20],*Muhallil*(Resolvent)[6, 7,8, 13,15,17],*Musakkin-e-Atash wa Hararat*(Thirst and heat relaxant)[2, 7, 9,12, 13, 15, 16, 17, 19, 20],*Khashunat-e-Halaq-wa-Zaban*(Dryness of larynx & tongue)[6-9,12,15,16,19], *Musakkin-e-Alam*(Analgesic/Anodyne), *Suda*(Headache)[6, 7,15],*Dafa-e-Humma*(Antipyretic/Febrifuge), *Humma* (Fever)[9,20],*Munafa-e-Amraz-e-Damviya*(Useful in blood disorders) [6], *Muqawwi-e-Sha'ar* (Hair tonic) [6,9,15], *Sual* (Cough)[3, 7, 12, 13, 15, 17-19], Waram-*e-Rahem*(Metritis) [10, 20], *Waja-ul-Mafasil*(Arthritis), *Niqras*(Gout)[6, 9, 15, 20], *Bawaseer*(Haemorrhoids)[3, 12, 15].

PHYTOCHEMICAL STUDIES

Atal *et al.*, (1964) was reported that embryo oil of the seeds of the PO is a good source of linoleic acid [21].

Patel *et al.*, (1979) was found a number of amino acids in the combined form, viz., valine, alanine, glycine, glutamic acid, cysteine, lysine, leucine, and tyrosine in its seeds. Valine, alanine, and glutamic acid were also found in the free form in PO [22].

PHARMACOLOGICAL STUDIES

Antibacterial study

Motamedi *et al.*, (2010) carried out a study on the antibacterial effect of ethanolic and methanolic extracts of PO and *Oliveria decumbens* endemic in Iran against some pathogenic bacteria. The results of the study showed that these plants had a proper antibacterial effect and could be considered as a new source of antibiotic discovery and development for infectious disease treatment purposes [23].

In another study, Bokaeian *et al.*, (2014) studied the antibacterial activity of silver nanoparticles produced by PO seed extract against antibiotic-resistant *Klebsiella pneumonia*. The seeds of POwere used for silver nanoparticle synthesis. It was concluded that at a specific dose, chitosan-based AgNPs killed bacteria without harming the host cells, thus representing a potential template for the design of antibacterial agents to decrease bacterial colonization and to overcome the problem of drug resistance [24].

Gastrointestinal motility study

Mehmood *et al.*, (2011) studied gastrointestinal motility disorders (constipation and diarrhoea) in the psyllium husk (*Ispaghula*) pharmacologically. The results of the study showed that *Ispaghula* has agut-stimulatory effect, mediated partially by muscarinic and 5-HT4 receptor activation, which might complement the laxative effect of its fiber content, and a gut-inhibitory activity possibly mediated by blockade of Ca_2 channels and activation of NO-cyclic guanosine monophosphate pathways [25].

Laxative study

Gilani *et al.*, (1997) evaluated the laxative activity of seed husks of PO (*Ispaghula*). The aqueous-methanol extract (1-10 mg/ml) of husks (obtained from a market in Pakistan) caused contractions of guinea pig ileum in a dose-dependent manner similar to that observed in the presence of acetylcholine. The results of the study indicated that the stimulatory effect of

Ispaghula at lower doses was mediated through an Arch-like mechanism and the effect of high doses was mediated partially through an unknown mechanism [26].

Antiulcerogenic study

Sahagun *et al.*, (2015) studied the antiulcerogenic effect on the duodenal mucosa of the soluble fiber PO husk. On the basis of results of the study, it was suggested that PO husk might protect intestinal mucosa probably by limiting acetylsalicylic acid penetration into epithelial cells although further studies were needed to confirm the same effect in other experimental models of induced mucosal damage and to elucidate the mechanisms of fiber protection [27].

Hypolipidemic study

Trautwein *et al.*, (1997) reviewed the hypolipidemic effect of psyllium (extracted from PO). The mechanisms responsible for the hypocholesterolemic effect of psyllium are elucidated, based on data from animal studies. The beneficial effect of psyllium was compared with that of other soluble fibers [28].

Romero *et al.*, (2002) studied the potential hypolipidemic effects of the seeds from the PO and the mechanisms associated with the lowering of plasma lipids. Male Hartley guinea pigs (n = 30; 10 per group) were fed either a control diet or diets containing 7.5 or 10 g/100 g PO for 4 wks. The results of the study suggested that PO exerted its hypolipidemic effect by affecting bile acid absorption and altering hepatic cholesterol metabolism [29].

Development of a tent

Mitra & Khara (1981) evaluated the tent prepared by using *Isabgol* husk named Dilex-C for its ability to produce a slow dilatation of the cervix. In 60 pregnant women (in the first trimester) Dilex-C could be inserted easily without anesthesia. There was no cervical injury and the process of evacuation was complete in all women within 24 hours and there was no incidence of subsequent cervical uterine infection. None of the women required any blood transfusion. Thus, the distinct advantages of Dilex-C were the ease of insertion, safety, economy, and efficacy [30].

Clinical Study on Irritable Bowel Syndrome (IBS)

Golechha *et al.*, (1982) carried out a double-blind crossover clinical trial. It was undertaken on the effect of *Isabghula* husk and placebo in 26 patients of irritable bowel syndrome. After 6 weeks treatment, significant improvement was reported in 50 percent patients receiving *Ispaghula* husk and in 23 percent receiving placebo. The results of the study showed the best results of *Ispaghula* husk in patients with constipation due to spastic colitis. It was observed that the husk had the least effect in patients with mucous diarrhea [31].

Chronic constipation study

Voderholzer *et al.*, (1997) carried out a study on clinical response to dietary fiber treatment of chronic constipation (84% women) patients. The results of the study concluded that slow gastrointestinal transit and/or a disorder of defecation might explain a poor outcome of dietary fiber therapy in patients with chronic constipation. It was suggested that high dose fiber treatment should be conducted before technical investigations were performed [32].

Antihemorrhoids study

Perez *et al.*, (1996) conducted a study on the effect of fiber supplements on internal bleeding hemorrhoids in 50 patients (48.3ñ13 years old). Patients were randomized into 2 groups. In the fiber group, hemorrhoids bled on contact in 5 out of 22 patients before treatment and in none after treatment; no differences were found in the control group. The study was concluded that the addition of dietary fiber might gradually improve the condition of internal bleeding hemorrhoids [33].

BIO-TECHNOLOGICAL STUDY

Bhattacharya *et al.*, (1994) studied the use of low-cost gelling agents and support matrices for industrial scale plant tissue culture. The efficacious of sago (from Metroxylon sagu), *Asapghol* as gelling agents, those of filter paper, nylon cloth, polystyrene foam and glass wool cloth as support matrices were tested for the propagation of chrysanthemum plantlets. The results showed that the potential of the substitutes for economic commercial application, replacing the costliest, though not indispensable, gelling agent agar [34].

CYTOMEIOTIC STUDY

In a study, Pandita (2013) analyzed the cytomeiotic activity of PO. It was generally an in-breeder and was characterized with the narrow genetic base, because of low chromosome number, chromosome size, chiasmata frequency, recombination index and abundance of heterochromatin in chromatin material. The various stages of meiosis viz; Pachytene, Diplotene, Diakinesis, Metaphase, and Anaphase were observed. The number of rod bivalents was 04 in PO. The recombination index at Diakinesis of PO and at Metaphase was 10 and 7, respectively. The personalization coefficient was 0.33 in PO [35].

PHARMACEUTICAL STUDY

Gulati *et al.*, (1982) studied the efficacy of a new technique for sustained release dosage form viz., imbibed *Ispaghula* husk had been reported [36].

Rao *et al.*, (2010) formulated and evaluated the development of fast dissolving tablets of the carbamazepine by wet granulation method, using different concentrations of a natural super-disintegrating agent like PO seed powder and mucilage. The results of the study concluded that fast dissolving tablets of the poorly soluble drug, carbamazepine showing enhanced dissolution, would lead to improved bioavailability, improved effectiveness and hence better patient compliance by using natural superdisintegrant like PO mucilage [37].

Devesvaran *et al.*, (2009) studied the disintegrating properties of mucilage and seed powder of *Isabgol* (PO) by formulating dispersible tablets of famotidine. The results of uniformity of dispersion showed that no particles were retained on sieve no. 22 and the *in vitro* dissolution profile exhibited maximum drug release from all the formulations [38].

Sahay (1999) conducted a study on the use of psyllium, (Asapghol) as an alternative gelling agent for microbial culture media. The mucilage husk of the medicinal plant, PO, was successfully used as an alternative gelling agent (5 % w/v as ground husk for pouring medium and 4% w/v as ground husk in combination with 0.5% agar for slant) for microbial culture [39].

Srinivas *et al.*, (2003) carried out a study of *Ocimum basilicum* and PO as disintegrants in the formulation of dispersible tablets. The results of the study showed that PO seed powder and mucilage powder were effective in low concentrations (5%) as disintegrants compared to others [40].

SUMMARY

Unani medicine is a traditional system of medicine has been practiced in India subcontinent. There is vast experience-based evidence of uses of Unani drugs mentioned in the Unani classical literature. *Isabgol or Bazre-e-qutuna* is widely used in pharmaceutical and cosmetic industry. Unani scholars had described three types of *Asapghol* extensively used for a number of human ailments as is evident from Unani classical literature. In present time scientific studies have been performed on *Asapghol* namely phytochemical, pharmacological, pharmaceutical and clinical studies. Many studies found its strong laxative, astringent, carminative, lubricant, diuretic, anti-inflammatory, antimicrobial, and analgesic. Therefore, more researches can be done to exploit the unexplored potentials of *Isabgol* which have already been mentioned in the Unani classical literature.

CONFLICT OF INTEREST

There is no conflict of interest.

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