



Isabgol (*Plantago ovata* Forsk.) - A Medicinal Herb: Good Source of Income Generation in Water Scarcity Regions

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Isabgol (*Plantago ovata* Forsk.) is an important herb that has been used in health care for many centuries in South Asia, whereas it is now widely used for its medicinal properties all over the world. It is mainly grown for husk which is used for the treatment of stomach disorders, tridosa, burning sensation, habitual constipation, gastritis, chronic diarrhoea, dysentery and colonic pain. It also being used in modern food industries for preparation of ice cream, candy etc.

Introduction

Isabgol (*Plantago ovata* Forsk.) is medicinal plants that have originated from arid and semi-arid zones and are used widely in traditional and industrial pharmacology. Seeds and husks of Isabgol are also used widely in pharmacology as laxatives. Interest in Isabgol has risen primarily due to its use in high fiber breakfast cereals and from claims that it is effective in reducing cholesterol. The World Health Organization (WHO) has estimated that more than 80% of world population in developing countries depends primarily on herbal medicine for basic healthcare. International market of medicinal plants is over US \$ 60 billion per year. India ranks first in isabgol production (98%) and the sole supplier of seeds and husk in the international market. India exports herbal materials and medicines to the tune of nearly 600 crores annually. India holds a monopoly in its production and trade in the world market and hence Isabgol is a major foreign exchange earner (Rs. 30 million annually). It is an annual herb and cultivated in Rajasthan, Gujarat, Madhya Pradesh & Haryana.



Plant Characteristics

Isabgol (*Plantago ovata* Forsk) belonging to family Plantaginaceae, is an annual herb that attains a height of 30–45 cm. Leaves are born alternately opposite, linear or linear lanceolate on the stem. A large number of flowering shoots arise from the base of the plant. Flowers are numerous, small, and white. The seeds are enclosed in capsules that open at maturity. The seed and husk are generally used for medicinal purpose. The husk is the seed epidermis made of polyhedral cells whose walls are thickened by a secondary deposit which is source of mucilage. The coating of seed provides the husk on

mechanical milling. The seed husk is age-old medicine in ayurveda for the treatment of constipation. The husk derived from *P. ovata*, also referred to as ispaghul or psyllium mucilloid. The husk absorbs water, increases moisture content in stool and swells up to give increased bulk in intestine which leads to solve the problem of constipation.

Composition of Seed

The seeds of isabgol are composed of many different types of chemicals that are used as medicine. It contains mucilage, fatty oil, proteins, carbohydrates, mineral element, etc. Psyllium husk is obtained by milling the seeds which contains a high proportion of a hemicellulose that is composed of a xylan backbone linked with arabinose, rhamnose, and galacturonic acid units.

Medicinal Properties

The husk widely used as a tool bulking agent for the treatment of constipation. Its laxative effect has been attributed to its ability to form a gel in water. They are used as a demulcent and as a bulk laxative in the treatment of constipation, dysentery and other intestinal complaints, having a soothing and regulatory effect upon the system. Their regulatory effect on the digestive system means that they can also be used in the treatment of diarrhoea and irritation of haemorrhoids. The jelly-like mucilage produced when psyllium is soaked in water has the ability to absorb toxins within the large bowel. Thus it helps to remove toxins from the body and can be used to reduce auto-toxicity. The oil in the seed embryo contains 50% linoleic acid and has been used as a preventative of atherosclerosis. It is also effective in reducing cholesterol levels in the blood. The husk has the property of absorbing and retaining water and therefore, it works as a Diarrhoea drug. It is beneficial in chronic dysenteries of amoebic and bacillary origin. It is also used for treating constipation and intestinal disorders because it works calorie free fiber food, protein regular bowel movement. It is reported to have no adverse side-effects. The seed has also cooling demulcent effects and is used in Ayurvedic, Unani and Allopathic system of medicine. The seed is sweet, astringent, refrigerant, emollient, mucilaginous, diuretic, laxative, antiinflammatory, dysenteric, expectorant, aphrodisiac, roborant and tonic. The seeds and husks are used in inflammations of the mucous membranes of gastro-intestinal and genito-urinary tracts, due to ulcers, gonorrhoea and piles. It can also be used as a cervical dilator for the termination of pregnancy. In addition to these medicinal uses, it has a place in dyeing, calico printing, in the ice-cream in as a stabilizer also in confectionery and cosmetic industries.

Other Uses

The seed without the husk, which contain about 17-19% protein, is used as cattle feed. Proteins are made up of long chains of amino acids, and are the main substrates for odour production. Proteins are the precursors for sulphurous, indolic and phenolic compounds and volatile fatty acids. Carbohydrate increases neural activity in a number of regions of the brain and in the mouth has been shown to improve performance during prolonged physical activity. The seed husk contains colloidal mucilage (30%), mainly consisting of xylulose, arabinose, galacturonic acid with rhamnose and galactose etc. The seed (embryo) yield 14.7% of a linoleic acid –rich oil and small amounts of glycoside acubin and tannin. Seed oils are used to make soap, paint, printing inks, and other industrial supplies. Recently, it is increasingly being used as a food additive in several processed materials like cookies, ice-cream, bread, etc.

Management Practices for Cultivation

Soil

Crop grows well in sandy loam to loamy soils at pH 7.2 to 8.5 but avoid soils with poor drainage. The crop can also be grown on clay loam, medium black, black cotton and heavy black soils. It can be grown well in saline soils with poor quality water in arid areas. The land should be free from inherent

contamination of any chemical pesticides and should be away from any potential source of contamination.

Climate

Isabgol is a *rabi* crop; and needs cool and dry weather during growth period. The temperature required for germination is about 20°C-25°C, whereas, 30°C-35°C at the time of maturity. It requires 50-125 cm annual rainfall.

Land Preparation

Field must be free from weeds and clods. The seeds are of small size and require a fine soil tilth for better germination of the seeds. By ploughing and harrowing bring the soil to fine tilth. About 10-15 tonne of farm yard manure per hectare should be well mixed into the soil.

Sowing

Early sowing with high seed rate makes the crop susceptible to downy mildew and increases more vegetative growth resulting in to lodging. Whereas, late sowing reduces total growth period and increases risk of seed shattering due to pre-monsoon rains towards maturity. Hence, last week of October to second fortnight of November is considered as ideal time for sowing. Early sowing with high seed rate makes the crop susceptible to downy mildew. For good germination fresh seeds should be used @ 4 kg per hectare after treatment with Mercuric compounds @ 3 mg/kg. Since the seeds are small and light in weight, they should be mixed with sufficient quantity of fine sand. Line sowing at of 30 × 5 cm row to row and plant to plant spacing give better yield over broadcasting.

Improved Varieties

Varieties	Seed yield (kg/ha)
Gujarat Isabgol 1 (GI 1) 800	800-900
Gujarat Isabgol 2 (GI 2)	900-1000
Gujarat Isabgol 3 (GI 3)	1300
Jawahar Isabgol 4 (MIB 4)	1300-1500
Haryana Isabgol 5	1000-1200
Niharika	1000-1200

Irrigation

Immediately after sowing light irrigation is essential. Seed germination takes place within 6-7 days. If the germination is poor second irrigation is given. Last irrigation is given when the maximum spikes at milk stage. Crop requires 6-7 irrigations. Plant can withstand low level of salinity hence; slightly saline water (up to 4 ds/m electrical conductivity) can be used for irrigation purpose. Increase in salinity beyond this level reduces seed yield significantly. Low water requirement as compared to traditional crop makes it suitable for such areas.

Weeding

The field should be kept weed free during early vegetative growth. Two hand weeding are sufficient to control the weeds. The first weeding is very critical for crop-weed-competition and must be done at 20-25 days after sowing and second at 35-45 days after sowing. Pre-emergence application of Isoproturone @ 500-700 g/ha is done for control of the weeds effectively and increase the profits.

Fertilizer

Application of 50 kg N + 25 kg P₂O₅ per hectare is recommended. Nitrogen is given in two splits. First dose of N as basal and second dose should be given 30 days after sowing. Potassium can be applied where the soil are inherently deficient in potassium.

Diseases

Downy mildew at the time of spike initiation is a major disease; intensity is high under humid weather condition. Downy mildew can effectively be controlled by; (a) seed treatment with Metalaxyl (Apron SD) at the rate of 5 g per kg seed, and (b) spraying of Metalaxyl and Mancozeb (Ridomil MZ 0.2%) together at 10-days interval. Effective disease management can increase seed yield more than 40% over the untreated diseased crop. It can also be controlled by using Bordeaux mixture 6:3: 100 or Dithane M - 45/ Z -78 @ 2.0 to 2.5 g/L.

Insect Pests

White grubs, termites damage the crop by cutting the roots. Use of Lindane 65 % @ 125 kg / ha should be done. Aphid, *Apis gossypii* is the major insect of isabgol crop. It generally appears 50-60 days after sowing. Two spraying of 0.025% Oxydemeton methyl (Metasystox 25 EC), first during first fortnight of February and subsequent spray at an interval of 15 days is recommended to effectively control of this insect which results in an increases of the seed yield upto 40 per cent.

Harvesting and Threshing

The crop will be ready for harvesting in March or April (100-120 days) duration). When the crop is mature and husk turns yellowish and spikes turn brownish or red. Seeds are shed when the spikes pressed lightly. The harvesting should be done in dry atmosphere; by cutting the plants 15 cm above the ground late in the morning. The produce is threshed and seeds are separated. Dried-harvested material is bundled in cloth and threshed preferable in the early morning for easy separation of spikes.

Yield

The average yield comes to 800-1000 kg/ha. Straw yield is twice of the seed yield (1200-1600 kg/ha). By adopting all the recommended cultivation practices, the cultivation costs is about 15,000/- and gives net return of 20,000/- per hectare. The average price of the seed is around Rs. 35 to Rs. 55 per kg.

Marketing and Processing

Marketing is an important aspect for getting better profit and must keep in mind before cultivation. Marketing takes place through Commission Agents or Processing Mills. During processing seed is passed through series of six grinding mills to separate out the husk from the seed. The total recovery of husk is around 30%. The husk from last two grindings is of superior quality. The husk is bought by the pharma and drugs companies. The dehusked grain is sold as animal or bird feed.

Crop Rotation

Use of nitrogenous fertilizers for the cultivation of isabgol can be minimized by following crop rotation with leguminous crops like groundnut, black gram or green gram during *khariif* season. Leguminous crops not only adds the N (15-25 kg/ha) to the soil but also improves the soil physical and chemical properties and gives better returns of the crop in rotation. The following crop rotations can be adopted:

- Soybean-Isabgol
- Maize-Isabgol
- Sorghum-Isabgol
- Groundnut-Isabgol
- Maize-Isabgol-Green gram