

Good Agricultural Practices for Isabgol



**ICAR – DIRECTORATE OF MEDICINAL AND AROMATIC PLANTS RESEARCH
BORIABI, ANAND – 387 310, GUJARAT**

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Isabgol plant



Isabgol seeds

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FOREWORD

Medicinal and aromatic plants are consumed by herbal industries, Ayurvedic industries, Pharmaceutical industries, household usages and export. Still, 90% raw drugs are collected from forest out of which 70% are collected by destructive harvesting methods. This resulted into dwindling natural resources, reduced biodiversity and irregular supply. Cultivation of medicinal plants ensures sustainability and uniformity of the plant material thus, ensuring quality of raw drugs. Good agricultural practices (GAP) are the pre-requisite for the medicinal plants cultivation and certification to produce good quality raw drugs.

Isabgol (Plantago ovate) is a short-stemmed annual herb that grows up to a height 30 to 40 cm. India is largest exporter of isabgol in the world, mainly produced in Gujarat and Rajasthan. In India, use of isabgol is as old as the Ayurveda System of Medicine. Isabgol is mainly grown for its husk which is used for the treatment of stomach disorders, tridosa, burning sensation, habitual constipation, gastritis, chronic diarrhoea, dysentery and colonicalgia. It also being used in modern food industries for preparation of ice cream, candy etc.

I am happy that ICAR- DMAPR, Anand has taken an initiative in compiling and publishing this extension bulletin that would serve as useful guide to the isabgol cultivators for the production of better yield and quality raw material.



(Jitendra Kumar)

Anand

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Good Agricultural Practices for Isabgol



1. Name of the plant

1.1 **Scientific name:** *Plantago ovata* Forsk.

1.2 **Local name:**

Hindi: Isabgol, Isabgul

English: Blond Psyllium, Spogel seeds

2. Plant parts used for medicinal purpose

Isabgol seed and seed husk (epicarp of seed) are used for medicinal uses.

3. Uses

In India, use of isabgol is as old as the Ayurveda System of Medicine. The seeds are sweet, astringent, refrigerant, emollient, mucilaginous,

diuretic, laxative, anti-inflammatory, antidysentec, expectorant, aphrodisiac, roborant and tonic. The isabgol husk is used mainly for treatment of stomach disorders, tridosha, burning sensation, habitual constipation, strangury, gastritis, chronic diarrhoea, dysentery and colonicalgia. Besides this, now-a-days it is used in food industries for preparation of ice cream, candy etc.

4. Characteristics of the plant

Isabgol is a short-stemmed annual herb that grows up to a height 30 to 40 cm. A large number of flowering shoots arise from the base of the plant. The word isabgol was originated from the Persian words “isap” and “ghol” that mean horse ear, which is descriptive of the shape of the seed. Isabgol is also called as *Psyllium*, originated from a Greek word for a flea, referring to the size, shape, and whitish colour of the seed, which is the commercially important part of this plant. The seeds are enclosed in capsules that open at maturity. The seed husk is thin, boat shaped, white, translucent, odourless with mucilaginous taste. The root system has a well developed tap root with few fibrous secondary roots.



5. Major production areas

Isabgol is extensively cultivated in many parts of the world. It is a native of the Mediterranean region and West Asia, extending up to Sulej and Sindh in Pakistan. It is also distributed in Canary Islands across Southern Spain, North Africa, Middle East and North-Western Asia. In India it has been introduced and cultivated in North Gujarat and adjoining parts of Western Rajasthan and Madhya Pradesh. However, the crop is spreading in non-traditional parts of the country such as Punjab, Haryana, Uttar Pradesh and Karnataka.

6. Cultivation methods

6.1 Climate

Originated from Mediterranean region and commercially grown in north western India, isabgol essentially a cool and dry *rabi* season crop. Since, the papery seed husk can absorb water many times than its own weight and swell and drop off due to increase in weight.

Hence, unseasonal rain or, even high dew deposition during the crop maturity is the major deterrent factor in isabgol cultivation and can cause total loss of the seed yield. Thus, regions receive winter rains are not suitable for isabgol cultivation. The temperature requirement for maximum seed germination is reported 20°C-25°C, whereas, at the time of maturity it requires 30°C-35°C temperature. It requires 50-125 cm annual rainfall.

6.2 Soil

Land selection for the cultivation of isabgol is the first and foremost step to produce safe and good quality product. The land should be free from inherent contamination of any chemical pesticides and should be away from any potential source of contamination. The land should also have access to a clean and reliable source of irrigation water. Isabgol is most suitable to grow on well drained, light sandy to sandy loam soils. Soils with poor drainage are not conducive for good growth and successful cultivation of this crop. However, recently it has been successfully cultivated on clay loam, medium black, black cotton and heavy black soils. The crop can withstand a low level of soil salinity with a pH between 7.2-7.9.

6.3 Land preparation

Field must be free from weeds and clods. Isabgol seeds are of small size and require a fine soil tilth for better germination of the seeds. Hence, depending upon the soil condition, previous crop and degree of weed infestation, the land is ploughed and harrowed to bring the soil in proper fine and friable condition. The whole field is subdivided into small plots of suitable size depending upon soil types and slope to facilitate irrigation. A plot size of 8-12 m × 3 m is desirable for light soil. Nourish the soils with plenty of organic matter. Care must be taken while procuring the organic manures and composts that it should not be made from city waste and human excreta and be well decomposed. About 10-15 tonne of farm yard manure per hectare should be mixed into the soil at the time of last ploughing.

6.4 Sowing time

Early sowing of isabgol increases more vegetative growth resulting in to lodging and susceptibility to downy mildew disease. 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 of isabgol. Yield reduction were noticed when sowing is delayed beyond first fortnight of December.

6.5 Method of Sowing

Direct sowing by broadcasting is a common practice followed by the farmers since long time. However, line sowing at of 30×5 cm row to row and plant to plant spacing give better yield over broadcasting and facilitate better intercultural operations. The seeds are very small hence mixed with soil or sieved farm yard manure for easy sowing. After sowing the seeds are covered by light one-way sweeping with a broom/ tree twigs having foliage. For uniform germination, care should be taken that the seeds do not get buried deep in the soil. A light irrigation with slow rate of flow is given immediately after sowing. With higher flow rate, the seeds may be carried out to one end of the plot and or get buried deep in the soil, resulting in poor seed distribution and uneven plant stand. If the germination is poor after 6-7 days of sowing, a second irrigation should be given.



6.6 Propagation material

Isabgol is commercially propagated through seeds. Use good quality seeds harvested during the previous season and free from pests. Seeds should be procured from a reliable source with the label of variety, origin and date of harvest.

6.7 Recommended varieties

The recommended high yielding varieties of isabgol and their source of availability are:

| Varieties | Seed yield (kg per hectare) | Source of availability |
|--------------------------|-----------------------------|--|
| Gujarat Isabgol 1 (GI 1) | 800-900 | MAP unit, Anand Agricultural University, Anand, Gujarat. |
| Gujarat Isabgol 2 (GI 2) | 900-1000 | MAP unit, Anand Agricultural University, Anand, Gujarat. |

| | | |
|---------------------------|-----------|--|
| Gujarat Isabgol 3 (GI 3) | 1300 | Spices Research Station, Jagudan, S.D. Agriculture University, Sardarkhrushi Nagar, Gujarat. |
| Jawahar Isabgol 4 (MIB 4) | 1300-1500 | MAP unit, College of Horticulture, RVSKVV, Mandsaur, Madhya Pradesh |
| Haryana Isabgol 5 | 1000-1200 | MAP unit, CCS Haryana University of Agriculture, Hisar, Haryana. |
| Niharika | 1000-1200 | CIMAP, Lucknow, Uttar Pradesh |

6.8 Seed rate

Mature, bold and disease free seeds from previous year crop are used for sowing. A seed rate of 4 kg per hectare is found optimum for good plant stand. Higher seed rate increases susceptibility to downy mildew disease.

6.9 Crop nutrition:

Optimum crop nutrition should be ensured to obtain higher yields of good quality produce. Soil testing should be done before applying the nutrients. Use of organic manure preferred over inorganic sources of nutrients for growing of isabgol. Organic manures like, farm yard manure, vermicompost, green manure etc. may be used as per requirement of the crop. Isabgol requires very low levels of nitrogen. Hence, inorganic nitrogen should be applied when the soil is very low in available nitrogen (<120 kg per hectare). Application of 20-30 kg per hectare of nitrogen and 15-25 kg per hectare of phosphorous is optimum to achieve higher yield of isabgol. Potassium can be applied where the soil are inherently deficient in potassium. Half dose of the nitrogen and full dose of phosphorous are applied at the time of sowing. Remaining half dose of the nitrogen is applied at 40 days after sowing as top dressing.

6.10 Irrigation

Use good quality water from a clean source for irrigation. Irrigate crop according to the water requirement because too little or too much irrigation may deteriorate the quality. In sandy loam soils generally 3 irrigations are required each at sowing, and 30 and 70 days after sowing to harvest good yields. The last irrigation should be given at milk stage. In the drier region with light soil, more irrigation (6-7) may be given. Since, 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.

6.11 Intercultural operations and weeding

Manage the weeds before they start competing with the crop for nutrients and light. Intercultural operations, two hand weeding are generally required within two months of sowing to control the weeds. The first weeding is very critical for crop-weed-competition point of view and must be done at 20-25 days after sowing. Pre-emergence application of Isoproturone at the rate of 500-700 g active ingredient per hectare is recommended to control the weeds effectively and increase the profits.

6.12 Crop rotation

Use of nitrogenous fertilizers for the cultivation of isabgol can be minimised by following crop rotation with leguminous crops like groundnut, black gram or green gram during *kharif* season. Leguminous crops, besides addition of 15-25 kg nitrogen per hectare, improves the soil physical and chemical properties and gives better returns of the crop in rotation. The following crop rotations are being adopted in various parts of India.

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

6.13 Insect pest and disease management

Areas which have low incidence of insect pests and diseases should be preferred for the cultivation of isabgol. Use of cultural methods, biological methods and mechanical methods are recommended for insect pest and diseases control in medicinal crops. Appropriate seed treatment with biological pesticides is preferred. Use of chemical pesticides only if there are no other options and only if there is sufficient time between application and harvest to guarantee that the chemical cannot be detected in the final product.

6.13.1 Diseases

Downy mildew is the major disease of isabgol caused by *Peronospora plantaginis* and cause severe yield loss, if not controlled. Early sowing, higher seed rate, higher dose of nitrogen and frequent irrigations make the crop more susceptible to this disease. 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. Other disease like damping off, leaf blight etc. does not cause much damage to the crop under normal cultivation conditions.

6.13.2 Insect pests

Aphid, *Apis gossypii* is the major insect of isabgol crop. Aphids generally appear 50-60 days after sowing. Application of neem based formulations is preferred as a control measure. However, two spray 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 this insect. It increases the seed yield by 40% over the unsprayed crop and gives the cost:benefit ratio up to 1:16.8. White grub and termites may also damage the crop by cutting off the roots.

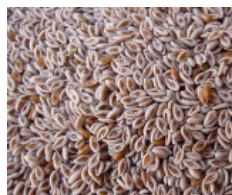
6.14 Harvesting

All the tools, containers and sacks to be used in harvesting should be washed, cleaned and dried. Harvesting should be done at the right stage to ensure better quality of produce. The crop should be harvested in the dry weather and not in rains or early in the morning when there is dew on the ground. Isabgol begins blooming two months after sowing and become ready to harvest during February-March. The crop takes 110-120 days to mature. At maturity the leaves become yellowish and spikes turn brownish in colour. The crop is harvested when plants are completely dried and seeds turn dark brown. The crop should be harvested when the dew dries out preferably after 10 a.m. and atmosphere becomes dry. To avoid the seed loss by shattering, slightly unripe spikes also can be harvested if there is possibility of unseasonal rain. However, the husk quality deteriorates from such harvest. Harvesting is done generally by

cutting at the ground level or uprooting plants when soil is very loose. Plants should be dried in sun until they are threshed.

7. Post harvest processing

Post harvest processing is usually the most critical stage in determining the end quality of the product. The harvested produce should be prevented from any contamination, degradation and/ or damage at any stage of processing. Transport the harvested plant material to the processing site and protect from heat and rain during transportation. The processing site should be clean and protected from direct sunlight and rain. Use a clean surface, preferably a cemented floor or a tarpaulin sheet which is in good condition, for laying out the harvested material. Remove weeds and other extraneous physical matter and substandard material. After couple of days, the seeds are separated by trampling using tractor or bullocks. The seeds are also threshed by motor/ tractor operated threshing machine.



Seed



Husk

Processing of husk from seeds is done in mills. About 25% husk is obtained on weight basis of the seeds. Isabgol husk is removed by grinding and then purified by sieving the mixture to separate the husk from the remainder of the seed parts or by blowing the husk away from the impurities. Pack the produce into clean and dry sacks, ensuring it is clearly labelled. Store the produce in a clean and dry room. Raise the sacks off the ground, away from the wall and not with fertilizers or pesticides. Use of rat poison and fumigation should be avoided in the storage rooms. As per the traders view the isabgol seeds has the longer shelf life. The dry seeds can be stored for 8-10 years.

8. Documentation of activities

The documentation of all the activities starting from cultivation to post harvest processing should be in continuation and maintained properly. Records should be kept for each activity of cultivation such as sowing, weeding, irrigation, harvesting, and of post-harvest processing after harvest to sorting, drying, grading, packing and

storage, with details of time and type of activity that refers to a complete history and ensure traceability of the final product.

9. Yield and economics

On an average 800-1000 kg per hectare seed yield of isabgol is obtained. However, higher seed yield of about 1500 kg per hectare can be obtained from medium textured soils with better crop management practices. Isabgol straw yield is twice of the seed yield and about 1200-1600 kg per hectare is generally obtained. Following all the good cultivation practices, isabgol cultivation costs about ₹15,000/- and gives net return of ₹20,000/- from the one hectare crop.

10. Marketing

Isabgol seeds may be marketed as a whole, or the husks may be sold separately. Isabgol husk is bought by the pharma and drugs companies. Internationally the main buyers are Procter & Gamble (USA), Dr. Morepen (USA) and Al Parigo (USA). India exports isabgol seeds and husk worth more than ₹35 million annually. Out of total production, 75% from Gujarat and about 90% from Rajasthan is exported with nearly 93% of being husk. There are around 70 organisations all over the country undertaking export of isabgol husk and seed. Most of the leading exporters/ processors are based in Sindhpur in Mehsana district and in Palanpur in Banaskantha district of Gujarat. Farmers from Rajasthan and Madhya Pradesh are also used to sale their produce in Gujarat.

11. Market demand

The production of Isabgol is demand driven but solely depends on the climatic conditions. Every year about 90,000 tonnes of isabgol is required to be produced in order to meet the domestic demand. From high fibre breakfast cereals, breads and ice cream to medicines, isabgol is now a popular ingredient with food product designers. Isabgol export is growing at 15% every year, and now India dominates the world market in the production and export of isabgol (80% share). Isabgol husks and industrial powders are exported to the countries like; U.S.A., U.K., France, Germany, Japan, Indonesia, Canada, Mexico, Sweden, Spain, Norway, Italy, Australia, Denmark, Korea, Pakistan, Gulf countries and some other small countries.

12. Crop calendar

| Major activity | Month | Activity details |
|--------------------------------------|--|---|
| Land preparation | First fortnight of October | Field should be prepared to achieve fine tilth and apply 10-15 tonnes farm yard manure per hectare |
| Sowing | Last week of October to second fortnight of November | 4 kg seeds per hectare sown at 30×5 cm spacing. After sowing the seeds are covered by light sweeping with a broom/ tree twig and give a light irrigation |
| Irrigation | November-February | Apply 6-7 irrigations in light soils |
| Intercultural operations and weeding | December-January | Two hand weeding, first at 20-25 days and second at 60-70 days after sowing |
| Spraying | January-February | Spray neem based bio-pesticides or metalaxyl and mancozeb together at 10-days interval to control downy mildew and two spray of 0.025% oxydemeton methyl to control Aphid |
| Harvesting | March | Harvest when plants are completely dried and seeds turn dark brown. Harvest the crop by cutting at ground level or uprooting the whole plant |
| Post harvest operations | March-April | Harvested plants are Sun dried for 3-4 days and then threshed. Separate the substandard material from the good quality seeds. Separate of husk from seed through grinding and sieving |
| Documentation | Through out the year | All the activities from sowing to harvesting and post harvest processing should be documented |



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