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**Council of Scientific &
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The *Heeng* in India

Country's First Effort to Cultivate the Top Condiment

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Training organised at farmers' field



Training organised at Kwaring, Lahaul & Spiti



Training organised at Beiling, Lahaul & Spiti



Heeng plantation by Dr. Shekhar C. Mande,
Secretary, DSIR and Director General, CSIR
at Janjehli, Mandi on 7 November 2020



Heeng (*Ferula assa-foetida*) plant



Heeng plantation by Dr. Sanjay Kumar,
Director CSIR-IHBT at Kwaring, Lahaul & Spiti on
15 October 2020

HEEENG, the pungent-flavoured herb that adds a zing to dishes in almost all kitchens in India, does not grow in India. India imports about 1,540 tonnes of raw heeng worth Rs 942 crore from Iran, Afghanistan, Tajikistan and Uzbekistan. And this is because India's climate conditions are not favourable for the plant.

But all this is about to change soon. Scientists at the CSIR-Institute of Himalayan Bioresource Technology (CSIR-IHBT), Palampur, have made the first, and a successful, attempt at growing *Heeng* in India. The first sapling was planted in Himachal Pradesh's Kwaring village in Lahaul valley in October 2020. And now, nearly 20,000 *Heeng* saplings grown at the nursery in CSIR-IHBT and distributed free to farmers are being grown in almost 3.5 hectares of land in Lahaul & Spiti, Kinnaur, Chamba and Mandi in Himachal Pradesh.

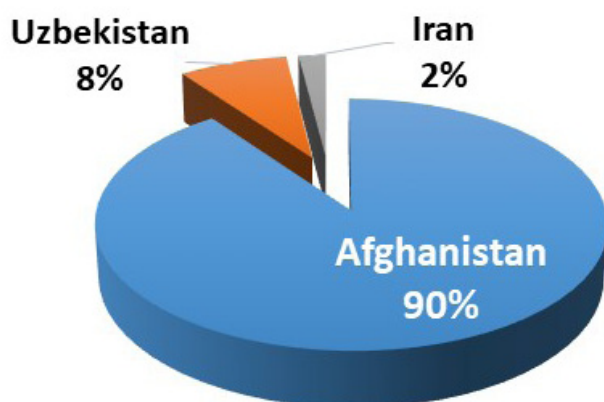
Heeng – Top Condiment

Heeng (*Ferula assa-foetida* L.) is a perennial herb indigenous to Iran, Afghanistan and Turkmenistan and growing at an elevation of 2000-4000 amsl with 250-350 mm annual precipitation. About 170 species of genus *Ferula* are found globally. In India, the genus *Ferula* is represented by four species viz. *Ferula jaeschkeana*, *Ferula narthex*, *Ferula thomsonii*, and *Ferula ovina*.

Commercially, Asafoetida is extracted from the fleshy roots of *Ferula assa-foetida* as an oleo-gum resin. India consumes about 60% of the world's produce as culinary and in medicines. *Ferula assa-foetida* produces pungently smelling oleo-gum resin from its roots which is used as a condiment and as an ingredient in Ayurvedic medicines for ailments related to the digestive system, anthelmintic, antiperiodic, deodorant, antispasmodic, sedative, carminative, expectorant, laxative, and stomachic.

There are two types of asafoetida produced in Afghanistan and Uzbekistan:

- White asafoetida/Milky white asafoetida
- Red asafoetida/Lal Heeng



Share of major countries in India's Import (Value)

Growing Heeng in India

Intending to achieve self-sufficiency in asafoetida production through widespread cultivation in India, team CSIR-IHBT, Palampur has been making relentless efforts since 2017 for the introduction of *Heeng* seeds from Iran, Afghanistan, Uzbekistan, Kazakhstan, and South Africa through



Heeng seeds (left) & Seed production centre (right)

ICAR-National Bureau of Plant Genetic Resources (ICAR-NBPGR), New Delhi. Eventually, the Institute introduced six accessions of *Heeng* seeds for the first time in the country from Iran through ICAR-NBPGR, New Delhi in 2018. Subsequently, 60 accessions of *Heeng* were introduced in 2020 from Afghanistan through ICAR-NBPGR.

ICAR-NBPGR confirmed that CSIR-IHBT is the only organization that has introduced *Heeng* seeds in the country for the first time in the last 30 years. After following due procedures of quarantine for the introduction of seeds in the country, ICAR-NBPGR handed over the seeds to CSIR-IHBT for further research.

Import of seeds for commercial cultivation is a long process and regulated by Plant Quarantine (Regulation of import into India) Order 2003. Plant quarantine is a legislative measure enforced to regulate the introduction of seeds, plants/planting materials, etc. to avoid the unintended introduction of new noxious weeds, insect pests, nematodes, fungi, bacteria, and viruses which may prove to be destructive to the Indian agriculture, horticulture. Transboundary movement of planting material carries the risk of the introduction of new associated pests to the region.

ICAR-NBPGR, New Delhi, has been instrumental in providing Plant Genetic Resources (PGR's), exotic as well as indigenous collections in the country. CSIR-IHBT imported seeds for research purposes through ICAR-NBPGR. CSIR-IHBT established seed production centres of *Heeng* in collaboration with State Agriculture Department (H.P.) in Chamba, Mandi, and Lahaul & Spiti districts of Himachal Pradesh to fulfill the requirement of seeds for further commercial cultivation of *Heeng*. The Seed Production Centres will help the state become self-reliant in seed production.



Heeng nursery



Heeng nursery (climate-controlled greenhouse facility)

Seed germination was a major constraint for nursery raising due to seed dormancy. Efforts were made at the institute to standardize seed germination through a series of experiments, and finally 60-70% seed germination was achieved for raising the planting material of *Heeng*. Efforts are being made to standardize tissue culture protocol for mass propagation of true to type planting material of *Heeng*.

Next, CSIR-IHBT established a climate-controlled greenhouse facility funded by the State Agriculture Department (H.P.) for the generation of planting material of *Heeng* as the young seedlings require a cool and dry climate with good sunlight for their growth and survival.

Cultivating Heeng

Recognizing the efforts of the Institute, Hon'ble Chief Minister of Himachal Pradesh Shri Jairam Thakur announced the introduction and cultivation of *Heeng* in Himachal Pradesh in his budget speech on 6 March 2020 under "Krishi Se Sampanta Yojana". Consequently, an MoU between CSIR-IHBT and State Department of Agriculture, Himachal Pradesh was signed on 6 June 2020 for a joint collaboration for the cultivation of *Heeng* in the State. With the permission of ICAR-NBPGR, New Delhi, for the cultivation of *Heeng* at farmers' fields, the Institute initiated *Heeng* cultivation in Lahaul & Spiti, Mandi, and Kinnaur districts of Himachal Pradesh.

The initiation of *Heeng* cultivation was marked by the plantation of seedlings at village Kwaring near Keylong on 15 October 2020. Dr Sanjay Kumar, Director, CSIR-IHBT, Palampur in the presence of scientists from the Institute, local progressive farmers of the region, and officials of State Department of Agriculture, Himachal Pradesh. CSIR-IHBT also organized training programs on *Heeng* cultivation and laid out demonstration plots in villages of Madgran, Beeling, and Keylong in Lahaul valley of Himachal Pradesh for the establishment of the seed production chain and cultivation of *Heeng* at a commercial scale. *Heeng* has also been planted at Kataru, Majhakhal, Janjehli, and Ghayan in district Mandi, and Mebar, Kothi, Duni, Reckong Peo, and Powari in district Kinnaur. Director-General, CSIR, Dr Shekhar C. Mande planted the first plant of *Heeng* in Janjehali on 8 November 2020, to mark the cultivation of *Heeng* for the first time in District Mandi.

So far, CSIR-IHBT has distributed 20,000 plants of *Heeng* to the farmers of Lahaul & Spiti, Kinnaur, Kullu, Mandi and Chamba districts of Himachal Pradesh covering an area of 2.5 ha under *Heeng* cultivation, 100 plants in Ladakh UT, 100 plants in Jammu & Kashmir and 100 plants in Uttarakhand through Material Transfer Agreement (MTA).

Cultivation Practices

The cultivation of *Heeng* requires a cool and dry climate. It can be cultivated in high-altitude regions of the Himalayas on unutilized slopy lands. *Heeng* can be propagated through seeds as well as the plantation of well-established seedlings raised in the nursery.

Seeds of *Ferula assa-foetida* are ellipsoidal in shape and light brownish-red in colour. The seeds are covered with flattened lateral wings on both sides. Due to dormancy, the seeds do not germinate readily. In order to germinate the seed, it is necessary to break the seed dormancy through various treatments.

Plants of *Ferula assa-foetida* are cultivated at a spacing of 0.75-1.0 m plant-to-plant and 1.0-1.5 m row-to-row, depending upon the method of planting and region. Seeds of *Heeng* are sown in the month of October-November before the onset of the winter season and germinate in the following spring season after the melting of snow.

Approximately 800 g seeds are required for the cultivation of *Heeng* in one hectare, depending upon the



MoU signed with State Department of

देश में हींग की खेती: एक नई पहल (हींग की उत्पादन तकनीक)



सौएसआईआर – हिमालय जैवसंपदा प्रौद्योगिकी संस्थान
पालमपुर – हिमाचल प्रदेश
CSIR-Institute of Himalayan Bioresource Technology
Palampur - Himachal Pradesh



हिमालय में हींग की खेती भारत में सबसे अधिक है, परंतु विश्वका बहु हि हि भारत में अभी तक कुसक उत्पादन नहीं होता है। कजल भारत हींग का सत-परिधान आयात करने देशों से करता है। देश में प्रतिवर्ष 1200 टन से अधिक शुद्ध हींग की खेती होती है तथा देश में प्रतिवर्ष 500 करोड़ रुपये से अधिक हींग के आयात पर खर्च किया जाता है। भारत में हींग की आपूर्ति के लिए अफगानिस्तान, उजबेकिस्तान तथा ईरान मुख्य देश हैं। देश में हींग का आयात मुख्यतः (दुब आयात का ~90 प्रतिशत) अफगानिस्तान से किया जाता है।



नई पहल
सी-एस-आईआर - हिमालय जैवसंपदा प्रौद्योगिकी संस्थान, पालमपुर देश का सत-परिधान कुसक उत्पादन अनुसंधान विभाग - राष्ट्रीय पाठ्य-आधारित संस्थान समूह के माध्यम से हींग के बीजों का इंगल से आयात किया गया। हिमालय जैवसंपदा प्रौद्योगिकी संस्थान, पालमपुर में हींग उत्पादन का लेक बढ़ी पहल की है। ऐसे में संस्थान की यह पहल देश को हींग के बीज से आत्मनिर्भर बनाने की दिशा में बड़ा कदम है।
हिमालय प्रदेश के आर्थिक-समर्थित विकास के लिए हिमालय जैवसंपदा प्रौद्योगिकी संस्थान के 'उपजाऊ जलवायु और विज्ञान केंद्र (CSHAB)' में पाठ्य अनुसंधान अध्यापन और उच्च गुणवत्ता शोध के औपचारिक योधा (जैसे की हींग), पर काम का आग बढ़ाया जा रहा है। बीज के माध्यम से तैयार किए गए हींग के पौधों का उच्च गुणवत्ता केंद्र में रोपण किया गया तथा हिमालय प्रदेश के विभिन्न जिलों को विस्तृत का-पौधों के लिए पर-पौधे लगाए जा रहे हैं। हिमालय प्रदेश, उत्तरांचल, उत्तरप्रदेश, झारखंड, पश्चिम बंगाल और केरल के मुख्य प्रशासकों/सचिवों से उच्च गुणवत्ता वाले बीजों की खेती पर रखा गया है। ऐसा प्रयास देश में पहली बार किया जा रहा है, जिसके फलस्वरूप इतनी खेती से न केवल गुणवत्ता को गारंटी मिलेगी अतिसु-विज्ञान की आय में भी वृद्धि होगी तथा आने वाले वर्षों में आत्म-निर्भर हो सकेगा।

germination percentage and place of sowing. For maintaining a uniform plant stand in the field, it is recommended to adopt the transplantation method of well-established seedlings for its cultivation.

It requires a cool and dry climate with full sunshine and well-drained soil for better growth and development. In the initial developmental stages, *Heeng* plants require irrigation at an interval of 4-5 days following

transplantation. After the establishment of plants, it requires occasional irrigation during the active growth phase with a dry spell. During the dormancy period, the plant does not require irrigation.

Ferula assa-foetida is a monocarpic plant that induces flowering and produces seeds after five years. The flower of *Heeng* is yellowish in colour. It can produce 150-200 gram seeds per plant (personal communication with *Heeng* cultivator in Afghanistan).

Heeng or oleo gum-resin produced in the fleshy roots of *Ferula assa-foetida* is harvested in the fifth year before the onset of flowering. *Heeng* or oleo gum-resin is extracted from the roots by slicing the top of the root horizontally. The milky white oleo gum resin starts extruding from the cut portion of the root. The dried oleo gum-resin is collected in the container and is now referred as *Heeng*. This slicing process is repeated 5-10 times with an interval of 3-5 days to collect the oleo gum-resin. As per reports, an average of 20-25 gram raw *Heeng* can be extracted from five years old mature plant.

The price of one kilogramme raw *Heeng* is ₹5000 to ₹25000 depending on its quality. Hence, the farmer can earn ₹9.0 lakhs from the cultivation of *Heeng* in one hectare after five years.

Training Programs on *Heeng* Cultivation

Team CSIR-IHBT conducted 14 on-farm training programs in collaboration with State Agriculture Department, Himachal Pradesh and has so far trained 269 farmers from Mandi, Kinnaur and Lahaul & Spiti districts of Himachal Pradesh in the cultivation of *Heeng*. A capacity building program on *Heeng* cultivation was also organized for the officers of the State Department of Agriculture, in which twelve officers participated from different districts of Himachal Pradesh. Monitoring and data recording of *Heeng* plantations at farmers' field is being carried out by team CSIR-IHBT from time to time and also through interactions with farmers involved in *Heeng* cultivation.

Processing of Raw *Heeng*

The fresh oleo-gum resin is extracted from the root of the *Ferula assa-foetida* plant and then crushed in a traditional method, between heavy stones or by a hammer – this requires a lot of manpower. But now, the process of crushing the raw asafoetida is done with machines converting it into hard pasty mass. This is followed by compounded asafoetida manufacturing which involves five steps:

- **Soaking in Water:** The pasty mass of asafoetida is soaked in water for a few hours to transform it into a slurry.
- **Mixing:** The base material (corn flour, edible gum) is then mixed in the required proportion using mixers. The slurry asafoetida is then added to the base material mixture and mixed well.
- **Milling:** Then using a milling machine the compounded asafoetida is crushed into the powder form.
- **Form:** Generally, asafoetida is in powder form but the compounded asafoetida or *Heeng* can be in different forms.
- **Packaging:** After the manufacturing process the compounded asafoetida or *Heeng* powder is packed with the help of packaging machine, to maintain its moisture content and quality.

Future Perspective

CSIR-Institute of Himalayan Bioresource Technology is focusing on the development of region-specific agrotechnologies and the establishment of seed production centres for commercial cultivation of *Heeng* in the country. Tissue culture and other relevant methodologies are also being standardized for the mass production of quality planting material for cultivation.

Himachal Pradesh will play a lead role in *Heeng* cultivation and its further spread in Ladakh, Jammu & Kashmir, Uttarakhand, and North East regions through the generation of quality planting material. This will also provide employment to the youth and enhance livelihood of the farmers of the cold desert regions. To meet our domestic demand of *Heeng*, 30000 ha of land is required to be covered under *Heeng* cultivation.

CSIR-IHBT's research focus is on the genetic improvement of *Ferula assa-foetida* for the development of an improved variety suitable for Indian climatic conditions. The germplasm introduced in the country from different sources is being characterized for morphological, molecular, and biochemical traits. The cultivation of *Heeng* in the country holds the promising of dramatically reducing its import, supporting the *Atmanirbhar Bharat* programme of the government of India.

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