

Cultivation Protocol For

Inula racemosa



Family: Asteraceae
(Compositae)

Local/common names:

Poshkar (Kashmir),
Pushkarmool, Mannu (Lahaul),
Manuchar, Minchenmarpo
(Ladakh)

Status: The Botanical Survey of India (BSI) in 1988 reported that the plant became vulnerable as the natural population of the species has been depleted due to indiscriminate collection from the wild and the harvest is mainly destructive because the root is the main raw harvest. The species has been found critically endangered nationally (BCCP, CAMP, 1998). The species is considered Critically Endangered (CR) by the IUCN.

Distribution and habitat: The plant is found in the Indian northwestern Himalayas at altitudes ranging from 1600-4200 m from Afghanistan to Central Nepal. In Jammu and Kashmir the species is available in Poggal (Banihal), Bhadarwa, Nubra valley, Upti and Khalsi region. In Himachal Pradesh, it is found in Parwati valley of Kullu district and now is under cultivation in Lahaul division.

Environment for growth: The plant exhibits optimum growth at altitude ranges of 2600-4000 m. Though the tolerable thermal range for the species varies from 15-35°C, optimum growth has been noted under the range of 15 to 25°C in the high altitude regions of Himalayas. The plant thrives well in slightly acidic to near neutral conditions. It prefers coarse porous soil with a sandy-loam texture. It has been found to be least tolerant to water logging and improper drainage. It cannot grow in the shade and requires moist soil.

Parts used: Roots

Market rate: Rs. 175- 200 per kg of dried roots.

Agro-technology:

- **Means of propagation:** Propagation is done either through seeds or through division of roots although root cuttings are preferred as means propagation.
- **Collection of seeds:** The farmers generally do not collect the seeds because vegetative means of propagation are preferred. The seeds are generally collected during September. They are very light and are scattered by wind.
- **Seed treatment and germination:** The natural seed germination rate is not more than 20-25%. Chilling and GA₃ treatment helps to break seed dormancy and facilitates germination. The seeds are mixed with soil (without any boulders or mixture) in a 1:9 ratio (1g seeds to be mixed with 9g of soil). Very little water is added to the soil while preparing the mixture. The seeds-soil mixture is added to the nursery beds by broadcasting. Within 17-20 days at around 20°C temperature seed germination occurs at about 75-80%.
- **Land preparation and soil work:** The land is ploughed to a fine tilth after the crop stubble, rocks, boulders, deep-rooted sedges and weeds are removed. The clods or hardened masses of soil are to be broken because they tend impede germination. Soil compaction resulting from snowfall must be removed by digging up the soil. The land attains a fine tilth after 2-3 rounds of deep ploughing after which, well rotten farmyard manure is mixed with the soil at the rate of 2-2.5 qt kg/ha or an equivalent of 200-250 kg/*bigha*. A sufficient gradient is achieved by ploughing and leveling of the soil to facilitate drainage.
- **Nursery preparation:** Beds of uniform size are prepared across the slope of the land, depending on the area and the shape of the land. Raised beds can be

prepared in case of heavy precipitation, the height of which should be determined by the soil texture and capability of the soil to hold water. The normal height for a raised bed would be 12-18 cm in areas of moderately heavy rainfall to facilitate water seepage into deeper soil layers. Raised beds can be prepared of 10-15 cm height in high precipitation areas with a predominantly sandy soil, as compaction is not possible in such soils. A preferable bed size of 1.5 m x 2 m is ideal in nurseries to facilitate tending and inter-cultural operations including weeding, plant protection and irrigation. Sunken beds are advisable for cold desert areas with a low rainfall or precipitation rate. Sowing is not done in lines or at fixed spacing. A layer of topsoil should be placed over the seeds prior to irrigation but care should be taken to not allow the seeds to go very deep into the soil. Placing the seeds at depths greater than 1 cm can lead to poor germination or increased mean germination time for the species. Light irrigation is necessary after seed sowing in the beds.

- **Transplantation:** A number of perennials produce self-sown seedlings that can be transplanted. A seedling bed can also be prepared for transplanting. Suitable planting holes with appropriate spacing for plant development must be made. The seedlings and the surrounding soil must be taken during transplantation and must be firmly replanted. The seedlings must be shaded from direct sun and watered regularly until they are stable.
- **Vegetative propagation:** The roots are used for propagation. During harvest, the upper 3-4 inches of the root where a cluster of nodes occurs is separated from the entire root and the nodes are separated and washed and used for further propagation. From one root 10-12 cuttings can be generated.
- **Planting density:** The seedlings are suggested to keep at least 30 cm apart from each other while line to line distance should be maintained at least 35 to 40 cm apart. In case of cut saplings 20-25 cm distance within the lines and between the lines are preferred as in the later case the root growth is comparatively straight and less horizontal as found in seedlings. In one bigha of land 8500-9000 seedlings are sufficient. In case of root-cut saplings 10000 per bigha is recommended. The mortality rate in the field is found very low in Lahaul region while in Ladakh survival rate is almost 80-85%.
- **Water management:** *Inula racemosa* has been found to perform well under moderate to heavy moisture conditions. The seedlings in the initial stages require frequent irrigation at shorter periods of a week or once in 10 days. The frequency can be extended to once in 10-14 days after the crop attains leaf differentiation. Light irrigation should be followed in the post-sowing phase to avoid the erosion of nutrients and seeds. In areas with greater slopes and steeper gradients, a controlled irrigation once in 10-14 days is advisable depending on the erosion of nutrients from the beds. The number of irrigations given to the crop should ideally depend on the stage of growth, soil texture and availability of irrigation. Alternate and improved systems of irrigation should be adopted in case of water scarcity. This can include sprinkler, pot and wick and drip irrigation methods, which help in increased efficiency and minimal wastage.
- **Weed control:** Regular weeding in the initial stages of crop establishment is an absolute necessity. As the crop grows, the leaf expanse of the species prevents the

growth of weeds in the vicinity. However, deep-rooted sedges should be removed as and when they appear. The weed population should not be allowed to attain flowering and fruit setting stages. Weeding once in 25 days is ideal as it helps check the regeneration of weeds. In the later stages of weed growth, weeding operations can be done at extended intervals depending on the agronomic conditions of the locality. Weeding should be done after light irrigation in the field, as it would help in easy uprooting of the weeds. A pre-winter weeding (September-October) and a pre-season weeding (March-April) can effectively help in the regeneration of the crop in the post winter period.

- **Maturity and harvesting:** In case of seed propagated plants, the first harvest is taken during the third year. The roots are harvested during September-October.