

Cultivation Protocol For

Swertia chirayta

No Image

Family: Gentianaceae

Local/common names:
Chirayata

Status: Vulnerable (IUCN)

Distribution and habitat: *Swertia chirayita* is found in the altitude range of 1,800-4,000 m. In the Central Himalayas it is found in Uttarakhand in Mandal, Tapovan, Dodital, Dayara, Har ki Doon, Badrinath, Balwan, Bampa and Ghumsali at altitudes of 3,500-3,900 m. In Himachal Pradesh the species grows in Bagsiad-Janjheli, Mandi, Kullu, Kangra and Rohru Division. In the eastern Himalayas the species is generally found in Shingalia range and Sandakphu-Kalapokhri stretch (West Bengal) and Tshoka-Fedang (Sikkim) at altitudes of 3,300-3,500 m. The species is highly exploited for its medicinal value and thus diminishing local populations have been reported.

Environment for growth: The plant prefers loose, moist, light soil with some shade. As the root goes deep into the soil, porous well-aerated soils are beneficial for cultivation. The plant can tolerate dry soils but gets scorched if growing under full sun. The species can not tolerate heavy clayey soils. The plant exhibits optimum growth conditions at altitude ranges of 2,600-4,000 m. The tolerable thermal range for the species varies from 15-35°C. However, the plant growth has been noted to be optimal at the range of 15-25°C in the high altitude Himalayas.

Parts used: The whole plant is used as medicine but the roots are valued for their medicinal value.

Market rate: The market value of 1 kg of dried root tubers ranges from Rs.125 to 175/-. Variations exist based on the quality and demand of raw products.

Agro technology

- **Means of propagation:** The plant can be propagated through seeds or root cuttings. The seeds show negligible levels of dormancy that make it easy for the propagation of the species. Germination at altitudes above 3,500 m has been noticed 14-18 days after sowing. However, altitudinal variations are seen in the case of reduced mean germination time of 2-3 days at lower elevations.
- **Collection of seeds:** The seeds can be collected from healthy, mature plants in August-September. The mature seeds should be collected and dried in partially shaded conditions before storage. Moisture content should be minimum for optimal storage and maximum viability.
- **Seed treatment and germination:** When the seeds are subjected to treatment with 0.2% solution of KNO_3 germination is faster and more uniform. There is a higher percentage of germination in seeds treated with plant hormones like GA_3 at various concentrations (100-150 ppm). Seed germination under ideal agronomic and weather conditions (20-25°C) can occur from the 14th-21st day after sowing. Irrigation is recommended at weekly intervals to maintain moist conditions in the beds during the early phase of plant growth. Variation in mean germination time is exhibited across different regions due to differences in altitude and agronomic conditions. In case of high solar radiation, leaf mulching can be done to avoid drying up of the plant or germinated seedling.
- **Land preparation and soil work:** The land is ploughed into a fine tilth after crop residues, boulders, deep-rooted sedges and weeds are removed. Soil

compaction resulting from snowfall has to be removed by digging up of the soil. The land must be ploughed 2-3 times to attain a fine tilth, then FYM is mixed with the soil at the rate of 3,500 kg/ha (280-300 kg/*bigha*). Leveling of the field has to be done and slope maintained within and between beds to facilitate irrigation.

- **Nursery preparation:** The recommended seed rate for the species is 6.5-7.5 kg/ha (550-600 g/*bigha*). The most common method of sowing practiced is line sowing. The seed rate can be further lowered by seed dibbling or individual placement in lines or rows between the beds. The spacing recommended for nursery beds is 30 cm between plants and 45 cm between rows. A higher spacing is recommended between the rows to accommodate a higher leaf expanse of the growing plants. The same spacing can be used in case of planting of root cuttings. For seed propagation, seedbeds of standard size are prepared. For vegetative propagation pieces of stem are planted directly into their permanent position. Seeds are sown in line in the seedbeds and irrigated after seed sowing. The seedlings are picked out when they are large enough to handle and grown in a greenhouse for the first year. Uniformly sized beds are prepared across the slope, depending on the area and shape of the land available. Raised beds can be prepared in areas of heavy rainfall or precipitation. The normal height for a raised bed should be 15-20 cm in areas with moderately heavy rainfall to facilitate the water seepage. The preferable bed size of 4.5 x 6 feet is ideal for nurseries to facilitate tending, weeding, plant protection and irrigation. Sunken beds are advisable for cold desert areas. Sowing is done in lines at fixed spacing and depths of 1-2 cm. A layer of topsoil should be placed over the seeds before irrigation. Light irrigation is necessary after seed sowing in the beds.
- **Transplantation:** Transplanting can be done after the plants attain sufficient root girth. Under field conditions, successful transplantation can be obtained in case of one-year old plants. Plants raised by early sowing (April) can be transplanted in March-April of the next season, whereas pre-winter crops are transplanted in September-October of the following year before winter.
- **Vegetative propagation:** Division of the stem is done in spring or at any time in the growing season if the divisions are kept well watered until established. The larger divisions can be planted directly into their permanent positions. Smaller divisions must be potted and grown under light shade and planted in summer.
- **Water management:** *Swertia* has been found to perform well under moderately moist conditions. The seedlings in the initial stage require frequent irrigation—once a week or once in 10 days. Once the crop attains leaf differentiation, irrigation can be done once in 10-14 days. Light irrigation should be done to avoid the erosion of nutrients and seeds. In areas with greater slopes and steeper gradients, a controlled irrigation once every 10-14 days is advisable. The frequency of irrigation should ideally depend on the stage of growth, soil texture and availability of water. Alternate and improved systems of irrigation like sprinkler and drip irrigation methods can be adopted in case of water scarcity.
- **Weed and pest control:** Regular weeding in the initial stages of crop-establishment is necessary. As the crop grows, the leaf expanse of the species prevents the growth of weeds in the vicinity. However deep-rooted sedges and

members of the *Cyperaceae* family should be removed as and when they appear. The weeds should not be allowed to attain flowering and fruit setting stages. 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. The disease infestations noted in the region mainly confine to leaf spots and powdery mildew. The powdery mildew infestation can be controlled by application of Sulphur compounds of organic or inorganic nature. Control of leaf spot diseases in the region can be attained by application of organic plant based extracts of Neem and Garlic. Burning of weed and crop stubble prior to seed sowing can help prevent and control pests and diseases.

- **Maturity and harvesting:** The roots are harvested in autumn from plants that are at least 3 years old. They are cut into small pieces, peeled and dried. The roots can be dug up and collected in mid-August to mid-September. Separation of root cuttings as propagules can be done simultaneously by separating and transplanting apical portions of the tubers in the field.
- **Post-harvest techniques:** The dug up roots are washed thoroughly in running water and dried under partial shade. Moisture level of 18-22 % should be maintained for longer shelf life of the roots. They are kept in closed containers or gunny bags to retain the aroma.