

Cultivation Protocol For

Rubia cordifolia



Family: Rubiaceae

Local/common names:

Manjista, Chitravali (Sanskrit),
Manjit (Hindi & Bengali), Indian
Madder, Dyers's Madder
(English)

Status: Vulnerable (IUCN)

Description and habitat: The plant is a perennial, herbaceous climber with long, rough, grooved stems. The base of the stems is woody and the bark is white. The leaves are in whorls of four and cordate-ovate to ovate-lanceolate in shape. The flowers are in terminal panicles and the branches are trichotomous and spreading. The bracts are ovate, acute and leafy, the calyx is globose and glabrous and the corolla is greenish with five lobes. The fruit is dymous or globose, smooth, shining, purplish black when ripe, fleshy, and sweetish in taste with 2 small seeds. The plant is found in the sub-tropical to temperate Himalayas at an altitude of 1200-3300 m in marginal lands and forests. It is common throughout India, ascending up to an altitude of 3750 m.

Environment for growth: The plant exhibits optimum growth conditions at altitude ranges of 2600-4000 m. The tolerable thermal range for the species varies from 15-35°C. However, plant growth has been noted to be optimal under the range of 15-25°C in the high altitude regions of Himalayas. The plant prefers loose, moist, light soil with some shade. As the root goes deep into soil, porous well-aerated soils are beneficial for cultivation. It tolerates dry soils but quickly becomes scorched if growing in full sun. The species does not tolerate heavy clay soils.

Parts used: Roots

Market value: The market value of root tuber ranges from Rs. 125-175/kg dried roots. 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 propagation. Germination at altitudes above 3500 m has been noticed 14-18 days after sowing. However, altitudinal variations are there 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 the August-September depending on the flowering season. The mature seeds are brownish-black and crescent shaped and should be collected and dried in partially shaded conditions before storage. The moisture content of the seeds should be minimum for optimal storage and maximum viability.
- **Seed treatment and germination:** 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. Leaf differentiation is initiated by the 10th day after germination. Variation in mean germination time is exhibited across different regions due to differences in altitude and agronomic conditions. However, a germination range of 20-25 days after sowing accommodates heterogeneity. 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 stubble, boulders, deep-rooted sedges and weeds are removed. The clods or hardened masses of soil are to be broken because they can impede germination

of the seeds. 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 3500 kg/ha (280-300 kg/*bigha*). Leveling of the field has to be done and slope is to be maintained within the beds and between the beds to facilitate irrigation.

- **Nursery preparation:** The land is deeply ploughed twice or thrice to break the soil. Well rotten farmyard manure is mixed to an adequate amount. For seed propagation, the seedbeds of standard size are prepared. For vegetative propagation, pieces of the stem are planted directly. Seeds are sown in line in the seedbeds and irrigated after the seed sowing. The seedlings are picked out when they are large enough to handle and grow them on in light shade in the greenhouse for the first year. Then they are planted into their permanent positions in early summer. Beds of uniform size are prepared across the slope of the land depending on the area and shape of the land available. Raised beds can be prepared in areas of heavy rainfall or precipitation. The height of such beds should be determined by the soil texture and water holding capacity. The normal height for a raised bed should be 15-20 cm in areas of moderately heavy rainfall to facilitate the seepage of water into deeper layers of soil. Raised beds of 10-15 cm height can be prepared in high precipitation areas with a predominantly sandy soil. A preferable bed size of 4.5 x 6 feet is ideal in case of nurseries to facilitate tending and inter-cultural operations. Sunken beds are advisable for cold desert areas with low rainfall and precipitation rates. Sowing is done in lines at fixed spacing and depths of 1-2 cm. A layer of topsoil should be placed over the seeds prior to irrigation. Placing the seeds at depths greater than the recommended can lead to poor germination or increased mean germination time for the species. Light irrigation is necessary after seed sowing in the beds.
- **Transplanting:** Transplanting can be done after the crop attains a sufficient root girth by the end of 6-8 months. However, 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 the pre-winter sown crops are ready for transplanting in September-October of the following year prior to the onset of winter. 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 in case of 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. A larger spacing of 60 x 60 cm can be used between the rows and plants in case of plantations where transplanting is not to be done. The same spacing can be used for planting of root cuttings.
- **Vegetative propagation:** Division is done in spring or at any time in the growing season and care is taken to keep the divisions well watered until they are established. The larger divisions can be planted out direct into their permanent positions while the smaller divisions can be potted and planted in the summer.
- **Water management:** The seedlings require frequent irrigation once a week or 10 days in the initial stages. 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 erosion of nutrients and seeds. In areas with greater slopes and steeper gradients, a controlled irrigation once in 10-14 days is advisable. The number of irrigations should depend on the stage of growth, soil texture and availability of irrigation. Alternate and improved systems of irrigation like sprinkler, pot and wick and drip irrigation methods should 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 weed plants 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 would be ideal, as it would help to check the regeneration of weed growth. Weeding should be done after a 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 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. Powdery mildew infestation can be controlled by application of sulphur-containing compounds of organic or inorganic nature. Common biocontrol agents used in the high altitude regions include neem oil and *Artemisia* based extracts. A prophylactic spray of neem-based formulations on a monthly basis is advisable for areas adjoining cultivated fields or areas with sizable weed population. Burning of weed and crop stubbles before seed sowing, avoiding water stagnation in the field can help in control of spread of 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 then dried. The roots can be dug up and collected in mid-August to mid-September though this period can vary from region to region. A light irrigation is given prior to the harvest of the roots. Separation of root cuttings as propagules can be done simultaneously by separating and transplanting apical portions of the tubers in the field for the establishment of the plantation.
- **Post-harvest techniques:** The dug up roots are washed thoroughly in running water and dried under partial shade. A 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.