STANDARD CULTIVATION PROCEDURE FOR SARPAGANDHA (RAUVOLFIA SERPENTINA IN ODISHA

Introduction:→ Sarpagandha is an erect perennial shrub that can grow to the height of 75 cm to 100 cm. Its root can get 50 to 60 cm deep into the soil with tuberous branches having a diameter of 0.5 cm to 3 cm. The parts used in Sarpagandha plant are "Roots" It grows in shady forests and is an endangered species in many parts of India. Its root is used in herbal medicines for Blood Pressure, Nervousness, Insomnia and any other mental disorders.

Varieties of Sarpagandha:→ The following three varieties are generally preferred by the cultivators.

1. Local collection from Wild
2. RS-1 by Jawaharlal Nehru Krishi Viswa Vidyalay, Indore
3. CIM Sheel by CIMAP Lucknow

Climatic Conditions for Sarpagandha Cultivation:→ This crop thrives best in tropical to subtropical regions under frost free conditions and required irrigation. Humid, warm climate, shade loving conditions are best suited for Sarpagandha Cultivation. It requires an annual rainfall of 1000 to 2500 mm rainfall. The following table depicts various climatic conditions for Sarpagandha Cultivation.

Temperature	Rain Fall	Sowing Temperature	Harvesting Temperature
10 - 35°C	Up to 2500mm	25 - 35°C	10 - 20°C

Soil Requirement for Sarpagandha Cultivation:→ The suitable soil for Sarpagandha crop is slightly acidic to neutral with medium to deep well drained black soils rich in organic matter. It can also grow well in clayey / sandy loam to laterites soil rich in humus and pH ranging from 5.0 to 6.5. It is always advisable to test the soil before cultivation of Sarpagandha and any nutrient or micro-nutrient deficiencies should be filled during the land preparation.

Propagation, Seed Rate & Sarpagandha Cultivation:→ Sarpagandha can be propagated through Seeds / Stem Cuttings / Root Stumps / Root Cuttings. Seed propagation technique should always be followed for commercial cultivation of Sarpagandha to get better yield. When seedlings are raised on nursery beds, it requires 6 to 7 Kg of seed to cover 1 Hectare of Land. If Stem / Root cuttings are used then 100 Kg of cuttings can cover 1 Hectare of land for commercial cultivation of Sarpagandha. For seed propagation seeds to be collected from January to February to be used and seeds to be dried under shade followed by removing plumpy matter by rubbing the seeds. **Stem cuttings & other methods apart from seed propagation, root cuttings have been found less satisfactory for cultivation, since many of them do not root easily.**

The Spacing for cultivation of Sarpagandha is 45 cm x 30 cm Spacing. For good growth of plant, it is advised to use seedling @ rate of 72,000 to 74,000 No. of plants / Hectare.

Time of sowing:→ If propagation is done through seeds then cultivation is done in the month of April–July (depending upon Monsoon), if propagation is by stem cutting then it is cultivated in June to July, if propagation is done by root cutting then it is cultivated in March to June and if propagation is done by root-stump then cultivation is done in the month of May to July.

Nursery Raising and Planting:→

1. ***Seed Propagation***: Seed germination depends on seed quality and it is always recommended to use heavier seeds for nursery raising (most preferred method) as well as broadcasting (Line Sowing). Freshly collected heavy seeds always give more germination (about 65%) as compared to previously collected heavy seeds (about 30 to 40%). 6 to 7 Kg of seed is required to cover 1 hectare of land. It is also advised to soak the seeds 24 hours prior to sowing for having best germination.
2. ***Stem Cutting Propagation***: Hardwood Stem Cuttings of Sarpagandha with 15 to 20 cm length are closely planted during the month of June-July (initial monsoon) in the nursery beds. These beds are to be maintained with continuous moisture conditions. After germination (Sprouting) and developing out roots, these plants should be carefully transplanted in the main field and care should be maintained not to break the primary root of the plant.
3. ***Root Cutting Propagation***: For this method of cultivation 5 cm long root cuttings should be planted in Nursery Beds with well decomposed FYM, sand and saw-dust. The beds should be watered regularly to maintain continuous moisturing status. Generally these root cuttings sprout 20 days after planting and it can be transplanted in the main field and care should be maintained not to break the primary root of the plant.

4. ***Root Sumps Propagation***: About 5 cm of Root Stumps are directly transplanted in the main field under irrigated conditions.

Nursery Management and Transplantation:→ Sarpagandha seeds are sowed on raised beds of 1.5m width, 150-200mm height and of convenient length. Prior to seed sowing seeds need to be treated with a diluted solution of cow urine or neem oil to get rid of fungus & diseases. Nursery beds are sown in the month of April and are irrigated first before sowing. Germination of seedlings starts within 30-35 days. Transplanting is done in the month of first week of June - July when the seedlings are 40-50 days old having 4-6 leaves. Transplanting is done in main field at the distance of 45 x 30 cm. After transplanting light irrigation is done. To protect crops from soil borne diseases after plantation, seedlings are dipped in Bavistin @0.1% for 30 mins or 50% neem oil solution for 4 hours before transplanting.

Land and Soil Preparation:→ For Sarpagandha plantation, it requires well prepared land. To bring soil to fine tilth, repeated ploughing is done. After tilling and ploughing the land is given manures, nutrients and growth promoters to enrich the soil. It is always advised to apply 5 to 7 Metric Tons of well decomposed FYM at the time of land preparation along with 25 Kg of fine powder of Neem Cake per Hectare of Land. For Nitrogen and Organic Carbon deficient land, it is advised to use green manure (Sun Hemp - Dhanicha or Azola) prior to preparation of land for Sarpagandha cultivation.

Soil Health & Pest Management:→ The medicinal plants have to be grown without chemical fertilizers and use of pesticides. Organic manures like, Farm Yard Manure (FYM), Vermi-Compost, Green Manure etc. may be used as per requirement during various stages of cultivation. To prevent diseases, bio-pesticides could be prepared (either single or mixture) from Neem (kernel, seeds & leaves), Turmeric, Garlic, Dhatura, Cow's urine etc.

1. ***Soil Health & Nutrition***: The recommended doses of Manure are as shown below and it is applied two times during the growing season of Sarpagandha, preferably a gap of 60 to 90 days between each application.

Type of Manure	Nitrogen (Kg / Hectare)	Phosphorous (Kg / Hectare)	Potash (Kg / Hectare)	Total Requirement of Manure
STANDARDIZED	20	30	30	20:30:30 Kg per Hectare or 8:12:12 Kg per Acre
Well Decomposed FYM	7500	11000	11000	11 MT / Hectare
Vermi-Compost	550	675	675	0.7 MT / Hectare

2. ***Plant Protection & Pest Management***: The following table depicts the pests and diseases that can cause damages to Sarpagandha crop and their management strategies.

Name of the Pest / Disease	Symptoms	Eradication Methodology
Pyralid caterpillar / Glyphodes Vertumnalis	The symptoms are rolling of leaves and defoliation of leaves. It feed on green leaves and make damage to leaves	• Application of 10% Solution of Neem Oil by adding 100 gram of Backing Soda to 1 Ltr of water at an interval of 15 to 21 days • Application of 20% Solution of Magic Tonic (decomposed solution of Neem, Cow Urine, Turmeric, Garlic and Dhatura) at an interval of 15 to 21 days.
Cockhafer Grubs / Anomala Polita	The symptom is seedling attack and then gets dried.	• Application of 25 Kg of fine powder of Neem Cake per Hectare of Land mixed well with soil is done at the time of land preparation to control the pests
Leaf Spot Disease	The symptoms are brown colored spots on upper and lower surface of leaves. The leave first become yellow then gets dried and then falls off.	• Application of 20% Solution of Neem Oil by adding 100 gram of Backing Soda to 1 Ltr of water at an interval of 15 to 21 days thoroughly to the whole plant • Application of 20% Solution of Magic

		Tonic (decomposed solution of Neem, Cow Urine, Turmeric, Garlic and Dhatura) at an interval of 15 to 21 days. • If possible uproot the plant manually and dispose it at a distance from main field
Root knot nematode Disease / Meloidogyne incognita & Meloidogyne hapla	The symptoms are stunted growth and decrease in leaf size.	• Application of 25 Kg of fine powder of Neem Cake per Hectare of Land mixed well with soil is done at the time of land preparation to control this disease. • Application of 20% of Neem Oil Solution to the Soil around the affected plant at an interval of 15 to 21 days. • Application of 20% Solution of Magic Tonic (decomposed solution of Neem, Cow Urine, Turmeric, Garlic and Dhatura) at an interval of 15 to 21 days to the Soil around the affected plant.

Weed Control & Irrigation:→ Do regular weeding followed by hoeing to keep the field weed free. At initial Stage, i.e. first year three weedings are preferred and in next half year one weeding followed by one hoeing is done at growing period of plant. If flowering starts in initial period, flowers should be nipped to raise root growth.

In summer, apply 2 irrigations, i.e. irrigation is done every fortnight at monthly interval and in winter month, apply one irrigation at monthly interval.

Harvesting & Post Harvesting:→ Root yields at different age and season have showndifferent results. And it is found that at 18 months duration this crop produces maximum root yield. Transplanting is done in July, the harvesting period coincides with the shedding of leaves during early autumn season next year. At this stage, the roots contain maximum concretion of total alkaloids. During the harvest the root may be found to go up to 40 cm deep in the soil. Harvesting is done by digging up the roots and thin roots are also collected. For better uprooting, before harvesting irrigation is done.

After digging the roots are cleaned, washed and cut into 12 to 15 cm pieces for convenience in drying and storage. The dry roots possess upto 8-10 per cent of moisture. The dried roots are stored in polythene lined gunny bags in cool dry place to protect it from mould.

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