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Ecological Requirements for Mulberry Cultivation & Nutritional Requirements

KEYWORDS

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Ecological requirements for mulberry cultivation:-

Climate : The optimum elevation for mulberry growth is about 710 m above MSL. For cultivation purposes, an elevation of 305 to 910 m above MSL is the optimum range. The ideal temperature is 23 to 27oC and relative humidity is 64 to 81%. Sunshine duration 5 to 12 hours per day. Mulberry cannot sprout below 13oC or above 38oC.

Rainfall : A rainfall range from 600 m to 2500 mm per year is considered ideal. During the growth period, mulberry requires about 280 – 400 ml of water to synthesize one gram of dry matter.

Soil : As mulberry is a perennial, deep -rooted plant, soil structure must be sufficiently porous to supply air and water to the root zone. Soil should be deep, fertile, porous, well drained and with good water holding capacity. Loamy, clayey- loamy or sandy - loamy soils are the best. Slightly acidic soils (6.2 to 6.8pH) free from injurious salts are ideal.

Mulberry varieties

Irrigated : Kanva 2 (M5) , MR 2, S 30, S36, S 54, DD, V1.

Semi irrigated : Kanva 2, MR 2.

Rainfed : S 13, S 34, RFS, 135, RFS, 175, S 1635.

Variety	Yield (ton/ha/year)
Local	23
Kanva2, MR2, S 30	32
S 36, DD	38
S 54	42
V1	59
Rainfed conditions	16-19

Methods of propagation :

The methods of propagation of mulberry are,

Sexual propagation

Vegetative propagation

Micro propagation.

Sexual propagation / seedling propagation

This method is rarely practiced for breeding purposes in research institutes. Here the flowers are protected from cross pollination and only controlled pollination allowed.

2. Vegetative propagation

This is the most popular method used for commercial plantation. Its chief advantages are,

i) The desired hereditary characters can be maintained throughout.

ii) Large number of plants can be raised quickly and economically.

iii) Pest and disease resistant plants can be grown.

The vegetative propagation methods are,

Cutting

Grafting

Layering

1. Cutting :

This is the most popular method of cultivation in South India. This method is adopted for growing varieties fully acclimated to local conditions. It is the easiest method.

Demerit : Under temperate conditions, rooting and establishment is slow.

2. Grafting :

Grafting is a technique of joining the parts of two plants in such a way that they unite and grow as one plant. Scion, which forms the upper portion is the desired variety and the stock, which forms the lower portion is local hardy variety. This method is not popular because of laborious process, high cost and skill involved. Large number of planting materials cannot be obtained in short period of time.

3. Layering :

This method of propagation involves the development of roots from a stem while it is still attached to the mother plant. The rooted stem is then detachted, to be grown as a new plant. Such a rooted stem is known as 'layer'.

Merits : Simplicity. There is no fear of the roots getting dried up as in cuttings. Used to obtain a large sized plant in a short time. Used to fill in the gaps in the field where cuttings have failed to grow.

Demerits : Time consuming, expensive, unsuitability for large scale multiplication, poor rooting varieties cannot be layered.

Micro-propagation methods:-

Conventional vegetative propagation methods like cutting, grafting and layering require a locally adapted variety for rooting to take place. They also take long time for establishment. They do not allow any room for genetic manipulation or improvement of the varieties.

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In order to develop new varieties as well as to propagate them in as short a period as possible and also in as large numbers as possible, new micro propagation methods involving tissue culture have been evolved.

d). Selection of semi hard wood cuttings:
Cuttings are selected from well established garden of 8 - 12 months old. Only full grown thick main stems (pencil thickness size) free from pest and disease damages having a diameter of 10-12 mm are chosen for preparation of cuttings. The cutting should be of 15-20 cm with 3-4 active buds and should have 45o slanting cut at the bottom end. Care should be taken to make a sharp cut at both the ends of cuttings without splitting the bark. Manually or power operated mulberry cutter (stem cutting machine) may be used for quick cutting of propagation materials.

e). Nursery propagation
An area of 800 m2 red loamy soil near water source is to be selected for raising saplings for planting one hectare of main field. 1600 kg of farm yard manure is applied in the nursery area and mixed well with the soil. Nursery beds of 4 x 1.5 m size are raised. The length may be of convenient size depending upon the slope and irrigation source. A drainage channel is provided.

f). Pre-treatment of cuttings
One kilogram of Azospirillum culture is mixed in 40 liters of water. The bottom ends of the cuttings are kept or 30 minutes in it before planting. Azospirillum is applied for inducement of early rooting.

g). Nursery planting
Vesicular Arbuscular Mycorrhiza (VAM) is applied at 100 g/ m^2 of nursery area. Nursery bed is irrigated. Cuttings are planted in the nursery at 15 cm x 7 cm spacing at an angle of 45o. Exposure of one active bud in each cutting is to be ensured.

h). Nursery management
Nursery is irrigated once in three days. To avoid termite attack one kg of endosulfan 4 D or malathion 5 D or quinalphos1.5 D is applied around the nursery bed. To avoid root rot and collar rot, soil is drenched with carbendazim 50 WP (2 g/l) using rose can or Trichoderma viride is applied at 0.5 g/m2. After weeding, 100 g of urea/m2 is applied between 45 and 50 days after planting.

i). Age of sapling
The saplings are ready for transplanting in the main field after 90-120 days of planting.

D). Main field preparation :
The field is leveled first. It is ploughed deeply initially using heavy mould board plough followed by country plough upto a depth of 12" to 15" in order to loosen the soil. Weeds and gravel are removed. FYM is applied at 20 t/ha (irrigated) or 10 t/ha (rainfed). The manure is incorporated by repeated ploughings.

Planting is done during monsoon period. Winters and summer months are avoided.

E). Nutritional requirements
Sixteen nutrient elements are recognized as being essential to all plants for their normal growth and development.

Essential elements used in relatively large amounts			**Essential elements used in relatively small amounts**
Mostly from air and water	**From soils**		
	Macronutrients	**Secondary nutrients**	**Micronutrients**
Carbon (C)	Nitrogen (N)	Calcium (Ca)	Iron (Fe)
Hydrogen (H)	Phosphorus (P)	Magnesium (Mg)	Manganese (Mn)
Oxygen (O)	Potassium (K)	Sulphur (S)	Boron (B)
			Molybdenum (Mb)
			Copper (Cu)
			Zinc (Zn)
			Cobalt (Co)

The two routes of entry of these elements are : 1. the roots and 2. the leaves. If the amount of available nutrient in the soil is below the requirement for mulberry, the plant shows deficiency disease symptoms. The usual remedy is to apply the appropriate fertilizer. For quick recovery, foliar spray application is also done. Mulberry is a fast-growing plant and depletes soil nutrients at a very fast rate. Therefore regular input of manures is necessary for optimum production of leaves. Manuring takes a maximum share of the total annual recurring expenditure. Manuring improves both the quality and quantity of leaf yield. Manures may be supplied in an organic or synthetic chemical form or as biofertilizers.

The concept of Integrated Nutrient Management (INM) is to

1. Increase the efficiency of absorption and utilization of added fertilizers.
2. Collection, conservation and utilization of organic waste materials.
3. To employ the biofertilizers

F). Organic manures
Organic content is necessary to build up the microflora which are involved in nitrogen fixation and the recycling pathways of other minerals. Organic matter can supply the essential micro nutrients and also improve the physical, chemical and biological properties of the soil.

Two types of organic manure are

1. Bulky organic manure. eg. Farmyard manure, Compost, Green manure
2. Concentrated organic manure. eg. Oilcakes, Fish meal.

1. Compost: It is made by the decomposition of grass or straw or other domestic and agricultural wastes in pits under anaerobic conditions. Lime- milk is added to quicken decomposition.

2. Farm yard manure (FYM): This consists of dung, urine and straw that has been used as bedding for cattle. Fresh FYM is harmful to mulberry roots. Decomposed or partially decomposed FYM can be used.

3. Sericulture wastes: The wastes used as fertilizers after decomposition include silkworm litter, dead worms, exuvia, pruned leaves, unused leaves, pupal wastes and dead and un used moths.

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4. Poultry manure: Litter, unfed feed and dropped feathers which are rich in phosphates are used after decomposition.

5. Oil cakes: Oilcakes of soya bean, neem and groundnut are used.

6. Green manures: Leguminous plants which have nitrogen-fixing root nodule bacteria are grown as intercrops in mulberry fields and after their yield is harvested, are mulched and used as green manures. Eg. 1.Sunhemp, Crotalaria juncea, 2.Daincha, Sesbania aculeata, 3. Bersem, Trifolium alexandrinum, 4.Cowpea, Vigna sinensis.

7. Biogas slurry : It is also used.

8. Press mud : it is an important by product of the sugar industry. Application of 7.5 tons of press mud per hectare is equivalent to 150 kg of P2O5 (Single super phosphate).

Advantages of organic manures:
It increases the water holding capacity of the soil. Improves the physical condition of the soil. Increases the chemical and biological activities of the soil.

G). Chemical fertilizers
The nutrient requirement of mulberry per hectare per year is the highest compared to any other field crops. Mulberry requires 300 Kg of Nitrogen, 120 kg of Phosphorus and 120 kg of Potassium per ha per year. Nearly 30-40% of total cost of production of cocoons goes to fertilizers and manures alone.

2 split doses.