
UNIT 2 MULBERRY CULTIVATION PRACTICES

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2.0 OBJECTIVES

After reading this unit, you will be able to:

- identify different mulberry varieties cultivated in South India;
- demonstrate different methods of pruning, irrigation, and leaf harvest followed in South India;
- determine the quantity of manures and fertilizers to be applied to mulberry plantation to get high leaf yield;
- summarize the precautions during transportation and preservation of leaf; and
- recognize the importance of soil fertility and soil moisture conservation for proper management of mulberry garden.

2.1 INTRODUCTION

Before you start studying this unit, please go through the Unit-1 of Block-1 once again to make yourself clear about various factors responsible for getting higher yield of quality mulberry leaf suitable for silkworm rearing. High leaf yield is very important since the quantity of silkworm reared and cocoon produced is mainly dependent on the leaf produced from a unit area.

By now, you have understood that the profitability in sericulture is mainly dependent on production of high leaf yield of good quality. With this background, let us study how to produce quality leaf in large quantity. Like any other agricultural crop, getting high leaf yield in mulberry also depends on three major factors *viz.*, high yielding

mulberry varieties, suitable cultivation practices and suitable plant protection measures against diseases and pests. All the three factors must be considered as an integrated package to get high yield of superior quality leaf. In the previous Unit, you have also studied that the mulberry is cultivated throughout India covering temperate to tropical regions. Depending upon the agro-climatic conditions, different regions follow different methods of cultivation practices suitable to that region to get high leaf yield.

The purpose of this unit is to make you understand the recommended cultivation practices for mulberry to get high leaf yield of better quality for stable cocoon crop under South Indian conditions. As explained earlier, to achieve high yield of good quality leaf within the shortest possible time, you should adopt suitable mulberry cultivation practices including variety, spacing, establishment of plantation, manure and fertilizers, pruning, irrigation etc.

Mulberry is a hardy, perennial deep-rooted plant capable of thriving under diverse agro-climatic conditions. The growth of mulberry is very much influenced by the climatic conditions. In the southern plains of India, it grows luxuriously as the area is in warm tropical region with abundant solar energy. Mulberry is generally grown as a bush under intensive cultivation practices. It is cultivated both under irrigated and rainfed conditions. Irrigated condition means growing mulberry by providing sufficient water. In rainfed condition, mulberry is grown entirely depending on rainfall.

Mulberry grows in a wide range of soil. Sandy loam, loam and clayey loam soils with good water holding capacity is most suitable for mulberry cultivation. As far as possible, the land must be flat and elevated to avoid water logging. Soil pH around 6.5 to 7.5 is desired. Land must be free from Nematodes and other soil-borne diseases.

2.2 MULBERRY VARIETIES AND SYSTEM OF PLANTATION

The popular mulberry varieties cultivated in South India are Kanva-2, MR-2, S₃₆, V₁, S₁₃ and S₃₄. The important characteristic features of these varieties are discussed in Unit-1, Block-1. The selection of varieties for a particular area is dependent on the availability of irrigation water. Kanva-2 and MR-2 are traditional varieties cultivated both under irrigated and rainfed conditions. V₁ and S₃₆ varieties are cultivated exclusively under irrigated conditions, whereas, S₁₃ and S₃₄ varieties are preferred under rainfed condition due to their better capacity to grow under limited water. In Fig. 2.1, a few popular mulberry varieties cultivated in South India are shown.



S₃₆



V₁



S₁₃

Fig.2.1: Popular Mulberry varieties

As you have already learnt about land preparation, method of propagation and planting system, let us concentrate on other topics of interest for good mulberry cultivation practices.

Planting of mulberry is ideally taken up during the rainy season (July-September) for better establishment of mulberry garden. Before the onset of monsoon, land has to be ploughed to a depth of 30 to 35 cm using a tractor taking advantage of pre-monsoon rains during April-May. The land is then levelled. Farmyard manure or compost is applied at the rate of 20 metric tonnes per hectare and thoroughly mixed with the soil by ploughing. Land is then divided into plots of convenient size and divided into ridges and furrows for taking up plantation.

Under irrigated conditions, mulberry is planted either in “pit” system of plantation with wider plant spacing of 90 x 90cm or in “row” system of dense plantation following row to row spacing of 60 cm and plant to plant spacing of 20 cm. Now-a-days, planting in “paired row system” following (150cm + 90cm) x 60cm spacing is becoming more popular as it helps in adoption of mechanization for inter-cultivation operations using tractor/power tiller thereby reducing the use of manpower and cost of cultivation (Fig. 2.2).



Fig. 2.2: Paired row system of plantation

Check Your Progress 1

Note: a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1) What are the major factors that can help to achieve high leaf yield in mulberry?

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2) Which are the popular mulberry varieties cultivated in South India?

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3) Describe different systems of plantation followed for mulberry cultivation in South India.

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2.3 SOIL FERTILITY, ORGANIC MANURE AND FERTILIZER USE

Once planted, mulberry can give high yield of quality leaf consistently for more than 15 years. But, this is possible only when the garden is maintained with proper inter-cultivation activities and soil fertility. Soil fertility means the capacity of the soil to supply essential nutrients for good growth of the plants. Soils are highly variable with respect to their fertility status, physical and chemical properties. So, it becomes necessary for testing the soil periodically to know its fertility status and to take suitable corrective measures to maintain consistent high leaf yield and quality. The nutrient demand in case of mulberry is high due to intensive cultivation, harvesting of the leaves many times a year and also repeated pruning of the branches resulting in loss of nutrients from the soil rapidly. Therefore, it is very essential to replenish the deficient nutrients after assessing the soil fertility status. Soil test should be undertaken at least once in two years. Proper method of collection of soil sample is discussed in Course 2, Block 4. In this context, the following information will give an idea about soil fertility rating for important soil nutrients to take suitable corrective measures (Table 2.1).

Table 2.1: Fertility Rating of the Soil

Sl. No.	Nutrient	Fertility Rating		
		Low (Below)	Medium	High (Above)
1.	Organic Carbon (%)	0.5	0.5-0.75	0.75
2.	Total Nitrogen (kg/ha)	250	250-500	500
3.	Available Phosphorus (kg/ha)	20	20-50	50
4.	Available Potassium (kg/ha)	125	125-300	300

- a) **Organic Manure:** Organic manures are obtained from decaying plant and animal material. It plays an important role in building up soil fertility and increasing moisture-holding capacity and growth of micro-organism in the soil. It also improves micro-nutrient levels and the physical condition of the soil. Organic manures helps in improving the soil moisture retention in sandy soils and easy percolation of water in clay soils. Hence, application of adequate quantity of organic manure to maintain the fertility status of the soil is very essential. The common organic manure used for mulberry garden is farmyard manure. Use of compost or vermicompost is very useful in increasing the nutrient availability to the plants. Under irrigated condition, farmyard manure is applied at the rate of 20 tonnes per hectare per year in 2-3 split doses, whereas, under rainfed condition, 10 tonnes of farmyard manure per hectare per year is applied during the onset of monsoon after annual bottom pruning. As the availability of good quality farm yard manure is becoming difficult day-by-day, it is highly beneficial for the farmers to prepare compost or vermicompost using sericultural farm residues like silkworm litter, rearing bed refuses, leftover mulberry twigs and other decomposable organic materials like weeds, leaves, green twigs etc. It has been estimated that one hectare of mulberry garden under irrigated conditions can provide about 6-8 metric tonnes of sericultural residues which can be used effectively for the production of compost/vermicompost (Fig. 2.3).



Fig.2.3: Vermicomposting

b) Application of Chemical Fertilizers: Mulberry is a nutrient hungry plant. The requirement of major nutrients especially nitrogen is very high compared to other crops as it is fast growing and grown mainly for its leaf which is harvested at least five times in a year. Hence, application of recommended dose of chemical fertilizers is essential as fertilizers break down quickly and the nutrients are readily available to the plants for quick and luxuriant growth. Chemical fertilizers are applied to the soil in the form of straight or complex fertilizers from time to time to improve the availability of major plant nutrients, i.e., Nitrogen, Phosphorus and Potash. The quantity of fertilizers and the schedule of application mainly depend upon the system of cultivation. The recommended dose of chemical fertilizers and schedule of application for irrigated and rainfed mulberry in South India is presented in Table 2.2.

Table 2.2: Recommended Dose & Schedule of Chemical Fertilizer for Mulberry Garden Maintained Under Irrigated & Rainfed Conditions

NPK (kg/ha/year)	Schedule	
	Crop No.	Quantity kg/ha/crop
Irrigated garden with shoot harvest NPK @ 350:140:140 in 5 equal splits	I	NPK @ 70: 28: 28
	II	NPK @ 70: 28: 28
	III	NPK @ 70: 28: 28
	IV	NPK @ 70: 28: 28
	V	NPK @ 70: 28: 28
Irrigated garden and leaf picking method of harvest NPK @ 300:120:120 in 5 splits	I	NPK @ 60: 60: 60
	II	60: - -
	III	NPK @ 60: 60: 60
	IV	60: - -
	V	60: - -
Rainfed garden and leaf picking method of harvest NPK @ 100:50:50 in 2 splits	I	NPK @ 50: 50: 50
	II	-
	III	50: - :-

Mulberry gardens maintained under irrigated condition with shoot cut method of harvest is provided with chemical fertilizer at the rate of 350:140:140 kg NPK/ hectare/year in 5 equal split doses corresponding to five harvests at the rate of 70:28:28 kg NPK per hectare per crop. In mulberry garden under irrigated condition with leaf picking method of harvest, the fertilizer is applied at the rate of 300:120:120 kg NPK/ha/year in 5 splits. The first and third dose of fertilizer is applied at the rate 60:60:60 kg NPK /ha/crop in the form of straight or complex fertilizer while second, fourth and fifth dose of fertilizer is applied in the form of Nitrogen only.

Under rain fed condition, NPK is applied at the rate of 100:50:50 kg/hectare/year in two split doses. The first dose of NPK is applied at the rate of 50:50:50 kg / hectare after annual bottom pruning during rainy season (June-July). The next dose of 50 kg nitrogen alone is applied 2-3 weeks after second leaf harvest.

Chemical fertilizers should be applied only after 20-25 days of pruning or leaf harvest. The most commonly used straight nitrogen fertilizers are urea (46% N) and Ammonium Sulphate (20% N), while for phosphorus and potassium, straight fertilizers used are Single Super Phosphate (16% P₂O₅) and Muriate of Potash (60% K₂O). Use of complex fertilizers like Suphala (15:15:15), Vijay complex (17:17:17) and Sampurna (19:19:19), for Nitrogen, Phosphorus and Potassium source respectively, is also very common.

Method and Time of Application: Fertilizers are applied by opening a furrow of about 5-8 cm deep by the sides of the plants after 25 days of shoot harvest / leaf picking using bullock drawn plough followed by covering it with soil (Fig. 2.4).



Fig. 2.4: Application of fertilizer

Irrigation should be provided immediately after the application of fertilizer for better uptake of nutrients by the plants. However, to reduce the cost of cultivation and soil pollution, chemical fertilizers can also be supplemented through the use of bio-fertilizers.

- c) **Bio-fertilizer:** Bio-fertilizers are made up of live or latent cells of micro-organisms like bacteria and fungi capable of helping the plants to get nitrogen and phosphorus. Bio-fertilizers are used as a cost effective supplement to fertilizers and are also eco-friendly. In mulberry cultivation, application of *Azotobacter* bio-fertilizer called **Seri-Azo** (Fig. 2.5) at the rate of 20 kg / ha / year in 5 equal split doses (4 kg/crop) corresponding to the application of 5 equal split doses of chemical nitrogen fertilizer has been recommended. Phosphate solubilizing bio-fertilizer called **Seri-Phos** has been recommended to be applied at the rate of 5 kg/ha/year in 5 equal split doses (1 kg /crop) corresponding to the 5 split applications of phosphorus fertilizer. The bio-fertilizer **Seri-Azo** helps in nitrogen fixation in soil while **Seri-Phos** helps in dissolving insoluble phosphorus in soil and making it available to the plants. Both the bio-fertilizers are mixed with 200 kg of powdered farmyard manure and applied in between the rows of mulberry by opening furrows 10 days before chemical fertilizer application. By the application of bio-fertilizer, it is possible to reduce the application of both nitrogen and phosphorus fertilizers by 50 %. Similarly, in rainfed mulberry, **Seri-Azo** and **Seri-Phos** can also be applied at the rate of 10 kg and 1 kg /ha/year, respectively during rainy season in two equal splits by mixing with 200 kg of powdered farmyard manure.



Fig. 2.5: Biofertilizer “Seri-Azo”

- d) **Green Manuring:** Green manuring is an age-old practice of growing leguminous plants and incorporating the same into the soil to improve the soil fertility. Green manuring plants can fix atmospheric nitrogen in the soil by the action of root nodule bacteria (*Rhizobium*). In mulberry garden, green manuring (Fig.2.6) is done by growing short duration green manuring crops like Sun Hemp, Dhaincha, Cowpea and incorporating the green biomass along with the roots in the soil by ploughing. In a year, green manuring can be done once or twice during rainy season (June-July and September-October). About 25-30 kg seeds of a selected green manure crop is required per hectare each time to be broadcasted between the rows of mulberry plants after pruning and inter-cultivation operations. After 35-40 days of sowing or before flowering, the green plants are cut into small bits and incorporated into the soil by ploughing. This helps in increasing soil organic matter and also supplies additional nitrogen besides improving soil structure and water holding capacity of the soil.



Fig. 2.6: Growing green manure crop

Check Your Progress 2

Note: a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

- 1) What is soil fertility?

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- 2) Which are the common organic manures used in mulberry cultivation?

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3) What is the recommended fertilizer schedule followed for mulberry under irrigated condition?

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4. Name two commercially available bio-fertilizers used in mulberry cultivation?

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5. Name two green manuring crops used in mulberry cultivation?

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2.4 METHOD OF IRRIGATION AND SOIL MOISTURE CONSERVATION

Of all the major inputs in mulberry cultivation, irrigation plays a vital role in increasing the leaf yield and quality as it helps in better utilization of the nutrients absorbed by the plants. Irrigation water should be used carefully without wasting this precious input. Mulberry plants with good irrigation show luxuriant growth with succulent leaf, which is relished by the silkworm. If there is scarcity of water, the growth of the mulberry plants is restricted and they become poor in yield and quality. Normally, about 120-150 mm well-distributed rainfall in a month is required for the luxuriant growth of mulberry. But, such conditions rarely exist. Hence, it is very essential to supplement the required quantity of water by irrigation from time to time to maintain optimal soil moisture. The frequency of irrigation for the mulberry crop depends upon several factors such as soil type, agro-climatic conditions and growth phase of the plant. Normally, the frequency of irrigation varies from 10-12 days interval in clayey loam soil and 7-10 days interval for sandy loam soils. For each irrigation, one and half inch of irrigation water (approximately 33,000 gallons) per acre is required. The different methods of irrigation are described below:

a) Furrow Method

This is the most common method of irrigation practised in mulberry cultivation. In this method, the mulberry garden is laid out into a series of ridges and furrows (channels) and the water is provided all along the furrows (Fig. 2.7).



Fig.2.7: Furrow method of irrigation

b) Overhead Sprinkler

This method of irrigation is generally practised in undulating land as well as in hilly areas where irrigation by furrow method is not possible. This method is also effective in saving irrigation water. Though, it is effective in saving the water, the initial cost of installation is very high. Hence, it has limitations in large-scale adoption.

c) Drip Irrigation

Drip irrigation or micro-irrigation (Fig.2.8) is an innovative method of irrigation, wherein the required quantity of water is released near the root zone through micro tubes. Drip irrigation is becoming popular as it minimizes water loss. Through drip irrigation, it is possible to save about 40% of irrigation water with minimum labour as compared to furrow method of irrigation. It also helps in avoiding soil erosion and weed growth as water is given at the required location. It can be gainfully utilized in paired row system of plantation.



Fig. 2.8: Drip irrigation

SOIL-MOISTURE CONSERVATION

The availability of irrigation water in agriculture or in mulberry cultivation is becoming very much limited day-by-day due to gradual reduction in the ground water table. Hence, it is highly essential to conserve the soil moisture through different methods as described below for productive growth of crop plants.

- i) Fall Ploughing:* This is done by repeated ploughing of land just before the onset of monsoon for maximum percolation of rainwater.
- ii) Compartmental Bunding:* Small sub-plots are made within the main plots with raised bunds to hold water in the sub plots.
- iii) Dead Furrow with Tide Ridges:* This can be adopted in relatively sloppy lands. The furrows should be intercepted with small bunds to stop run-off water.
- iv) Growing Green Manure Crops:* Application of sufficient organic matter, tank silt, and farmyard manures can be added to improve water-holding capacity of the soil. However, in the days of scarcity of these inputs, one can practise green manuring with leguminous plants like sun hemp, dhaincha, cowpea etc. to improve the organic matter content of the soil which in turn can conserve soil moisture effectively.
- v) Mulching:* Covering the surface of the soil with dry leaves, weeds etc. to check the loss of soil moisture through evaporation is called **mulching**. This can also be done economically by growing green manure crops and using the same as mulch material. The soil surface should be covered with dry weed mulch to check the soil moisture loss through evaporation. Under rainfed condition, the plants are entirely dependent on rainwater; therefore, it is very

important to conserve soil moisture by means of mulching to avoid run-off loss of rainwater from the land.

vi) **Growing Drought Tolerant Mulberry Varieties:** Some plants in nature can survive with limited water, which is governed by their genetic capacity to tolerate water scarcity and they are called drought tolerant plants. In mulberry also, there are varieties like S-13 and S-34, which are very efficient in withstanding drought conditions and can produce reasonably high leaf yield. These varieties grown under rainfed conditions can very well survive with efficient use and hence can be very useful in sericulture.

Check Your Progress 3

Note: a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1) What are the different methods of irrigation followed in mulberry cultivation?

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2) Give two advantages of using drip irrigation.

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3) Explain the need for soil moisture conservation.

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4) What is mulching?

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2.5 TYPES OF PRUNING

In Unit-1 of this Block, we have discussed in detail about the types of plantation followed in different regions of India. Please go through that chapter once again, so that you can understand the importance of pruning in mulberry cultivation to improve yield and cultivation practices.

Pruning is one of the most important activities of mulberry cultivation. It is a process of removing certain branches systematically to give the mulberry plants a convenient shape and size and also to activate the buds to sprout and produce new branches. Pruning is done mainly to improve the yield and quality of the leaf. It is also followed to harvest the shoots for silkworm rearing and to carry out different inter-cultivation operations like ploughing, weeding, manure and fertilizer application and synchronization of silkworm rearing. Pruning is done using a sharp secateur, pruning saw or sickle without damaging the bark or stem.

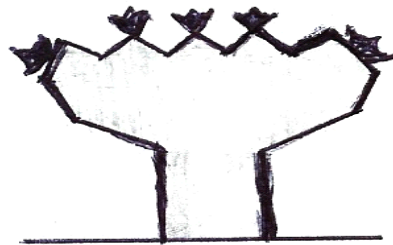
Under rainfed conditions, the plants are pruned only once a year at 10-20 cm above

the ground level during June-July at the onset of monsoon. Then, the plants are allowed to grow as bush, with many branches until the next year. Harvest of leaf is done by leaf picking method only.

- a) **Types of Pruning:** Pruning is classified on the basis of the height of the stem at which it is cut. When the main stem is cut at ground level at every harvest without allowing for the formation of stump, it is called **bottom pruning**. In case of low-cut pruning, the plants are cut about 10-30 cm above the ground level for the development of the main stump. Medium cut and high cut pruning is followed at around 60 cm and 100 cm above ground for development of medium to small sized trees.

There are mainly two types of pruning:

- i) **Fist Form:** Where the branches are cut at the base at the same height (Fig 2.9). Since no new branches are allowed to develop into new stump, it enlarges in width giving the shape of a fist to the plant.



Fist form of training

Fig. 2.9: Fist form of training

- ii) **Non-fist Form:** The branches are cut leaving 2-3 buds at the bottom of the shoot. Due to this, the height of the plants increases after every harvest of shoot. Non-fist form of pruning helps to produce more number of shoots (Fig 2.10).



Fig. 2.10: Non-fist form of stem

- b) **Thinning of Branches:** Thinning of branches is a process of removal of excess branches from a plant to facilitate it to grow well and to produce more leaves. When mulberry plants are pruned, many buds are sprouted and after a few days, you can observe that only few sprouted buds have developed into healthy shoots, while other sprouted buds remain stunted and weak. Such weak shoots are not suitable for silkworm rearing. In addition, the competition among many growing shoots causes improper distribution of plant nutrients among all the shoots and as a result weak shoots develop. Hence, it is very essential to restrict the number of branches (10-12) per plant by removing the excess branches after 30-35 days of pruning. This results in better growth, development of mulberry plants and production of quality leaves (Fig. 2.11).



Fig. 2.11: Thinning of shoots

Check Your Progress 4

Note: a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1) What are the types of pruning followed in mulberry cultivation?

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2) What is thinning?

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2.6 METHOD OF LEAF HARVEST

Harvesting of leaves is an important activity of mulberry cultivation as the harvested leaves are used for silkworm rearing. There are mainly two methods of harvesting of leaves viz., (i) leaf picking and (ii) whole shoot harvest.

a) Leaf Picking: In this method, leaves are harvested by picking the leaves individually. This method has the advantage of harvesting the leaf according to the growth stage of the silkworm. Tender leaves are harvested to feed the young age silkworm and matured leaves for late age silkworm rearing. The disadvantage of this method is that it is highly labour intensive and therefore, becomes expensive.

In southern states, especially under rainfed condition, after the harvest of leaves from the main branches, the terminal buds are removed and the auxiliary buds are allowed to develop into many lateral branches. Subsequently, the leaves from the lateral branches are harvested by picking. In leaf picking method, from a garden, six harvests can be made in a year at an interval of 55-60 days per crop. Normally, after annual bottom pruning, first leaf picking starts after 8-10 weeks and subsequent harvests by picking of leaf is followed at an interval of 6-8 weeks.

b) Shoot Harvest: In this method of harvest, whole shoot is cut at the stump height of 20-25 cm above the ground level and the entire shoot is used for silkworm rearing. In this method, five harvests are made in a year following 70 days of crop cycle from one crop to another crop. In this method, harvesting of leaf and pruning of plants are completed simultaneously (Fig. 2.12). For pruning, it is very beneficial to use pruning saw or secateur and the bark of the main stump should not be damaged.



Fig. 2.12: Shoot pruning and harvest

Shoot harvest method has many advantages like:

- Reduced expenditure on labour for harvesting, transportation and feeding silkworms.
- The number of feeds per day is reduced considerably.
- Leaf moisture is retained for longer period.
- Shoots can be preserved easily.
- It is more hygienic.

Check Your Progress 5

Note: a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1) Describe the methods of harvest followed in mulberry cultivation.

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2) Explain two advantages of shoot harvest.

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2.7 WEED MANAGEMENT

The unwanted plants growing along with the main crop are called **weeds**. Weeds are a menace in any cultivated land and mulberry cultivation is not an exception. Weeds compete with mulberry plants for water and nutrients and reduce the yield considerably. Weeds also act as host for many harmful pests and diseases of mulberry. Therefore, it is very much essential to keep the plantation free from weeds.

Among the weeds, *Cynodon* (Hariyali) and *Cyperus* (Nut grass), which are perennial and very common in mulberry garden, causes maximum damage to the mulberry plantation in terms of leaf yield and quality. These weeds are in general very much difficult to control. Generally, weeds are removed manually by using various farm implements like weeding sickle, Kolgudali, Pick-axe etc. and by ploughing. However,

these practices are not very effective for controlling the above said perennial weeds. In such a situation, it is better to use commercially available weedicides like Glycel. Spraying of 0.71% of Glycel two times in a year after bottom pruning (before I crop and after II crop) at the rate of 1.36 kg active ingredients per hectare (7.1ml Glycel in one litre of water) is found to be very effective in controlling these perennial weeds. However, care should be taken to remove any left-over leaves from mulberry stumps before spraying the weedicide to avoid any damage to the plant. About 600 litres of solution is required each time to cover one hectare plantation for spraying.

Check Your Progress 6

Note: a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1) Name some weeds common in mulberry gardens which are difficult to control.

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2) What is Glycel?

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2.8 LEAF TRANSPORTATION AND PRESERVATION

So far, we have discussed the various activities of mulberry cultivation with the primary objective to produce nutritious and succulent leaf to feed the silkworm. Now, let us discuss the importance of maintenance of leaf moisture during transportation of leaf from the field to the rearing house and their preservation. The leaf / shoot starts losing moisture very soon after harvest and transportation to the rearing house. This is more so when the atmospheric temperature is high and the humidity is low. This makes the leaf unfit for silkworm rearing. Therefore, it is very essential to transport the leaf from the field to the rearing house with great care to avoid moisture loss. This is more important when the leaves are harvested for young age silkworm rearing.

In order to preserve the leaf moisture, it is desirable to construct the rearing house / shed near the mulberry field for easy and quick transportation of leaf / shoot. This will ensure the supply of fresh leaves for silkworm rearing and also reduces the cost of transportation. Harvest of leaf / shoot should preferably be done during cooler hours of the day and transported to the rearing house in baskets covered with wet gunny cloth (Fig. 2.13). When large quantity of leaf / shoot is required to be transported, it must be covered with wet gunny cloth (Fig. 2.13) or polythene sheets to reduce the loss of moisture. As the silkworms are fed 2-3 times in a day, it is very important to preserve the leaf / shoot in a cool, moist and clean place. It is desirable to preserve the leaf in a leaf chamber covered with wet gunny cloth, while the shoots are preserved by covering with wet gunny cloth.



Fig. 2.13: Transportation of leaf/shoots to rearing house

Check Your Progress 7

Note: a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

- 1) What precautions are to be taken while transporting mulberry leaf for silkworm rearing?

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- 2) What precautions are to be taken while preserving mulberry leaf for silkworm rearing?

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2.9 ASSESSMENT OF LEAF YIELD AND QUALITY

Mulberry starts yielding to its optimum level after two years of plantation, provided a recommended package of practices is followed. In southern states, improved mulberry varieties like S_{36} and V_1 produces about 38,000 - 45,000 kg and 45,000 – 55,000 kg of leaf/hectare/year, respectively, under irrigated condition. Thus, approximately 7,000 to 9,000 kg and 9,000 to 11,000 kg of leaf/hectare/crop can be harvested from S_{36} and V_1 mulberry varieties, respectively. This much of leaf would be sufficient to rear 500-650 and 650-800 dfls of improved silkworm hybrids. It is important to note that for every 100 dfls of silkworm eggs, about 1,400 kg of leaf is required to rear bivoltine or improved multivoltine silkworm breeds. Similarly, under rainfed conditions, improved mulberry varieties like S_{13} and S_{34} can produce about 10,000 – 12,000 kg of leaf per hectare per year. Thus, approximately 2,000-2,400 kg of leaf/ hectare/crop can be harvested. This would be sufficient to rear approximately 200-250 dfls of commercial multivoltine hybrids per crop at the rate of 1,000 kg leaf for every 100 dfls. However, uniform production of leaf yield throughout the year is difficult to achieve as leaf production varies depending upon the season and management practices. Hence, before taking up silkworm rearing, it is very much important and essential to assess the availability of leaf to decide the quantum of silkworm layings to be brushed.

The success of rearing mainly depends upon the quality of the leaf produced. The requirement of quality leaves for silkworm varies depending on the age of the silkworm and the race used. For young age silkworm (chawki worms), tender, soft and succulent leaves which are rich in moisture (>78%), sugar (11-13 %) and protein (23-25%) contents are desired for easy consumption of leaf and vigorous and uniform growth. For the middle and late age silkworm, large quantity of medium to coarse leaves with moisture around 70% are preferred.

Check Your Progress 8

Note: a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

- 1) What is the leaf yield expected per year from a mulberry garden of one hectare area maintained under irrigated and rainfed conditions?

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2.10 LET US SUM UP

The quantity and quality of leaf have a direct impact on cocoon production as well as profit as it accounts for about 60% production cost of silk. Cultivating high yielding mulberry varieties and adopting suitable cultivation practices ensure high yield of quality leaf. Though mulberry is cultivated both under rainfed and irrigated conditions, production and quality of leaf is always higher in irrigated condition. At present, mulberry varieties viz., S₃₆ and V₁ and S₁₃ and S₃₄ are recommended in South India under irrigated and rainfed conditions, respectively. Mulberry is generally raised as bush plantation under wider spacing of 90 cm x 90 cm or closer spacing under 60 cm x 20 cm. However, planting of mulberry in wider spacing is advantageous. Paired row system of plantation following (150 cm+90 cm) x 60 cm spacing is becoming more popular as it facilitates adoption of mechanization for inter-cultivation operations by using tractor / power tiller. To get high leaf yield continuously for many years, it is very essential to maintain the soil fertility status of the mulberry garden. Timely application of recommended dose of manure and fertilizers in every year is very essential to maintain the consistent leaf yield. Soil fertility can be improved effectively by application of compost or vermicompost. Application of bio-fertilizers is highly useful and eco-friendly and also helps to decrease the dependency on chemical fertilizers and reduce the cost of cultivation. Irrigation water is the most vital input for consistent leaf yield and quality. Efforts should be made to save water by adopting drip irrigation system and *in-situ* soil moisture conservation practices.

2.11 GLOSSARY

Grafting	: A method of multiplication.
High Cut	: Plant pruned at 150-175 cm height for the development of crown.
Layering	: A method of multiplication.
Low Cut Mulberry	: Bush type of mulberry shaped by cutting the plants at 20-25 cm height.
Medium Cut	: Plants pruned at 60-70 cm height for the development of crown.

Pit System	: Method of plantation in pits.
Propagation	: Multiplying the plant.
Row System	: Method of plantation by making rows and furrows.
Spacing	: Desired spacing between plants and rows.
Weeds	: Unwanted plants in a crop.

2.12 SUGGESTED FURTHER READING

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2.14 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

- 1) High yielding mulberry varieties, suitable cultivation practices and suitable plant protection measures.
- 2) Kanva-2, V₁, S₃₆, S₁₃, S₃₄ and MR-2.
- 3) Pit system, row system and paired-row system.

Check Your Progress 2

- 1) Capacity of the soil to supply essential nutrients for good growth of the plants.
- 2) Farm yard manure, compost and Vermi-compost.
- 3) NPK @ 350:140:140 in five equal splits.
- 4) Seri-Azo and Seri-Phos.
- 5) Sun Hemp, Dhaincha and Cowpea.

Check Your Progress 3

- 1) Furrow method, Sprinkler and Drip irrigation.
- 2) Saves water and cost of irrigation.
- 3) To save soil moisture.
- 4) Covering the surface of the soil with dry leaves, weeds etc. to check the loss of soil moisture through evaporation is called Mulching.

Check Your Progress 4

- 1) Fist form and Non-fist form.
- 2) Removal of excess branches.

Check Your Progress 5

- 1) Leaf picking and Shoot harvest.
- 2) Reduced expenditure and More hygienic.

Check Your Progress 6

- 1) Cynodon and Cyperus.
- 2) Commercial weedicide.

Check Your Progress 7

- 1) Harvest during cooler hours and cover the leaf with wet gunny cloth.
- 2) Preserve in a cool, moist and clean place and use leaf chambers covered with wet gunny cloth.

Check Your Progress 8

- 1) Around 35-50 MT under irrigated and 10-12 MT under rainfed conditions.