UNIT 3 RAISING AND MAINTENANCE OF CHAWKI MULBERRY GARDEN

Structure

3.0 OBJECTIVES

After reading this unit, you will be able to:

- explain the importance and benefit of chawki rearing;
- defend the need of a mulberry garden exclusively for young stage silkworm rearing;
- evaluate the quality of mulberry leaf as silkworm feed;
- support its economic benefits; and
- summarize the maintenance of chawki garden.

3.1 INTRODUCTION

The purpose of this unit is to spell out clearly what you mean by a chawki mulberry garden and why it is required. It is understood that you have acquired sufficient knowledge from the previous units "Establishment of Mulberry Garden" (Unit 1) and "Mulberry Cultivation Practices" (Unit 2). In this Unit, you will learn about a special mulberry garden called "**Chawki Mulberry Garden**". Chawki mulberry garden is a very important aspect of study in sericulture. This mulberry garden is developed to obtain a very high quality mulberry leaf to rear young stage (baby) silkworm which is called "**Chawki Rearing**". Chawki rearing is a vital aspect of sericulture industry for development of healthy worms and ultimately a successful cocoon crop. Do you know that "high quality" mulberry leaf means tender and soft leaves rich in moisture or water content (79-80 %), carbohydrate or sugar (11-13 %) and protein (23-25 %)? This quality leaf is mainly required for developing young silkworm. By providing this type of leaf, the young silkworm will be healthy, develop resistance to diseases and produce good quality cocoons.

As you all know, when a human baby is looked after with good care and nourished with quality food, the baby will be strong and healthy in later life. The same is applicable in the case of silkworm too. When silkworms are hatched from the eggs, they look like small ants, are very tender and can only get required food by feeding on tender mulberry leaf. They grow day-by-day as matured larvae by eating quality mulberry leaves. In the young stage up to second moult, silkworm is fed with tender and quality leaves as mentioned above. If you provide coarse leaf or older matured leaf, the young silkworms become weak and prone to various diseases in later age due to lower moisture content and poor quality of leaf. When young silkworms are reared with good care and good quality of leaf as mentioned above, they will be healthy and strong and as a result the cocoon yield will be good and high.

3.2 CONCEPT OF CHAWKI MULBERRY GARDEN

The concept behind the chawki mulberry garden is to develop a completely separate mulberry garden as a continuous source of production of quality leaf suitable for young age silkworm rearing. You cannot produce such specific quality of leaves in sufficient quantity from a general mulberry garden meant for late age silkworm rearing. Because the leaves of general mulberry garden contain very less moisture (68 -70%) and are poor in other nutritional contents, a separate mulberry garden is required to develop healthy and robust silkworms so that the worms can produce better quality of cocoons and you can get increased silk production. Further, hygienic and proper chawki rearing with good quality leaf will increase disease tolerance in silkworm and help them remain healthy till spinning of cocoon. Suppose you want to take up sericulture as a livelihood, this concept will be very much useful. You can also reduce the expenditure in rearing by obtaining chawki reared worms from commercial Chawki Rearing Centre (CRC) and you can engage yourself in other household work till you get the chawki reared worms. The concept of a chawki mulberry garden is thus very appropriate particularly for a chawki rearing centre.

Fig. 3.1: A chawki mulberry garden in different stages

3.3 MULBERRY VARIETIES

To develop a chawki mulberry garden exclusively for young age silkworm rearing, a high yielding mulberry variety with superior leaf quality is required. In South India, S_{36} or V_1 mulberry varieties are found to be most suitable for young age silkworm rearing. These varieties produce high quality leaf rich in moisture (water content), sugar and protein, besides various other nutrients required for good growth of silkworm. The characteristic features of the two varieties are described below.

VARIETY S_{36}

- **Branch type** : Spreading
- **Leaf** : Large, entire, pale green, smooth and glossy
- **Leaf yield from late age garden**: 40 -50 metric tonnes per hectare per year (Tender, Medium and Matured leaves)
- **Leaf yield from chawki garden**: 30- 35 metric tonnes per hectare per year (Only tender chawki leaves)

VARIETY V_1

- **Branch type** : Erect
- **Leaf** : Large, entire, dark green, thick and glossy
- **Leaf yield from late age garden**: 50 - 60 metric tonnes per hectare per year (Tender, Medium and Matured leaves)
- **Leaf yield from chawki garden**: 30 - 40 metric tonnes per hectare per year (Only tender chawki leaves)

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) Give 2-3 important points on the advantages of chawki rearing.

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2) Write 2-3 important points on the leaf quality of mulberry from a chawki garden.

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3) Write the names of two important mulberry varieties used for chawki garden.

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3.4 PLANTATION

This part of the lesson is very important, as you will be able to learn how to take up a new mulberry plantation to raise a chawki garden. The steps to be taken are the same as those described in Block1, Unit1. Once the plantation is completed, it is now the time to take up establishment care of the plantation.

3.5 ESTABLISHMENT OF PLANTATION

Mulberry plantation gets established generally in 8-10 months time. Thus, during the establishment period of the plantation, you should take much care to support the plants to grow properly. Irrigation should be provided at regular intervals of 7-10 days depending on the soil condition. Weeding should be done manually after two months of planting. When the plantation is three months old, you have to apply first dose of chemical fertilizer @ 50 kg nitrogen (250 kg of ammonium sulphate), 50 kg

phosphorus (300 kg single super phosphate) and 50 kg potash (80 kg Muriate of potash) per hectare as first dose and the plants should be allowed to grow for six months without pruning or leaf harvest. The second weeding should be done after four months of plantation and you should apply another dose of nitrogen @ 50 kg per hectare as ammonium sulphate (250 kg). When the plants are 6- 8 months old, it is suitable for first pruning. The plants should be pruned with the help of a secateur at the height of 20-25 cm above the ground level to build a well developed crown. Only 10-12 well developed shoots should be allowed to grow from each plant and all the excess side branches including weak branches should be removed. If you follow all the procedures mentioned above, you can get a very well established chawki mulberry garden. Afterwards, the chawki mulberry garden has to be maintained following the package of practices mentioned in next section.

Fig. 3.2: An established chawki mulberry garden

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) After how many months of plantation, is it advisable to prune a mulberry garden?

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2) What is the recommended dose of chemical fertilizers to be applied during establishment period of a mulberry garden?

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3) What is the recommended frequency of irrigation during establishment period?

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4) Name three important chemical fertilizers used for mulberry garden.

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3.6 MAINTENANCE OF CHAWKI MULBERRY GARDEN

Package of practices for the maintenance of chawki mulberry garden from the second year onwards involves pruning, ploughing of the land, weeding, application of manure

and chemical fertilizers in time, irrigation at regular intervals as well as harvest of eight crops per year as leaf and shootlet, alternately. Since from a particular chawki mulberry garden eight crops will be harvested in a year, it is highly essential to follow the recommended package of practices without any deviation to make a successful chawki garden as stated below:

a) Pruning

Once the garden is established, first pruning has to be done at 20-25 cm above the ground level. First crop of chawki leaf is harvested after 40 – 45 days of pruning and the plants are top clipped. After 35 days of top clipping, the second crop is harvested in the form of shootlets and then the plants are once again pruned at 20 –25 cm above the ground level (Fig. 3.3). Thus, in a span of 90 days, two crops are harvested. However, the pruning should be done with a secateur so as to maintain proper stump height and without any injury to the plants.

Fig. 3.3: Chawki mulberry garden pruned at 25 cm above ground level

b) Ploughing the Land

Ploughing the land is very essential to maintain the health of the soil. It helps the soil to absorb rain water or irrigation water effectively. It also increases the soil aeration and helps to remove weeds along with the roots so that the plants can grow properly. Ploughing has to be done after every pruning to remove the weeds. You can get the land ploughed by a tractor or power tiller or by a country plough. The land should be ploughed along the mulberry rows as well as across the rows (Fig. 3.4). The space (150 cm width) between paired rows of plantation can be maintained by a tractor or a power tiller through ploughing along the rows of mulberry, while it is not possible to plough across the rows due to narrow space (60 cm x 60 cm) between the plants. Hence, one country plough is also necessary to cross plough the land and to remove all the weeds especially grasses. It is better to provide one irrigation at least 5-6 days before each ploughing.

Fig. 3.4: Ploughing the land

c) Weeding

Weeds in mulberry garden, especially grasses, take out a good quantity of soil moisture and plant nutrients, and as a result, reduce the leaf production and leaf quality. Hence, removal of weeds from mulberry garden is very essential to maintain mulberry growth and yield. Weeds can be easily removed from a mulberry garden manually after ploughing. Ploughing will uproot weeds along with the roots and will be easy to remove with the help of garden implements (Fig. 3.5). Thus, ploughing is very important for weed control. You can also check the weed incidence in mulberry by spraying 0.71 % Glycel, a chemical for killing the weeds. The spraying of weedicide should be done preferably in the morning hours on a sunny day within 2-3 days after pruning. All the left-over leaves in the mulberry plant should be removed prior to the spraying. This practice can save manual weeding operation and money.

Fig. 3.5: Weeding

d) Application of Organic Manure

Once a chawki mulberry garden is established, it can produce leaf continuously for a period of 15 – 20 years without any decrease in leaf yield and quality, provided manure and fertilizers are applied at timely intervals along with irrigation and weeding. Since the plants are pruned four times and the leaves are harvested eight times in a year, a large quantity of leaves and branches are removed by the process. These in turn remove good quantity of nutrients from the soil, which needs to be added from time to time to maintain the soil health. Thus, farmyard manure or compost should be applied @ 40 metric tonnes per hectare per year in four equal split doses (10 metric tonnes per split) after every pruning (Fig. 3.6). This helps in maintaining soil health and improves leaf yield and quality. Apply farmyard manure after every pruning and weeding. The manure should be applied and mixed with the soil by ploughing. Irrigate the garden after manure application.

Fig. 3.6: Application of Organic Manure

e) Application of Chemical Fertilizers

Since chemical fertilizer is a very important input for the supply of nitrogen, phosphorus

and potash to the mulberry plants, its application is a must for the production of good quality leaf in the mulberry chawki garden. Apply chemical fertilizer in the chawki garden @ 260 kg nitrogen, 140 kg phosphorus and 140 kg potash per hectare per year in eight equal split doses corresponding to the eight crops harvest. For this, you can apply 1,300 kg ammonium sulphate, 875 kg single super phosphate and 233 kg muriate of potash annually in one hectare of chawki garden. If you divide this into eight equal split doses, then you have to apply 163 kg Ammonium Sulphate, 109 kg Single Super Phosphate and 30 kg Muriate of Potash in every crop in one hectare garden. You should apply chemical fertilizer in chawki mulberry garden within 10-15 days of every crop harvest. Before fertilizer application, you should be very sure that the garden is made weed free and arranged for irrigation. This will help the mulberry plants to get proper nutrition. Apply fertilizer in 5-8 cm deep furrows made by ploughing and cover the furrows with soil after fertilizer application (Fig. 3.7). This will minimize the loss of nutrients applied through fertilizer by direct exposure to rain and sunlight. Irrigate the garden through furrows immediately after fertilizer application.

Fig 3.7: Fertilizer application

f) Irrigation

Irrigation is an important aspect in mulberry cultivation as it helps in dissolving the nutrients for its proper use by the plants. Provide irrigation to a chawki mulberry garden once in every 4 - 5 days, so that the soil remains wet and the leaf gets more water content. Since chawki mulberry leaf should contain more than 70 % moisture, it is very essential to provide sufficient irrigation without fail (Fig. 3.8). Irrigate the garden by making furrows at least 15 cm deep in between every paired row of mulberry and fill it with irrigation water. This will be sufficient to keep the leaf afresh up to 4 - 5 days. During rainy season, the frequency of irrigation can be reduced as per the need.

Fig.3.8: Irrigation

g) Harvest Schedule

After the establishment of the chawki mulberry garden, the first pruning of the plants should be done at 20–25 cm above the ground level. This is done preferably in rainy season (July-August). After 45 days of bottom pruning, first harvest is done by leaf

picking for 5 days for first batch of chawki rearing of silkworm up to second moult. At the end of the chawki rearing, the top terminal buds of each shoot of the plants are clipped on 5th day. Other practices like ploughing, weeding, fertilizer application and irrigation are to be followed as detailed above. Thirty five days after top clipping, second harvest in the form of shootlet (branches) is done for another 5 days for second batch of chawki rearing. Thereafter, the plants are once again bottom pruned at 20-25 cm above the ground level. This completes one cycle of ninety days and harvest of two crops. The similar cycle has to be repeated four times to get eight crops in a year.

➢**Leaf harvest: Individual leaf picking for 1st,3rd,5th and 7th crops while shootlet harvest in 2nd, 4th, 6th and 8th crop.**

➢**Pruning: Plants are to be pruned at the crown four times in a year after 2nd, 4th, 6th and 8th crops.**

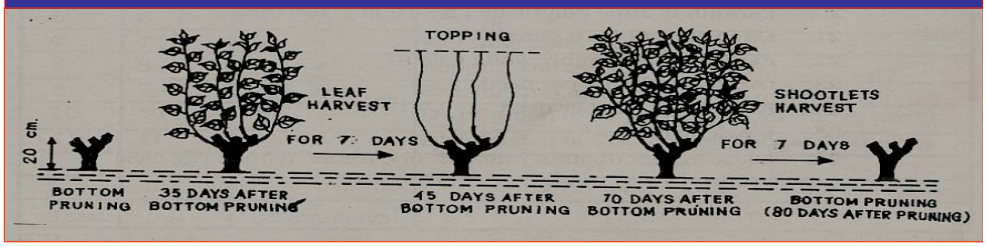

Fig. 3.9: Chawki garden ready for leaf harvest

Fig. 3.10: A chawki garden top clipped after leaf harvest

Fig. 3.11: Shootlet formation

h) Yield and Qualities of Chawki Leaf

Following the package of practices mentioned above, it is possible to obtain 30 – 35 metric tonnes of chawki leaf per hectare per year from S_{36} and V_1 mulberry varieties. Further, it is also possible to achieve 78 % leaf moisture, 3.75 % nitrogen and 23.43 % of crude protein in chawki leaf of S_{36} variety and 79 % leaf moisture, 3.8 % nitrogen and 23.75 % crude protein in chawki leaf of V_1.

i) Capacity of Chawki Silkworm Rearing

From the above mentioned quantity of leaf it is possible to rear approximately 1.66 to 1.94 lakhs dfls of chawki silkworm per hectare per year or 20,000 – 24,000 dfls per crop with the chawki leaf of S_{36} and V_1 variety.

j) Cost of Chawki Leaf Production

The cost of production of one kilogram of chawki leaf is worked out to be Rs.3.

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 is the recommended dose of farm yard manure to be applied in an established chawki mulberry garden?

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2) What is the recommended dose of chemical fertilizers to be applied in an established chawki mulberry garden?

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3) A chawki mulberry garden is irrigated at an interval of how many days?

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4) How many times are leaves harvested from a chawki mulberry garden in a year?

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5) How much chawki leaf can be produced annually from one hectare of S_{36} or V_1 mulberry garden?

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6) How much silkworm can be chawki reared annually by using chawki leaf from S_{36} or V_1 variety from one hectare of mulberry garden?

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3.7 LET US SUM UP

Chawki rearing is a vital aspect of sericulture industry for development of healthy silkworms and ultimately a successful cocoon crop. Of the different factors responsible for healthy chawki rearing, leaf quality plays an important role. Moreover, the nutritional need of chawki silkworms is totally different from that of late age worms. Thus, to produce such specific quality of leaves, establishment of an exclusive chawki mulberry garden is the need of the day. Following the package of practices as described above, it is possible to develop a chawki mulberry garden and to serve the local sericultural farmers. This will ultimately help to develop sericulture industry by producing successful cocoon crops. However, it is very important for you to find

out the linkage between each of the items described above and follow the same meticulously to get the full benefit out of it and to become a successful resource person in sericulture industry.

3.8 GLOSSARY

Chawki Mulberry Garden : A mulberry garden raised specifically to obtain quality leaf for feeding young age silkworms.

Chawki Rearing : The rearing of young silkworm (baby) immediately after hatching from the eggs for a period of 6-7 days up to second moult.

Chawki Rearing Center : Chawki rearing center or CRC is a place where a large quantity of young age (baby) silkworms are reared after hatching commercially with utmost care and delivered to the sericultural farmers after completion of second moult.

Coarse Leaf : The leaves which are matured and hard containing less moisture.

Moulting : The silkworms have five phases in larval stage. Each worm enters from one phase to another by casting-off their old skin. While doing so, they stop eating leaf for a certain period and cast-off their old skin. Immediately after passing off the stage they start eating once again.

Package of Practices : A system of production of any agricultural / horticultural / plantation crop following certain accepted principles and technologies. For mulberry, it means a cultivation practice comprising a variety, a planting system, soil and plant nutrition management, irrigation, pest and disease management as well as crop harvest technique.

Paired Row System : This is a planting system with wider spacing followed for mulberry growing under irrigated conditions. In this system, cuttings / saplings are planted at a distance of 60 cm between each other, while the distance between the two rows are maintained with a gap of 90 cm from each other. The distance between the two paired rows is maintained with a gap of 150 cm. This system facilitates partial mechanization.

Pruning : A practice by which mulberry plants are cut and trimmed to maintain the proper structure and height of the plants to facilitate proper growth and yield.

Tender Leaf : The leaves which are produced in the mulberry plants at the apical / uppermost portion which are soft and succulent with high moisture content.

Weeding : A practice by which unwanted plants growing along with mulberry are removed by digging land or using power tiller / tractor / country plough.

3.9 SUGGESTED FURTHER READING

Anonymous. 1975. *Textbook of Tropical Sericulture*. Japan Overseas Cooperation Volunteers, 4 -2-24 Hiroo, Sibuya-Ku, Tokyo, Japan. pp. 1-194.

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Kawakami, K. and Yanagawa. 2003. *Illustrated Working Process of New Mulberry Cultivation Technology* (English – Kannada). JICA, India Project for Strengthening Extension System for Bivoltine Sericulture in India. pp. 1-78.

3.10 REFERENCES

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3.11 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

1) For continuous supply of quality leaf and to grow healthy, robust and uniform young silkworm.

2) Rich in leaf moisture (79-80%), Sugar (11-13%) and protein (23-25%).

3) S_{36} and V_1 varieties.

Check Your Progress 2

1) 6-8 months.

2) I dose of NPK after 3 months of plantation @ 50:50:50 *kg/ha*. II dose of 50 kg N after 6 months.

3) Once in 7-10 days.

4) Ammonium Sulphate, Single Super Phosphate and Muriate of Potash.

Check Your Progress 3

1) 40MT/ha/year in 4 split doses.

2) NPK@ 260:140:140 kg/ha/year in 8 equal splits.

3) Once in 4-5 days.

4) 8 times in the form of leaf picking and 4 times shootlet harvests.

5) 30-35 MT/hact/year.

6) 1.66 to 1.94 lakhs dfls.