PROGRESS OF MORICULTURE RESEARCH IN PAKISTAN.

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Abstract

A number of research studies were undertaken for selection and determination of qualitative and quantitative foliage yield of different mulberry varieties under different treatments of spacing fertilization and pollarding at the Pakistan Forest Institute, Peshawar. It was found that density of planting in directly related to the mulberry leaf yield. The spacings of 1 x 1 meter was found optional for improved management and high yield of mulberry plantations. The application of nitrogen at the rate of 200 Kg N per hectare, if applied 50% after sprouting of plants in spring and 50% after 20 days of leaf plucking, increased mulberry leaf yield by more than 100%. The PFI-1 early sprouting variety was selected and distributed among all forest departments of provinces and AJ&K for further propagation and raising of plantations. Pollarding at 30 to 70 height cm from ground level was suitable in mulberry plantations on agriculture flat land and 70 cm to 170 cm height in irrigated forest plantations. The best planting time for mulberry was 15th December to 31st January in Punjab and N.W.F.P.

INTRODUCTION

Sericulture industry in Pakistan depends on the mulberry trees grown in the irrigated plantations in the Punjab and scattered trees raised on farm lands at other places. Sufficient mulberry leaves are available in the country for rearing 30-40 thousands boxes of silk seed annually. For expansion of silk industry, mulberry cultivation on large scale is essential in public as well as private sectors. Therefore, emphasis will have to be laid on cultivation of bush type mulberry in the form of small compact blocks in irrigated plantations and on the farm lands.

Mulberry tree is a perennial woody plant consisting of vegetative organs including roots, stem and leaves and re-productive organs of flowers and fruit. Although these organs are different in form, structure and physiological functions, yet they act on and restrict one another in growth under given conditions. Mulberry tree growth is also affected by ecological factors mainly light, temperature, air, water, mineral salts, soil etc. Some factors are independent and cannot be substituted e.g., increase light cannot make

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up for the deficiency nutrients in the soil. On the other hand, some factors are related to each other i.e. strong wind force and irrigation brings down the soil and air temperature.

This paper presents results of studies of selection and determination of quantitative and qualitative foliage yield of different varieties of mulberry under different treatments of spacings, fertilizer application and pruning methods undertaken in the Pakistan Forest Institute, Peshawar.

Material And Methods

Four spacing treatments tested trials at the Pakistan Forest Institute, Peshawar to find out planting density and leaf yield. Planting of mulberry was done in pits, 30 cm deep and 40 cm wide in January, 1983. Pruning of plants was done at 15 cm from ground level after planting. Plucking of leaves to calculate yield was carried out twice a year leaving top 5 leaves intact for growth.

To find out the effect of urea on mulberry leaf yield an experiment was designed in complete randomized block. The planting of mulberry was done in February, 1983, at a spacing of 1 x 1m. Three doses of Urea were applied each in three replications. The plot size was 90 square meters. A check where no fertilizer was applied, was kept in each block. The leaves were plucked twice a year, once in spring in the month of April and second in the month of September. These were weighed soon after plucking alongwith petioles.

To study the effect of different pollarding methods planting of mulberry was done with spacing of 1 x 1m. Four cuts i.e. weight were tried using 3 replication.

Two hundred individual plants were ear-marked on the basis of good morphogenetic characters to select high yielding and early mulberry varieties. The saplings selected in the nursery beds were transplanted in the field for individual selection on the basis of sprouting dates and leaf yield. Cutting were taken from these selected plants for propagation to raise saplings. The selected PFI-1 early variety was by cultivating 100 plants in three replications alongwith 4 other varieties.

Results And Discussions

Spacing trials for mulberry leaf yield.

The planting distance or spacing is determined by soil fertility level, training system, mulberry variety and leaves harvesting method. In case of bush type mulberry, it is important have a large number of plants per unit area for making full use of space, increasing the leaf surface area to utilize light energy fully and for distribution of root mass in the soil uniformly.

Selected variety trained during winter
at 15cm to make it bush mulberry

Bush type mulberry at optimal 1 m x 1 m space

plants at 15 cm from ground level after planting was done. The total utility leaf yield recorded in each treatment twice a year (spring and autumn) is as follows:

Table 1. Annual leaf yield/hectare in different spacings

Spacing (m)	No. of plants per ha	Yield per ha (kg)	% increase of leaf yield
1.0 x 0.3	23000	27500	69.8
1.5 x 0.6	14166	26000	60.0
1.0 x 1.0	10000	25000	54.2
2.0 x 1.0	4666	16200	Check

It was observed that density of planting has direct effect on the yield of mulberry leaves. The spacing of 1 x 1 m was found to be most appropriate for high leaf yield and for better management. It also yielded 54% more leaves than spacing of 2x1 m.

Effect of nitrogen fertilizer (Urea) on the mulberry leaf yield.

As mulberry leaves are plucked several times a year to feed silkworms, it is therefore not possible to rely upon the soil itself to provide all necessary. Therefore, application of artificial fertilizer at appropriate time to soil fertility is essential for obtaining high yield of quality mulberry leaves for feeding silkworms. Mulberry leaves contain 0.8 to 1.2% Nitrogen 0.19-00.24% Phosphorus 0.51 to 0.56% Potassium. These three major elements are taken by the plant directly from the soil. Among these, nitrogen is the most important element and in usually deficient in the soil to meet the needs of mulberry plant. As far as other nutrient elements are concerned, no deficiency occur if organic manure is used. Khattak, et. al., (1979) have investigated the effects of micro and macro nutrients on mulberry leaf yield and found that fresh foliage increased by 30% with application of 20 grams of urea per plant. Ahmad, (1986) found that after one year of planting, an increase of 78.8%, 120% and 175% increase in annual leaf yield occurred when 100 Kg 200 Kg and 300 Kg, of nitrogen were applied.

To determine the effect of urea, the first application of fertilizer in the form of 50 percent of the dose was made when the leaves size was 3 to 5 cm at beginning of March. The remaining fertilizer was applied after 20 days of first plucking of leaves in the month of May. The data on leaf yield are given in Table 2.

Table 2. Annual leaf yield/hectare of mulberry

Fertilizer dose	Annual leaf yield kg/ha	% of increase
No fertilizer	14000	Check
100 Kg N	26600	90
200 Kg N	28800	105
300 Kg N	32200	130

It was found that application of nitrogen at the rate of 200 Kg of nitrogen if applied, 50 percent after sprouting in spring and 50 percent after 20 days of leaf plucking, increased the yield by more than 100 percent in 3-4 years old mulberry plantations.

Pollarding of mulberry

Pollarding or pruning is practised to improve the yield of foliage and to maintain the shape of plants for easy leaf harvest. If the mulberry plant is allowed to grow without any pruning, if will become an arbor tree with disordered stem and branches, small leaves and numerous flowers and fruit. For the sake of convenience in harvesting, culturing and improving the vegetative development, it is necessary to prune mulberry trees for desired tree shape.

The tree shape is closely related to the planting density and management practices.

The tree shape may be classified on the basis of the height of the mulberry stem (main stem and branch) in the following types:

High trunk mulberry:	170 cm and above
Medium trunk mulberry:	70 - 170 cm
Low trunk mulberry:	30 - 70 cm
Trunkless mulberry: (ground mulberry)	The stem at/or near the ground level

Sheikh (1983) examined low cut (30 cm) medium cut (50-80 cm) and high cut (80-100 cm) and recommended adoption of low and medium cuts for convenience in leaf harvesting.

In the present experiment, plants cut trained on 31st January at four heights e.g., at ground level, 15 cm, 30 cm and 60 cm. The treatments were applied in three replications in randomized block design. The leaf yield data were recorded and are given in Table 3.

Table 3: Utility mulberry leaf yield/hectare in different training leaves.

Training level	Leafyield during spring and Autumn, 1986	1987	1988	1989 (spring) kg/ha
1. Ground level	14000	20000	25000	16000
2. 15 cm above ground	17800	22500	23000	15100
3. 30 cm above ground	16000	18000	24500	14300
4. 60 cm above ground	15000	15500	23500	18000

There is not much difference in leaf yield in different pruning levels. However, prunings at 15 cm 30 and 60 cm above ground level were found most suitable for better management and harvesting of leaves than that at ground level.

Selection of mulberry varieties based on phenological character

The main factors affecting leaf yield of a mulberry plant is its number of branches and size and thickness of its leaves. The selected PFI early variety was tested alongwith 4 other bush type mulberry varieties. The date on leaf sprouting leaf fall and yield per/ha were determined in the study. The results are presented in Table 4.

Table 4 Leaf sprouting and fall dates and leaf yield of 5 mulberry varieties.

	Variety	Date of Sprouting	Leaf Fall	Yield/ha (metric tons)
1	Husang (Chinese)	1.2.84	Early	10.00
		28.1.85	November	16.00
		3.2.86	"	20.00
		31.1.87	"	21.00
		2.2.88	"	22.00
		29.1.89	"	21.00
		2.2.90	"	21.50
2	Japanese (Hybrid)	30.1.84	Middle	11.00
		25.1.85	November	15.50
		28.1.86	"	21.50
		27.1.87	"	22.00
		31.1.88	"	23.00
		29.1.89	"	22.50
		31.1.90	"	22.00
3	Korean	22.3.84	End of	9.00

.....(Karyansuban)..	26.3.85.....	November	11.50
.....	1.4.86	"	22.50
.....	29.3.87.....	"	23.00
.....	30.3.88.....	"	23.50
.....	1.4.89	"	22.50
.....	28.3.90.....	"	23.00
4.....Suwan 4	13.4.84.....	End of.....	10.00
.....(Korea).....	15.3.85.....	November	15.40
.....	21.3.86.....	"	20.50
.....	22.3.87.....	"	21.00
.....	8.3.88	"	22.00
.....	20.3.89.....	"	20.50
.....	16.3.90.....	"	20.00
5.....PFI-1.....	13.1.84.....	Middle	11.80
.....(Early	14.1.85.....	November	18.00
.....variety)	16.1.86.....	"	24.20
.....	12.1.87.....	"	25.50
.....	13.1.88.....	"	24.50
.....	14.1.90.....	"	25.00

It was found that the PFI-1 sprouted about two week earlier than Japanese and Chinese hybrids and two months earlier than Korean hybrid varieties. The PFI-1 early variety was distributed in NWFP, Azad Kashmir and Punjab for cultivation and commercial rearing. Moreover, the leaf yield of this variety was also higher than that of other varieties.

Conclusion

Results indicate that in case of bush type mulberry it is important to have large number of plants per unit area for making full use of space to obtain high leaf yield.

Almost 100% mulberry leaves are plucked for feeding silkworm, it is therefore essential to apply artificial fertilizer at appropriate time to improve soil fertility for obtaining high yield of quality mulberry leaves

It was found that for the sake of convience in harvesting leaves and better management it is necessary to pollard mulberry for managements desired tree shape. Early sprouting mulberry varieties are good for commercial silkworm rearing by the farmers before commencement wheat harvesting.

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