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EFFECT OF DIFFERENT HARVESTING METHODS ON SPROUTING, LEAF AREA AND LEAF YIELD IN MULBERRY UNDER KASHMIR CLIMATIC CONDITIONS

Aadil, H., M.R. Mir, I. L. Khan, Gora, M. M., S. Maqbool*, S. Z .H. Rufaie, and R.K. Sharma.
College of Temperate Sericulture, Mirgund Sher-e-KashmirUniversity of Agricultural Sciences & Technology of Kashmir, J&K
*Division of Agristatistics F.O.H, Wadura, SKUAST (K)

ABSTRACT
In Kashmir, mulberry (*Morus sps*), the only food to silkworm (*Bombyx mori* L.) remains dormant during the winter months. The buds start sprouting during March-April and the leaves grows gradually and is fed o the worms during May-June, the main cocoon crop at farmers' level in the region. The leaf requirement during the 5th stage of silkworm is too high to be met through individual plucking, thereby necessitating leaf harvesting through shoot cutting right from the crown base. This is also the annual pruning of the plant. After this the buds left as such sprout again and grow into shoots of more than one and a half meter with luxuriant leaf till the end of September which can again be used for feeding worms reared during August –September. Individual plucking is laborious and uneconomic and shoot harvesting during this phase is not also feasible. Hence different harvesting methods were tested to identify the most suitable method of leaf harvesting during the second cocoon crop. The results reveal that the sprouting was enhanced by clipping as well as by thinning of branches the plant which was completely harvested in autumn showed less yield, less leaf area and sprouting. Leaf yield per plant particularly during the spring crop was also influenced by the harvesting method with T6 (25% branch cut by length) yielding the maximum 2.87 kilograms per plant.

KEY WORDS: Mulberry, leaf yield, sprouting, harvest, spring.

INTRODUCTION

Mulberry (M*orus Sp.*) is a typical East Asian plant which can be trained as bush, dwarf and tree. It is widely distributed in varied ecological and geographical zones from intensive cultivation in temperate, subtropical and tropical areas to natural occurrence in forests throughout the world. This clearly indicates that mulberry possesses a high degree of adaptability to changes in the environment. The crop production efficiency is highly influenced by fixed inherent characteristics of the plant itself, the cultivation technique and the environmental conditions during the growth of the plant. The permanent characteristics of the plant are important factors in the cultivation of a crop. In order to increase the efficiency of mulberry field, the first important step is to select better variety of mulberry. The practical characteristics are those which are important for cultivation as well as for silkworm rearing.

Yield being a complex character entails information regarding its correlation that exists among important character. An understanding of correlation that exists among economic characters. Under Kashmir conditions the winter buds in mulberry sprout during March–April and the leaf becomes available during May-June. The leaf requirement during the 5th Instar is so tremendous that the leaf is harvested along with the shoots and fed to worms as such which incidentally coincides with the annual pruning of mulberry. The lower buds left on the stump after pruning the plant sprout again and the leaf becomes available again during August-September which is harvested by individual plucking either along with the petiole or leaving the petiole on the plant to avoid damage to the buds that will sprout in the next spring. In no case can we go for complete pruning as more than one pruning in a year can prove deleterious. Harvesting by individual plucking though helps the plant, is not practicable because it is laborious and moisture which plays a crucial role, is lost faster as compared to leaves harvested along the shoots. The present study therefore aims to find out a suitable leaf harvesting method for the second crop without sacrificing the main crop (spring crop).

MATERIALS AND METHODS

The investigation, "effect of different harvesting methods on sprouting, leaf area and leaf yield in mulberry under Kashmir climatic conditions" was carried out at College of Temperate Sericulture, SKUAST-K Mirgund during the year (2018- 2019). Established dwarf mulberry plants of Goshoerami (mulberry variety mostly used for commercial rearing in the region) having uniform growth and vigour were used for the study. Cultural practices were followed as per the package of practices recommended by the College of Temperate Sericulture, SKUAST-K, except leaf harvesting which was done as per the experimental treatments (Listed below). The treatments were given during the 1st week of September 2018, the leaf so got was considered towards the yield per plant. The plantation was left as such during the winter and the observations on various growth and yield parameters were recorded during spring 2019.

Treatment details:-

T_1 : No leaf plucking
T_2 :100% leaf plucking
T_3 :50% leaf plucking
T_4 :25% branch cut (By No)
T_5 :50% branch cut (By No)
T_6 :25% branch cut (By Length)
T_7 :50% branch cut (By Length)

The observations on sprouting were recorded during March-April, increment in leaf size from 1st May till the 5th stage of spring rearing and leaf yield during both spring and autumn crops coinciding with the 5th stage of silkworm rearing. The observation were compiled, average calculated and the data analyzed statistically.

RESULTS

1. Sprouting of winter buds

The results revealed that the sprouting behavior in all the treatments was 1simultaneous where all the buds sprouted simultaneously within one week except T2 (100% leaf plucking) where sprouting was non simultaneous as the sprouting of winter buds prolonged for three weeks and did not sprout simultaneously. The extent of sprouting was maximum (88 %) in T7 being at par with the values 84.62,83.38,80.23,79.96 and 78.10 percent recorded respectively in T6, T4, T3, T5 and T-1 and significantly different from 49.01 percent sprouting recorded in T2 (100% leaf plucking). as shown in Table 1.

TABLE 1. Percent sprouting recorded in different Treatments

Treatments	*Sprouting Behavior*	*Sprouting (%)*
T-1	*Spontaneous*	78.10[a] (8.83)
T-2	*Non-Spontaneous*	49.01[b] (6.99)
T-3	*Spontaneous*	80.23[a] (8.94)
T-4	*Spontaneous*	83.38[a] (9.13)
T-5	*Spontaneous*	79.96[a] (8.94)
T-6	*Spontaneous*	84.62[a] (9.19)
T-7	*Spontaneous*	88.00[a] (9.37)
C.D ($p \leq 0.05$)		0.707

2. Periodic increment in leaf size (cm^2)

Leaf area per plant (cm^2) was the highest 16512.61cm^2 per plant in T1 (No leaf plucking) and was at par with 14117.06, 15361.11, 16333.33 and 15738.72cm^2 per plant registered respectively in T3 (50% leaf plucking), T4 (25% branch cut By No), T6 (25% branch cut By Length) and T7 (50% branch cut By Length) on Ist May. Leaf area 11124.17cm^2 per plant was the lowest in T2 (100% leaf plucking).

On 10th May it was the highest 57137.1157 cm^2 per plant in T1 which was at par with 52571.56 cm^2 per plant T6 (25% branch cut by number) and it was the lowest 41455.55 cm^2 per plant in T2 (100% leaf plucking)

On 20th May the leaf area again followed the same trend as on 10th May. It was the highest 81316.6757 cm^2 per plant in T1 which was at par with 76494.45 cm^2 per plant in T6 (25% branch cut by number) and it was the lowest 54833.33 cm^2 per plant in T2 (100% leaf plucking).

Leaf area was the highest 112312.83 (cm^2) per plant in T1 being at par with the 105352.83 cm^2 per plant in T6 (25% branch cut by length) on 30th May. Leaf area was lowest 84348.57 cm^2 per plant in T2 (100% leaf plucking).

TABLE 2. Leaf area in Different treatments

Treatments	01-May	10-May	20-May	30-May
T-1	16512.61[a]	57137.11[a]	81316.67[a]	112312.83[a]
T-2	11124.17[b]	41455.55[c]	54833.33[d]	84348.57[d]
T-3	14117.06[a]	42427.78[c]	65989.78[c]	93545.72[c]
T-4	15361.11[a]	42933.33[c]	64672.22[c]	90852.86[c]
T-5	11822.22[b]	43555.56[c]	62455.56[c]	87704.28[c]
T-6	16333.33[a]	52571.56[a]	76494.45[a]	105352.83[a]
T-7	15738.72[a]	50639.94[b]	72061.11[b]	99345.71[b]
C.D ($p \leq 0.05$)	3688.134	4999.636	5938.752	8238.116

3. Leaf yield per plant

During autumn, the yield per plant was maximum (3.50kg) in T2 (100% leaf plucking) which was significantly higher than the rest of the treatments with 1.80, 1.77, 1.74, 1.29 and 0.82 kilograms per plant respectively in T5, T7, T3, T6 and T4.In T1 no leaf could be got as it was left un harvested.

During spring highest yield per plant (3.00kg) was registered in T1 (no leaf plucking) which was however statistically at par with (2.87kg) leaf per plant in T6 (25%

branch cut by length). Leaf yield of 2.76, 2.51, 1.03 kilograms was recorded respectively in T7, T4 and T2 where as both T3 and T5 registered a leaf yield of 2.40 kg per plant.

The annual leaf yield per plant was the highest (4.53 kg) in T-7 (50% branch cut by length) which was statistically at par with 4.53, 4.20 and 4.16 kilograms leaf per plant recorded respectively in T2, T5 and T6. Annual leaf yield per plant was the least (3.00 kg) in T1 (no leaf plucking) as shown in Table 3.

TABLE 3. no leaf plucking

Treatments	Autumn	Spring	Annual
T-1	0.00	3.00[a]	3.00
T-2	3.50[a]	1.03[c]	4.53
T-3	1.74[b]	2.40 [b]	4.14
T-4	0.82[d]	2.51 [b]	3.33
T-5	1.80 [b]	2.40 [b]	4.20
T-6	1.29 [c]	2.87[a]	4.16
T-7	1.77 [b]	2.76[b]	4.53
C.D p≤0.05)	0.068	0.132	0.44

DISCUSSION

During the severe winter conditions, the buds in all the treatments remained in a state of dormancy from November till next March. With an increase in temperature the buds became active and started sprouting during April and completed their sprouting by the end of first fort night of April except in T2 (100% leaf plucking).The sprouting of winter buds though a genetic behavior was similar in all the treatments except T2 (100% leaf plucking) which has shown non simultaneous and less percentage of sprouting of winter buds. Similar results have also been reported by Mir *et al* (2005).The less sprouting in T2 (100% leaf plucking) could be due to less reserve food in the shoots of plants of this treatment because of complete defoliation in the previous autumn and also due to mechanical damage caused to some of the buds due to leaf harvesting.

T2 though yielding the highest (3.50 kg per plant) during autumn does not seem to be economic as the treatment has adverse effect on the yield of following spring which is the main crop at farmer's level in Kashmir. T1 (No leaf plucking) during spring too has yielded 3 kilograms leaf per plant being the highest in spring. T7 (50% branch cut by length) seems to be a better treatment for two crop system in Kashmir valley as the growth and yield of the plants is improved besides providing the farmer options for 2 crops in a year.

CONCLUSION

Sprouting of winter buds was non simultaneous and less in the treatment T2 where complete defoliation (100% leaf plucking) was resorted to during the preceding autumn. Similarly the leaf yield per plant particularly during the spring crop was also influenced by the harvesting method with T6 (25% branch cut by length) yielding the maximum 2.87 kilograms per plant. The treatment has yielded a good quality of leaf (1.77 kg/plant) during the previous autumn which is better than almost all the treatments. Complete defoliation in autumn by individual plucking (T2) has resulted in weakening the plant that has resulted in decreased yield in spring, the main crop at farmer's level in Kashmir. The treatment T2 (100% leaf plucking), T6 (25% branch cut by length) has outscored all other treatments except T1 (no leaf plucking) as far as leaf area per plant and annual leaf yield per plant there by seems to have promise for two crops system under kashmir climate conditions.

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