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Effect of Rearing Performance of Silkworm as Influenced by Different Spacing in Mulberry, *Morus alba*. L.

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Mulberry is an economically important tree, being cultivated for its leaves to rear silkworm *Bombyx mori* L. Mulberry is a perennial and broad leaf plant. Investigation is carried out to know the effect of rearing performance of silkworm as influenced by different spacing in mulberry *morus alba* L. In the present study the Effective rate of rearing was found to be good in 9×3 ft spacing (89.74 % and 87.64 % in first and second rearings respectively) and lowest was recorded in 3× 3 ft spacing (85.83 % and 83.17 % in first and second rearings respectively). This might be due to less disease incidence in 9×3 ft spacing compare to the 3×3 ft spacing. The maximum instar duration was recorded in 3×3 ft spacing [(I (89.04 h), II (67.92 h), III (115.92 h), IV (128.4 h) and V (195.12 h)] in first rearing and second rearing [I (88.56h), II (66.96 h), III (115.44h), IV (127.44h) and V (194.64h)]. Total larval duration was also recorded maximum in 3×3 ft spacing (697.44 h in first rearing, 693.36 h in second rearing). The maximum matured larval weight was observed in 9×3 ft spacing (30.33 g in first tearing and 26.21 g in second rearing) and least was recorded in 3×3 ft spacing (25.31 g in first tearing and 22.43 g in second rearing).

Keywords: Silkworm, mulberry, spacing, rearing.

Sericulture is an agro-based, labour intensive, foreign exchange earning commercial activity. Sericulture has been successful in eradicating rural poverty, resulting in social as well as economic development of rural people. It includes the technical aspects such as increasing productivity of land as well as labour, stabilization of cocoon production, improvement of silk yarn, fabric and generating profitable income for rural people. The mulberry raw silk production in India during 2012-13 was 18,715 MTs (Anonymous, 2013).

The different factors responsible for a successful cocoon crop are mulberry leaf (38.2%), climate (37.0%), rearing technique (9.3%), silkworm race (4.2%), silkworm eggs (3.0%) and other factors (8.2%) (Miyashita, 1986). Thus, quality of mulberry leaf plays a major role in successful cocoon production.

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MATERIALS AND METHODS

Investigations were carried out to know the "The evaluation of rearing performance of silkworm as influenced by different spacing in mulberry *Morus alba*". The experiments were conducted in University of Agricultural Sciences, Bengaluru, College of Sericulture, Chintamani during the year 2013-14.

Silkworm rearing

Disinfection of rearing room

Before commencement of rearing the silkworm rearing room and equipments were washed with water, then disinfected using 0.2 % Decol solution at the rate of 2 litres per m^2 plinth area.

Choice of silkworm breed

The commercial cross breed PM × CSR_2 was used for the study. The disease free layings (DFLs) were procured from NSSO grainage, CSB, Chintamani.

Incubation of dfls

Five DFLs were kept on paraffin paper in plastic trays and covered with another paraffin paper. The optimum temperature and relative humidity was maintained by keeping moist foam rubber strips all around the egg sheets. The eggs were subjected to black boxing for 24hrs at blue egg stage. After which the eggs were exposed to diffused light on the expected day of hatching to obtain uniform hatching.

Brushing

The newly hatched larvae were provided with chopped mulberry leaves of required quantity and quality. After 30 minutes of feeding, the larvae were transferred on to the plastic trays along with the mulberry leaves having paraffin paper at the bottom and wet foam rubber strips provided all round.

Silkworm rearing

Mass rearing was done in plastic tray from brushing till third moult. The worms were reared by feeding three times a day (8.30 A.M., 12.30 P.M. and 6.30 P.M). Bed cleaning was done once twice and thrice during I, II, III instars, respectively. Whereas, daily once during IV and V instar. During rearing, optimum spacing was provided according to the age of silkworm, after each bed cleaning. Lime powder was dusted on silkworm before settling for moult so as to keep the bed dry and facilitate easy moulting in each moult a bed disinfection with Vijetha was practiced. The rearing trays were covered with uzi fly proof nylon nets. After III instar, hundred worms were allocated for each replication.

Feeding

The mulberry leaves were harvested during cooler hours of the day from mulberry plots with different spacings. The leaves of respective spacing were fed to worms separately. Leaves were provided to chawki worms whereas whole shoot feeding was followed for late age silkworm rearing.

Mounting and harvesting

The ripe worms were handpicked and mounted on bamboo mountage as per treatment and cocoons were harvested manually on 4th day of mounting.

Observation recorded during rearing performance

Effective rate of rearing (%)

The number of cocoons harvested at the end of rearing were recorded and the ERR was calculated by using formula.

$$\text{ERR}(\%) = \frac{\text{Number of cocoons harvested}}{\text{Number of worms brushed}} \times 100$$

Instar duration (days)

Instar duration was recorded by observing the duration between previous moult to next moult.

Moulting duration (h)

Moulting duration was recorded by observing the silkworm from the period of settling to moult to coming out of moult.

Total larval duration (days)

The duration between the brushing day to 50 per cent ripening of larvae was recorded to workout the total larval duration.

Grown up larval weight (g)

Weight of ten randomly picked silkworms at fifth day of fifth instar was selected per each replication and the average of the same was calculated.

Disease incidence (%)

Infected worms of different diseases were observed in each replication for every treatment.

RESULTS AND DISCUSSION

Rearing parameters

In the present study the Effective rate of rearing was found to be good in 9×3 ft spacing (89.74 % and 87.64 % in first and second rearings respectively) and lowest was recorded in 3× 3 ft spacing (85.83 % and 83.17 % in first and second rearings respectively). This might be due to less disease incidence in 9×3 ft spacing compare to the 3×3 ft spacing. These results are also in accordance with the findings of Ramakanth *et al*. (2001) who revealed that wider spacing influence on the effective rate of rearing.

The maximum instar duration was recorded in 3×3 ft spacing [(I (89.04 h), II (67.92 h), III (115.92 h), IV (128.4 h) and V (195.12 h)] in first rearing and second rearing [I (88.56h), II (66.96 h), III (115.44h), IV (127.44h) and V (194.64h)] and minimum instar duration was recorded in 9×9 ft spacing [I (83.04 h), II (64.32 h), III (76.56 h), IV (119.52 h) and V (184.08) in first rearing and in second rearing I (81.12 h), II (62.64 h), III (75.12 h), IV (117.84 h) and V (182.88 h)] and similar trend

Table 1. Impact of different spacings in mulberry on different larval and moulting durations of silkworm(first rearing-October 2013)

Stages/duration (h)Treatments	I Instar	1stMoult	II Instar	2ndMoult	III Instar	3rdMoult	IV Instar	4thMoult	V Instar
T1-9×3 ft. spacing	83.04	24.03	64.32a	24.46	76.56	24.25	119.52	24.70	184.08
T2-6×3 ft. spacing	89.04a	24.45a	67.44b	24.97b	109.20b	25.23b	126.48b	25.43b	190.32b
T3-(6+3) ×3 ft. spacing	83.76	24.09	65.52	24.52	77.28b	24.73	122.64	24.98	184.80
T4-3×3 ft. spacing	89.52a	24.47a	67.92a	25.03a	115.92a	25.45a	128.40a	25.61a	195.12a
T5-(5+3) ×2 ft. spacing	84.72b	24.16b	66.96	24.86	102.00	25.02	123.12	25.32	188.88
F-test	*	*	*	*	*	*	*	*	*
SE.m±	0.018	0.010	0.025	0.010	0.366	0.013	0.025	0.007	0.397
CD at 5%	0.053	0.030	0.075	0.029	1.102	0.039	0.075	0.020	1.198

Table 2. Impact of different spacings in mulberry on different larval and moulting durations of silkworm(second rearing-April 2014)

Stages/duration (h)Treatments	I Instar	1stMoult	II Instar	2ndMoult	III Instar	3rdMoult	IV Instar	4thMoult	V Instar
T1-9×3 ft. spacing	81.12	24.00	62.64	24.43	75.12	24.19	117.84	24.68	182.88
T2-6×3 ft. spacing	88.08b	24.35b	66.48b	24.91b	107.04b	25.18b	125.28b	25.37b	189.36b
T3-(6+3) ×3 ft. spacing	81.84	24.02	65.04	24.48	74.88	24.68	122.16	24.93	184.32
T4-3×3 ft. spacing	88.56a	24.43a	66.96a	25.00a	115.44a	25.38a	127.44a	25.59a	194.64a
T5-(5+3) ×2 ft. spacing	83.28	24.00	65.28	24.81	101.04	25.00	122.64	25.28	187.92
F-test	*	*	*	*	*	*	*	*	*
SE.m ±	0.019	0.024	0.024	0.022	0.022	0.023	0.023	0.025	0.029
CD at 5%	0.058	0.074	0.073	0.068	0.068	0.071	0.071	0.076	0.087

Table 3. Impact of different spacings in mulberry on total larval duration, larval weight and effective rate of rearing (ERR) of silkworm (first rearing-October 2013)

Treatments	Total larval duration (h)	Weight of mature larva (g/10 larva)	ERR (%)
T1-9×3 ft. spacing	624.96	30.33 a	89.74 a
T2-6×3 ft. spacing	682.56b	27.76	86.13
T3-(6+3) ×3 ft. spacing	632.16	28.93 b	88.72 b
T4-3×3 ft. spacing	697.44a	25.31	85.83
T5-(5+3) ×2 ft. spacing	665.04	28.23	86.63
F-test	*	*	*
SE.m ±	1.209	0.155	0.121
CD at 5%	3.645	0.466	0.364

Table 4. Impact of different spacings in mulberry on total larval duration, larval weight, effective rate of rearing (ERR) and disease incidence in silkworm(second rearing-April 2014)

Treatments	Total larval duration (h)	Weight of mature larva (g/10 larva)	Disese incidence (%)	ERR (%)
T1-9×3 ft. spacing	616.80	26.21 a	3.00 b	87.64 a
T2-6×3 ft. spacing	675.84b	23.65 b	5.25	84.37
T3-(6+3) ×3 ft. spacing	626.16	22.77	3.50b	84.94
T4-3×3 ft. spacing	693.36a	22.43	6.75	83.17
T5-(5+3) ×2 ft. spacing	659.28	23.11	2.00 a	85.61 b
F- test	*	*	*	*
SE.m ±	1.555	0.177	0.555	0.173
CD at 5%	4.680	0.534	1.674	0.521

was also observed with respect of moulting duration where maximum duration recorded in 3×3 ft spacing [1st (24.74 h), 2nd (25.03 h), 3rd (25.45 h) and 4th (25.61 h) in first rearing and 1st (24.43 h), 2nd (25.00 h), 3rd (25.38 h) and 4th (25.59 h) in second rearing]. However, minimum moulting duration was recorded in 9×3 ft spacing [1st (24.03 h), 2nd (24.46 h), 3rd (24.25 h) and 4th (24.70 h) in first rearing and 1st (24.00 h), 2nd (24.43 h), 3rd (24.19 h), 4th (24.68 h) in second rearing] instar and moulting duration was maximum in worms which are reared with the leaves from closer spaced plantation and minimum was recorded in wider spacing. This might be due to nutrition quality of leaf, as the quality increases the rate of larval growth, hastens and reduces the instar and moulting duration.

Total larval duration was also recorded maximum in 3×3 ft spacing (697.44 h in first rearing, 693.36 h in second rearing).However, minimum larval duration was observed in 6×3 ft spacing (624.96 h in first rearing and 616.80 h in second rearing). This is because of increasing in the instar and moulting duration.

The maximum matured larval weight was observed in 9×3 ft spacing (30.33 g in first tearing and 26.21 g in second rearing) and least was recorded in 3×3 ft spacing (25.31 g in first tearing and 22.43 g in second rearing). These results are not in conformity with Rahman *et al*. (1999), who reported that closer spacing recorded significantly more larval weight. This might be due to the adoption of different package of practice.

REFERENCES

1. Anonymous, Highlights of activities. *Annu. Rep.,* Central Silk Board, Bangalore, 2013, pp.1.
2. Miyashita YA, Report on Mulberry Cultivation and Training Methods Suitable to Bivoltine Rearing in Karnataka. Central Silk Board, Bangalore, India, 1986, pp. 1-7.
3. Ramakant BD, Singh A, Sarkar A, and Hasegawa K, Effect of different plant geometry and levels of fertilizer on yield of semi-mechanized mulberry garden under irrigated condition for corporate sector. *Proc. Natl. Sem. Mulb.Ser. Res. India*., 2001, pp.288-294.
4. Rahman MS, Doss SG, Vijayan K, and Roy BN, Performance of the mulberry variety S-1635 under three system of planting in west Bengal. *Indian J. Seric*., 1999, **38**(2): 165-167.