



Age specific life table of mulberry silk worm (*Bombyx mori* Linn. race Nistari and NB₄D₂×SH₆) on the different cultivar of mulberry silk

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ABSTRACT

Life table studies, viz. age specific and survival of Bombyx mori on the two different hosts i.e. Nistari and NB₄D₂×SH₆ species of mulberry plant (Morus alba) under room condition carried out at Sericulture Research Demonstration and Training unit, Department of Entomology, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut during 2017-18 indicate that the insect preferred all the two hosts species out of these Nistari were found most suitable food for the overall growth and development of B. mori.

Keywords: Hosts plants, life table, *Bombyx mori*, survival.

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INTRODUCTION

India is the only country in the world produced all the four types of commercial silks- mulberry, tasar, eri, and munga. Besides this, India holds the monopoly on the eri silk and its products, the eri silkworm which have the unique distinction among the other three silkworm of having as its principal host, the castor (*Ricinus communis*), an important agriculture oil bearing crop next to the food crops. Eri silk, a kind of natural silk, produced by the wild silkworm, *Samia Cynthia ricini* (*Philosamia ricini*) ranks next to mulberry silk produced by *Bombyx mori* Linn. it is an oligophagous and multivoltine insect without diapauses. [7].

The mulberry silk worm (*Bombyx mori* Linn.) belongs to the order Lepidoptera and family bombycidae reared for production of mulberry type of silk. The industrial and commercial use of silk, the historical and economical importance of production and its application all over the world finally contributed to the silkworm promotion a powerful laboratory for the basic research in biology [1,3]. Investigations are directed at new improved methods of silkworm rearing, convention breeding and innovation techniques of silk production. Various studies in the past and present, on silkworm nutrition, have established that is the quality of leaf that ultimately affect the growth and development of silkworm as well as overall silk production [2, 15]. Realizing the important of the mulberry silk worm as a beneficial insect, an effort was made to construct life-tables of different races of *Bombyx mori* L. under laboratory condition so as to obtain its population trend on its most suitable races of mulberry silkworm.

Silkworm (*Bombyx mori* L.) is essentially monophagous insect feeds solely on mulberry leaves. Leaf quality is an important parameter used for evaluation of varieties aimed at selection of superior varieties for rearing performance [5]. Growth and development of silkworm *B. mori* L. is known to vary depending on the quality and quantity of mulberry leaf used as food source, which in turn indicated by commercial characteristics of cocoon crop [4, 10, 12].

Realizing the important of the mulberry silk worm as a beneficial insect, an effort was made to construct life-tables of different races of *Bombyx mori* Linn. under laboratory conditions as to obtain its population trend on its most suitable races of mulberry silkworm.

MATERIAL AND METHODS

The studies on various aspects of mulberry silk worm were conducted in Sericulture Research, Demonstration and Training Unit Research lab, Department of Entomology, College of Agriculture, Sardar Vallabhbhai Patel University of Agriculture & Technology, Modipuram, Meerut (U.P.).

Age Specific life table

Observation on number of alive and dead insect out of hundred were recorded daily. The following assumption was used in the construction of age specific life table.

x = Age of the Insect in days.

l_x = Number surviving insects at the beginning of each interval x out of 100.

d_x = Number dying during the age interval x out of 100.

$100q_x$ = Mortality rate at the age interval x .

e_x = Expectation of life or mean life remaining for individuals of age x .

Life expectation was calculated using the equations

$$e_x = T_x / L_x$$

To obtain e_x two other parameters L_x and T_x were also computed as given below:

L_x = the number of individual alive between age x and $x+1$ and calculated by the equation.

$$L_x = l_x + l_{x+1} / 2$$

T_x = The total number of individual of x age units beyond the age x , and obtained by the equation.

$T_x = l_x + (l_x + 1) + (l_x + 2) + \dots + l_w$

Where, l_w = the last age interval

RESULTS AND DISCUSSION

Hybrid cross Nistari × Nistari at room temperature

The hybrid crosses of mulberry silkworm *Bombyx mori* L. (N × N) took 42 days to complete its life cycle. In this case, the survivorship declined from the second day and continued decreasing with a number of pauses till 27th day. Thereafter l_x remained stable from 28th to 36th day. (Table-2)

The l_x once again starts declined from 37th to 42th day. A sharp decline in l_x was observed on 37th to 41st day. The generation was terminated by a reduction of five on 42th day.

In contrast of survivorship, the mortality curve followed a pattern with few high and negative low peaks. The highest observed on 41st and 40th day. The generation terminated by the reduction of 5 on 42nd day.

High mortality of 15, 7, 8, 12 and 20 were observed on 2nd, 38th, 39th, 40th and 41st day, respectively, while 3, 4 and 5 deaths were encountered on 8th, 13th, 37th and 42nd day followed by 2 deaths on 4th, 11th, 16th, 18th, 22nd and 27th day. A lower mortality of 1 was seen on 3rd, 6th, 7th, 10th, 15th, 20th, 23rd, 24th and 26th day. No mortality was exhibited on the remaining days.

Hybrid cross NB₄D₂ × SH₆ at room temperature

The hybrid crosses of NB₄D₂ × SH₆ completed its life cycle in 43 days on mulberry plant. In case the survivorship declined from the second day and continued decreasing with several pauses till 28th day. Thereafter, l_x remained stable from 29th to 38th day followed by reduction of 29th on 38th day.

The l_x remaining stable from 29th to 38th day. A sharp decline in l_x was observed on 39th to 42nd day. The generation was terminated by a reduction of ten on 43rd day.

The high mortality of 25, 14, 13 and 10 was observed on 42nd, 2nd, 41st and 43rd day, respectively, while 7 and 5 deaths were encountered on 40th and 39th day followed by 4 and 3 deaths on 13th and 24th day. Lower mortality of 2 was seen on 4th, 8th, 22nd and 27th day and 1 were seen on 3rd, 6th, 7th, 10th, 11th, 15th, 16th, 17th, 19th, 25th and 28th day. No mortality was exhibited on the remaining days.

This finding was found resembling with the finding of Rizvi, [13]; Dar & Rizvi, [6] and Kumar *et al.*, [11], who studied about *Spodoptera litura*, *Papilio demoleus* respectively. Screening of popular bivoltine silkworm (*Bombyx mori* Linn.) hybrid breeds of West Bengal in monsoon and autumn seasons of Uttar Pradesh climatic condition, Gangwar, 2011. Construction of life table for mulberry silkworm (*Bombyx mori* Linn. race Nistari) on different species of mulberry plant for Kumar *et al.*, 2010. The initial decline was followed by an intermittent decline which continued for few days, thereafter, in l_x could be attributed to the death of larvae, never the less a steep decline was seen at adult stage on all the two species of Mulberry silkworm (*Bombyx mori* Linn.) on a mulberry plant at control condition and room condition. The life expectancy exhibited an initial decline from 0 to 4 days in all cases, thereafter it increased slightly and again dropped down gradually with the advancement of age. A similar trend was also reported by Gurs [9]; and Rizvi & Pathak, [14] for different insects.

Table-1. Age specific life table of *Bombyx mori* Linnaeus hybrid cross N×N at room temperature

X	lx	dx	100qx	Lx	Tx	ex
0	100	0	0.00	100.00	2759.00	27.59
1	100	0	0.00	100.00	2659.00	26.59
2	100	15	15.00	92.50	2559.00	25.76
3	85	1	1.18	84.50	2466.50	29.19
4	84	2	2.38	83.00	2382.00	28.70
5	82	0	0.00	82.00	2299.00	28.04
6	82	1	1.22	81.50	2217.00	27.20
7	81	1	1.23	80.50	2135.50	26.52
8	80	3	3.75	78.50	2055.00	26.18
9	77	0	0.00	77.00	1976.50	25.67
10	77	1	1.30	76.50	1899.50	24.83
11	76	2	2.63	75.00	1823.00	24.31
12	74	0	0.00	74.00	1748.00	23.62
13	74	4	5.41	72.00	1674.00	23.25
14	70	0	0.00	70.00	1602.00	22.89
15	70	1	1.43	69.50	1532.00	22.04
16	69	2	2.90	68.00	1462.50	21.51
17	67	0	0.00	67.00	1394.50	20.81
18	67	2	2.99	66.00	1327.50	20.11
19	65	0	0.00	65.00	1261.50	19.41
20	65	1	1.54	64.50	1196.50	18.55
21	64	0	0.00	64.00	1132.00	17.69
22	64	2	3.13	63.00	1068.00	16.95
23	62	1	1.61	61.50	1005.00	16.34
24	61	1	1.64	60.50	943.50	15.60
25	60	0	0.00	60.00	883.00	14.72
26	60	1	1.67	59.50	823.00	13.83
27	59	2	3.39	58.00	763.50	13.16
28	57	0	0.00	57.00	705.50	12.38
29	57	0	0.00	57.00	648.50	11.38
30	57	0	0.00	57.00	591.50	10.38
31	57	0	0.00	57.00	534.50	09.38
32	57	0	0.00	57.00	477.50	08.38
33	57	0	0.00	57.00	420.50	07.38
34	57	0	0.00	57.00	363.50	06.38
35	57	0	0.00	57.00	306.50	05.38
36	57	0	0.00	57.00	249.50	04.38
37	57	5	8.77	54.50	192.50	03.61
38	52	7	13.46	48.50	138.00	02.85
39	45	8	17.78	41.00	89.50	02.18
40	37	12	32.43	31.00	48.50	01.56
41	25	20	80.00	15.00	17.50	01.67
42	5	5	100.00	02.50	02.50	0.50

Table -2. Age specific life table of *Bombyx mori* Linneaus hybrid cross NB₄D₂×SH₆ at room temperature

X	lx	dx	100qx	Lx	Tx	ex
0	100	0	0.00	100.00	2969.00	29.69
1	100	0	0.00	100.00	2869.00	28.69
2	100	14	14.00	93.00	2769.00	27.69
3	86	1	1.16	85.50	2676.00	31.30
4	85	2	2.35	84.00	2590.50	30.84
5	83	0	0.00	83.00	2506.50	30.20
6	83	1	1.20	82.50	2423.50	29.38
7	82	1	1.22	81.50	2341.00	28.72
8	81	2	2.47	80.00	2259.50	28.24
9	79	0	0.00	79.00	2179.50	27.59
10	79	1	1.27	78.50	2100.50	26.76
11	78	1	1.28	77.50	2022.00	26.09
12	77	0	0.00	77.00	1944.50	25.25
13	77	4	5.19	75.00	1867.50	24.90
14	73	0	0.00	73.00	1792.50	24.55
15	73	1	1.37	72.50	1719.50	23.72
16	72	1	1.39	71.50	1647.00	23.03
17	71	1	1.41	70.50	1575.50	22.35
18	70	0	0.00	70.00	1505.00	21.50
19	70	1	1.43	69.50	1435.00	20.65
20	69	0	0.00	69.00	1365.50	19.79
21	69	0	0.00	69.00	1296.50	18.79
22	69	2	2.90	68.00	1227.50	18.04
23	67	0	0.00	67.00	1159.50	17.31
24	67	3	4.48	65.50	1092.50	16.68
25	64	1	1.56	63.50	1027.00	16.17
26	63	0	0.00	63.00	963.50	15.29
27	63	2	3.17	62.00	900.50	14.52
28	61	1	1.64	60.50	838.50	13.86
29	60	0	0.00	60.00	778.00	12.97
30	60	0	0.00	60.00	718.00	11.97
31	60	0	0.00	60.00	658.00	10.97
32	60	0	0.00	60.00	598.00	09.97
33	60	0	0.00	60.00	538.00	08.97
34	60	0	0.00	60.00	478.00	07.97
35	60	0	0.00	60.00	418.00	06.97
36	60	0	0.00	60.00	358.00	05.97
37	60	0	0.00	60.00	298.00	04.97
38	60	0	0.00	60.00	238.00	03.97
39	60	5	8.33	57.50	178.00	03.09
40	55	7	12.73	51.50	120.50	03.10
41	48	13	27.08	41.50	69.00	01.66
42	35	25	71.43	22.50	27.50	01.22
43	10	10	100.00	05.00	05.00	0.50

CONCLUSION

The data obtained for age-specific life table revealed that the age-specific survivorship (lx) on the two hybrids cross of mulberry silkworm Nistari×Nistari and NB₄D₂×SH₆ followed almost the same pattern. There was an initial drop in survivorship followed by an intermittent steady declined with long pauses till the formation of the adult stage. At the adult stage, a sharp decline was recorded on all the two-hybrid crosses of mulberry silkworm until each generation was eliminated. The insect hybrid crosses of Nistari×Nistari at room temperature in 42 days. Whereas NB₄D₂×SH₆ at room temperature it required the maximum time 43 days to complete their life cycle.

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