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REARING PERFORMANCE OF OAK TASAR SILKWORM, *ANTHERAEA PROYELI J* ON DIFFERENT HOST PLANTS IN HIMACHAL PRADESH

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ABSTRACT

The studies on rearing performance of *Antheraea pryoeli*, a silkworm of oak tasar was conducted by feeding with three different host plants *viz*., *Quercus incana, Q. serrata and Q. semicarpifolia* during 2018-19, 2019-20 and 2021-22. The rearing was conducted during the year 2018-19, 2019-20 and 2021-22 and it was observed that *Quercus incana, Q. serrata* are better than *Q. semicarpifolia* for rearing of *A. pryoeli* in Himachal Pradesh. Economic parameters such as cocoons per dfl were found highest in case of *Quercus incana* (61.35 & 23.58) and *Q. serrata* (41.44 & 33.04) during 2021-22 and 2018-19 respectively as compared to *Q. semicarpifolia* (22.18 & 18.01). At the same time other parameters like cocoon weight , shell weight and shell ratio were recorded higher in *Q. semicarpifolia & Quercus incana* as compared to *Q. serrate* during the year 2018-19 & 2019-20. The shortest average larval period of 36 & 35 days were recorded when the worms feed on *Q. serrata* foliage during 2018-19 & 2019-20.

Key words: *Antheraea proyeli*, *Quercus incana, Q. serrata and Q. semicarpifolia*

Introduction

In India, tasar and oak tasar culture is practiced from the immemorial in tropical and temperate belts even prior to the introduction of mulberry in India. The tasar culture has substantial income generation potential especially for the tribal folk who lives in undulating forest regions. Indian oak tasar silk is produced by non-mulberry silkworm, *Antheraea pryoeli.* The oak tasar silkworm is a temperate species feeds on different species of the leaves of oak tree *Quercus* species found only in the states of Arunachal Pradesh, Assam, Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalya, Nagaland and Uttarkhand, is an important source of oak tasar silk, a rough and coarse silk usually with natural shades of beige. The forest fauna of the sub- Himalayan belt of india is the natural abode of a large variety of sericigenous insects (Jolly *et al*., 1976; Chaudhury, 1981; Sarkar, 1993; Thangavelu, 1991; Baruah *et al.,* 2000; Singh *et al*., 2000; Singh and Maheswari, 2003; Devi *et al.,* 2011). Out of the thirty five recorded *Antheraea* species. It is highly imperative to tap the other important wild genetic resources to boost the Vanya silk production. *Antheraea proyeli* is one of such oak feeding silk moths found in the forest of North–Western India, which can be exploited for production of Oak tasar silk. However, reports on rearing of wild silkworms are very few. During the survey and exploration, it is revealed that *Antheraea pryoeli* cocoons and feeding larvae are found on *Q. incana, Q. serrate* and *Q. semicarpifolia.* Hence, the present study was under taken to find out a preferred host plant for probable commercial exploitation.

Materials and Methods

Seed cocoons of *Antheraea proyeli* were collected from the previous season cocoon preservation. The collected seed cocoons were consigned for conducting grainage in the grainage hall of Chauntra farm, District: Mandi (H.P.). The emerged moths were allowed to couple for 13-15 hours inside bamboo

basket covering black cloth. The decoupled moths were kept inside bamboo monia or nylon netted bags (8" x 6") for 72 hours. The prepared disease free layings (dfls) were incubated at 22 ± 2ºC and RH 70-80% which is as per the method of Jiang *et al.,* 1992 with slight modification. The eggs were disinfected in 3% formalin for 10 minutes followed by washing in plain water before incubation. Another second disinfection and washing were also employed in the same concentration just before two days of hatching.

The rearing field was well cleaned and disinfected by sprinkling with mixture of lime and bleaching powder (9:1) before 7-10 days of brushing. The eggs are spread in a thin layer when the hatching is started and exposed to light. A few twigs of the three different host plants *viz*., *Q. incana, Q. serrate* and *Q. semicarpifolia* were placed separately on the hatched larvae. The worms crawl over the leaves within half an hour and then the twigs were directly shifted in outdoor on the foliage of the respective host plants. The bags or boxes containing eggs may be directly shifted on branches when the hatching started so that the worms can crawl over the leaves. The rearing was conducted on the foliage of *Q. incana, Q. serrate* and *Q. semicarpifolia* in outdoor under net cover in three years *i.e.,* 2018-19, 2019-20 and 2021-22 for three years. There were three replications in each treatment. While transferring of the worms, the branches with the worms are cut with the help of a secateure and shifted to another bush having quality foliage. Worms are not touches by hand as far as practicable. Utmost care is taken while transferring of worms from one bush to another because the worm gets injured or vomited by the slight touch or disturbance. Transfer of worms is always carried out in the morning and evening hours only. As in other silkworms the worms are not disturbed during the time of moulting. If any diseased or death worms are observed in the field, it was removed immediately by forceps and dipped in bleaching powder solution and buried under soil. Harvesting of cocoons was done after 6-7 days of spinning.

Results and Discussion

The results obtained from the economic characters such as larval duration, effective rate of rearing, cocoon per dfl, single cocoon weight, single shell weight, shell ratio and fecundity and hatching of Oak feeding silk moth, *A. proyeli* reared on the foliages of *Q. incana, Q. serrate* and *Q. semicarpifolia* during 2021-22, 2019-20 and 2018-19 are presented here under.

Larval Development: Hatching of eggs takes place after 9-10 days when the eggs are incubated at 22 ± 2^0C and RH 70-80%. The worms started hatching early in the morning (5 am) till about 12 noon and continued up to 3rd days. The larva prefers tender leaves to mature and hard leaves irrespective of the instars. Just after hatching the larvae crawl in search of food and are in the habit of eating bits of egg shell when hatched. It is desirable to provide tender leaves to the chawki worms while semi-mature and succulent mature leaves should be provided during 4th and 5th instars respectively for healthy growth of the larvae. The larva stops feeding at the slight disturbance.

The results on larval duration presented in Table-1, 2 and 3 (Fig. 01) revealed that, during 2019-20 & 2018-19 the minimum larval duration of 36 & 36 days were observed when the worms are feed on *Q. serrata* followed by *Q. incana* (36 & 39 days) and *Q. semicarpifolia* (40 & 55 days). During 2021-22 the shortest larval period of 41 days was recorded on *Q. incana* followed by *Q. serrata (43 daya)* and *Q. semicarpifolia* (47 days) and there is no much more difference between food plant on larval period during the year 2021-22.

Table 1: Rearing performance of *A. proyeli* during 2021-22 on different food plants.

Host plants/ Parameters	Larval Duration (Day)	Effective rate of rearing (%)	Cocoon per dfl (No.)	Single cocoon weight (g)	Single shell weight (g)	Shell ratio (%)	Fecundity (No.)	Hatching (%)
Q. incana	41	40.41	61.35	06.91	0.70	10.13	96	66.00
Q. serrata	43	30.02	41.44	06.31	0.75	11.88	110	60.00
Q. semicarpifolia	47	36.46	22.18	06.72	0.70	10.41	117	52.00
Mean	43.67	35.63	41.66	6.65	0.72	10.81	107.67	59.33
SD	3.06	5.24	19.59	0.31	0.03	0.94	10.69	7.02

Table 2: Rearing performance of *A. proyeli* during 2019-20 on different food plants.

Host plants/ Parameters	Larval Duration (Day)	Effective rate of rearing (%)	Cocoon per dfl (No.)	Single cocoon weight (g)	Single shell weight (g)	Shell ratio (%)	Fecundity (No.)	Hatching (%)
Q. incana	36	46.10	26.00	05.33	0.64	12.00	95	48.20
Q. serrata	35	24.07	17.18	04.48	0.38	08.48	100	61.00
Q. semicarpifolia	55	51.29	27.00	06.90	0.80	11.59	115	45.00
Mean	42.00	40.49	23.39	5.57	0.61	10.69	103.33	51.40
SD	11.27	14.45	5.40	1.23	0.21	1.92	10.41	8.47

Table 3 : Rearing performance of *A. proyeli* during 2018-19 on different food plants.

Host plants/ Parameters	Larval Duration (Day)	Effective rate of rearing (%)	Cocoon per dfl (No.)	Single cocoon weight (g)	Single shell weight (g)	Shell ratio (%)	Fecundity (No.)	Hatching (%)
Q. incana	39	17.71	23.58	05.35	0.63	11.77	98	60.00
Q. serrata	36	47.07	33.04	05.41	0.60	11.09	100	60.00
Q. semicarpifolia	40	38.49	18.01	07.90	0.90	11.39	117	40.00
Mean	38.33	34.42	24.88	6.22	0.71	11.42	105.00	53.33
SD	2.08	15.10	7.60	1.46	0.17	0.34	10.44	11.55

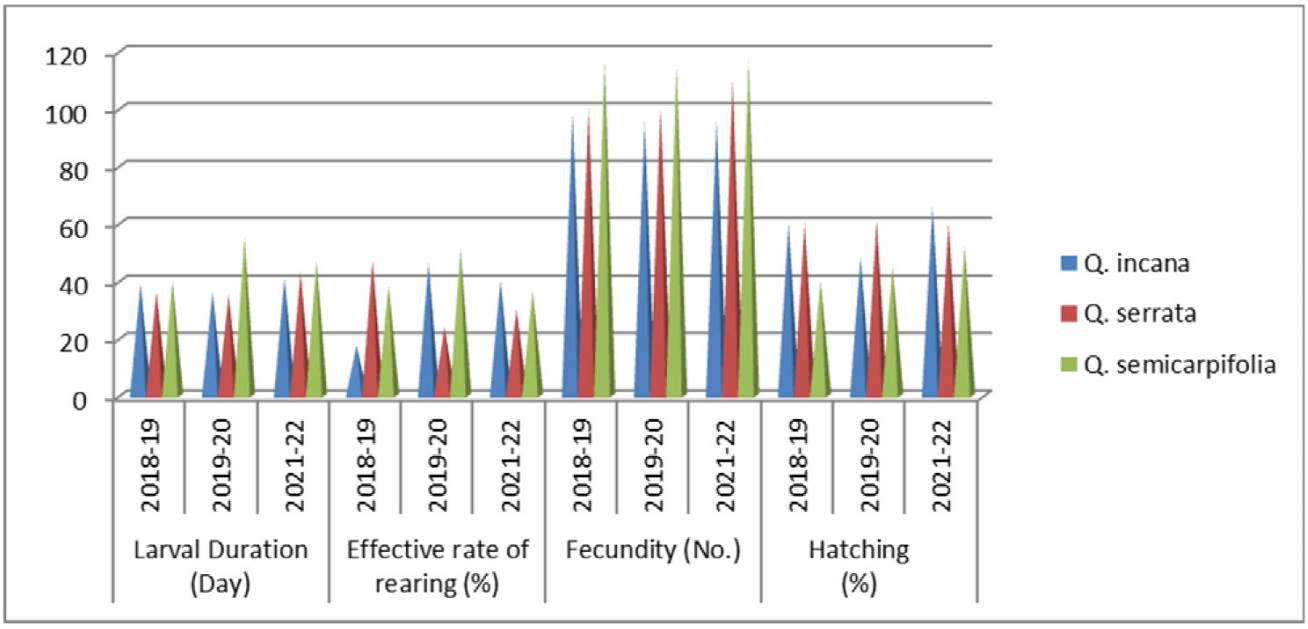

Fig. 1: Effect of different food plant feeding on rearing parameters of *A. proyeli*

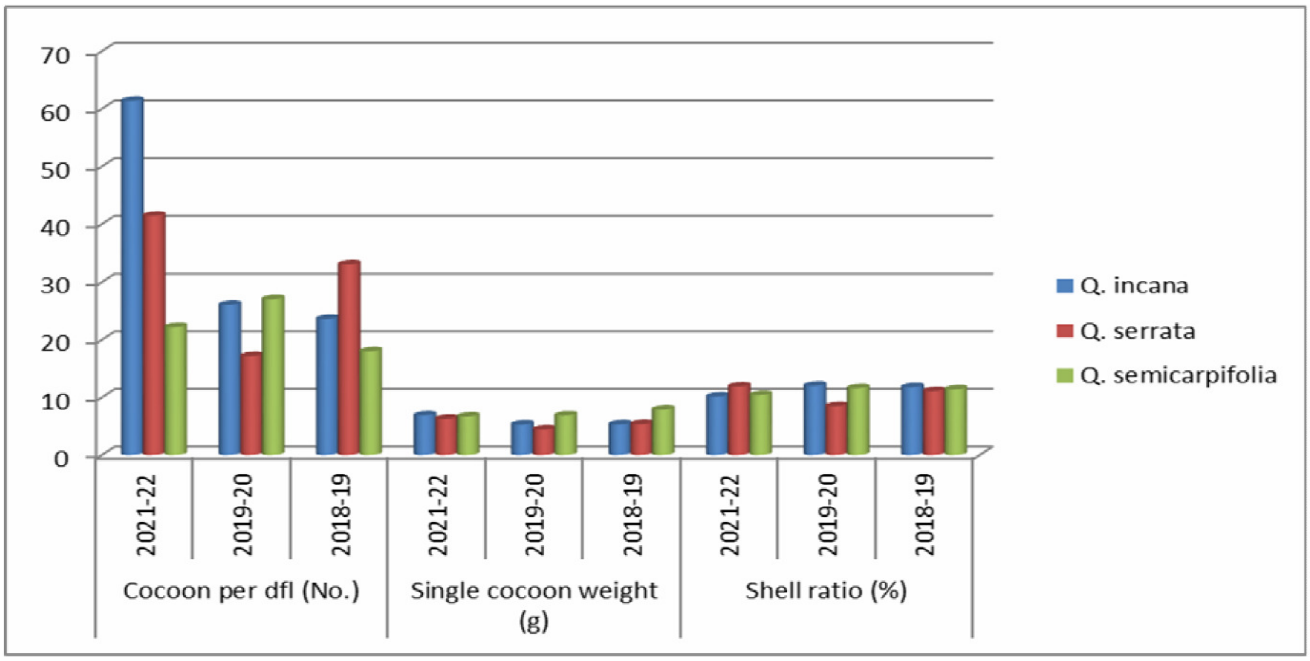

Fig. 2: Effect of different food plant feeding on economic parameters of *A. proyeli*

Cocoon yield and survivability: The data in Table 1, 2 and 3 (Fig. 02) revealed that the effective rate of rearing was superior during 2019-20 i.e., 51.29 % and 46.10 % respectively on *Q. semicarpifolia* and *Q. incana.* However, it was lowest 17.71 % and 24.07 % during 2018-19 and 2021-22 respectively on *Q. incana* and *Q. serrata.* The result of the rearing in three years revealed that the average cocoon yield varies from Lowest 17.18 cocoon per dfl on *Q. serrata* to 61.35 cocoons per dfl on *Q. incana* during 2019-20 & 2021-22 respectively (Table-1 & 2). The variations of cocoon yield are mainly attributed due to the variation of the host plant on which the silkworm was reared and between the years the average cocoon yield is more or less same.

Cocoon parameters: The mature larvae form cocoon on the tree itself by making a hammock. The cocoon has a peduncle 2.0 to 7.0 cm in length and less flossy. The average single cocoon weight was highest (7.90 g) on *Q. semicarpifolia* during 2018-19 followed by *Q. incana* (6.91 g) during 2021-22 and *Q. serrata* (6.31 g) during 2021-22 as shown in Table-1 and 3 (Fig. 02). However, the average single cocoon weight was highest and significant when *A. proyeli* was fed on *Q. semicarpifolia* in all three years. It is due to high altitude food plant effect on cocoon weight, low temperature, less human interference and less natural enemies. The result revealed that the average single shell weight was superior both in 2019-20 and 2018-19 with 0.90 g and 0.80 g respectively when the worms feed on *Q. semicarpifolia.* It is observed that the cocoon parameters are almost similar or less difference when the worms feed on *Q. incana* and *Q. serrata* during all three years of rearing.

Fecundity and hatching: The average fecundity was ranged from 95 eggs (*Q. incana*) to 117 (*Q. semicarpifolia*) eggs during all three years of rearing. The highest average fecundity of 117 eggs was recorded during 2021-22 & 2018-19 from the worms which was reared on *Q. semicarpifolia* and the lowest was observed from those worms which were reared on *Q. incana* during 2021-22 (95 eggs). The percent hatching was superior (66%) on *Q. incana* followed by *Q. serrata* (61%) during 2021-22 & 2019-20. However, lowest hatching per cent (45%) was observed on *Q. semicarpifolia* (Table-2 and Fig. 01).

Conclusion

Feeding of oak tasar silkworm, *A. proyeli* with different food plants was studied for economic parameters of oak tasar cocoons for three years (i.e., 2018-19, 2019-20 and 2021-22). The cocoon productivity and effective rate of rearing was observed better with worms fed on *Q. semicarpifolia* food plants as compared to *Q. serrata* and *Q. incana.* The silk ration was recorded better when worms fed with both *Q. incana* and *Q. serrata* as compared with *Q. semicarpifolia.* It is due to exposure of worms to favorable natural condition and early sprouting of food plant (*Q. incana*) and better management of food plant

(*Q. serrata*) as well as rearing of spring crop at middle altitude area. The study showed that feeding of *Q. semicarpifolia, Q. incana* and *Q. serrata food plants to A. proyeli* on favorable and natural condition have direct effect on the cocoon yield, effective rate of rearing and silk ratio respectively.

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