Chapter - VI

SUMMARY AND CONCLUSION

An investigation was made in Cooch Behar district of West Bengal to identify the rearing condition, host plant and season for muga silkworm (*Antheraea assama* Westwood) rearing in the non-traditional, newly explored area of mugaculture with special reference to nutritional efficiency of the silkworm. Muga silkworm, *Antheraea assama* Westwood, being wild, reared outdoors, and hence prone to natural hazard such as high temperature, heavy winds or rain, hail storms etc. apart from falling prey to pests and predators. Attempts were made to compare the natural outdoor rearing and indoor rearing on both the principal host plants namely som and soalu during seven periods in a year to avoid crop loss due to natural hazards in field condition with special reference to host plant effect on rearing ; to evaluate the consumption of leaves of two principal host plants and their combinations for selection of better food supply as well as to measure the leaf requirement and to identify seasons for muga silkworm rearing in the zone under consideration with reference to nutritional efficiencies into body, cocoon and egg.

The rearing and grainage were carried out at adopted farmer's field and Muga Research Laboratory of A. B. N. Seal College, Cooch Behar during seven seasons in a year. During out door rearing in the field 4-6 big trees together, cover with a mosquito net (rearing net) to kept them away from the natural enemies like birds, snakes, wasps, beetle, lizard etc. At the same time as for indoor rearing the branches of the food plant, som and soalu were kept immerged in water contained in earthen pots, these were kept in a stand in three tiers, and the whole setup was covered with polythene cover except the ground surface. The polythene cover was knitted on all sides except on the front and the front sheet was used like door curtain enabling rearing operation and these also facilitated maintaining the desired level of crop loss in outdoor rearing. In each seasons, eggs after hatching were reared following the proposed plan of work schedule until the attainment of cocoon, adult moth and egg.

For outdoor and indoor rearing, the larvae were fed with the leaves of som (*Machilus bombycina*) and (*Litsea polyantha*). Trees were used after two months of pruning. For nutritional efficiency besides pure som and pure soalu, eight different combinations were utilized as 1st instar on som and rest on soalu, 1st and 2nd instar on som and rest on soalu, 1st to 3rd instar on som and rest on soalu, 1st to 4th instar on som and rest on soalu, 1st instar on soalu and rest on som, 1st

and 2nd instar on soalu and rest on som, 1st to 3rd instar on soalu and rest on som and 1st to 4th instar on soalu and rest on som.

All the parameters were recorded on fresh weight basis. Twenty larvae as well as cocoons (10 males and 10 females) were taken for each of the three replications for assessment of quality of cocoon. For fecundity, twenty gravid females were taken for each of the three replications. All values of rearing results comprising rearing performance as well as quality of cocoons were subjected to suitable statistical analysis.

In order to determine the consumption and utilization of som and soalu leaves a colony of muga silkworm was raised in the laboratory and was maintained from brushing till spinning in indoor. Three replication with fifty larvae per replication were maintained for the study of nutritional efficiencies. Aliquot was kept for dry weight determination. An additional larval batch was also maintained as above for determining dry weight values. The healthy larvae were counted daily in each replication and unequal, weak, unhealthy if any, were replaced by healthy ones of the same age from the reserve stock. The left over leaf (LOL) and excreta were collected carefully and separated daily at 9 AM. The excreta and leaf were dried at 60^0C to a constant weight.

For pure som, pure soalu and different combinations the experiments were conducted during two main commercial crop rearing season (April – May and October – November). Later on pure som and better combinations were conducted during five different seasons namely February – March, April – May, June – July, August – September and October – November.

1. Consequences indicated that almost all the rearing parameters namely larval weight, cocoon weight, shell weight, effective rate of rearing and absolute silk content were better in indoor condition while shell ratio and fecundity were higher in outdoor. Moreover, better cocoon weight and absolute silk content in indoor condition also reflected no deleterious effect on silk due to indoor rearing. However, oviposition was not completely inhibited due to indoor rearing but a considerable reduction in fecundity due to domestication might further be studied in future.

Effective rate of rearing (ERR) varied greatly during the different rearing seasons and the same was quite high during April – May and October – November both in indoor and outdoor condition, repr esenting t he spring and autumn commercial crops respectively and the other seasons were found unfavorable for mugaculture utilizing only to augment seed multiplication.

The performance among the two important food plants viz. som and soalu were studied in indoor rearing. The study indicated higher effective rate of rearing and all other rearing parameters with som than with soalu except larval weight.

2. The efficiency of converting the ingested and digested food varied among silkworm under the influence of season and host plant. Food ingestion during fifth instar was 82% of the total consumption. Total food ingestion was higher in larvae fed on som than on soalu and higher consumption was during October – November. Digesta values followed the similar trend. Reference ratio was higher in the larvae fed on som leaves. 69% and 67% weight gain in fifth instar by larvae fed on som and soalu respectively which was maximum and 22-23 % weight gain was recorded in fourth instar. CI was less when fed on som leaves and during October – November showing higher utilization efficiency in som especially during October – November. When CI decreased, the passage of food through gut was slow and facilitated increased digestion and assimilation, which ultimately resulted in improved AD and other corresponding efficiency parameters.

The ECI and ECD values were higher in early instars and higher when fed on som leaves. The mean daily food ingesta (MDFI) and digesta (MDFD) in each instar increased as the larval growth progressed. The values were low in young instars and higher in late instars. MDFI and MDFD were higher when fed on soalu leaves. One-gram larval dry weight production required 5.664 gm. ingesta and 1.860 gm. digesta in som and 6.081gm.ingesta and 1.914 gm. digesta in soalu.

Overall observation reflected that for a unit larval growth, larv a fed on som leaves required less ingesta and digesta compared to soalu leaves. This indicated that larva fed on som leaves had a better efficiency of converting ingested and digested food into body substances.

3. Nutritional efficiencies of the larvae fed on som leaves were better than the larvae fed on soalu leaves, still the lower food ingestion, larval duration and mean daily food ingestion by the larvae fed on soalu leaves has provoked to investigate the possibility of better nutritional efficiencies by utilizing soalu leaves in different combinations with som leaves. Soalu upto third instar in combination with som for fourth and fifth instar when fed showed better food ingestion. Combination of leaves showed lower excreta than single type food which increased the digesta values. Reference ratio and weight gain were also observed higher in the aforementioned combination. Lower consumption index and higher AD, ECI and ECD were observed in the combination soalu upto third instar and then som

Lowest ingesta requirement to produce one gram larval body weight was 5.407 gm in the combination soalu upto third instar followed by som which was even lower than the som alone (lower than soalu) where the value was 5.664 gm. Digesta requirement to produce one gram larval body weight was also lowest in combination soalu upto third instar followed by som (1.873 gm), which was close to the som alone (lower than soalu) where the value was 1.860 gm.. Lesser ingesta and digesta requirement to produce unit larval dry weight was due to efficient assimilation by the aforementioned combination of leaves. Better season was observed October – November so far as nutritional efficiency.

Still, this combination and slightly lower performing combination i.e. soalu upto second instar followed by som (third, fourth and fifth instar) along with the som leaf feeding alone should be assessed in detail taking all the seed crop as well as commercial crop rearing seasons under consideration and their conversion efficiencies in cocoon, cocoon shell and egg before going to any strong recommendation towards the food source selection.

4. Food ingestion was highest in combination where soalu and som were in combination of up to 3rd instar and 4th and 5th instar respectively followed by som alone. Seasonal variation showed higher food ingestion by the larvae fed on that combination in every season followed by som alone in every season except August – September where food ingestion was lowest from som. Moreover, food ingestions were higher during commercial crop rearing seasons followed

by seed crop rearing season. As a whole digesta values were higher in upto 3rd instar and then som; only during February-March, digesta values were higher in som alone. Like ingesta, digesta values were higher during commercial crop rearing seasons. Reference ratio, the expression of absorption and assimilation of food was highest in the combination soalu upto 3rd instar then in som. Non-significant variation among the treatments in all the seasons except during October – November where combination of leaves showed higher than som alone reflecting similar rate of absorption and assimilation of food through out the seasons and seasonal average in RR varied from 1.466 to 1.489 among the treatments. Weight gain by the larvae was best in combination soalu up to 3rd instar then som in all the seasons and highest during October - November due to higher larval duration coupled with higher food consumption and digestion. Som alone when fed to the larvae showed better weight gain.

Lowest consumption index in the larvae fed on soalu up to 3rd instar and then som in the present investigation reflected. higher efficiency in feed utilization than from any other food source. Feed utilization efficiency by som alone was also better due to lower consumption index and during October - November the lowest consumption index reflected highest feed utilization efficiency during that time.

Efficiency of conversion of ingested food (ECI) was highest in combination of leaf in the form of soalu up to 3rd instar and then som reflecting larvae had the highest ability to utilized the ingested food when fed on that combination of leaves and it was also noticed that higher ability to utilized that ingested food was from som fed larvae. Efficiency of conversion of digested food (ECD) showed significant variation among som leaf feeding and combination as soalu up to 3rd instar then som. However, during October – November ECD was higher in single leaf fed larvae than the larvae fed on combination of leaves.

The present study revealed that nutritional efficiencies in the form of approximate digestibility, efficiency of conversion of ingested and digested food and better when fed on leaves in combination in the form of soalu up to 3rd instar and som in 4th and 5th instar than any other combination of leaves or som alone. Lower consumption index associated with lower ingesta requirement to produce one-gram body weight, the most important part of nutritional

efficiency, were also in the combination in a year round observation. ECI/ECD can be considered as indices for the physiological efficiency of any breed. The economic parameters namely single cocoon weight, ERR and fecundity were observed better during October – November and April – May and fed on the combination of leaves in the form of soalu upto third and som for fourth and fifth instar.

So, for commercial crop rearing as well as for seed crop rearing soalu upto 3rd instar and then som leaf utilization might be the most suitable food source for better muga silk worm rearing. However, the conversion efficiency into cocoon, shell and egg should be assessed for final recommendation.

5. The percentage of ECI and ECD to cocoon was highest when larvae fed on soalu upto 3rd then som were utilized in last two instars. Lowest values of ECI and ECD were observed in the combination where som leaves were utilized in last three instars. Ingesta and digesta requirement to produce one gram cocoon was less in the combination where som were utilized in last two instars. Efficiency of conversion of ingested food to cocoon was higher during October – November and April – May and at the same time during these periods, ingesta requirement to produce one-gram cocoon was lower. This observation justified the commercial crop rearing during these periods.

So, for silk production, October – November and April – May were found better and soalu upto third instar followed by som leaves in forth and fifth instar was found the best food source followed by only som leaves. Moreover, as only 5% of total leaf consumption was recorded as the requirement for early instars (1st to 3rd), plantation of soalu in a small portion might be recommended.

For seed production, ECI and ECD to egg were the two efficiency parameters to be considered. ECI to egg was also the highest when soalu upto 3rd instar and rest on som was utilized as food. However, som alone when supplied although the instars showed better ECI to egg. Moreover, though during October – November the conversion efficiency of ingested food to egg was higher than February – March and August – September, efficiency of conversion of

digested food to egg was better during the later two seasons. Ingesta requirement to produce one-gram egg was less in the combination where soalu upto third instar and rest on som was used and som alone. Ingesta requirement was lower during October – November and April – May while digesta requirement to produce one-gram egg was less during August – September and February – March.

So, for seed production, August – September and February – March was found successful to supply the egg for commercial rearing during October – November and April – May and soalu upto 3rd instar followed by som during 4th and 5th instar was found superior to utilize for better silk and seed yield as the nutritional efficiencies of muga silk worm larvae were better on the particular feed as well as during those particular seasons. So, for silk or for seed, soalu in early stage and som at late stage should be recommended for better production and successful mugaculture in terai region of West Bengal, a newly explored area.