Chapter VI

SUMMARY AND CONCLUSION

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With a view to study the feeding behaviour of eri silkworm, *Samia ricini* (Donovan) towards different hosts, basic nutritional aspects of the host plants, stimulating substances present in these plants, their role on growth and development of eri silkworm in terms of rearing and grainage performances as well as basic post-cocoon parameters, investigations were carried out on four host plants i.e. Castor, Borpat, Borkesseru and Kesseru in different combinations through study on the attraction behaviour of the silkworm, chemoassay and bioassay. The prime goal of the study was to find out the best substitute perennial host plant or its combination with other host plant to the primary food plant of eri silkworm i.e., Castor, mainly for late age rearing when more than 90% of the total food is consumed by eri silkworm.

The study revealed that, among all the host plants, eri silkworm preferred Castor and Borpat leaves the most, also survivability of the young worms found more when fed with tender leaves. Medium leaves of Borpat were mostly preferred by late age worms as revealed by the feeding behaviour, survival per cent and ultimately healthy cocoon yield. Visual field observation of the feeding behaviour of the worms also supported the findings.

In respect of quality parameters of the leaves of different host plants at three different maturity levels, it has been revealed that, for all the nutrient constituents as a whole, Castor was superior, which was at par with Borpat over other host plants irrespective of season and type of leaves. Tender leaves of Castor and Borpat possess significantly the highest amount of carbohydrate, tannins, β-sitosterol, crude fat and phytic acid. Castor tender leaves also have been found to contain significantly the highest total phenol, whereas Borpat tender leaves possess the highest lignin content. The tender leaves of Kesseru possess the highest crude fibre and chlorogenic acid

whereas tender leaves of Borkesseru contain the highest crude protein. Tender leaves of all host plants except Borkesseru contain the highest trypsin inhibitor activities.

The semi-tender leaves of Castor and Borpat was found to be superior in respect of carbohydrate, β-sitosterol, crude fat and phytic acid besides higher total phenol and tannin contents in Castor and the Lignin content in Borpat semi-mature leaves. The comparative higher carbohydrate, crude fibre, β-sitosterol and lignin contents were also recorded in Borpat leaves. The highest tannin, β-sitosterol, crude fat, chlorogenic acid, phytic acid, carbohydrate and total phenol were also recorded in mature leaves of Castor.

Experiment on rearing of eri silkworms feeding on different treatments i.e. combinations of food plants indicated the superiority of the Castor with Borpat leaves. The best performance was observed for rearing the early stage (1^{st} & 2^{nd} instar) larvae followed by late stage (3^{rd} to 5^{th} instar) larvae in Castor and Borpat, respectively. The lowest larval duration, higher mature larval weight, single cocoon weight, single shell weight, cocoon yield per dfl in numbers, effective rate of return (ERR) and cocoon shell yield per 100 dfls were found the highest in treatment of Castor in combination with Borpat as mentioned above. Further, the treatment Borpat alone i.e. feeding from brushing (1^{st} instar) till spinning (5^{th} instar) was also found better as compared to the rest of the treatment. The lowest performance in all economic characters of rearing in terms of higher larval duration and the lowest mature larval weight, single cocoon weight, single shell weight, cocoon yield per dfl in number and cocoon shell yield per 100 dfls were recorded in the treatment feeding eri silkworm from 1^{st} instar till spinning on Kesseru food plant.

The better performances in terms of economic characters of eri silkworm rearing in Borpat fed worms might be contributed by the better palatability of the leaves and biochemical constituents i.e. primary and secondary metabolites of semi-mature and mature leaves of Borpat. The higher survivability in Borpat fed eri

silkworms might be due to rich quassinoids, flavonoids, alkaloid, terpenoids, and proteins, etc., which are other-wise, have the antifungal, anti-bacterial and anti-protozoan properties as established by different researchers in recent days all over the world. However, detail study on disease tolerance of eri silkworm incited by feeding the leaves of Borpat or Borkesseru, popularly known as "Tree of Heaven" may be conducted in future to validate this hypothesis.

In terms of grainage performance of eri silk, the highest fecundity was recorded in the treatment of Castor in combination with Borpat, which was at par with the treatment of Castor in combination with Borkesseru as compared to other treatments. Similarly, the higher hatchability, moth emergence and lower cocoon: dfl ratio was recorded in the treatment of Castor in combination with Borpat. The different researchers earlier opined the superiority of eri silkworm in grainage performance on Castor food plant. Hence, it may be concluded that Borpat along with Castor has extended the synergetic effect not only in rearing performances but also in grainage performances in eri silk.

In case of post-cocoon parameters, the cocoons of either Borpat or Borkesseru fed eri silkworm or in combination with Castor showed significant increase in yarn recovery *vis-a-vis* reduction in boil off losses as well as silk waste. This might be due to lower sericin content in Borpat and Borkesseru fed cocoons of eri silk which can be assessed from visual observations besides biochemical analysis.

It was evident from the study that rearing of eri silkworms during July-August (summer) season performed better on feeding the worms with Borpat as compared to other seasons. Hence, the technique has also emerged as tool for mitigation of climate change in respect of eri silkworm rearing. The Borpat tree may help not only in sustainable rearing throughout the year but also it may be taken up as a strategy to address the recent environmental challenges. Lignin plays a significant role in the carbon cycle and sequestering atmospheric carbon found

highest in all types of Barpat leaves. Hence, large scale of plantation of the tree may also help in carbon trading as well as to address the problem of environmental pollution and deforestation.

During field trials in the farmers field also showed better performance of Borpat fed eri silkworm in terms of higher hatchability, mature larval weight, cocoon yield per dfl in numbers, ERR, single cocoon weight, single shell weight, shell ratio and yield per dfl in weight as compared to laboratory conditions. This might be due to congenial soil and climatic conditions of the location selected for field trial i.e. Barekuria area of Tinsukia district, which is otherwise natural habitat of the Borpat plantations in large scale. The farmers of the area were mostly unaware of utilization of this plant in respect of eri silkworm rearing. However, during the process, awareness was created among most of the farmers of the area and they have adopted the technology i.e. rearing of eri silkworm feeding on Borpat for improvement of eri silk production and their income. Hence, the area has been brought under Institute Village Linkage Programme (IVLP) of Central Silk Board for pre-cocoon eri silk sector. Considering the positive aspects of the tree, the Department of Sericulture, Assam Agricultural University, Jorhat has initiated the programme for mass multiplication of the species for free distribution of seedlings among farmers under Rashtriya Krishi Vikash Yojana (RKVY) during 2015.

The leaf biomass production of Borpat is much higher than Castor and Kesseru plants and available throughout the year as evident from the findings of present study. Hence, the farmers may increase the rearing capacity by three times in a season and 4-5 crops may be raised in a year by utilizing this tree. It is expected that adoption of Borpat tree for rearing of eri silkworm among eri rearers will help in commercialization of eri culture and will overcome the problem of non-availability of sufficient leaves throughout the year.

Suggestions for future works:

A few new areas of the investigation have emerged out from the present study and it has also been felt that future research works may be undertaken by other researchers on following aspects to make the present study more meaningful and full proof for greater interest of the farming community.

- Study on quantitative nutritional aspects of eri silkworm feeding on Castor, Kesseru and different *Ailanthus* trees to assess the palatability of food in terms of digestibility, growth rate, etc.

- Study on the role of secondary metabolites of Borpat and Borkesseru such as alkanoids, flavonoids, terpenoids, etc. on disease and insect resistance or tolerance to eri silkworms.

- Development of semi-synthetic diet for late stage rearing of eri silkworm after validating the specific role of individual biochemical constituents of Borpat.

- Development of complete package of practices of Borpat *vis-à-vis* eri silkworm rearing.