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Research Paper

Commercial Prospective of *Lagerstroemia parviflora* (Roxb.) as Choice Food Plant of Tropical Tasar Silkworm, *Antheraea mylitta* (Drury)

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Abstract - *The commercial rearing of polyphagous Indian tasar silkworm, Antheraea mylitta Drury being practiced on naturally grown primary food plants like Terminalia tomentosa (Asan), Terminalia arjuna (Arjun) and Shorea robusta (Sal) available in the tropical forests of central India. At times, the non-accessibility to primary food plants made the tasar farmers of Goilkera area of Jharkhand, India to use Lagerstroemia parviflora (locally called as Sidha, the traditionally known alternative food plant) to feed tasar silkworm, which are vastly available in the region. However, its suitability for tasar rearing, impact on the cocoon and silk yields were not studied in comparison with primary food plants, in spite they being vital for tasarculture sustainability. The comparative study on rearing and cocoon quality among L. parviflora and T. tomentosa revealed that the effective rate of rearing (ERR), cocoon and silk yields are low in L. parviflora, while the other commercially important larval, cocoon and shell weights, pupation and silk ratios have shown improvement over T. tomentosa plant. The study indicates the commercial prospective of L. parviflora as alternative food plant for A. mylitta during exigency to supplement the pupation, shell weight and silk ratio, if not the total cocoon and silk yields.*

Keywords: *Antheraea mylitta*, Commercial prospective, *Lagerstroemia parviflora*, Tasarculture, *Terminalia tomentosa*.

Introduction

The tropical tasarculture is an important forest based agro-industry of producing vanya silk by rearing a wild silkworm, *Antheraea mylitta* Drury (Lepidoptera: Saturniidae), primarily on *Terminalia tomentosa* (asan), *Terminalia arjuna* (arjun) and *Shorea robusta* (sal) and secondarily on *Lagerstroemia parviflora, Zizyphus mauritiana, Anogeissus latifolia, Syzigium cumini, Careya arborea* and *Hardwickia binata*, in addition to other trivial tasar food plants [1,2,3]. The *L. parviflora* is extensively available in the tropical tasar rearing areas of Jharkhand and Chhattisgarh states of India, which is known as Sidha locally and considered as one of the traditional food plant for tasar silkworm, *A. mylitta* [2,4]. The quantitative and qualitative nutrition is specific for sericigenous insects, which controls the physiological status and the productivity of silk insect in terms of silk and egg yields [5, 6]. The tasar food plant leaf quality in terms of nutrition can influence the health and growth of larvae, effective rate of rearing (ERR) and crop yields as it has correlation with the weight of silk cocoon and cocoon shell and silk ratio [7,8], and can influence the crop economics [9,10,11]. The leaf nutrient status of tasar food plant is fundamental not only for silk productivity, but also for its metamorphosis during life cycle and subsequent parental moth reproductive efficiency [12, 13, 14,15]. The larval feeding status of any polyphagous commercial insect has impact on food storage and budgeting for biological activities so as to combat the adverse or to excel during favourable conditions [16, 17, 18, 19, 20, 21, 22]. The immense availability of *L. parviflora* in the rearing areas of tropical tasar silkworm in Jharkhand and Chhattisgarh states of India and lack of information on its commercial prospective for rearing *A. mylitta* has made the authors to take up present study.

Material and Methods

The present work has been chosen to analyze the impact of two different tasar food plants (primary and secondary) like *T. tomentosa* and *L. parviflora* on rearing and cocoon economic traits of Daba ecorace of *A. mylitta.*

The study has been carried out in the command area of Pilot Project Centre (PPC), Goilkera, West Singbhum district, functioning under the Department of sericulture, Government of Jharkhand, India during July to September, 2010. Under the study, five nucleus tasar silkworm seed rearers for each tasar food plant variety have been selected from Mohuldiha village under the command area of PPC, Goilkera for conducting seed crop rearing. The basic tasar silkworm seed of 200 disease free layings (Dfls) each of ecorace, Daba of source, Basic Seed Multiplication and Training Centre (BSM&TC), Boirdadar, Chhattisgarh, India has been supplied to the identified rearers during first week of July, 2010. The observations on different rearing parameters like larval weight, larval span, effective rate of rearing (ERR), cocoon yield and pupation percentage on cocoon commercial traits like single cocoon weight, single shell weight, silk ratio percentage and total silk yield per Dfl along with food plant leaf moisture contents have been recorded and the data were processed for the statistical significance.

Results and Discussion

The data presented in Table 1 indicates the comparative rearing performance and cocoon parameters of Daba ecorace reared on *T. tomentosa* and *L. parviflora* food plants and their level of statistical significance. The variations in the leaf moisture content, larval duration, effective rate of rearing (ERR), cocoon yield, single shell weight, silk ratio and total silk yields are significant at $P<0.01$; the average larval weight and pupation percentage are significant at $P<0.05$, while the single cocoon weight was non significant on comparison among the *T. tomentosa* and *L. parviflora* food plants. The leaf moisture content, ERR, cocoon yield and total silk yields are more in T. *tomentosa*, while the larval duration, larval weight, pupation percentage, cocoon and shell weights and silk ratios are higher in *L. parviflora* food plants.

The comparison made for commercial impact among the two different tasar food plants, *T. tomentosa* and *L. parviflora* in respect of tasar silkworm rearing performance and cocoon commercial traits has been presented in the Table 2. The evaluation for commercial impact was positive for larval weight, pupation percentage, single cocoon and shell weights and silk ratios, while the leaf moisture content, larval duration, ERR, cocoon yields and total silk yields are negative for *L. parviflora*. The larval weight (+9.97), pupation percentage (+10.86), single shell weight (+11.76) and silk ratio (+11.19) are positively higher, while the ERR (-51.67), cocoon yield per Dfl (-53.07) and total silk yields (-47.59) are negatively higher for *L. parviflora*. However, the other parameters are either marginally higher or lower between the two tropical tasar silkworm food plants, i.e., *L. parviflora* and *T. tomentosa*.

The success of tasarculture is mainly depends on the accessibility of food plant and their leaf nutritional status as the consequent silkworm larval rearing on them could result to higher number of cocoons or the cocoons of superior quality in terms of pupation or silk content. This further guide to either seed or silk production for the commercial sustenance of tasarculture and thus, the industry must aim for optimal utilization of available tasar biodiversity as flora and fauna. Though, there is no dearth of tasar food plants in general, their availability in the forest periphery and accessibility for the silkworm rearings makes the tasar rearers to choose or prefer them as choice food plants. To utilize the nature grown primary food plants by preference for tasar insect rearing in the forests, many a time the rearers hesitate to invest time and manpower as the tasar based economics are always tentative compared to their other alternative agro-based activities. Such situation compels the tasar rearers to search for choice food plants to save time and man power and to manage their tasar rearings even if the cocoon and silk yields are less in comparison to primary food plants, so to attend the other time bound farming activities in-time.

The *L. parviflora*, with local name, Sidha is widely available in the tasar rearing areas of Jharkhand and Chhattisgarh states of India and is considered as one of the dependable secondary food plant of tropical tasar silkworm, *Antheraea mylitta* Drury [2, 4]. In spite of vast availability of this food plant, the exclusive tasar rearings have not been conducted on commercial scale and only under exigencies the *L. parviflora* leaf was used to feed tropical tasar silkworm. The longer larval period on feeding with *L. parviflora* leaf compared to *T. tomentosa* might resulted to higher larval weight and subsequently to better cocoon and shell weights and silk ratio. However, such extended larval span might also contributed negatively in terms of lesser ERR and cocoon yields with the probability of longer exposure to environmental vagaries, diseases, pests and predators. The extension of larval span might be either due to low nutrition levels or less leaf succulence. Even the low leaf moisture in *L. parviflora* might made the tasar insect not to attain its required growth and maturity as like on *T. tomentosa* food plant to spin the cocoon nest and to advance its life cycle at faster pace. The quantitative as well as qualitative nutrition is highly essential and specific for sericigenous insects to maintain the important physiological status [15, 16, 20] and under the lack of such required nutrition in *L. parviflora*; the tasar silkworm might have extended its larval span. Further, the potential fitness and maturity attainment is only possible when the larva obtain adequate amount of necessary nutrients in a required relative balance. The lower ERR and cocoon yields are inter-linked and might be the result of inadequacy and imbalance in the nutrient availability in the feed, which led to longer larval span. The larvae can survive better on getting the required nutrition by improving defense system, which also shorten its larval span and lessen the chance of exposure to the diseases, pests and pathogens [6, 20, 23] and in the instant case the coincidence of longer larval duration and lesser ERR and cocoon yields might be due to inter-related and cumulative impacts.

The requirement and balancing of nutrients is essential for larval metamorphosis to pupa with necessary shell formation to construct the nest and the varied levels of availability of such nutrition among two food plants might resulted to insignificant change in the cocoon weight with significant change in shell weight among the cocoons raised on *L. parviflora* and *T. tomentosa*. Further, the extra feeding time was implied essential for the tasar silkworm larvae to acquire maturity and thus to budget high for shell content

resulting to higher cocoon shell weight in *L. parviflora* fed batch and such increase in silk and shell contents were also reported with other food plants during commercial crop rearing seasons, which might be with ample nutrients obtained and their allocation for silk production [17, 24, 25]. Further, the abundance of nutrition and its required balance available in *L. parviflora* plant and the preference by the tasar silkworm larvae contemplating the rearing season might got matched for silk production rather than the larval body tissue growth. This is coinciding with lesser increase in cocoon weight than shell weight of the cocoons raised on *L. parviflora* plant, which further resulted to significant rise in silk ratio. The total silk yield was negative in *L. parviflora* fed cocoons (in spite of better cocoon and shell weights) was due to lesser ERR and cocoon yields as these are inter-connected to total silk yield. The food plant nutrition can highly influences the larval rate of growth, metamorphosis and the reproductive efficiency in many insects [12, 13, 14] and thus the male cocoons have better silk while female cocoons have better pupae with their prioritized budgeting of food reserves [18, 22]. The quantity and number of required amino acids available in the leaf of host plant has greater role on the vitellogenesis in insects [16, 19]. The higher pupation in the cocoons raised on *L. parviflora* food plant can anticipate the possibility for better silkworm seed recovery, being the important commercial trait associated with the number of live cocoons available in total cocoons harvested. The positively higher larval weight, pupation, cocoon weight, shell weight and silk ratio further indicate the commercial prospective of *L. parviflora* over *T. tomentosa*, in spite of negative trend in other commercial traits. Nevertheless, the improved shell weight and silk ratio in addition to the pupation percentage in the cocoons produced on *L. parviflora* plant indicates it's prospective as choice food plant for *A. mylitta* under the dearth of primary food plants.

Conclusion

The rearing performance of tasar silkworm, *A. mylitta* on *L. parviflora* food plant has shown lesser feasibility in general than *T. tomentosa*. But, the traits like larval weight, pupation percentage, cocoon weight, shell weight and silk ratios are positive in *L. parviflora* fed cocoons. The study indicates the commercial prospective of *L. parviflora* as alternative food plant of *A. mylitta* during exigency to supplement the pupation, shell weight and silk ratio, if not the total cocoon and silk yields. However, the reason for the longer larval span with lesser ERR and cocoon yields of tasar silkworm on feeding *L. parviflora* needs a detailed study to pick and utilize *L. parviflora* as choice food plant for tropical tasar silkworm.

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Table 1: Comparative performance on rearing and cocoon parameters of *A. mylitta* fed on *T. tomentosa* and *L. parviflora* food plants

Parameter	*T. tomentosa* (Asan)		*L. parviflora* (Sidha)		t - test
	Mean	S.D.	Mean	S.D.	
Leaf moisture content (%)	65.82	4.77	59.26	5.01	5.79**
Larval duration (days)	34.60	1.14	45.80	1.30	14.46**
Average larval weight (g)	54.67	4.63	60.12	5.89	4.31*
Effective rate of rearing (%)	61.00	9.45	29.00	4.18	6.92**
Cocoon yield (nos)/ Dfl	48.80	7.56	23.20	3.35	6.92**
Pupation (%)	66.49	5.73	73.71	6.45	5.84*
Single cocoon weight (g)	10.92	0.16	11.01	0.33	0.57 NS
Single shell weight (g)	1.19	0.03	1.33	0.05	5.75**
Silk Ratio (%)	10.92	0.19	12.12	0.41	6.01**
Total silk yield (g)	58.96	8.11	30.90	3.74	7.03**

**Significant at P<0.01; *Significant at P<0.05; NS- Non Significant

Table 2: Comparison for commercial prospective in rearing performance and cocoon commercial traits of *A. mylitta* fed on *T. tomentosa* and *L. parviflora* food plants

Parameters	*T. tomentosa* (Control)	*L. parviflora* (Treatment)	% change over control	Commercial prospective
Leaf moisture content (%)	65.82	59.26	-9.97	Negative
Larval duration (days)	34.60	45.80	+32.37	Negative
Average larval weight (g)	54.67	60.12	+9.97	Positive
Effective rate of rearing (%)	61.43	29.69	-51.67	Negative
Cocoon yield (nos)/Dfl	48.80	23.20	-53.07	Negative
Pupation (%)	66.49	73.71	+10.86	Positive
Single cocoon weight (g)	10.92	11.01	+0.824	Positive
Single shell weight (g)	1.19	1.33	+11.76	Positive
Silk Ratio (%)	10.90	12.12	+11.19	Positive
Total silk yield (g)	58.96	30.90	-47.59	Negative