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Full Length Research Paper

Studies on the Sequential development of the leaves of Soalu *Litsaea polyantha* Juss.; A Primary host plant of Muga silkworm *Antheraea assama* Ww. in Bageshwar District of Uttarakhand.

Mahesh Kumar, Garima Joshi*, D.P Paliwal and Kamal K Pande*****

Department of Zoology M.B. Govt. P.G. College, Haldwani, Nainital, 263139, Uttarakhand.
**Department of Zoology, Govt. P.G. College, Bageshwar, Uttarakhand.*
***Central Silk Board REC, Bageshwar, Uttarakhand.*
****Department of Chemistry and Department of Biotechnology & Allied Sciences, M.B. Govt. P.G. College, Haldwani, Nainital, Uttarakhand, 263139.*

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Corresponding Author:
Mahesh Kumar
Department of Zoology,
M.B. Govt. P.G. College
Haldwani, Nainital
(Uttarakhand), 263139.

Abstract
Present paper deals with sequential development of Soalu Litsaea polyantha Juss. in Bageshwar District of Uttarakhand. This is primary host of Muga silkworm Antheraea assama Ww. Soalu Litsaea polyantha Juss. Naturally occurs in this region of Uttarakhand. Owing to its availability in the region Muga silkworm has been introduced in Bageshwar Uttarakhand. It was observed that leaf development and weather conditions during the seasons have direct correlation. Studies on the sequential development of Soalu Litsaea polyantha Juss. will further help to esteblish the Muga culture in this region.

Key words: *Muga host plant, Soalu, Sequential development, Muga silkworm.*

Introduction

Muga silk has a unique distinction among all natural silks due to its natural fabulous gold shine. Muga silkworm *Antheraea assama* Ww. is a multivoltine, polyphagous insect and feeds on a wide range of host plants of which *Litsaea polyantha* Juss. and *Machilus bombycina* King. Syn. *Persea bombycina* Kost. are the primary host plant species. It also feeds on a number of several others host plants. Rearing of Muga silkworm is conducted outdoor whereas cocoon spinning and egg production activities are carried out under indoor conditions.

The Muga silkworm is a polyphagous insect and thrives on various endemic plants, mainly on representatives of the family Lauraceae and secondarily on few representatives of families Celastraceae, Melastomaceae, Rhamnaceae, Rutaceae, Verbenaceae etc. The family Lauraceae comprises about 6 genera and 2,000 species, a vast majority of which are trees or well formed shrubs. Its members are mostly restricted to the tropical and subtropical forests. As regards to India here the family occupies an important economic position since some of its species like *Litsaea citrata*, *L. polyantha* and *L. salicifolia* as well as *M. bombycina* are cultivated in the N-E part of India i.e., chiefly in Assam and Meghalaya states in N-E region for rearing the muga silkworms. Otherwise, these Muga host plants are widely distributed in Burma, Indonesia, Malaysia and Nepal (Jolley *et al*., 1979). Brandis (1972) followed by Isa and Thangavelu (1988) have reported the natural distribution of one of the Muga host plant *L. polyantha* (Fig.1) in the Doon valley and its adjoining hilly areas upto an altitude of 800m. It is locally known as Katmara/Karkawa or Thiskiya whereas the occurrence of the other host plants *M. bombycina* and *M. odoratisima* locally known as Kaul/Kaula or Kaw have been reported between the altitude of 800–2,700 m in the hills of Uttarakhand State.

Present studies focus on the sequential development of the leaves of *Litsaea polyantha* Juss. in Bageshwar, Uttarakhand as it is a primary host plant of Muga silkworm *Antheraea assama* Ww. and it is abundantly found in Bageshwar district of Uttarakhand. *Litsaea polyantha* Juss. utilized for the present investigation belong to the family Lauraceae. The information thus gathered is of immense help for the establishment of Muga culture in Bageshwar, Uttarakhand.

Materials and methods

In respect of observing the leaf growth and development regarding the Muga silkworm host plant species, the samples of leaves were collected from healthy host plants of Soalu (***L. polyantha*** Juss.).growing in the nearby villages i.e., Panura and Devalchaura of District Bageshwar. Further, three sets of @ 10 leaves on the twigs were marked and observed foliage growth increment and moisture

contents in leaves after an interval of 5days till attainment 25 days growth. Accordingly, the foliar development of respective Muga host plant species was observed by tracing their outline on a sheet of a graph paper and moisture contents in leaves was calculated by using the formula mentioned hereunder:

$$\text{Moisture \%} = \frac{\text{dry wt.of leaves}}{\text{fresh wt.of leaves}} \text{x100}$$

Results and Discussion

Morphometrical Changes in the Leaf Development in Different Seasons:

Leaf Development:

The leaf development study was carried out in *L. polyantha* under weather conditions of District Bageshwar. The young leaf emerges from apical bud as narrow appendages, having yellowish green hue. At this stage leaf surface is covered with densely arranged trichmoes. As the leaf expands, its colour gradually changes from light to dark green. The leaf completed its growth in volumetric in a period of around one and a half month. The morphometrical changes in leaf were recorded during different seasons in District Bageshwar (Table-1 and Fig.1-2) and observed that leaf development and weather condition during the seasons has direct correlation due to that foliar expansion influenced season to season.

Foliar Area Development:

The changes in the leaf area (mm^2**)** and its sequential increment of plant species *L. polyantha* Juss. were recorded at an interval of 5 days from day of sprouting till 25 days (leaf maturation). It is depicted in Table-1 and Fig.1-2 and observed that on 25^{th} day, the leaf attains maximum increase in leaf area 9655 mm^2 with maximum moisture 56% and minimum 5050 mm^2 with minimum moisture 45% in Rainy and Autumn season, respectively where as the leaf development during spring season showed normal leaf development 8600 mm^2 with moisture 55% than the other respective seasons upto the 25^{th} day. The influences of seasonal variations was also observed on the foliar development as the study showed that during rainy season the weather conditions were found to be congenial for foliar development with maximum moisture contents and observed maximum expansion in the leaf in the season whereas, because of low temperature during winter, the minimum foliar expansion with minimum moisture content was recorded, though no gradual pattern in respect of foliar increment day to day was observed. Further, on the whole it was observed that the moisture contents in the leaf are decreased with sequential increment of the leaf.

The young leaf emerging from the apical bud is a narrow appendage, having yellowish tinge. At this stage the appearance of the leaf is not well pronounced, because the leaf surface is covered with densely arranged trichomes. As, the leaf expand its colour gradually changes from light green to dark green. The leaf completes growth (in volume) in a total period of 25 days and during this span the leaves of plant species *L. polyantha* attains maximum with moisture changes in an average 9655 mm^2 with moisture 56 % and 5679 mm^2 with 58% respectively during rainy season in the year. Further, it was observed that the moisture contents in the leaf are decreased with sequential increment the size of the leaf in both of the muga host plant species. The changes in the size and days are shown in (Tables-1).

As, it is evident from observations that the leaf development in Muga silkworm host plants showed a sequential growth pattern, the findings are in agreement with several earlier authors in respect to several tropical and sub-tropical species Paliwal *et al*., (1975), Badola *et al*., (1983) and Paliwal *et al*., (2010), who advocated that usually, in the young leaf, which is unfolded from the bud only a sparse reticulum of areoles is visible and vein endings develops progressively, in due course of time. In the present study same pattern was observed in the leaves of both of the Muga host plant species and it was observed that leaf development and weather condition during the seasons has direct correlation due to that foliar expansion influenced season to season. The investigations carried out in respect of present study revealed that foliar expansion in different seasons of *L. polyantha* and the increment in leaf area was found highest between 10-15 days and decline trend observed after 20 days leaf under Bageshwar conditions.

Conclusion

Muga silk is exclusively cultivated through rearing of Muga silkworm *Antheraea asssama* Ww. on the foliage of the plant species *Litsaea polyantha* Juss. (Soalu) and *Machilus bombycina* King. (Som) in the North-Eastern states particularly in Assam, India in the world. It is because of availability of the Muga silkworm host plants as well as the conducive weather as prevailing during rearing of the silkworm in the region. Presently, the Muga silk production is merely around 100 MT which is not enough to fulfill the demand of silk of the domestic market. The attempt for expansion of this precious silk production is being made by Central Silk Board, Ministry of Textiles, Govt. of India. In connection to find the nature grown host plantation in other than North-Eastern states a survey had been made by the scientists of the Board and they reported that the state Uttarakhand is endowed with rich fauna, flora, sericigenous insects and the both of the host plants of Muga silkworm are also found intensely in the forest of the state in between the altitude 800-2700 AMSL. Present endeavor is a part of the above objective to study the details of the host plants and establish the Muga culture in other parts of the country.

Table 1 : Leaf size development in *Litsaea polyantha* Juss. in different seasons

S.No.	Days	Average Growth of Leaf During Year 2011-13											
		Spring				Rainy				Winter			
		Net Area (mm²)	Gross Area (mm²)	%	Moisture %	Net Area (mm²)	Gross Area (mm²)	%	Moisture %	Net Area (mm²)	Gross Area (mm²)	%	Moisture %
1	0-1	16	16	0	88	20	20	0	90	8	8	0	82
2	1-5	290	306	94.77	78	300	320	93.75	82	124	132	93.93	74
3	5-10	880	1186	74.2	67	986	1306	75.49	68	520	652	79.75	62
4	10-15	1400	2586	54.13	60	1625	2931	55.44	62	890	1542	57.71	58
5	15-20	2990	5576	53.62	58	3124	6055	51.59	58	1688	3230	52.26	50
6	20-25	3034	8600	35.27	55	3600	9655	37.28	56	1820	5050	36.03	45

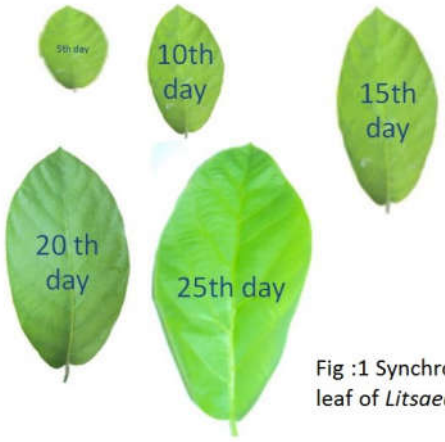
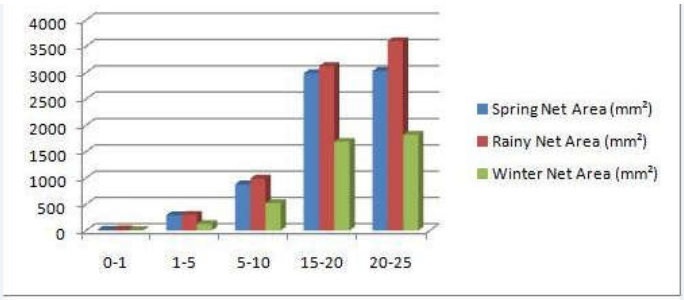
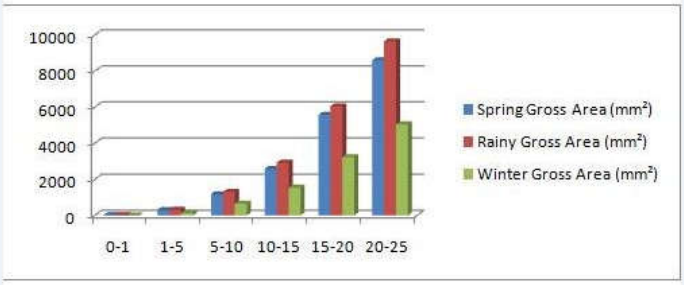


Fig :1 Synchronized development of leaf of *Litsaea polyanantha* Juss.



Net area development in leaf



Gross area development in leaf

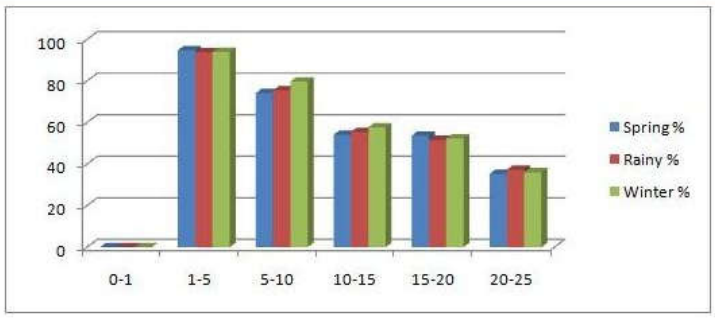


Fig:2 Net area, Gross area & Leaf increment (%) in *Litsaea polyantha* Juss. in different seasons

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