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Full Length Research Paper

Studies on the foliar development of Som *Machilus bombycena* King; A Primary host plant of Muga silkworm *Antheraea assama* Ww. in Bageshwar District of Uttarakhand.

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Abstract
Present paper deals with the foliar development and sequential growth of leaves of the Muga silkworm host plant Som Machilus bobmycina King. Leaf development in M. bombycina King and weather conditions as prevailing in the area during the rearing seasons have direct correlation, due to that foliar expansion and moisture contents in the leaf are influenced season to season. Rainy season was found to be congenial for foliar development of M. bombycina King. Moisture contents in the leaf decrease with sequential increment of the leaf.

Key words: *Som, Muga silkworm, foliar development, Host plant*

Introduction

Among all natural fibers silk is the only fiber which comes through the rearing of silkworms on the leaves of their respective host plant species. There are mainly four kind of silks i.e., Mulberry, Tasar, Eri and Muga are widely cultivated in the world. . Muga silkworm *Antheraea assama* Ww. is a multivoltine, polyphagous insect and feeds on a wide range of host plants of which *Machilus bombycina* King. Syn. *Persea bombycina* Kost. and *Litsaea polyantha* Juss. are the primary host plant species. The nature of Muga silkworm is wild and it is reared on its host plant under natural weather conditions.

Uttarakhand state encompasses an area of 53483 sq. km. of which 35394 sq. km. ha, around 65% comes under forest in which about 33% is classified as *"dense"* forest area. Muga primary host plants *M. bombycina* King. Syn. *P. bombycina* Kost. and *L. polyantha* Juss. Syn. *L. monoptela* are found abundantly which exhibit magnificent growth and covers around 0.01 % population of vegetational wealth of the state forest (Choudhary, S.N., 1981).

District Bageshwar is located at 29°51′N 79°46′E29.85°N 79.77°E. It has an average elevation of 1,004 metres (3,294 feet). District Bageshwar is characterized by mountainous topography with alpine and pine forest. It covers 900–5000 AMSL altitude because of altitude variation all kind of weather like tropical to temperate are found at different altitudes in the District. The foliar development plays a vital role in ideal rearing of silkworm during different seasons. Therefore, the studies of sequential development of leaf of the Muga silkworm host plant species *M.bombycina* King. In different seasons have been carried out.

Material and methods

Morphometerics of the host plant leaves:

In respect of observing the leaf growth and development regarding the Muga silkworm host plant species, the samples of leaves were collected from concerned healthy host plant of Som (***M. bombycina*** King. Syn. *P. bombycina* Kost.) 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:

$$\text{Moisture \%} = \frac{\text{dry wt.of leaves}}{\text{fresh wt.of leaves}} \text{X100}$$

Result and discussion

Morphometrical Changes in the Leaf Development during different Seasons:

Leaf Development:

The leaf development study was carried out in *M. bombycina* King. under weather conditions of District Bageshwar. The young leaf emerges from apical bud as a narrow appendage, having yellowish green hue. 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 recovered during different seasons in District Bageshwar (Table-1 & Fig.1-2) and it was seen that leaf development and weather condition has direct correlation which has been reflected in leaf expansion during different seasons.

Foliar Area Development

The changes in the leaf area (mm^2) and its increment day to day were plotted in (Fig.1-2) which showed that there was maximum increase in leaf area 5679 mm^2 with maximum moisture 58% minimum expansion of leaf between 0-25 days from July–September (rainy season) followed by a moderate leaf area expansion 4830 mm^2 with moisture 54% during March-April (spring season) and minimum expansion of leaf 3073 mm^2 with minimum moisture 52% was noticed from October to November (winter season).

The influence of seasonal variations was observed on the foliar development as the study showed that during the weather conditions of the rainy season was found to be congenial for foliar development and observed maximum expansion of leaf was observed. The weather during winter is cold which restrict the leaf expansion to the minimal level though no gradual pattern in respect of foliar increment day to day was observed. Further, on the whole it was observed same pattern as found in plant species *L. polyantha* (Kumar et. al.2016) and the moisture contents in the leaf are decreased with sequential increment of the leaf.

The growth organ is the product of the divisions, expansion and subsequent differentiation of the component cells. Its development is completed in four phases i.e., (A)initiation of the leaf primordial (B) Further development of the individual leaf (C) Growth of the leaf surface as a whole in relation to life-history of the plant and (D) Mechanism controlling leaf initiation and growth. In present study, detailed work has been carried out on the growth and development of leaf of host plant species *M. bombycina* King during spring, rainy and winter seasons in District Bageshwar.

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 leaf of host plant species *M. bombycina* King attains maximum with moisture changes in an average 5679 mm^2 with 58% 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 this host plant species. The changes in the size with respect (days) are shown in (Table-1).

Table 1: Leaf size development in *Machilus bombycina* King. in different seasons

S.No.	Days	Average Leaf Growth During Year 2011-13											
		Spring				Rainy				Winter			
		Net Area (mm^2)	Gross Area (mm^2)	%	Moisture %	Net Area (mm^2)	Gross Area (mm^2)	%	Moisture %	Net Area (mm^2)	Gross Area (mm^2)	%	Moisture %
1	0-1	8	8	0	88	10	10	0	94	4	4	0	82
2	1-5	152	160	95	74	165	175	94.29	78	98	102	96.07	70
3	5-10	422	582	72.5	68	466	641	72.69	70	204	306	66.66	64
4	10-15	734	1156	63.49	61	822	1463	56.18	64	569	875	65.02	60
5	15-20	1614	2770	58.26	58	1946	3409	57.08	60	1050	1925	54.54	56
6	20-25	2060	4830	42.65	54	2270	5679	39.97	58	1148	3073	37.35	52

As, it is evident from observations that the leaf development in above 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) Badoni *et al*.,(1986) 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 are visible and vein endings develop progressively, in due course of time. The investigations carried out revealed that foliar expansion in different seasons of *M. bombycina* King the increment in leaf area was found highest between 10-15 days and decline trend was observed after 20 days under Bageshwar conditions.

CONCLUSION

The Muga cultivation in N-E region is an age old practice, but the Muga production is declining due to inbreeding in Muga silkworms, destruction of habitat of Muga silkworms and its host plants and lack of interest of new generation in Muga culture. At present there is a wide gap between demand and supply of this precious silk. Owing to the availability of Muga host plants and N-E

like weather in Bageshwar district, trials are in progress to increase the Muga cultivation area. Present studies on the foliar development of primary Muga host plant *M. bombycina* King will help to establish Muga silkworm in its new abode i.e. Bageshwar, Uttarakhand.

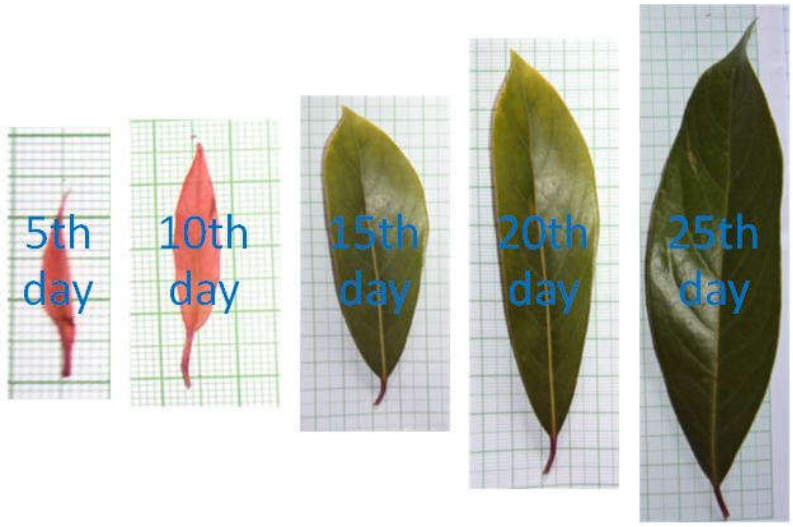
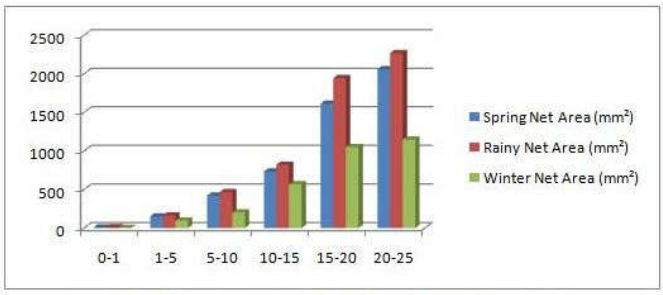
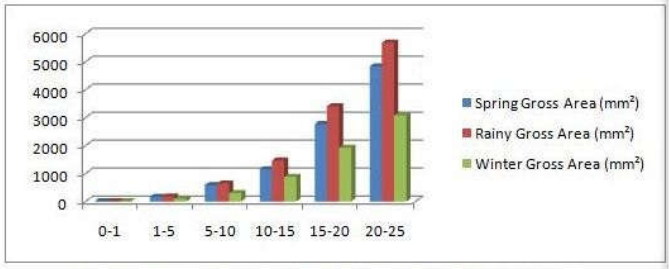


Fig: 1 Synchronize development of leaf of *Machilus bomycina* King. (Som)



Net area development in leaf of *Machilus bombycina* King.



Gross area development in leaf of *Machilus bombycina* King.

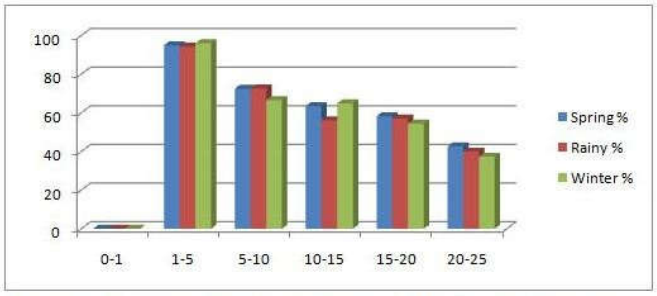


Fig: 2 Net area, Gross area & Leaf increment (%) in *Machilus bombycina* King. in different seasons

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