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Seasonal Variation in Foliar Constituents of Oak Leaf (*Quercus serrata* Thunb.) and its Impact on Oak Tasar Silkworm (*Antheraea proyeli* Jolly.) Rearing

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ABSTRACT

Quercus serrata Thunb. is the primary food plant of oak tasar silkworm Antheraea proyeli Jolly. The chemical constituents of leaf i.e. crude protein, crude fibre, crude fat, carbohydrates were estimated in different seasons i.e. spring and autumn. Bioassay were also conducted in spring and autumn season. In spring leaf moisture, crude protein, crude firbe, crude fat, ash, carbohydrates and ERR% were recorded 68.98%, 10.28%, 6.78%, 2.34%,1.88%, 10.80% and 64.50% respectly. During autumn season the leaf moisture 57.23%, crude protein 5.13%, crude fibre 7.09%, crude fat 1.94%, ash1.90%, carbohydrates 21.33% and ERR 31.60% were recorded from Oak leaves. In spring season higher leaf moisture, crude protein and ERR% were observed while in autumn season less % leaf moisture and ERR% but higher % of carbohydrates were recorded. There were no significant different observed for crude fibre, crude fat and ash% content in both the season.

Key words: *Chemical constituents, Quercus serrata, Antheraea proylei.*

INTRODUCTION

Antheraea proylei Jolly. is mainly reared on naturally grown forest of Oak (*Quercus serrata* Thunb.) in North East India for the production of oak tasar silk. The Rearing of oak tasar silkworm is successful using spring season[6]. Spring crop is seed crop as well as commercial crop. Seed cocoons were preserved from one spring season to next spring season and were lost due to erratic emergence (20-30%) during the preservation period. So it is highly essential to conduct rearing in autumn crop as seed crop to get additional seed cocoons for the next spring crop grainage for production of more diseases free layings. In the present study seasonal variation of major leaf constituents of *Q. serrata* & nutritional indices of oak tasar silkworm in both spring and autumn season were estimated. Moreover an attempt has been made to study the cause of autumn season partly favourable for oak tasar crop.

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MATERIALS AND METHODS

Oak leaves of different types namely tender, semimature and mature were collected from plants/trees of Research Extension Centre, Umrangso field , Dima Hasao district of Assam during Spring and Autumn season in 2013 and 2014. For spring crop pruning and pollarding were done during the 1st week of December and for Autumn crop light pruning/clipping were done in 2nd week of August. The agronomical practices, application FYM and NPK were done for better quality and quantity of leaves for rearing seasons. The collected oak leaves (tender, semimature and mature) were dried separately at 60°C for 24 hours and powdered. The moisture content was estimated using the following formula.

$$\text{Moisture (\%)} = \frac{\text{Fresh weight} - \text{Dry weight}}{\text{Fresh wieght}} \text{x } 100$$

Leaf constituents such as moisture, crude protein, crude fibre, crude fat, ash and carbohydrate were estimated according to A.O.A.C (1984) methods, at Central Muga Eri Research & Training Institute, Lahdoigarh, Jorhat, Assam. Nitrogen content of the leaves was estimated by Micro-kjeldahl method and crude protein was calculated by multiplying the estimated value of nitrogen content by 6.25. NPK and FYM in recommended dose per plant 48 gm Urea, 46.5 gm SSP, 9.3gm MOP, and 10 Kg FYM were applied. The pruning/pollarding, light pruning/clipping were done which help in maintaining optimum height of plant suitable for rearing and results to increase in the of soluble proteins, total sugar and free amino acids etc. besides reducing fibre contents. The seasonal change in the leaf constituents of *Quercus serrata* are present in Table.1,Table.2 and Table.3.

Table 1: Foliar constituents of Oak leaf *(Quercus serrata)* in 2013

Season	Leaf	Moisture %	Crude protein %	Crude firbe %	Crude fat %	Ash %	Carbohydrates %	ERR %
Spring 2013	Tender	73.50	12.30	5.25	1.80	1.65	8.85	65.10
	Semi mature	70.10	10.25	6.65	2.35	1.90	10.90	
	Mature	62.25	8.25	8.40	2.80	2.10	12.75	
	Mean	68.62	10.27	6.76	2.32	1.88	10.83	
	S.E ±	3.335	1.705	0.912	0.289	0.3535	1.128	1.756
	C.V	8.41	19.72	23.34	21.59	25.02	18.015	8.522
Autumn 2013	Tender	60.05	5.65	5.60	1.7	1.60	16.50	32.40
	Semi mature	57.15	5.10	6.75	1.90	1.85	20.35	
	Mature	54.40	4.5	8.90	2.25	2.30	26.30	
	Mean	57.2	5.08	7.08	1.95	1.92	21.00	
	S.E ±	1.625	0.3394	0.9683	0.161	0.205	2.854	1.046
	C.V	4.91	11.34	23.66	14.28	18.474	23.513	10.204

Table 2: Foliar constituents of Oak leaf *(Quercus serrata)* in 2014

Season	Leaf	Moisture %	Crude protein %	Crude firbe %	Crude fat%	Ash %	Carbohydrates %	ERR %
Spring 2014	Tender	73.60	12.5	5.20	1.85	1.60	8.80	63.90
	Semi mature	70.15	10.4	6.70	2.40	1.85	10.85	
	Mature	64.30	8.30	8.50	2.82	2.15	12.70	
	Mean	69.35	10.30	6.80	2.36	1.87	10.78	
	S.E ±	2.72	1.22	0.955	0.281	0.159	1.128	1.72
	C.V	6.78	20.424	24.294	20.614	14.73	18.098	8.493
Autumn 2014	Tender	60.10	5.75	5.75	1.65	1.60	16.55	30.80
	Semi mature	57.20	5.20	6.60	1.95	1.80	20.40	
	Mature	54.50	4.60	8.95	2.20	2.25	26.45	
	Mean	57.27	5.18	7.10	1.93	1.88	21.67	
	S.E ±	1.62	0.3325	0.96	0.159	0.1924	2.91	0.83
	C.V	4.89	11.104	23.38	14.27	17.71	23.229	8.493

Table 3: Foliar constituents of Oak leaf *(Quercus serrata)* 2013& 2014

Season	Moisture %	Crude protein %	Crude firbe %	Crude fat %	Ash %	Carbohydrates %	ERR %
Spring 2013	68.62	10.27	6.76	2.32	1.88	10.83	65.10
Spring 2014	69.35	10.30	6.80	2.36	1.88	10.78	63.90
Mean	68.98	10.28	6.78	2.34	1.88	10.80	64.50
Autumn 2013	57.20	5.08	7.08	1.95	1.92	21.00	32.40
Autumn 2014	57.27	5.18	7.10	1.93	1.88	21.66	30.80
Mean	57.23	5.13	7.09	1.94	1.90	21.33	31.60

RESULT AND DISCUSSIONS

The study shows that in spring season leaf moisture, crude protein, crude firbe, crude fat, ash, carbohydrates and ERR% were recorded 68.98%, 10.28%, 6.78%, 2.34%,1.88%, 10.80% and 64.50% respectly and during autumn season leaf moisture 57.23%, crude protein 5.13%, crude fibre 7.09%, crude fat 1.94%, ash1.90%, carbohydrates 21.33% and ERR 31.60% were recorded from Oak (*Quercus serrata* Thunb.) leaves. In spring season higher leaf moisture, crude protein and ERR% were observed while in autumn season less % leaf moisture and ERR% but higher % of carbohydrates were recorded. There were no significant different observed for crude fibre, crude fat and ash% content in both the season. The difference in nutritional quality of host leaves is an import factor for the success and partly success for silkworm rearing in different seasons. For instance,the predominant occurance of lepidopterous pests and feeding Chinese tasar silk worm, *Antheraea pernyi* on oak during the spring

season had been attributed to the presence of lesser amount of tannins, but increase of tannin in the following seasons the leaves become unsuitable for silkworm. In spring season higher crude protein% and lesser crude fibre % resulting higher % of ERR. of oak tasar silkworm(*Antheraea proylei*.). The quality of leaves has got direct influence on the healthy growth and survival of silkworm Sinha *et al*[9]. Better the quality of leaves, greater possibilities of obtaining good cocoon harvest. Therefore, the selection of the food plants possessing superior nutritive value could be utilized for the healthy development of silkworm for obtaining good cocoon crop. According to findings of Pandey & Goel[4], crude protein contents of young leaves were higher than old leaves in 3 oak species where *Q. serrata* showed maximum 28.92%, *Q. semecarpifolia* 20.77%, and *Q. incana* 16.47% but old leaves contained nearly half of total protein contents of young leaves. The young leaves contained less crude fibres, old leaves had nearly double the fibre content. Again, Pandey[6] observed seasonal changes in the leaf composition of *Q. serrata*, where leaf proteins were 6.81% in March and 7.89% in April which were decreasing 4.74% in October, and ash 2.23% in April which was increased from March 1.95% ,as result, the leaf quality of March and April month was found most suitable for rearing of *A. proylei*. A strong positive correlation was found between leaf content and larval body weight. The higher survival of oak tasar silk worm during spring season may be due to higher protein content of the leaves during April. Leaf quality for many lepidopteron larvae is determined on protein content basis[3].The autumn crop of oak tasar not fully success may be due to decline in protein content. Ponnuvel *et al.*[7] leaf moisture percentage of *Quercus serrata* leaves decreasing from February to November (71.9% to 56.78%) and crude protein decreasing from March (10.17%) maximum and minimum in September and October (5.39% and 5.07% respectly). In spring leaves contained less crude fibre (0.90% in February and 5.28% in March) but in autumn crude fibre 6.85% in September and 7.66% in October. Carbohydrates contents in leaves low in spring season and increasing in autumn in mature leaves.

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