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***Research Article***

# *MORUS SERRATA*, A HIMALAYAN MULBERRY VARIETY AN ADDITIONAL FEED FOR LATE AGE SILKWORM AND ADDITIONAL CROP IN DHAR BLOCK OF PATHANKOT DISTRICT OF PUNJAB

***Shashi Kanta**
*S.S.M. College Dinanagar, Punjab*
**Author for Correspondence*

## ABSTRACT
Morus in India is represented by four species *M. indica, M. alba, M. laevigata* Wall, *M. serrata* Roxb. Morus serrata, very natural Himalyan mulberry tree is found in abundance in forest as well on bunds of farmer's field in Dhar Block region of District Pathankot in Punjab. This is a famous Kandi area near the foot hills of Shivalik. *Morus serrata* is being used as fodder by farmers during stress condition. This area and little area of Gurdaspur alone contribute about 90% of the total cocoon production of state and out of this only Dhar sub division contributes approx. 85% of the total two districts production. The climatie of Dhar Block favour sericulture development. Experiments results indicate that Mulbery is useful as alternate feed during late age silkworm rearing. The average cocoon production was in range of 32 to 45kg/100dfls while the ratio varied from 16.8 to 19.37%.

***Key Words:*** *Morus serrata, Silkworm, Feed*

## INTRODUCTION
Only 30 countries are in the list of raw silk producer by mulberry. Himalaya Mulberry can be grown successfully in all conditions, even in tropical, subtropical and temperate climates. As reported that 70% of the silk protein produced by the silkworm is directly derived from the protein of mulberry leaves (Narayanan *et al.,* 1967; Krishnaswami *et al.,* 1970a, 1970b; Petkov and Dona, 1979b). This led to development of several high yielding improved mulberry varieties in last 2 decades and quantum jump in qualitative and quantitative production of Silk in India the extension strategy requires understanding factors liked local geographical condition and people ability to adopt new livelihood activity in phase manners rather imposing technologies of which participants are not sure of result, this in spite external agencies having knowledge of advanced technologies.

Morus Sp. can survive with rainfall ranging from 400-4500 mm per annum, optimum temp. for growth is between 18 and 30 degree census , mulberry can survive even when the temperature goes beyond 48degree C or below 0 degree C. So mulberry is considered as a universal plant, under various climate conditions. Mulberry's different species that are suitable for silkworm rearing are cultivated in the plain and on hilly ground. *M. serrata* are grown in hilly area because of their deep root system, the leaves remain green for most of the year. It is depending upon agro climate distribution, morphological parameters showed wide variation. *M. serrata* possess coarse hairy leaves suitable to adjust in adverse condition i.e cold, drought and disease resistance due to less stomata. *M. serrata* posses several agronomically importance traits such as higher leaf thickness, greater leaf moisture content, moisture retention and resistance to abiotic and biotic stress.

Morrus serrata is endogenous mulberry species found naturally in wild condition at high altitude area in Dhar Block of District Pathankot Punjab. Leaves, Fruits are long green color and sweet in nature. A 20 to 40 years old tree can yield leaves from 500 kg to 2000 kg /crop respectively. Local inhabitant's use this species leaves for feeding livestock animals during stress condition. They were unaware of its use for feeding mulberry silkworms for commercial gain. Some reports are available on distribution and utilization of *M. serrata* (Dandin *et al.,* 1993; Tikader *et al.,* 1999, 2000). Tikander and Dandin (2005) have reported about ex- situ performance of 15 accessories of *M. serrata* from Uttaranchal Pradesh but utilization for silkworm rearing is scanty due to lack of characterization. Though improved mulberry

variety S- 149 suitable for hilly areas is being promoted, it was considered worthwhile to study the biochemical characters and impact of feeding *M. serrata* leaves on the economic characters of silkworm B. mori (L) due to its abundance and source of viable alternate feed and potential of undertaking additional silkworm crop.

## MATERIALS AND METHODS

### *Biochemical Analysis*

The leaf samples were drawn from five randomly selected trees on Morus serrata and morus alba (s-146 variety).species at different growth stages representing tender (30 days old), medium (45 to 50 days) and mature (75 days). The samples were dried under shades followed by oven drying at 60 to 65 c for 24 hrs (to attain constant weight) and powered to uniform size particles and preserved in the air tight glass bottles. The leaf samples in triplicate were used for estimation of biochemical constituents by standard methods of analysis namely Moisture Contents: Gravimetric method (AOAC 1970), sugar: Phenol sulphuric acid method (Dubois *et al.,* 1956), Protein: Folins method (Lowry *et al.,* 1951) and Nitrogen: (Kjeldahl, 1881).

The bioassay test was conducted with silkworm race PMxCsR hybrid and results indicate that it is suitable for late stage silkworm cocoon and from hatching to cocoon harvest. The crop yielded 32 Kg./100 disease free laying (Singh *et al.,* 2006). Mulberry leaves were fed to Bombyx mori (L). Larvae as per rearing method suggested by Krishnaswami *et al.,* (1978). Experimental as well control groups had 3 replications consisting of 100 larvae each. Mulberry leaves of M .serrata in combination with M. alba (control) were used for feeding B. mori larvae. The experiment was set as follow:

a. Group fed only with M .serrata (local wild mulberry leaves).
b. Rearing with M. alba (S- 146 variety) and last 4 days of % 5th instar with *M. serrata* sps. Mulberry leaves.
c. Mixed: Up to 3$^{rd}$ instar with M. alba and rest with *M. serrata* wild mulberry.
d. Only M. alba (improved S-146).

Parameters like total cocoon wt. (gm). Shell wt. (gm) and shell ration (%) were recorded and data was analyzed while for cocoon production / 100dlfs were based on mass rearing of 25dlfs*3 replication for each set. The rearing technique followed in present investigation was essentially similar to that described by Krishnaswami *et al.,* (1978). The temperature and humidity was in the range of 26 +2 C and 70 to 80 % RH respectively conducted during the rainy season (month July to August, 2005).

## RESULTS AND DISCUSSION

The endogenous species of mulberry are found in all district of Himachal Pradesh except few districts which are at high altitude. This area is on the way of Dalhousie, which has all friendly conditions of for this mulberry variety. At present mulberry silkworm rearing practiced in 6 districts. During 2005-2006 and 2004- 2005, the total cocoon production was 138285kg and 118512 kg respectively. This production is 16.68% higher over previous year, Sub tropical and temperature climatic conditions are found suitable to a wide range of fauna and flora of sericigenous insects (Raja Ram, 1997).

Agro climate conditions of Dhar block of Pathankot District indicate suitability of area for silkworm rearing in term of temperature and humidity. This area is situated near the Chamba district at 2500 meter above sea level. Presently two mulberry crops (spring and autumn season) are being under taken by farmers. The pre breeding efforts highlights the possibility of using wild *M. serrata* effectively and efficiently (Tikader and Dandian, 2007).

Present authors observed that farmers as well department official of this district are unaware about suitability of this Morus species as silkworm feed and used only for fodder purpose called as “Chimmu” found in abundance at farm bund as well in forest. No report is available regarding its use. The present investigation was an attempt to study the potential of compared to M. alba species. (Table) with maturity

of leaves. Rupa *et al.,* (1993) and Bongale *et al.,* (1994) too have reported about nutritional composition of mulberry leaves change with maturity.

The effect of feeding *M. serrata* on economic parameters during rainy season is presented in Table 3. Group fed with *M. serrata* showed significantly least cocoon productivity (32kg/ 100dlfs) as well cocoon characters (1.25 g cocoon wt., 0.21 g shell wt. and 16.80% shell ratio) as compared to only M. alba (1.50g cocoon wt., 0.32 g shell wt. and 21.33% shell ratio) and in combination. Group fed with M. alba showed significantly highest cocoon productivity (55 kg/ 100dlfs). Mixed combination especially feeding. B. mori (L) being monophagous, Morus species are the only source of nutrition for the silkworm (Yakayama, 1963). However, it is well established that silkworms fed on different mulberry varieties show different performances in different characters (Das and Sikdar, 1970; Opender *et al.,* 1979; Tayade *et al.,* 1984; Haque *et al.,* 1990). The present investigation clearly indicates the suitability of improved high yielding variety of M. alba (S-146) for this region The present results is in conformity of earlier reports of feeling of nutritionally enriched leaves as well as improved 1979b). Therefore, quality of mulberry leaf influences the growth, development of mulberry silkworm and greatly affects the economics of sericulture industry (Das *et al.,* 1983).

**Table 1: Agro-climatic condition of Dhar block in Pathankot district**

| Sr. no | Parameters | Particulars | Average |
|---|---|---|---|
| 1. | Temperature | Minimum 1(d) c Maximum48 (d) c | 22(d) c |
| 2. | Humidity | Minimum 60RH Maximum90RH | 75% |
| 3. | Average rain fall | | 1770 cm annual |
| 4. | Attitude height from sea level | Minimum300 Maximum900 | 600meter |
| 5. | Present Number of Mulberry crop and rearing season | April October | 2 crops |

**Table 2: Leaf biochemical constituents at different growth stages**

| Sr. no | Biochemical parameters | Mulberry sps. | Leaves growth stages | | |
|---|---|---|---|---|---|
| | | | 30 days | 45 to 50 days | 75 days |
| 1. | Moisture(%)content | *M. serrata* | 65 | 63 | 56 |
| | | M.alb | 77 | 74 | 70 |
| 2. | Nitrogen (%) | *M. serrata* | 3.8 | 4.0 | 3.2 |
| | | M. alba | 4.50 | 4.60 | 3.7 |
| 3. | Protein (%) | *M. serrata* | 17.00 | 18.50 | 15.25 |
| | | M. alba | 21.20 | 22.00 | 19.00 |
| 4. | Sugar (%) | *M. serrata* | 9.47 | 9.45 | 10.32 |
| | | M. alba | 12.47 | 13.32 | 11.25 |

**Table 3: Results of feeding *M. serrata* (wild Variety) and M. alba (s-146)on B. mori (L.)**

| Sr. no | Mulberry type | cocoon wt. | Shell wt. | Shell ratio% | Cocoon wt./100 dfls |
|---|---|---|---|---|---|
| 1. | Only with *M. serrata* (local Wild Mulberry leaves) | 12.50 | 2.10 | 16.80 | 32kg |
| 2. | Rearing with M. alba (S-146 variety) and last days of 5$^{th}$ instar with *M. serrata* sps. Mulberry leaves | 12.20 | 2.50 | 19.37 | 45kg |
| 3. | Mixed (Up to 3$^{rd}$ instar with M. alba and rest with *M. serrata* wild mulberry | 12.90 | 2.20 | 18.03 | 40kg |
| 4. | Only M. alba (Improved variety S-146) | 15 | 3.20 | 21.33 | 55kg |

Interestingly, results also indicate suitability of feeding Morus serrata during last few days before spinning of silkworm in case of shortage of improved variety leaves. Raja Ram (1997) has reported the cocoon characteristics of 1.79 gms cocoon weight , shell weight 0.35 gm and 19.55% for shell ratio and the cocoon productivity of only 30kg/100 dfls for B. mori fed with M. alba secondly, this also confirms, an additional crop can be taken exclusively on *M. serrata* during the rainy season even though the productivity is less but on par with current cocoon production in the state .Thirdly family having trees on farm bund including landless can take up rearing on such species to supplement their income as additional crop or as alternate feed during the last stages. The Himachal Pradesh state is considered suitable for silkworm rearing due to similar agro –climate condition China. Our this area has very similar climate conditions of suitable for *M. serrata* because Dhar Block area is adjoined with Chamba District The abundant natural flora of *M. serrata* species can be harnessed for economic benefits as additional crop or supplementing feed while promoting improved mulberry management and sericulture practices. This social approach will be advantageous for promoting sericulture and augmenting raw silk production in this region and the country**.**

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