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# Zoological and Entomological Letters

## Impact of certain plant extracts on different larval and cocoon characters of silkworm *Bombyx mori* Linn.

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### Abstract

Silkworm *Bombyx mori* L. feeds on the leaves of mulberry tree which is only the host plant for silkworm. The improvement of larval feeding is enrichment of mulberry leaves with supplementary nutrients. The present study has been aimed at investigating various economic traits of the silkworm cocoon, when fed on mulberry leaves fortified with the effect of leaf extract of *Ocimum sanctum* ("Queen of Herb" Tulsi), *Azadirachta indica* (Neem or Nim tree) and *Vitex negunda* (Nirgundi or Sindvar) medicinal leaf extract at different concentration viz., 0.1%, 1.0%, 2.5% and 5.0% on silkworm was studied. There was significant improvement in silk ratio % and filament length at 2.5% concentration of different medicinal plant leaf extract but the cocoon and shell weight decreased in comparison to control. In was significantly increased the larvae, economic traits like cocoon weight, shell weight, pupa weight, shell percentage, filament length, fibroin, sericin and denier of silk filament. Extract has growth promoting effect on silkworm, which helps to enhance the commercial qualities of silk and can be used in sericulture for yield improvement.

**Keywords:** *Ocimum sanctum*, *Azadirachta indica*, *Vitex negunda*, silkworm larvae and cocoon traits

### Introduction

The silkworm *Bombyx mori* is a typical monophagous insect and mulberry leaf is its sole food. The healthy growth of the silkworm and ultimately the economic traits are influenced largely by the nutritional status of the leaves fed to silkworms (Krishnaswami, S. *et al.* 1971 and Ravikumar, C., 1988) [4, 18]. Tulsi is an aromatic medicinal plant is often taken in combination with other herbs. *Azadirachta indica* is a tree and its natural medicinal properties and *Vitex negunda* leaf is widely herbal medicinal use of fertility property. Ayurveda is mainly based on plants. From the ancient period plant and their parts are being used for their medicinal properties. On the basis of their literature, recently (Mokashe *et al.*, 1989, Kaushik and Kumar., 1991 and Gehlot and Bohra., 1996) [17, 15, 16] evolved various plant extracts for the anti-microbial activity. The nutritional status of mulberry leaves can be improved by enriching them with botanicals such as, herbal tonic (Manimuthu. M, *et al.* 2010) [6] and herbal extracts (Takhliq, M. *et al.*, 2012 and Amirmohammadi, F., 2013) [12, 1]. This is due to the physiological stimulation by plant extracts on silkworm larvae leading to remarkable larval growth leading to increased food consumption and cocoon weight. This report is in agreement with the present study, where, the larval weight and all the economic characters increased due to application of 2% Ethanolic extract of *O. sanctum*, *Azadirachta indica*, *Vitex negunda* along with mulberry leaves. Several workers have explored the plant products from different tissue of plants with great interest (Saxena *et al.*, 1990) [10]. The plant extracts have influence on life and behavior of insects. As there is little information regarding the influence of plant extracts on silkworm, an attempt has been made here to study the effect of Neem, Tulsi and Vitex leaf extracts on silkworm cocoon characters.

### Materials and Methods

The mulberry silkworm rearing, being completely domesticated, demands specified environmental conditions like  $26 \pm 1$  °C and relative humidity  $80 \pm 5\%$  RH. It is therefore necessary to evolve measures for economic cooling through selection of proper material for wall and roof fabrication, orientation of building, construction method, design, etc. Further, enough space must be available to carry out leaf preservation, rearing, late age rearing and

moulting. It should also be convenient enough to conduct effective cleaning and disinfection. Silkworms were reared on Kanva leaves up to spinning under recommended environmental conditions (Krishnaswami, 1978) [5]. The fifth instar larvae were grouped into batches with three replications on 100 larvae each. The tender leaves of Tulsi, Neem and Vitex were collected from botanical garden. These leaves were powdered after air drying for a month under shade. Different concentrations (0.01%, 1.0%, 2.5% and 5.0%) of each material were prepared with petroleum ether as solvent in a round bottom flask. After a week the contents of the flask were filtered and filtrate were used for fortification. After 24hrs, 48hrs, 72hrs, 90hrs and 120hrs of fourth moult before feeding, the fresh mulberry leaves were weighed and sprayed with known volume of leaf extract by using an atomizer. The silkworms fed with petroleum fortified leaves were kept as control and water treated worms as normal. The ripened worms were allowed to spin cocoon and cocoon characters were studied.

## Results and Discussion

The effect of different plant extract on cocoon and post cocoon characters of silkworm are given in (Table 1) and explained as under:

### 1. *Ocimum sanctum*

The cocoon weight values found with 0.01%, 1.0%, 2.5% and 5.0% concentration of Tulsi were 1.55g, 1.39g, 1.62g and 1.11g respectively when compared to control group 1.56g. Except with 2.5% of Tulsi leaf extract where it is on higher side, the shell weight at 0.1%, 1.0% are almost at par with control whereas at 5.0% concentration it decreased by 0.67g in comparison with control 0.26g. The depletion in silk ratio % and filament length at 0.1% concentration were

in order of 0.13% and 17.7m over the control while there was a slight increase in silk ratio percentage and filament length in 1.0% and 2.5% concentration.

### 2. *Azadirachta indica*

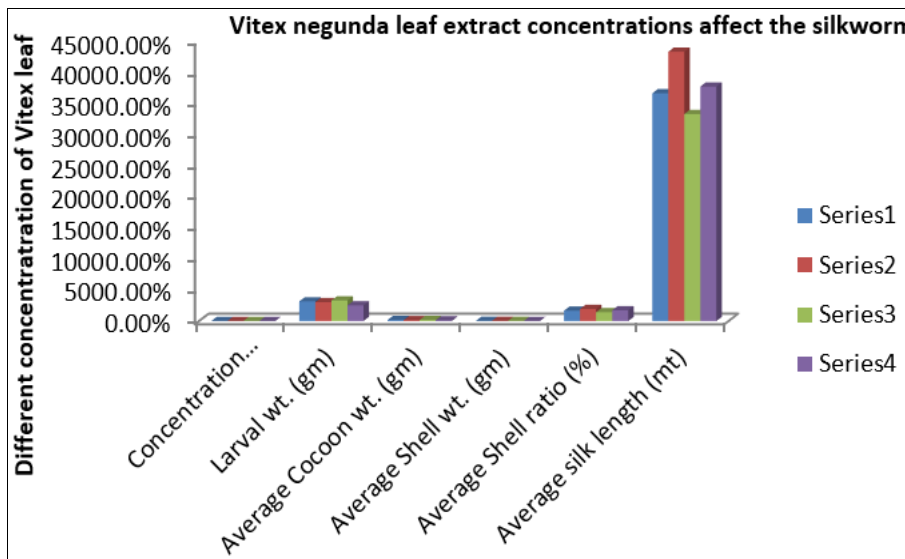
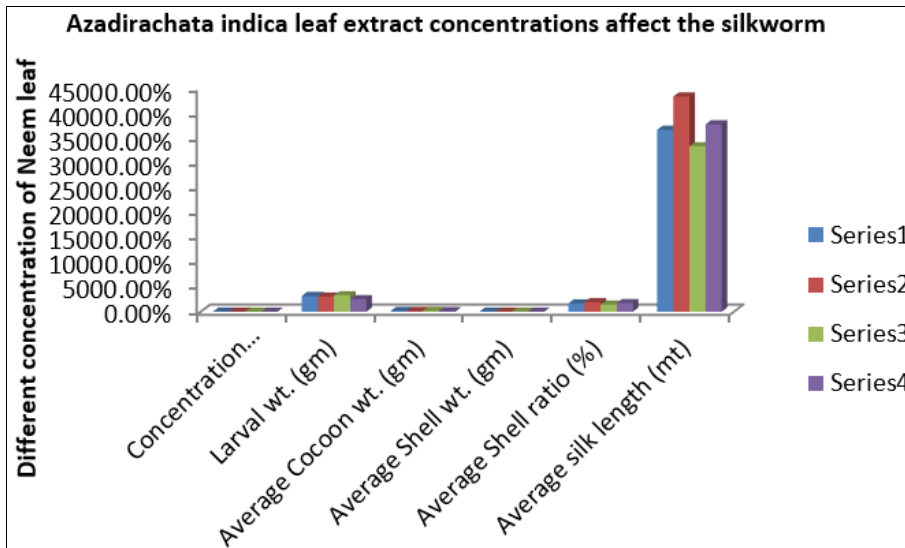
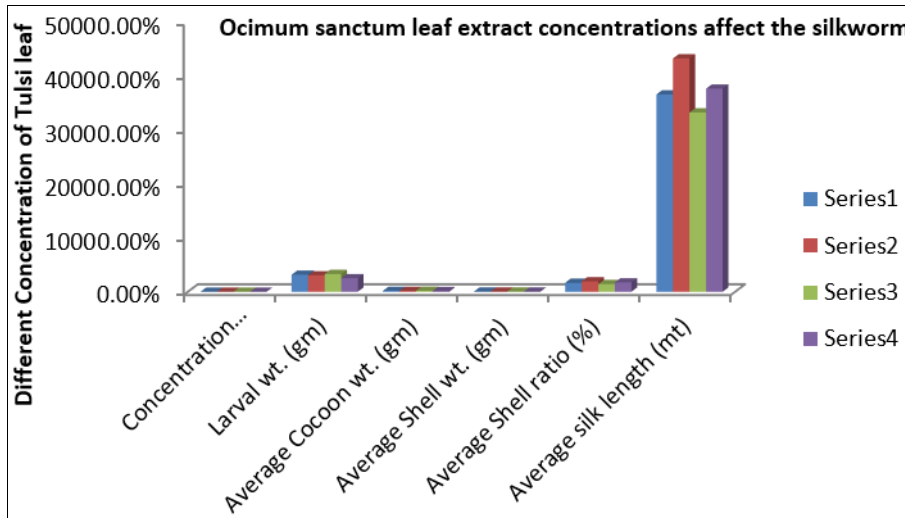
Except with 5.0% concentration, all other concentrations i.e. 0.01%, 1.0% and 2.5% of neem extract showed increase in cocoon weight by 1.41 g, 1.31 g and 1.45 g as compared to control 1.56 g. The shell weight has decreased by 0.21 g, 0.20 g. However the silk ratio % had slightly increased by 0.69% and 3.10% in 1.0% and 2.5% while at 5% concentration it decreased by 1.21% over the control. The silk filament in neem treated lot has increased with 0.1%, 1.0%, 2.5% and 5.0% concentrations and are in the order 7.5 m, 22.9 m, 46.9 m and 1.3 m respectively in comparison to 363.9 m silk length of control.

### 3. *Vitex negunda*

The cocoon weight values found with 0.01%, 1.0%, 2.5% and 5.0% concentration of *Vitex negunda* were 1.61 g, 1.42 g, 1.68 g and 1.12 g respectively when compared to control group 1.56g. Except with 2.5% of *Vitex negunda* leaf extract where it is on higher side, the shell weight at 0.1%, 1.0% are almost at par with control whereas at 5.0% concentration it decreased by 0.61g in comparison with control 0.261 g. The depletion in silk ratio % and filament length at 0.1% concentration were in the order 2.44% and 31.3 m over the control while there was a slight increase in silk ratio percentage and filament length in 1.0% and 5.0% concentration.

**Table 1:** Effect of different medicinal plant leaf extract on larval and cocoon characters of silkworms

Concentration of leaf extract (%)	Larval wt. (gm)	Average cocoon wt. (gm)	Average shell Wt. (gm)	Average silk ratio (%)	Average silk length (mt.)
<b><i>Ocimum sanctum</i> leaf extract concentrations</b>					
0.1%	25.60	1.35	0.22	17.27	381.1
1.0%	30.88	1.25	0.21	18.30	386.8
2.5%	32.77	1.33	0.26	19.70	435.1
5.0%	28.99	1.58	0.25	16.80	346.2
<b><i>Azadirachta indica</i> leaf extract concentrations</b>					
0.1%	26.60	1.41	0.21	16.28	371.4
1.0%	31.87	1.31	0.20	17.36	386.8
2.5%	33.92	1.45	0.25	19.77	433.7
5.0%	29.33	1.61	0.24	15.86	365.2
<b><i>Vitex negunda</i> leaf extract concentrations</b>					
0.1%	31.66	1.61	0.26	16.66	366.0
1.0%	30.45	1.42	0.27	19.36	432.9
2.5%	33.11	1.68	0.24	14.23	332.8
5.0%	25.11	1.12	0.20	17.36	376.9
P Control	34.20	1.56	0.261	16.67	363.9
N	34.00	1.22	0.22	18.06	372.3



The silkworms were fed with botanical fortified mulberry leaves at 0.01%, 1.0%, 2.5% and 5.0% concentrations. When comparison was drawn, highest cocoon weight 1.68g was recorded at 2.5% concentration of Vitex leaf extract which was followed by 5% of Neem 1.61g and Tulsi 1.58g cocoon weight. The increase can be related to similar observations with plant extracts by (Patil, R.R, et.al. 2005; Sivaprakasam and Rabindra., 1996 & Deshmukh, B.R, 2012) [8, 13, 3] who observed with aqueous leaf extract of *P. corylifolia* at a

concentration of 800 ppm once during third, fourth and fifth instars reduced the Grasserie disease in silkworm and enhanced the larval and cocoon parameters. The growth promotory effect of plant extracts was also reported by (Murugan *et al.*, 1998 and Chavan, J.A., 2013) [7, 2] who reported that Ethanolic treatment of leaf of silkworm with botanicals increased the larval weight, silk gland weight, cocoon weight and silk filament length. It is believed that the enhancement of silk yield with plant extract are a

concerted effect of the conversion of additional quality of leaf consumed during rearing and a direct stimulatory effect of the compounds on protein synthesis in silk gland as reported by (Kanavar and Nair., 1973 & Sujatha, K and Rao, A. P., 2003) <sup>[14, 11]</sup>. These changes at the physiological and molecular level might be the result of an alteration in the ratio of the circulating hormones. The supplementation of different plant extract with mulberry leaves at different concentration enhanced the quality and quantity of silk in *B. mori* and reported that the moderate concentration (2.5%) of plant extract had growth promoting effect in silkworm, *B. mori*.

### Conclusion

Thus it may infer that the physiological and biochemical stimulation by plant extracts on silkworm larvae leading to remarkable larval growth leading to increased food consumption and cocoon weight. This report is in agreement with the present study, where the larval weight and all the economic characters increased due to application of different plant extract of Tulsi leaf, Neem leaf and Vitex leaf along with mulberry leaves which have a vital role in improvement of sericulture rearers and silk industry for commercial purpose.

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