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Effect of Feeding *Mikania micrantha* on the Qualitative Parameters of Silk Fiber of Eri Silkworm *Samia ricini* Donovan

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Abstract

The larvae of eri silkworm *Samia ricini* Donovan were fed on leaves of *Ricinus communis* fortified with different concentrations of *Mikania micrantha* leaf extracts (T_{10}—T_{100}) from first instar till maturity at the rate of 4ml/ sq cm leaf area and the qualitative parameters (denier, tenacity, elongations and defective cocoon percentage) were studied. Significantly finer denier (1.766 ± 0.070), higher breaking strength or tenacity (3.880 ± 0.150) and lower percentage of elongation at break (24.033 ± 1.383) were recorded in the larvae treated with 40% (T_{40}) extracts of Japanese weed leave over control. No defective cocoons were recorded in any case under the laboratory condition conducted under investigation. Thus *Mikania micrantha* a commonly available weed all over can be commercially exploited for better growth, development and silk yield of *Samia ricini* Donovan.

Key words : *Samia ricini* Donovan, *Mikania micrantha*, Leaf extracts, Qualitative parameter.

The nutritional value of leaf has been implicated as a major factor in the survival of non-mulberry silkworms (1). Many plants contain a variety of metabolites which are harmful and beneficial to biotic stresses, whereas same compounds in plants are beneficial to insects also for their better growth and development to perpetuate their life style. There are number of plants which are having insect growth regulatory (IGR) activity, used in higher concentration they are detrimental to the insects but useful at lower concentrations particularly for productive isects (2, 3). The weed plants such as *Cassia tora, Lantana camara*, *Clerodendron inermae, Tribulus terrestris* are being tried to increase the silk and egg production in mulberry silk worm *Bombyx mori* and eri silk worm, *Samia cynthia ricini* Bois. Shivkumar and Anantharaman (4) reported the weed plant *Cassia tora* extracts in accelerating the maturity of *Bombyx mori*. Chowdhary et al. (5) also observed that the butanol extracts of *Cassia tora* decreased the larval period and increased the silk ratio of *Bombyx mori*. The present study was made to assess the effect of feeding *Mikania micrantha*, a commonly available weed all over on the qualitative parameters (denier, tenacity, elongations and defective cocoon percentage) of silk fiber of eri silkworm *Samia ricini* Donovan.

Methods

Immediately after hatching the larvae of eri silkworm were tranferred to locally available red and white variety of castor leaves fortified with different concentrations of extracts of *M. micrantha* leaves. A total (11) treatments including control was fixed and replicated thrice with 100 larvae in each replication. An additional water control was also maintained simultaneously to assess the treatment effect. The stock solutions were at first prepared by crushing 100 g of *Mikania micrantha* leaves (cleaned with water) using an electrically operated grinder. This was considered as 100% (T_{100}) extract and another nine concentrations, 10 to 90% (T_{10}–T_{90}) were prepared from it using distilled water. The stock solutions were stored in refrigerator and fresh extracts were prepared in every 3 days. Leaf extract was smeared on both sides of the castor leaves (*Ricinus communis)* at the rate of 4 ml/sq cm area, shade dried, and were fed four times upto third instar and five times till the larvae start spinning. Temperature was maintained at 22 ± 3C and relative humidity was maintained at 78 ± 4% . The cocoons were harvested on sixth day. The qualitative parameters such as denier, tenacity, elongations and defective cocoon percentage were calculated and sta-

Table 1. Silk quality parameter of eri silkworm *Samia ricini* Donovan reared on fortified castor leaves with different concentrations of *Mikania micrantha* leaf extracts.

Concentrations (%)	Denier (degummed) Mean ± SE	CV%	Tenacity (g/den) Mean ± SE	CV%	Elongation (%) Mean ± SE	CV%
10	1.912 ± 0.066	19.04	3.522 ± 0.152	23.74	24.581 ± 1.468	32.712
20	1.911 ± 0.064	18.58	3.572 ± 0.152	23.70	24.378 ± 1.465	32.919
30	1.825 ± 0.061	18.6	3.720 ± 0.150	22.12	24.096 ± 1.396	31.748
40	1.766 ± 0.070	17.69	3.880 ± 0.154	21.94	24.033 ± 1.383	31.53
50	1.841 ± 0.064	18.6	3.501 ± 0.150	23.51	24.908 ± 1.151	33.258
60	1.922 ± 0.065	18.68	3.501 ± 0.150	23.51	24.992 ± 1.532	33.59
70	1.924 ± 0.069	19.80	3.405 ± 0.146	23.45	25.022 ± 1.563	34.26
80	1.918 ± 0.070	20.07	3.405 ± 0.146	23.45	25.068 ± 1.546	33.79
90	1.918 ± 0.070	20.07	3.202 ± 0.151	25.89	25.068 ± 1.546	33.79
100	1.927 ± 0.069	19.86	3.205 ± 1.150	25.71	25.154 ± 1.531	33.35
Water control	1.806 ± 0.061	18.72	3.584 ± 0.154	23.60	24.381 ± 1.452	32.61
Absolute control	1.819 ± 0.061	18.58	3.572 ± 0.155	23.80	24.383 ± 1.452	32.63

tistically analyzed.

Results and Discussion

Extrafoliation of aqueous extracts of *Mikania micrantha* leaves showed profound effect on denier, tenacity and elongation at break. However, the data recorded in water control (WC) were found to be insignificant with absolute control (AC). The finer denier (1.766 ± 0.070) was recorded in the larvae treated with 40% (T_{40}) extracts of Japanese weed leave followed by control (1.819 ± 0.061) and other treatments. Significantly higher breaking strength or tanacity (3.880 ± 0.150) in eri silk fiber was recorded in T_{40} followed by T_{30} (3.720 ± 0.150), control (3.572 ± 0.155) and other treatments, the lowest tenacity being recorded in T_{100} (3.205 ± 1.150). Similarly lowest percentage of elongation at break (24.033 ± 1.383) was observed in T_{40} followed by T_{30} (24.096 ± 1.396), T_{20} (24.378 ± 1.465), control (24.383 ± 1.452) and other treatments, the highest percentage being shown by T_{100} (25.154 ± 1.531). However, no defective cocoons were recorded in any case under the laboratory condition conducted under investigation.

All silk fibers become finer from the outside towards the inside after a slight initial rise. Finer silk fibers have higher strength and lower percentage elongation at break (6). It is also known that lower the single cocoon filament denier, better is the quality of cocoons (7). A lower denier implies finer silk filament and hence is more desirable. On the other hand , if the tenacity becomes lower, the elongation becomes higher as the mean thread size (denier) increases (8). IIzuka (8) who worked on antheraea silk observed that the thinner antherea silk has more developed fiber structure. He further, claimed that the same is true in Bombyx silk whose mean thread size ranges from 1.5 to 3.5 denier. The higher tenacity of finer fiber is due to the more compact structure of finer filament. However, in eri fiber, which is not reelable, fiber fineness estimated from the average fiber denier in a particular layer results in high CV%. In the present study, lower single cocoon filament denier, higher tenacity and lower elongation at break were recorded in the silk from the larvae fed on 40% aqueous extracts of *Mikania micrantha* fortified on castor leave implies finer silk filament compared to the control and other treatments. The finer silk filament may be attributed to the increased protein synthesis particularly the fibrion synthesis inthe posterior silk gland which in turn influences the fiber fineness. Significantly finer denier was recorded by mulberry silkworm fed on soyabean supplementation (2.72) and coarser denier (2.86) in control (9). The findings are in conformity with the findings of Santoshkumar et al. (10), who obtained lowest denier produced by the silkworm fed on mulberry leaves dusted with weed plant *Lantana camara.* The present observations are also in consensus with findings of Sridhar and Radha (11) and Babu (12) for experiment with glycine supplementation in mulberry leaf. The coefficient of variation (CV%) ranged from 17.54 to 35.44 respectively. It indicates substantial reliability of conducted experiment with an exception to 20.07 to 35.44% which may be due to the open mouthed nature of eri cocoon.

Further, in the present investigation no defective cocoons in any case under laboratory condition were noticed which further proved better quality of cocoons, hence better quality of silk fiber produced by eri silkworm reared with Japanese weed extracts under different treatments.

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