Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(1): 20-22

Received: 18-11-2017
Accepted: 20-12-2017

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Effect of *Glyphodes pyloalis* Walker (Pyralidae: lepidoptera) infested leaves on the commercial characters of silkworm hybrid (NB_4D_2 X SH_6) *B. mori* L.

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Abstract
The study was conducted on silkworm larvae fed with infested leaves of two mulberry varieties viz Kokuso 20 and Goshoerami and also another lot of larvae were fed with fresh leaves of these varieties as a control. Student's t-test was applied for analysis of data. Observations were made on some commercial characters like larval duration, larval weight, cocoon yield, single cocoon weight, single shell weight, shell ratio and filament length. In all these observations, it was found that there was a more negative impact on the traits when the silkworm larvae were fed with infested Kokuso 20 leaves as compared to infested Goshoerami leaves. The minimum (2.52%) and maximum (22.47%) increase in larval duration were recorded in silkworms when they were fed with the *Glyphodes pyloalis* Walker infested leaves of kokuso-20 and Goshoerami respectively.

Keywords: silkworm larvae, kokuso20, goshoerami, commercial traits

Introduction
A major factor determining productivity, and hence profitability in sericulture is the yield of the mulberry crop. The productivity of mulberry silk cocoons and superior quality of the silk is dependent on the healthiness of silkworm, *Bombyx mori* L., Which in turn is closely related to quality feed (mulberry leaf). Several factors like biotic and a-biotic components influence the quality of mulberry leaf. Sometimes the nutritive values are also degraded due to insect pest damage. So for 300 species of insect pests have been reported on mulberry from various parts of the world [15].

Under Kashmir climatic conditions too mulberry foliage is vulnerable to several insect pests but among them *Glyphodes pyloalis* Walker causes considerable damage to mulberry leaves especially in autumn season (July to October) [18]. In recent years *Glyphodes pyloalis* Walker assumed greater significance owing to its damage to mulberry plants both qualitatively and quantitatively. The reduction in leaf quality by this insect pest leads to the poor performance of silkworm rearing during the autumn season by adversely affecting the growth and development of silkworms. The importance of quality feed on the growth and development of silkworms and production of silk has been worked out by many workers [8, 5, 6, 16, 17]. reported that the quality of mulberry leaves has a predominating influence on the development of the silkworms and the quality of the cocoons. This contention is further supported by the valuable information available in the literature that nutritional quality of mulberry influences the silkworm rearing performance [4, 12, 10]. Therefore a study was undertaken to study the impact of feeding the pest infested mulberry leaves on the commercial characters of silkworm hybrid (NB_4D_2 X SH_6) *B. mori* L.

Materials and Methods: Disease free laying of commercial silkworm hybrid (NB_4D_2 X SH_6) *B. mori* L. obtained from Temperate Sericulture Research Institute Mirgund were reared on healthy leaves of mulberry from 1st to 4th instar during autumn season 2005 and 2006 (Sep. Oct.) at TSRI Mirgund SKUAST K.

Freshly resumed fifth instar larvae were grouped into four batches, with seven replications of 100 worms under each treatment and reared (cellular) as per package of practices as recommended by [2]. The experiment was initiated on the 1st day of the 5th instar by feeding pest infested mulberry leaves of Kokuso 20 and Goshoerami to the silkworms of batch 1st and

3rd (experiment) while those of batch 2nd and 4th (control) were fed with healthy mulberry leaves of above two varieties. In the beginning of the 5th stage the weight of the worms were recorded for the calculation of average wt. gained. Finally, Student's t-test was used for analysis of data.

Results and Discussion: The observations recorded on the commercial characters of silkworm by feeding pest infested and healthy mulberry leaves have been presented in tables 1 and 2. In the presented study, the commercial characters, such as larval duration was prolonged by feeding the infested mulberry leaves to the silkworms. The minimum (2.52%) and maximum (22.47%) increase in larval duration were recorded in silkworms when they were fed with the *Glyphodes pyloalis* Walker infested leaves of kokuso-20 and Goshoerami respectively (table 1 and 2) which might be due to the reduced concentration of essential minerals and amino acids present in pest infested leaves fed to silkworm larvae. These findings coincide with the findings of [1] who also reported prolongation in the larval duration of silkworms fed with spiralling whitefly (*Aleurodicus disperses* Russel) affected mulberry leaves. Whereas the other parameters such as, weight of mature larvae(g) cocoon yield (by No. and wt.kg), single cocoon wt.(g), single shell wt.(cg), shell ratio(%) and filament length (m) were reduced in both the batches of silkworms fed with infested leaves. The larval weight was reduced to minimum (21.42%) and maximum (28.20%) fed with the infested leaves of Goshoerami and Kokuso20 respectively (tables 1 and 2). Which is in corroboration with the findings of [11] who also reported decrease in the larval weight of silkworm race, PCN fed with mealy bugs infested leaves from K-2 variety [7, 3, 9]. The probable cause for the decrease in the larval weight can be attributed to reduced appetite of silkworms due to their feeding on pest infested mulberry leaves which are nutritionally inferior. Similar results were observed in other experiments when silkworms were fed with Tukra by [11] and leaves from mulberry plants attacked by giant African snails by [13].

The yield /10,000 larvae by number reduced to (6.36%) and maximum to the tone of (9.54%), and by weight was reduced to the maximum (26.77) and minimum (15.57) level in silkworms when fed with infested leaves of Goshoerami and kokuso 20 respectively (tables 1 and 2). Single cocoon weight was reduced to the minimum (4.21%) and maximum (12.02%), cocoon shell wt. was reduced to (22.22%) and (30.76%) when fed with the infested leaves of Goshoerami and kokuso 20 respectively (table 1 and 2). The silkworms fed with infested mulberry leaf of Goshoerami recorded a minimum reduction in shell ratio with a value of 16.37% while maximum reduction in shell ratio was (21.39%) with Kokuso-20 infested leaves (table 1 and 2). These findings coincide with the findings of [9, 3] who also reported a decrease in the shell weight and cocoon yield in silkworms fed with mulberry leaves infested by spiralling white flies [14]. also observed reduction in cocoon weight, shell weight, and cocoon shell ratio in the silkworm larvae fed with infested leaves from mulberry plants of M5 variety infested by giant African snails. The length of silk filament reduced to 33.03% and 38.14% in the cocoons procured from the larvae fed with *Glyphodes* infested leaves of the mulberry variety of Kokuso-20 and Goshoerami respectively (tables 1 and 2) as in studies conducted by [11] by feeding silkworms with Tukra infested leaves in case of PCN which also exhibited reduction in filament length. The present findings are also supported by the studies conducted by [9] who also reported significant decrease in cocoon weight, shell weight, shell ratio, silk filament length and reliability in the cross (P M xNB_4D_2) fed with leaves of M5 variety infested by spiralling whitefly.

Table 1: Impact of *Glyphodes pyloalis* Walker infested mulberry leaves of variety Goshoerami on the commercial characters of silkworm hybrid NB_4D_2 x SH_6 during autumn season.

S. No	Parameters	Treatment		P.Value	%Change over Healthy leaves (Goshoerami)
		Infested Leaves T1 (Mean ± SD)	Healthy Leaves T2 (Mean ± SD)		
1.	Larval duration Days/hours(D:H)	10:9±5 hours	8:9± 7 hours	0.0120	22.47*
2.	Weight of 10 mature larvae (g)	28.10±0.90	39.00±0.76	0.0001	-28.20**
3	Cocoon Yield/10,000 larvae By number By weight (Kg)	8400±0.72 11.84±0.72	9114±167.62 16.17±0.67	0.0060 0.0070	-6.36* -26.77*
4.	Single Cocoon weight (g)	1.59±0.05	1.66±0.09	0.0640	-4.21(NS)
5.	Cocoon shell weight (cg)	0.24±0.05	0.31±0.01	0.0001	-22.22**
6.	Shell ratio (%)	15.99±0.42	19.12±1.40	0.0001	-16.37**
7	Filament length (m)	540±15.48	873±14.07	0.0001	-38.14**

* Significant.
** Highly Significant.
NS Non-Significant.

Table 2: Impact of *Glyphodes pyloalis* Walker infested mulberry leaves of variety Kokuso -20 on the commercial characters of silkworm hybrid NB_4D_2 x SH_6 during autumn season.

S. No	Parameters	Treatment		P.Value	%Change over Healthy leaves (Goshoerami)
		Infested Leaves T_3 (Mean ± SD)	Healthy Leaves T_4 (Mean ± SD)		
1	Larval duration Days/hours(D:H)	10:15± 5 hours	9:9± 4 hours	0.0220	2.52*
2	Weight of 10 mature larvae (g)	27.50±0.25	35.00±1.11	0.0001	-21.42**
3.	Cocoon Yield/10,000 larvae By number By weight (Kg)	7714±440.40 10.37±0.48	8528±213.80 12.28±0.52	0.0080 0.0010	-9.54 -15.57*
4	Single Cocoon weight (g)	1.39±0.03	1.58±0.02	0.1080	-12.02 (NS)
5	Cocoon shell weight (cg)	0.22±0.05	0.32±0.01	0.0001	-30.76**
6	Shell ratio (%)	16.52±1.05	20.99±1.34	0.0001	-21.39**
7	Filament length (m)	456±18.27	681±22.18	0.0001	-33.03**

* Significant.
** Highly Significant.
NS Non-Significant.

Conclusion

From the above investigation, it can be concluded that feeding of the *Glyphodes* Walker infested leaves of kokuso-20 and Goshoerami have undesired (negative) effects on silkworms in respect of their commercial characters viz larval duration, larval weight, cocoon weight, shell ratio, filament length etc which are responsible for overall quantity and quality of the final product that is silk and as such the feeding of silkworm larvae with infested leaves should be avoided as much as possible to get good yield with the best commercial traits for sustainability of the silk industry.

Acknowledgement

I express my sincere thanks to professor and head Dr H. U. Dar and Dr N. A. Malik major advisor. Temperate Sericulture Research Institute Mirgund Kashmir for their help, support and encouragement. I remember with gratitude the support and help by my colleagues and friends during the course of this investigation is acknowledged with thanks.

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