**Research Journal of Chemical and Environmental Sciences**
Res J. Chem. Environ. Sci. Vol 11 [4] August 2023: 01-05
Online ISSN 2321-1040
CODEN: RJCEA2 [USA]

Website: www.aelsindia.com/rjces.htm
RJCES
**ORIGINAL ARTICLE**

# Evaluation of Different Mulberry Genotypes for *Glyphodes pyloalis* Walker Infestation under Temperate Climatic Conditions

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**ABSTRACT**
*The exclusive nutritional source for silkworm (Bombyx mori L.) is the mulberry leaf making the quantity and quality of mulberry leaves pivotal for successful sericulture. In the region of Jammu and Kashmir, a lepidopteran pest, Glyphodes pyloalis Walker, poses a significant threat to mulberry. The present study assessed the impact of Glyphodes pyloalis Walker on eight mulberry genotypes viz., Goshoerami, KNG, Koksu-21, Koksu-20, Ichinose, Enshutakasuke, Kairiyoroso and Kanva-2. Observations recorded on pest incidence (%), larval count per plant, infested area per leaf (%) and infested area per plant (%) were used to classify the genotypes as per their susceptibility status. Among the different mulberry genotypes KNG, Koksu-21 and Goshoerami were classified as susceptible. Koksu-20 and Ichinose were rated as moderately resistant while as three genotypes viz., Kanva-2, Enshutakasuke and Kairyoroso were rated as resistant genotypes.*
***Keywords:*** *Mulberry, pest, infestation, Glyphodes pyloalis.*

Received 10.03.2023 Revised 12.06.2023 Accepted 12.08.2023

## INTRODUCTION

Mulberry (*Morus* spp.) is a woody plant extensively cultivated across diverse climates including tropical, sub-tropical and temperate regions [2]. Recognized for its economic significance as the only feed for domesticated silkworms (*Bombyx mori* L.), mulberry also entices farmers due to its delectable fruits and various applications in traditional medicine [7]. The silkworm, *Bombyx mori* L., which exclusively feeds on mulberry leaves, relies entirely on mulberry foliage for crucial nutrients during its growth and developmental stages [8]. Therefore, the quantity and quality of mulberry leaves play a pivotal role in the success of sericulture as mulberry leaves contribute significantly accounting for 38.2 per cent towards the success of cocoon crop [14]. To ensure a robust sericulture industry, it becomes imperative to scientifically optimize the cultivation of mulberry leaves.

Various factors are responsible for deterioration of both the quality and quantity of mulberry leaves with pest and disease infestations being predominant among them. Globally, more than 300 insect pest species have been documented on mulberry [15]. In the Karnataka region alone, over 100 insect pests have been identified and in Maharashtra 20 insect pests have been recorded on mulberry [15].

In the context of Jammu and Kashmir, the region witnesses 11 major and 10 minor insect pests [17, 10] with *Glyphodes pyloalis* Walker (Pyralidae: Lepidoptera) being a notable threat under its temperate climate [4]. *Glyphodes pyloalis* Walker inflicts considerable damage to mulberry crop particularly during the summer and autumn seasons extending from July to October [6]. Its impact is substantial leading to a significant foliage loss of up to 20-25 per cent during its peak period as observed in the Kashmir region [19]. The reduction in leaf quantity caused by this pest has many repercussions especially for the silkworm during the autumn season hampering its growth and overall development. Interestingly, the life cycle of this pest goes simultaneous with that of the silkworm posing a direct threat to the second commercial crop and potentially jeopardizing the entire sericulture industry. In Kashmir, information regarding the resistance of different mulberry genotypes against *Glyphodes pyloalis* Walker is limited thereby making it imperative to undertake the evaluation of different mulberry genotypes for their response to this pest.

## MATERIAL AND METHODS

The research investigation was undertaken at germplasm bank of the College of Temperate Sericulture, Mirgund, SKUAST-Kashmir under field conditions to assess the resistance of eight mulberry genotypes- Goshoerami, Ichinose, Koksu-21, Koksu-20 KNG, Enshutakasuke, Kanva-2 and Kairiyoroso against *Glyphodes pyloalis* Walker. The genotypes were maintained as per the recommended package of practice [1]. The experimental design employed was a Randomized Block Design with three replications for every treatment. Within each replication, three mulberry plants were selected to observe the following parameters, coinciding with the fifth stage of the second silkworm rearing.

### Pest Incidence (%)

The pest incidence was calculated by using the formula:

$$PI = \frac{\text{No. of infested leaves per plant}}{\text{Total no. of leaves per plant}} \times 100$$

### Larval count

Three plants of mulberry were randomly selected for the presence of *Glyphodes pyloalis* Walker larvae from each plot. The observations were recorded on weekly basis from mid June onwards and the average number of larvae per plant worked out.

### Extent of damage

The extent of damage caused by *Glyphodes pyloalis* Walker to the leaf of different genotypes was calculated by adopting graph paper technique and the damaged area per leaf was calculated as:

$$\text{Infested area per leaf} = \frac{\text{Infested area of leaf}}{\text{Total area of leaf}} \times 100$$

### Infested area per plant

It was calculated by using the formula:

$$\text{Infested area/plant} = \frac{\text{Total infested area of plant}}{\text{Total area of plant}} \times 100$$

### Pest susceptibility rating in mulberry plant

Based on the per cent leaf damage, the damage score for each genotype was calculated on the basis of susceptibility rating scale adopted by McKinney [13].

**Pest susceptibility rating scale:-**

| Leaf damage (%) | Grade | Rating |
|---|---|---|
| 0 | 1 | Immune/completely resistant |
| 0-5.0 | 2 | Resistant |
| 5.1-20.0 | 3 | Moderately resistant |
| 20.1-50.00 | 4 | Susceptible |
| 50.1-100 | 5 | Highly susceptible |

## RESULTS AND DISCUSSION

### Pest Incidence and Population

The highest pest incidence of 34.46 per cent was recorded in KNG where as the lowest pest incidence of 5.94 per cent was recorded in Kanva-2 (Table-1). The results of the present study are more or less in conformity with the findings of Khan *et al.* [10] who reported *Glyphodes pyloalis* Walker as the major pest of mulberry of this region with pest incidence ranging from 2.03 per cent to 27.52 per cent in different mulberry genotypes. The larval count per plant was highest (279) in KNG and lowest (11) in Kanva-2 (Table-1). This receives support from the findings of Hamid *et al.* [5] who reported highest pest population on KNG and lowest on Tr-10. The higher larval count in the preferred host can be attributed to the physical injury caused to the foliage by *Glyphodes pyloalis* Walker which may have enhanced the leakage of volatile compounds present in the leaf attractive to female pest and stimulate the attracted females to lay eggs around the pest damaged area thereby enhancing population build up. Similar observations have been made by Matsuyama *et al.* [12] while studying the oviposition stimulants of mulberry pyralid, *Glyphodes pyloalis* Walker in mulberry leaves.

**Table-1: Pest incidence and larval count of *Glyphodes pyloalis* observed on different mulberry genotypes**

| Genotype | Pest incidence (%) | Larval count/plant |
|---|---|---|
| Goshoerami | 30.99 | 164 |
| Ichinose | 18.98 | 73 |
| Kokso-21 | 31.62 | 146 |
| KNG | 34.46 | 279 |
| Enshutakasuke | 10.59 | 42 |
| Kanva-2 | 5.94 | 11 |
| Kokso-20 | 23.46 | 78 |
| Kairiyoroso | 13.15 | 39 |
| C.D ($p \leq 0.05$) | 0.51 | 29 |

**Severity and Extent of Damage**

The severity of pest infestation also varied significantly with different mulberry genotypes. It was found to be maximum (13.95%) in KNG and minimum (0.28%) in Kanva-2 (Table-2). The extent of damage to mulberry leaf of different genotypes due to *Glyphodes pyloalis* Walker infestation showed significant variations. The maximum infested area per leaf (40.46%) was recorded in KNG and minimum (4.83%) in Kanva-2 (Table-3). The findings are in line with the findings of Dar *et al.* (2017) who measured the population dynamics of *Tetranychus turkestani* on four commercial mulberry varieties *viz.,* Goshoerami, KNG, Tr-10 and Ichinose and reported that pest was dominant on Ichinose variety (3.37 mites/25cm$^2$) followed by KNG (3.13 mites/25cm$^2$), Goshoerami (2.97 mites/25cm$^2$) and was least on Tr-10 (1.56 mites/25cm$^2$) mulberry variety indicating existence of varietal reaction to pest population build-up. The varietal preference of the *Glyphodes pyloalis* Walker could be attributed to their better nutritional value of these genotypes in comparison to others. Similarly, the inappropriateness of some of the genotypes for *Glyphodes pyloalis* Walker may be due to the presence of some enzyme inhibitors in these genotypes or absence of an essential nutrient for the growth of *Glyphodes pyloalis* Walker. Certain morphological characteristics of leaf like leaf lobation, trichome density and length, surface leaf wax and climatic conditions of the area can also affect the pest incidence and hence susceptibility of genotypes as has been revealed by Manjunath [11 who reported that the trichomes were thin and longer on susceptible $MR_2$ and intermediate in $RFS_{175}$ whereas thick and shorter trichomes were recorded in the tolerant Mysore Local. Somashekar [18] also reported maximum trichome density (182/cm$^2$) in susceptible TG and minimum (145/cm$^2$) in DD mulberry variety.

**Table-2: Severity of pest infestation to different genotypes of mulberry**

| Genotype | Total leaf area/plant(m$^2$) | Total infested area /plant (m$^2$) | Infested area /plant (%) |
|---|---|---|---|
| Goshoerami | 69.55 | 7.64 | 10.99 |
| Ichinose | 39.75 | 2.14 | 5.46 |
| Kokso-21 | 36.94 | 4.34 | 11.75 |
| KNG | 76.81 | 10.67 | 13.95 |
| Enshutakasuke | 67.59 | 1.54 | 2.28 |
| Kanva-2 | 19.09 | 0.14 | 0.73 |
| Kokso-20 | 32.90 | 1.74 | 5.44 |
| Kairiyoroso | 42.50 | 1.00 | 2.35 |
| C.D ($p \leq 0.05$) | 10.44 | 0.41 | 1.85 |

**Table-3: Extent of damage to mulberry leaf of different genotypes due to *Glyphodes pyloalis* Walker infestation**

| Genotype | Total leaf area (cm$^2$) | Infested area/leaf (cm$^2$) | Infested area/leaf (%) |
|---|---|---|---|
| Goshoerami | 281.60 | 99.15 | 35.21 |
| Ichinose | 219.25 | 63.21 | 28.84 |
| Kokso-21 | 185.70 | 68.89 | 37.08 |
| KNG | 247.30 | 99.95 | 40.46 |
| Enshutakasuke | 254.22 | 28.17 | 11.09 |
| Kanva-2 | 131.37 | 6.38 | 4.83 |
| Kokso-20 | 242.86 | 56.63 | 23.30 |
| Kairiyoroso | 192.19 | 20.14 | 10.49 |
| C.D ($p \leq 0.05$) | 15.07 | 7.77 | 0.33 |

 

## Susceptibility status

The observations in all the eight mulberry genotypes were analyzed and based on the percent infestation index, KNG, Koksu-21 and Goshoerami were classified as susceptible, Koksu-20 and Ichinose as moderately resistant and Enshutakasuke, Kanva-2 and Kairiyoroso as resistant (Table-4). In a similar study, Somashekar [18] screened 15 mulberry varieties against leaf webber, *Diaphania pulverulentalis* and classified TG as susceptible, 248 as moderately susceptible and DD as resistant variety.

**Table-4: Susceptibility status of different mulberry genotypes to *Glyphodes pyloalis* Walker infestation**

| Genotype | Percent infestation index | Rating |
|---|---|---|
| Goshoerami | 20.29 | Susceptible |
| Ichinose | 11.30 | Moderately resistant |
| Kokso-21 | 21.51 | Susceptible |
| KNG | 26.14 | Susceptible |
| Enshutakasuke | 4.53 | Resistant |
| Kanva-2 | 2.19 | Resistant |
| Kokso-20 | 14.97 | Moderately resistant |
| Kairiyoroso | 4.75 | Resistant |

## CONCLUSION

The current study has revealed a noteworthy revelation regarding the impact of *Glyphodes pyloalis* Walker on mulberry foliage. Quantitatively, it is evident that this pest takes a considerable toll, a discovery that holds significant implications for the growth and maturation of silkworms. The repercussions are far-reaching as the diminished foliage quality may precipitate a reduction in cocoon crop yield. Given the weight of these findings, it becomes imperative to take proactive measures for pest management. The urgency of addressing this issue is heightened by the consideration of the second commercial silkworm rearing. Therefore, it is imperative to undertake concerted efforts aimed at effective pest control and mitigation ensuring the sustained viability and productivity of mulberry-silkworm ecosystems.

## COMPETING INTEREST

The authors declare no conflict of interest in the publication of this manuscript.

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**CITE THIS ARTICLE**

Omais Bin Ayoub, Nisar Ahmad Ganie, Khursheed Ahmad Dar, Munazah Yaqoob, Shakeel Ahmad Mir and Aroos Rauf Rafiqui. Evaluation of Different Mulberry Genotypes for *Glyphodes pyloalis* Walker Infestation under Temperate Climatic Conditions. Res. J. Chem. Env. Sci. Vol 11 [4] August 2023. 01-05