Original Research Article

Evaluation of bed disinfectants on rearing performance of multivoltine hybrid mulberry silkworm [NISTARI × (SK6×SK7)], in Kishanganj district, Bihar

Abstract

The silkworm, (*B. mori L).* is highly susceptible to pathogens such as protozoa, virus, bacteria and fungus. To evaluate the various bed disinfectant *viz*, Vijetha, Sericilin, Labex, and Amla compare with untreated control for their suitability and standardization for the management of diseases during silkworm rearing. The rearing of silkworm multivoltine hybrid race [NISTARI × (SK6×SK7)] was carried out in the centre. In the present study the larvae treated with Labex @ 5g/sq. ft. ½ an hour before resuming feeding had shortest (20.00 days) larval duration. Larvae weight higher (31.24 g) respectively at late 5th instar stage. Larval mortality was observed (25.93 %) Effective rate of rearing (64.08 %) and significantly lowest disease incidence (26.06 %) was recorded.

Keywords: susceptible, standardization, bed disinfectants,

Introduction

Sericulture involves a biotechnological process that creates diverse revenue streams across multiple stages, encompassing activities like cultivating host plants, nurturing silkworms, and carrying out post-cocoon operations within the textile industry. Sericulture's products and biproducts also contain medical properties that are beneficial to mankind (Dandin, 2008). Silk is known as “QUEEN OF TEXTILE” and “BIOSTEEL because of its glistening shine, softness, elegance, durability, and tensile properties (Hiware, 2001). Silkworm are more prone to disease, leading to mortality among them and causing a reduction in cocoon yield throughout the year (Shashidhar et al., 2018). In India, the cocoon crop loss due to diseases was reported as 15-20 % (Balavenkatasubbaiah et al., 2011; Selvakumar et al., 2002). annual crop losses due to silkworm diseases are to the extent of 35-40% (Sharma et.al., 2020, Veeranna, 1999), out of 5-6 cocoon crops two crops are lost partially or completely due to silkworm diseases every year (Patil et al., 1993) It is challenging to stop the disease after it has infected the silkworm. Therefore, preventing any disease is more important than trying to treat or cure it. Viral diseases can be stopped via cultural practises, physical and chemical agents. The use of bed disinfectants on rearing beds helps to stop contamination, further spread and multiplication of diseases causing microorganism. Use of bed disinfectants gains a

lot of importance in successful cocoon crop production. The present study is undertaken to estimate the comparative efficacy of various silkworm bed disinfectants against their rearing performance of multivoltine silkworm.

2. Materials and Methods

The current experiment was created and carried out at the Advance Center on Sericulture, Kishanganj Bihar during March to June 2022. The district Kishanganj The multivoltine hybrid race [NISTARI × (SK6×SK7)] was utilised to examine the effect of bed disinfectants affected the commercial attributes and rearing efficiency. which were then reared by adopting the usual approach until spinning.

2.1 Treatment details

T1 – Application of bed disinfectant Vijetha @ 5g/sq ft daily, after the bed cleaning before ½ an hour of feeding from 2nd moulting to before spinning.

T2 - Application of bed disinfectant Sericilin @ 5g/sq ft daily, after the bed cleaning before ½ an hour of feeding from 2nd moulting to before spinning.

T3 - Application of bed disinfectant Labex @ 5g/sq ft daily, after the bed cleaning before ½ an hour of feeding from 2nd moulting to before spinning.

T4 - Application of bed disinfectant Amla @ 5g/sq ft daily, after the bed cleaning before ½ an hour of feeding from 2nd moulting to before spinning

T5 – Untreated control

2.2 Rearing techniques:

The experiment was conducted with completely randomized design with five treatments and four replications mulberry silkworm race namely \multivoltine [NISTARI × (SK6× SK7)]. Fifty diseases free layings (DFL's) where selected and black boxing was done in egg racks covered with black sheets for hatching at room temperature in laboratory. It was observed that 90-95 per cent of hatching in both the races. After hatching of eggs tender mulberry leaves of variety C-2038 chopped into small pieces of 0.5 sq.cm size and sprinkled over newly hatched first instar larvae crawling over leaves and start eating at cutting edges.

Feeding of silkworm is done four times a day. The timing for feeding of silkworm were fixed at 6 AM, 11 AM, 4 PM and 10 PM for each day. In total four moulting were observed in silkworm during its growth phase. During each moulting silkworm stops feeding

and rests with raising their head and change their colour. After 2nd moulting, 300 each 3rd instar larvae were taken as per treatments. There were four replications in each treatment, the larvae were separated in to different rearing tray as per there treatments and replications. Silkworm bed were made with uniform size as per there space requirement. Bed cleaning was done daily by removing waste material by hand picking method, after cleaning bed disinfectants were dusted with help of muslin cloths before ½ an hour of feeding. The quantity and size of leaves were increased after each moulting.

Full grown late instar larvae become sluggish and stop feeding, change their colour and become transparent, mature larvae become restless and raise their head and find support for spinning the cocoon. These larvae where hand-picked and shifted to Chandrika where it takes 6 to 10 days for spinning the cocoon. Worms were converting itself into pupae within cocoon in two to three days. Harvesting of cocoon was done on 7th day of spinning. After harvesting weight of 100 cocoon was taken and a lot of 50 green cocoon are separated for shell ratio and shell weight, after that green cocoon were oven dried at different temperatures from higher to lower as follows 110°C for fifteen-minute, 100°C for thirty-minute, 85°C for one hour, 70°C for two hour and 55°C for six hours. Later 150 grams of dried cocoon separated from each replication of treatment for further observing the post cocoon parameter.

Schedule of feeding:

Chopped leaves of mulberry of variety C-2038 was fed to worms four times a day *viz*., 6 AM, 11AM, 4PM and 10 PM. For initial stage worm small size chopped leaves of 0.5mm is used to feed. After each moulting the size and quantity of feed is increases, for late-stage worm even whole leaves are given for feeding.

Schedule for bed disinfectants:

Bed disinfectants was dusted on worm from 3rd instar till 5th instar on daily basis after bed cleaning and before ½ an hour of feeding with help of muslin cloths. Dose of dusting of bed disinfectants was @ 5g/sq ft.

2.3 Observations recorded

2.3.1 Larval duration (days)

Duration of the larvae from hatching through the fifth instar to spinning was recorded in days for climatic condition of Bihar

2.3.2 Weight of mature larvae (g)

Ten randomly chosen larvae were taken each day to measure the weight of the larvae from the third instar to the fifth instar on electronic balance.

2.3.3 Disease incidence (%)

During the rearing, the total number of healthy larvae and diseased larvae infected due to disease were recorded in each treatment. The percent incidence of the diseases was calculated as follows and it was expressed in percentage.

$$\text{Disease incidence (\%)} = \frac{\text{Number of diseased larvae}}{\text{Total number of larvae}} \times 100$$

2.3.4 Larval mortality (%):

Dead and diseased larvae are separated from healthy one and the larval mortality was counted daily and noted.

$$\text{Mortality (\%)} = \frac{\text{Number of dead larvae}}{\text{Total number of larvae}} \times 100$$

2.3.5 Effective rate of rearing (%)

ERR was calculated by the following formula,

$$\text{ERR (\%)} = \frac{\text{Number of cocoons harvested}}{\text{Number of worms brushed}} \times 100$$

3.Result and discussion

3.1 Effect of different bed disinfectants on total larval duration in multivoltine hybrid race [NISTARI × (SK6×SK7)] of mulberry silkworm.

The effect of different bed disinfectants was observed from egg hatching till spinning of cocoons which included all the five instars. In the present study, four different bed

disinfectants namely, Vijetha, Sericilin, Labex, and Amla along with control were used. The disinfectants were used @ 5g/sq ft in each treatment and were applied half an hour before feeding by the caterpillars from 3rd instar to 5th instar. The effect of larval duration was observed against different disinfectants both on multivoltine silkworm races. the minimum larval duration was observed in Labex (20.00 days) followed by Amla (20.25 days) and maximum (22.00 days) in untreated control. Surapwar PH (2019) use Vijetha, Labex and Ankush @ 4g/sq ft. ½ hour before resuming feeding after each moulting. and @5g/sq ft. ½ hour before resuming feeding after each moulting. the minimum larval duration (22.03 days) was recorded in application of bed disinfectants Vijetha at the rate 5g per sq.ft. ½ hour before resuming feeding after each moult which was at par Labex at the rate 4g per sq.ft. ½ hour before resuming feeding after each moult (22.86 days). The significantly highest larval duration was recorded in untreated control (24.43 days). Swathi et al. (2014) reported that the lowest larval duration of silkworm *B.mori* L. in daily application of hydrated lime powder @of 5 g per sq + application of bundh powder after each moult (25.23 and 25.22 days), Jawale and Tayade (1987) also observed that the least larval duration was recorded in cleaned leaves with cotton (24.41 days) and in turmeric powder treatment.

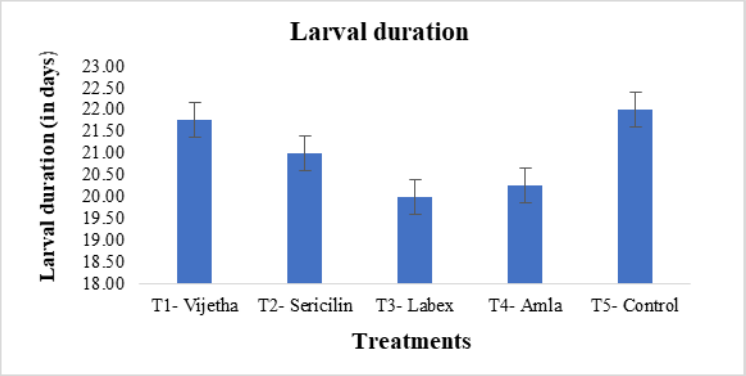

Fig 1: Larval duration multivoltine hybrid race [NISTARI × (SK6×SK7)] using different bed disinfectants

3.2 Effect of different bed disinfectants on total larval weight in multivoltine hybrid race [NISTARI × (SK6×SK7)] of mulberry silkworm.

The significantly higher (31.24g) larval weight of 10 mature larvae at 5th instar of multivoltine hybrid race [NISTARI × (SK6×SK7)] mulberry silkworm (*Bombyx mori* L.) was recorded in treatment T3 i.e., application of bed disinfectant Labex @ 5g/sq ft were applied half an hour before feeding followed by treatment T4 i.e. application of bed disinfectant Amla (30.45g) and the lowest larval weight of 10 mature larvae found T5 i.e. untreated

control (24.74g). Manimegalai and Subramaniam (1999) recorded 32.70 g larval weight and Sivaprakasam (1999) reported maximum of 35 g larval weight of silkworm with Vijetha treatment. Anonymous (2002) also reported maximum larval weight of 3.45 g in silkworm with use of bed disinfectant Vijetha as compared to other disinfectants. Kuntamalla et al. (2007) noticed significantly increase in larval weight with larvae treated with turmeric powder

3.3 Effect of different bed disinfectants on disease incidence % in multivoltine hybrid race [NISTARI × (SK6×SK7)] of mulberry silkworm.

The effect of different bed disinfectants on disease incidence was overserved during the experiment for multivoltine hybrid race [NISTARI × (SK6×SK7)] of mulberry silkworm. The percent disease incidence was lowest (26.06 %) in treatment T3 i.e., application of bed disinfectant Labex @ 5g/sq ft were applied half an hour before feeding followed by treatment T4 i.e., application of bed disinfectant Amla (27.18 %), and highest disease incidence was observed in untreated control treatment (39.54%). Manimegalai and Subramaniam (1999) recorded that dusting of turmeric powder + chalk powder and Vijetha resulted in 63.16 per cent decrease in grasserie infection. Samson (2000) noticed that among bed disinfectant potential active against of the disease of silkworms are RKO, Vijetha, Resham Jyothi and Suraksha. Anonymous (2002) recorded that Vijetha has recorded lowest disease incidence (5.47 per cent) as compare to other disinfectants. Singhvi *et al*. (2004) observed the im portant disinfection of silkworm larvae by use of bed disinfectants *viz*., TKO, Resham Jyothi and Vijetha in protecting Tasar silkworms from invasion of pathogens. The maximum disease preventive effect was recorded in order of Vijetha. [Table-1] [fig-2]

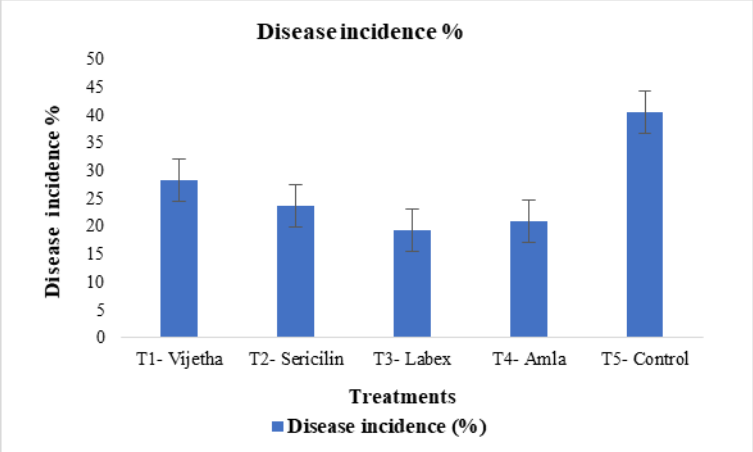

Fig 2: disease incidence during the rearing of Multivoltine mulberry silkworm

3.4 Effect of different bed disinfectants on mortality % in multivoltine hybrid race [NISTARI × (SK6×SK7)] of mulberry silkworm.

The effect of different bed disinfectants in multivoltine mulberry silkworm race [NISTARI × (SK6×SK7)] are presented in [Table-1] [fig-3] The results revealed, that significantly lowest mortality (19.13 per cent) was observed in the treatment T3 *i.e.*, application of bed disinfectant Labex @ 5g/sq. ft. ½ an hour before resuming feeding followed by treatment T4 Amla (20.15 per cent). The significantly highest motility (40.55 per cent) was recorded in treatment T5 *i.e.*, untreated control (Fig 3). Hema *et al.*, (2015) noticed while conducting experiment to evaluate the various plant-based disinfectant such as, neem, amla, haldi, ber, Tulsi compared with RKO and other chemical disinfectant and found that larval mortality was nearly 1% and 4% with amla and Tulsi. Dhirwani et al. (2015) evaluated different bed disinfectant against the diseases of silkworm, Bombyx mori and reported that disinfectant such as Turmeric + RKO, Pure Turmeric and RKO produced 12, 16 and 20 per cent larval mortality as compared to untreated control, respectively. The results were also supported by the works of Ayandokan *et al.* (2017); Balavenkatasubbaiah et al. (2014).

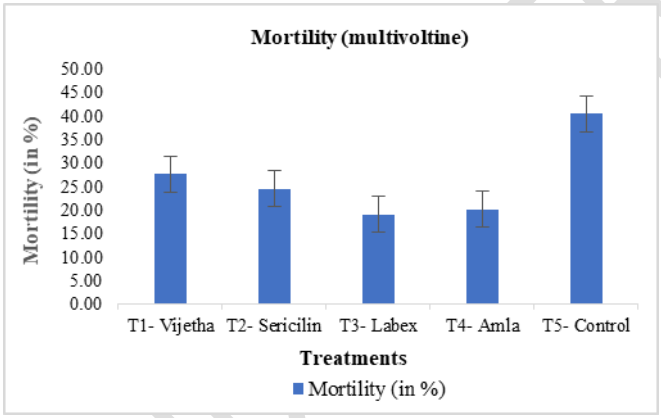

Fig 3: mortality % during the rearing of Multivoltine mulberry silkworm

3.5 Effect of different bed disinfectants on effective rearing rate [ERR] in multivoltine hybrid race [NISTARI × (SK6×SK7)] of mulberry silkworm.

The observations for multivoltine race of mulberry silkworm [NISTARI X (SK6×SK7)] are presented in [Table1][Fig.4]The results revealed that the significantly highest ERR (80.83 per cent) was observed in the treatment T3 *i.e.*, application of bed disinfectant Labex @ 5g/sq.ft. ½ an hour before feeding followed by treatment T4 i.e., Amla (79.83 per cent). The significantly lowest ERR (59.42 per cent) was recorded in treatment T5 i.e., untreated control. Venkataramana et al. (2002) reported that the significant improved effective rate of rearing (ERR) with the use of Vijetha and Resham Jyoth bed disinfectants as comparison to

the control. Swathi et al. (2014) also recorded lowest effective rate of rearing in control as compared to other bed disinfectant used silkworms rearing. surapwar et al., (2019) applied bed disinfectant Vijetha @ 5g/sq ft. ½ hour before resuming feeding after each moulting and record highest Effective rate of rearing significantly. The results were also supported by the works of Narasimhanna et al. (1975); Baig et al. (1993); Sharma et al. (1994).

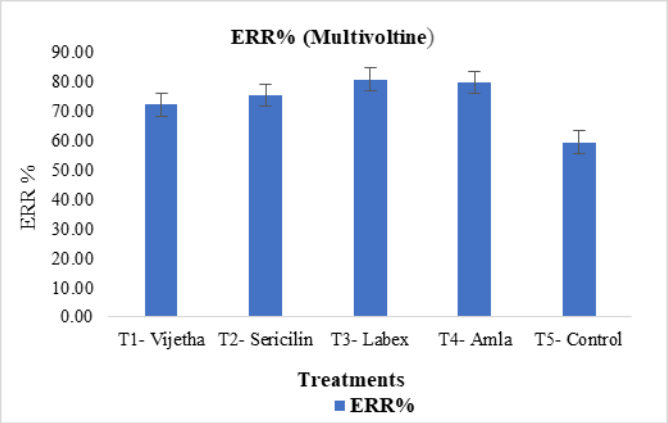

Fig 4: ERR% of multivoltine hybrid using different bed disinfectants

Table 1: Effect of different bed disinfectants on the rearing performance of multivoltine hybrid race [NISTARI × (SK6×SK7)] of mulberry silkworm (*Bombyx mori* L.).

Treatments	Mean larval duration (In days)	Mean larval weight (in gram)	Mean Larval mortality (%)	Disease incidence (%)	ERR %/300 larvae
T1- Vijetha	21.75	28.72	31.71 (27.63*)	32.14 (28.30*)	58.27 (72.33*)
T2- Sericilin	21.00	29.29	29.70 (24.55)	29.15 (23.73)	60.28 (75.42)
T3- Labex	20.00	31.24	25.93 (19.13)	26.06 (19.30)	64.08 (80.83)
T4- Amla	20.25	30.45	26.67 (20.15)	27.18 (20.87)	63.32 (79.83)
T5- Control	22.00	24.74	39.55 (40.55)	39.54 (40.53)	50.43 (59.42)
SE(±m)	**0.09**	**0.30**	**0.61**	**1.21**	**0.60**
CD at 5%	**0.28**	**0.92**	**1.83**	**3.82**	**1.80**

CV%	**0.87**	**2.12**	**4.60**	**7.91**	**1.63**

*Figures are in parentheses are arc sign transformed value

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