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Effect of different bed disinfectants on economic traits of double hybrid mulberry silkworm (*Bombyx mori* L.)

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Abstract
The significantly highest larval weight of 10 matured larve (40.58g 0, single shell weight (0.44g), cocoon shellratio (22.68 per cent), cocoon yield per 10,000 larvae (19.79 kg), filament length (952.33m), denier (2.83), Effective rate of rearing (98.15 per cent) and significantly lowest disease incidence (1.17 per cent) was recorded in application of bed disinfectant Vijetha @ 5g/sq ft. ½ hour before resuming feeding after each moulting. Highest single cocoon weight (1.94g) and filament weight (0.30 g) also observed in use of bed disinfectant Vijetha @ 5g/sq ft. ½ hour before resuming feeding after each moulting.

Keywords: Mulberry silkworm, bed disinfectant, economic traits

Introduction
Silk is called the queen of textiles due to its glittering luster, softness, elegance, durability, and tensile properties. It was discovered in China between 2600 and 2700 BC. Sericulture is known as agro-based cottage industry which plays an important role in improving the rural economy because it possess high employment and income generation capability with minimum investment (Hiware, 2001) [4].

Silkworms are susceptible to a number of diseases caused by different infectious organisms (Doreswamy *et al*., 2004) [3]. The cocoon loss due to diseases in India is estimated to be about 15-20 kg per unit of 100 disease free layings which accounts for about 30 per cent of total loss (Selvakumar *et al*., 2002) [8]. Once the pathogen invades the silkworm, it is difficult to curb the pathogen. Hence, prevention of any disease is rather essential than attempting to control or cure. The pathogens including the virus can be prevented by cultural methods, physical and chemical agents. The bed disinfectants are those substances which are applied on rearing bed to prevent contamination, further spread and multiplication of diseases causing germs. Use of bed disinfectants gains a lot of importance in successful cocoon crop production. The present study was undertaken to know the effect of different bed disinfectants on economic traits of double hybrid mulberry silkworm (*Bombyx mori* L.).

Material and Methods
The present investigation was undertaken during October-November, 2015 at Department of Agricultural Entomology, College of Agriculture, Latur. The experiment was conducted in a Randomized block design with seven treatments and three replications. Each treatment consisted of 100 silkworms. Disease free layings of bivoltine double hybrid mulberry silkworm (*Bombyx mori* L.) race (CSR_2 X CSR_{27}) X (CSR_6 X CSR_{26}) were used to feed on the leaves of mulberry variety V_1 in the present investigation.

Treatment details
T_1: Application of bed disinfectant Vijetha @ 5g/sq ft. ½ hour before resuming feeding after each moulting.
T_2: Application of bed disinfectant Ankush @ 4g/sq ft. ½ hour before resuming feeding after each moulting.
T_3: Application of bed disinfectant Vijetha supplement @ 5g/sq ft. ½ hour before resuming feeding after each moulting.
T_4: Application of bed disinfectant Labex @ 4g/sq ft. ½ hour before resuming each moulting.
T_5: Application of bed disinfectant Sericillin @ 4g/sq ft. ½ hour before resuming feeding after each moulting.

T_6: Application of bed disinfectant Amruth powder in water @ 20g/litre. ½ hour before resuming feeding after each moulting.
T_7: Untreated control.

Method of recording observations

Larval weight (g)

The maximum larval weight was recorded by taking the weight of 10 matured larvae just before the onset of spinning, which was expressed in grams.

Single cocoon weight (g)

The cocoon weight was recorded on 6th day of spinning, when the cocoon weights are assumed to be maximum. The average of 10 cocoons was taken as single cocoon weight and which was expressed in grams.

Single shell weight (g)

The cocoons were cut open at one end and the shell weight was recorded after removing the pupae. The average of 10 shells was taken as single shell weight and which was expressed in grams.

Cocoon- shell ratio (Per cent)

The cocoon shell ratio was calculated as per the formula:

$$\text{Cocoon shell ratio (\%)} = \frac{\text{Cocoon shell weight}}{\text{Cocoon weight}} \times 100$$

Yield of cocoon/10,000 larvae brushed (kg)

Randomly selected 100 cocoons were weighed and the cocoon yield per 10,000 larvae brushed was computed.

Cocoon filament length (m)

Average cocoon filament length was measured in meters by reeling 10 cocoons after boiling in the water with the help of epprovate.

Filament weight (g)

The average filament weight was recorded by taking the weight of randomly selected 10 reeled silk filaments. It is expressed in g.

It is the term used to denote the thickness of silk filament. It is expressed in terms of ratio of weight of filament to the filament length multiplied by 9000.

$$\text{Denier} = \frac{\text{Filament weight (g)}}{\text{Filament length (m)}} \times 9000$$

Disease incidence (Per cent)

The total number of healthy larvae and diseased larvae infected due to grasserie and flacherie disease were recorded during the course of rearing in each treatment and the per cent incidence of the diseases was worked out as under and it was expressed in percentage.

$$\text{Disease incidence (\%)} = \frac{\text{No. of diseased larvae}}{\text{Total no. of larvae}} \times 100$$

$$\text{ERR (Per cent)} = \frac{\text{No. of cocoon harvested}}{\text{No. of larvae retained}} \times 100$$

Results and Discussion

Effect of different bed disinfectants on the larval weight of 10 mature larvae of double hybrid mulberry silkworm (*Bombyx mori* L.) (g).

The significantly higher larval weight of 10 mature larvae of double hybrid mulberry silkworm (*Bombyx mori* L.) was recorded in treatment T_1 i.e. application of bed disinfectant Vijetha at the rate 5g per sq.ft. ½ hour before resuming feeding after each moulting (40.58 g) and the lowest larval weight of 10 mature larvae found T_7 i.e. untreated control (29.90). Manimegalai and Subramaniam (1999) [6] recorded 32.70 g larval weight and Sivaprakasam (1999) [12] reported maximum of 35 g larval weight of silkworm with Vijetha treatment. Anonymous (2002) [1] also reported maximum larval weight of 3.45 g in silkworm with use of bed disinfectant Vijetha as compared to other disinfectants. These results are in agreement with the results of the present investigation.

Effect of different bed disinfectants on the single cocoon weight of double hybrid mulberry silkworm (*Bombyx mori* L.) (g).

Results (Table-1) revealed that the highest single cocoon weight (1.94 g) was recorded in treatment T_1 i.e. application of bed disinfectant Vijetha at the rate 5g per sq.ft. ½ hour before resuming feeding after each moulting and it was at par with treatment T_2 i.e. application of bed disinfectant Ankush at the rate 4g per sq.ft. ½ hour before resuming feeding after each moulting (1.89 g). The significantly lowest single cocoon weight was recorded in the treatment T_7 i.e. untreated control (1.60 g). Manimegalai and Subramaniam (1999) [6] recorded maximum single cocoon weight (1.63 g) in Vijetha treatment. Sivaprakasam (1999) [12] reported single cocoon weight of 1.6 g in Vijetha bed disinfectant treatment. Anonymous (2002) [1] observed maximum single cocoon weight (1.684 g) in Vijetha treatment as compared to other disinfectants. The above results are in conformity with the results of present investigation.

Effect of different bed disinfectants on the single shell weight of double hybrid mulberry silkworm (*Bombyx mori* L.) (g).

The significantly highest single shell weight (0.44 g) was recorded by T_1 i.e. application of bed disinfectant Vijetha at the rate 5g per sq.ft. ½ hour before resuming feeding after each moulting. Whereas significantly lowest shell weight (0.29 g) was recorded by T_7 i.e. untreated control. The maximum single shell weight of double hybrid mulberry silkworm (*B. mori* L.) with the use of Vijetha bed disinfectant was reported by Manimegalai and Subramaniam (1999) [6] (0.24 g), Sivaprakasam (1999) [12] (0.20 g) and Anonymous (2002) [1] (0.285 g) as recorded in the present investigation.

Effect of different bed disinfectants on the cocoon shell ratio of double hybrid mulberry silkworm (*Bombyx mori* L.) (Per cent).

The data was statistically significant. The significantly highest cocoon shell ratio (22.68 per cent) was recorded by T_1 i.e. application of bed disinfectant Vijetha at the rate 5g per sq.ft. ½ hour before resuming feeding after each moulting. The significantly lowest cocoon shell ratio (18.13 per cent) was recorded by T_7 i.e. untreated control. Manimegalai and Subramaniam (1999) [6] recorded 15 per cent cocoon shell ratio with use of Vijetha bed disinfectant. Sivaprakasam (1999) [12] observed 16 per cent cocoon shell ratio in Vijetha treatment.

Effect of different bed disinfectants on the cocoon yield per 10,000 larvae brushed of double hybrid mulberry silkworm (*Bombyx mori* L.) (kg).

The significantly highest cocoon yield (19.79 kg) was obtained in treatment T_1 i.e. application of bed disinfectant Vijetha at the rate 5g per sq.ft. ½ hour before resuming feeding after each moulting. The significantly lowest cocoon yield (13.36 kg) was obtained by treatment T_7 i.e. untreated control. Shankar Rao and Giridhar (2000) [9] reported that bed disinfectants contribute 55.44 per cent among all the factors responsible for higher cocoon yield per 100 dfls. Anonymous (2002) [1] observed that the treatment of bed disinfectants Vijetha recorded maximum cocoon yield (15-12 kg). Shashi Kanta (2015) [10] recommended use of bed disinfectants Labex, Resham Keet Aushad, Sanjeevani, Suraksha, Resham Jyothi and Vijetha which may boost up productivity to the tune of 20 to 40 per cent. However, Hosney *et al.* (1986) [5] reported that silk production was not affected by the bed disinfectants.

Effect of different bed disinfectants on the cocoon filament length of double hybrid mulberry silkworm (*Bombyx mori* L.) (m).

The significantly highest filament length (952.33 m) was recorded by treatment T_1 i.e. application of bed disinfectant Vijetha at the rate 5g per sq.ft. ½ hour before resuming feeding after each moulting. The shortest cocoon filament length (795.73 m) was recorded in treatment T_7 i.e. untreated control. Sivaprakasam (1999) [12] recorded maximum filament length 670 m with the use of bed disinfectants Vijetha. Manimegalai and Subramaniam (1999) [6] observed filament length of (*B. mori* L.) of 821 m when Vijetha bed disinfectants used. Anonymous (2002) [1] recorded longest filament length (705 m) with bed disinfectants Vijetha as compared to other disinfects. The results in the present investigation are in agreement with the result of the above workers.

Effect of different bed disinfectants on the filament weight of double hybrid mulberry silkworm (*Bombyx mori* L.) (g).

The highest filament weight (0.30 g) was recorded by treatment T_1 i.e. application of bed disinfectant Vijetha at the rate 5g per sq.ft. ½ hour before resuming feeding after each moulting, this was at par with treatment T_2 i.e. application of bed disinfectants Ankush at the rate 4 g per sq.ft. ½ hour before resuming feeding after each moulting (0.28 g). The significantly lowest filament weight (0.21 g) was recorded in treatment T_7 i.e. untreated control. The literature on the effect of bed disinfectants on filament weight of double hybrid is scanty so result could not be discussed.

Effect of different bed disinfectants on the denier of double hybrid mulberry silkworm (*Bombyx mori* L.).

The significantly highest denier (2.83) was recorded by treatment T_1 i.e. application of bed disinfectant Vijetha at the rate 5g per sq.ft. ½ hour before resuming feeding after each moulting. The significantly lowest denier (2.37) was recorded in treatment T_7 i.e. untreated control. The results could not be discussed for want of relevant literature on this aspect.

Effect of different bed disinfectants on the disease incidence on double hybrid mulberry silkworm (*Bombyx mori* L.) (Per cent).

The data on effect of different bed disinfectants on the disease incidence on double hybrid mulberry silkworm (*Bombyx mori* L.) are presented in Table-1. The significantly lowest disease incidence of diseases (1.17 per cent) was observed in the treatment T_1 i.e. application of bed disinfectant Vijetha at the rate 5g per sq. ft. ½ hour before resuming feeding after each moulting. The significantly highest disease (3.06 per cent) was recorded in treatment T_7 i.e. untreated control. Datta *et al.* (1998) [2] reported that Vijetha as bed disinfectant (3 kg/100 dfls) after each moult before feeding as well as on fourth day of final instar effectively prevent infection and spread of the diseases during silkworm rearing. It is a unique formulation against all silkworm diseases namely grasserie, flacherie, pebrine and muscardine under various conditions. Manimegalai and Subramaniam (1999) [6] observed that dusting of turmeric powder + chalk powder and Vijetha resulted in 63.16 per cent reduction in grasserie infection. Samson (2000) [7] observed that among bed disinfectant potential active against the disease of silkworms are RKO, Vijetha, Resham Jyothi and Suraksha. Anonymous (2002) [1] shown that Vijetha has recorded lowest disease incidence (5.47 per cent) as compare to other disinfectants. Singhvi *et al.* (2004) [11] reported the necessitates 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: Effect of different bed disinfectants on the life cycle of double hybrid mulberry silkworm (*Bombyx mori* L.)

Treatment. No.	Treatment detail	Mean larval weight (g)	Mean shell weight (g)	Mean Filament length (m)	Mean cocoon yield (kg)	Mean cocoon shell ratio (%)	Mean disease incidence (%)	Mean single cocoon weight (g)	Mean filament weight (g)	Mea denier	Mean ERR (%)
T_1	Application of bed disinfectant Vijetha @ 5g/sq ft. ½ hour before resuming feeding after each moulting.	40.58	0.44	952.33	19.79	22.68 28.43)*	1.17 (6.20)*	1.94	0.30	2.83	98.15 (82.49)*
T_2	Application of bed disinfectant Ankush @ 4g/sq ft. ½ hour before resuming feeding after each moulting.	34.65	0.40	922.37	18.08	21.16 (27.38)	1.67 (7.40)	1.89	0.28	2.73	94.61 (76.67)
T_3	Application of bed disinfectant Vijetha supplement @ 5g/sq ft. ½ hour before resuming feeding after each moulting.	36.65	0.38	902.53	18.48	20.76 (27.10)	2.04 (8.20)	1.83	0.26	2.59	93.85 (75.66)
T_4	Application of bed disinfectant	32.87	0.36	905.80	18.44	19.88	2.30	1.81	0.27	2.68	92.76

	Labex @ 4g/sq ft. ½ hour before resuming feeding after each moulting.					(26.47)	(8.74)				(74.44)
T_5	Application of bed disinfectant Sericillin @ 4g/sq ft. ½ hour before resuming feeding after each moulting.	37.71	0.39	858.19	17.38	20.96 (27.24)	2.55 (9.19)	1.86	0.25	2.62	92.54 (74.30)
T_6	Application of bed disinfectant Amruth powder in water @ 20g/litre. ½ hour before resuming feeding after each moulting.	35.23	0.35	833.62	16.98	19.66 (26.30)	2.60 (9.28)	1.78	0.24	2.59	93.21 (74.96)
T_7	Untreated control.	29.90	0.29	795.73	13.36	18.13 (25.20)	3.06 (10.07)	1.60	0.21	2.37	89.16 (70.83)
	S.E. ±	0.724	0.007	6.933	0.356	0.321	0.087	0.024	0.005	0.023	1.022
	C.D. at 5%	2.232	0.021	21.363	1.096	0.990	0.268	0.074	0.015	0.069	3.149
	C.V. (%)	3.548	3.174	1.362	3.521	2.719	6.848	2.311	3.220	1.485	1.894

Effect of different bed disinfectants on the ERR of double hybrid mulberry silkworm (*Bombyx mori* L.) (Per cent).

The significantly highest ERR (98.15 per cent) was observed in the treatment T_1 i.e. application of bed disinfectant Vijetha at the rate 5g per sq.ft. ½ hour before resuming feeding after each moulting. The significantly lowest ERR (89.16 per cent) was recorded in treatment T_7 i.e. untreated control. Venkataramana *et al*. (2002) [13] reported bed disinfectants, Vijetha and Resham Jyothi significantly improved effective rate of rearing. Vijetha was found to be very effective in improving ERR by number in line with the results obtained in the present investigation.

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