The Pharma Innovation Journal 2022; 11(10): 522-527

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(10): 522-527

www.thepharmajournal.com
Received: 18-08-2022
Accepted: 29-09-2022

Sumya Kapoor
P.G. Department of Sericulture, Poonch Campus, University of Jammu, Jammu and Kashmir, India

Muzafar Ahmad Bhat
P.G. Department of Sericulture, Poonch Campus, University of Jammu, Jammu and Kashmir, India

Divya Sudan
P.G. Department of Sericulture, Poonch Campus, University of Jammu, Jammu and Kashmir, India

Corresponding Author:
Muzafar Ahmad Bhat
P.G. Department of Sericulture, Poonch Campus, University of Jammu, Jammu and Kashmir, India

A comparison of different bed disinfectants on the rearing performance of the double hybrid silkworm FC1 X FC2

Sumya Kapoor, Muzafar Ahmad Bhat and Divya Sudan

Abstract
Since silkworms have been raised in farms for a very long time, their bodies are more sensitive and prone to infection due to their close contact with the environment. Lime was employed as a bed sanitizer @ 5 gm/sq.ft, Vijetha to disinfect beds @ 3 gm/sq. ft and lime+ash as a bed disinfectant @5gm/sq.ft. However, using the bed disinfectant from Vijeta and Lime+Ash only minimally raised the weight of the larvae. Vijeta-derived population had superior ERR to the untreated population by 91.33%. The longest larval duration was seen in the untreated control group. However, the ERR for the bed sanitizer from Lime and Lime+Ash was 88.00% and 90.67%. Vijeta's bed disinfection has greatly improved in terms of the shell weight of cocoons. Bed disinfectants Lime, Vijeta, and Lime+Ash produced cocoons with shell weights of 0.46, 0.62 and 0.34 g respectively. The pupa's weight peaked at 1.30g on day 6 in the population derived from Lime bed disinfectant larvae. The population from Vijeta's bed disinfection had the highest percentage of cocoon shells (34.97%) and shell ratio of 26.07%.

Keywords: Comparison, bed disinfectants, commercial, traits, rearing, hybrid

1. Introduction
Sericulture, often known as silk farming, is the raising of silkworms for the purpose of producing silk. The development of highly productive mulberry cultivars, disease and climate-tolerant silkworm races are necessary to boost silk production. Since they have been farmed for so long, silkworms have developed a sensitive body and are more prone to diseases as a result of being infected by various pathogens. Disease-related losses to the cocoon crop are common in all major silk-producing nations. Numerous diseases brought on by various infectious agents can affect silkworms (Dore swamy *et al*., 2004) [4]. About 15-20 kg per unit of 100 disease-free layings are thought to be lost from cocoons in India due to illnesses, which makes up about 30% of all losses (Selvakumar *et al*., 2002) [8]. 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 practices, physical barriers, and chemical agents. The use of bed disinfectants on rearing beds helps to stop contamination, further dissemination, and microbial growth that can lead to sickness. Different bed disinfectants and disinfection techniques have been developed to control illnesses in silkworm raising. The use of bed disinfectants becomes increasingly crucial for a productive cocoon crop. The diseases fungus, bacterium, virus, and microsporidian are particularly prone to affect the silkworm, *Bombyx mori*. The only commercial practice nowadays is to eliminate huge stocks of worms in case of illness to prevent the spread of disease because there are no specific preventive measures for the occurrence and spread of disease aside from sterilised rearing procedures (Acharya *et al*., 2002) [1]. This research was done to find out how different bed disinfectants affected the FC1 X FC2 double hybrid mulberry silkworm's economic traits and rearing abilities.

2. Materials and Methods
The current experiment was created and carried out at the P. G. Department of Sericulture, Poonch Campus, University of Jammu. The bivoltine FC1 X FC2 silkworm hybrid was utilised to examine how various bed disinfectants affected the commercial attributes and rearing efficiency. The UT Sericulture Department in Mehander, Poonch, Jammu and Kashmir provided FC1 X FC2 2nd moult larvae, which were then reared by adopting the usual approach (Jolly *et al*., 1987) [5] until spinning.

2.1 Treatment regimen
T1: Using lime as a bed sanitizer @5gm/sq.ft
T2: Using Vijetha to disinfect beds @3gm/sq.ft
T3: Using lime+ash as a bed disinfectant @5gm/sq.ft
T4: Control

2.2 Observations recorded
2.2.1 Weight of mature larvae (g)
Ten fully developed larvae were chosen at random from each replication a day before spinning and weighed.

2.2.2 Duration of the fifth instar larva (hours)
The duration of the larval stage was measured from the start of the first instar until the moment that 50% of the silkworms began to spin.

2.2.3 Effective rate of rearing (%)
ERR was calculated by the following formula,

$$\text{ERR} = \frac{\text{Numberofcocoonsharvested}}{\text{Numberoflarvaebrushed}} \times 100$$

2.2.4 Pupation rate (%)
Based on the number of cocoons collected and healthy pupae revealed in each treatment, pupation was determined.

2.2.5 Cocoon weight (g)
About 10 cocoons were selected randomly from each replication 6 day after spinning and their weight was recorded individually. Average weight of the cocoons was determined.

2.2.6 Shell weight (g)
For shell weight, 10 cocoons randomly selected from each replication were used and weight of the cocoon shell was recorded after removing the pupa from the cocoons.

2.2.7 Shell ratio (%)
Shell ratio was calculated based on the shell weight of the respective cocoon weight using the formula,

$$\text{Shellratio} = \frac{\text{Shellweight}}{\text{Cocoonweight}} \times 100$$

2.2.8 Pupal weight (g)
For pupal weight, the pupae removed from randomly selected 10 cocoons of each replication were used and their weight was recorded individually. Average weight of the pupa was determined.

3. Findings
3.1 Changes in the larval growth due to effect of different bed disinfectants
The larval growth as influenced by different bed disinfectants was measured based on their weight on day 6th of fifth instar. Accordingly, an average weight of the larvae recorded was 2.63, 2.51, 2.81 and 2.62 g that corresponds to Control, Lime, Vijeta and Lime+Ash larvae of FC1 X FC2 respectively. However, slight improvement of larval weight was observed by using bed disinfectant of Vijeta and Lime+Ash. Interestingly, increased weight of 2.81 g was observed in the larvae derived from Vijetaagainst control (2.63 g) (Figure 1). Besides, bed disinfectant of Lime showed lowest larval weight of 2.51 g against control (2.63 g).

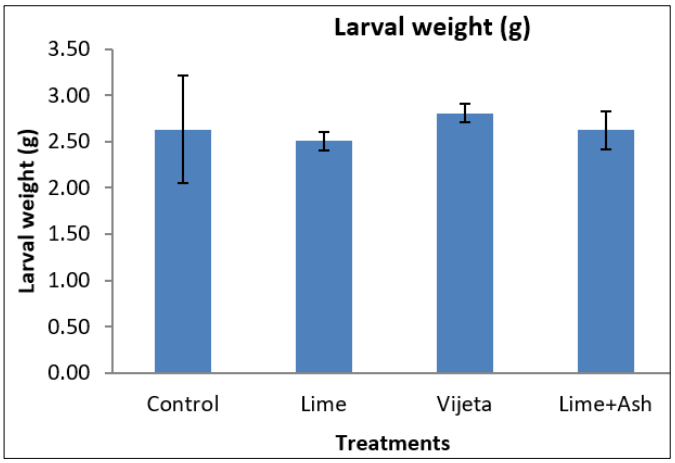

Fig 1: Larval weight FC1 X FC2 by using different bed disinfectants

3.2 Changes in the total larval duration due to effect of different bed disinfectants
Total larval duration as influenced by different bed disinfectants was measured based on the number of days from the start of the first instar until the moment that 50% of the silkworms began to spin. Accordingly, total larval duration recorded was 28.00, 27.00, 26.00 and 27.00 days that corresponds to Control, Lime, Vijeta and Lime+Ash larvae of FC1 X FC2 respectively. However, more larval duration was observed in control and least larval duration was observed in the bed disinfectant of Vijeta (Figure 2).

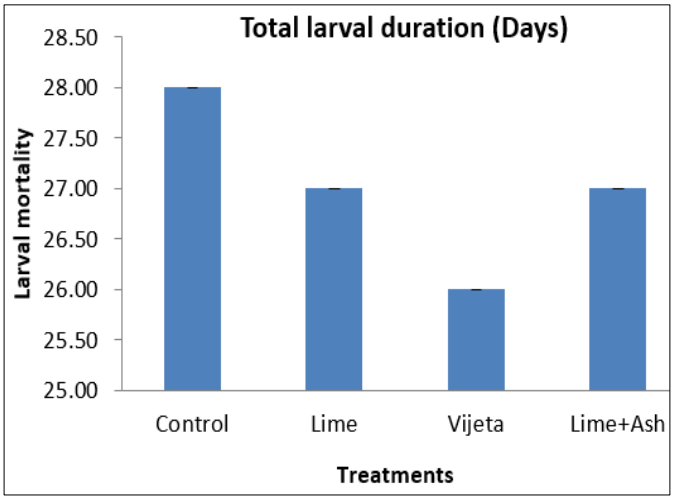

Fig 2: ERR of FC2 X FC1 larvae by using different bed disinfectants

3.3 Changes in the ERR due to effect of different bed disinfectants
The ERR denotes for the larvae succeeding to spin cocoons. Eventually, the silkworm larvae derived from different bed disinfectants were reared under natural environmental conditions prevailed in the rearing house. Interestingly, 91.33% of improvement in ERR was recorded in the population derived from Vijeta against control (88%). However, ERR of 88.00 and 90.67% was observed from the bed disinfectant of Lime and Lime+Ash (Figure. 3).

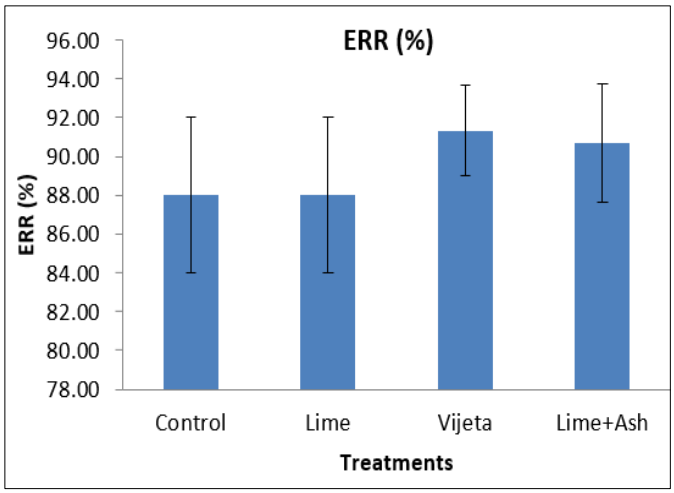

Fig 3: ERR of FC2 X FC1 larvae by using different bed disinfectants

3.4 Changes in relation to cocoon weight due to effect of different bed disinfectants

Weight of the cocoon spun by the FC1 X FC2 silkworm larvae derived from effect of different bed disinfectants on day - 6 was found significantly increased compared to control (Figure, 4). The highest weight of the cocoon 1.77 g was observed from Vijeta. An average weight of cocoon 1.76 and 1.59g was recorded that corresponds to Lime and Lime+Ash respectively against control (1.58 g).

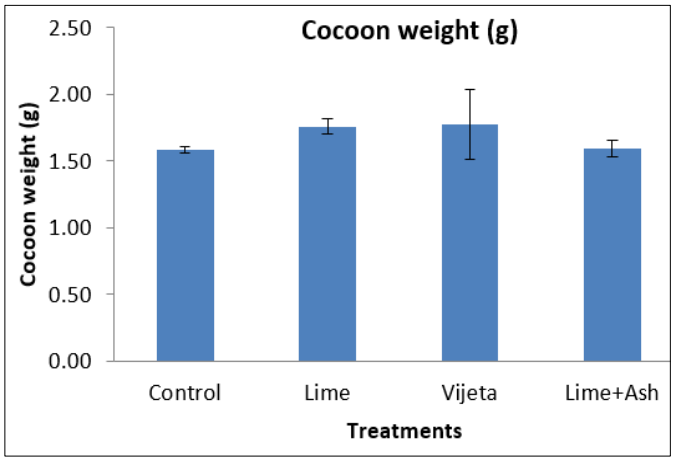

Fig 4: Cocoon weight of FC2 X FC1 larvae by using different bed disinfectants

3.5 Changes in relation to cocoon shell weight due to effect of different bed disinfectants

The cocoon shell weight was also obviously affected as that of cocoon weight in control due to fluctuated environmental condition in the rearing house. As a result, the cocoon shell weight in control was 0.30 g. But, significant improvement in the shell weight was noticed in the bed disinfectant of Vijeta. The cocoons spun from bed disinfectants of Lime, Vijeta and Lime+Ash had shell weight of 0.46, 0.62 and 0.34 g respectively (Figure 5) against control 0.30 g.

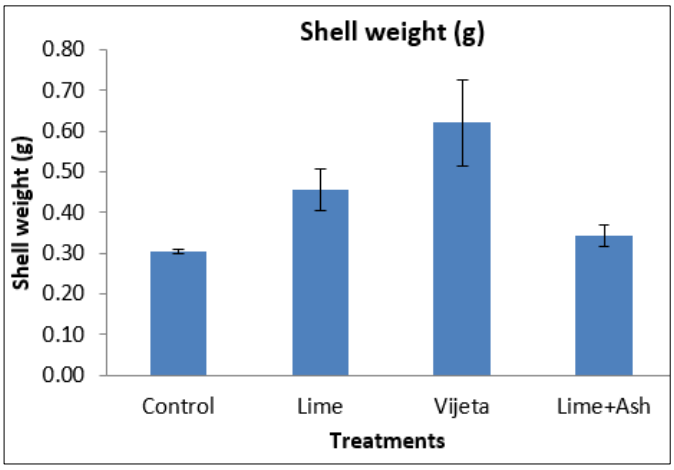

Fig 5: Cocoon shell weight of FC2 X FC1 larvae by using different bed disinfectants

3.6 Changes in relation to pupal weight due to effect of different bed disinfectants

Interestingly, weight of the pupa, as an index of its growth, showed highest weight 1.30 g in the population derived the larvae of Lime bed disinfectant on day-6 respectively. Whereas, 1.15 and 1.26 g of pupal weight was observed from Vijeta and Lime+Ash bed disinfectant during 6th day larval stage of FC1 X FC2 against control (1.28 g) (Figure 6).

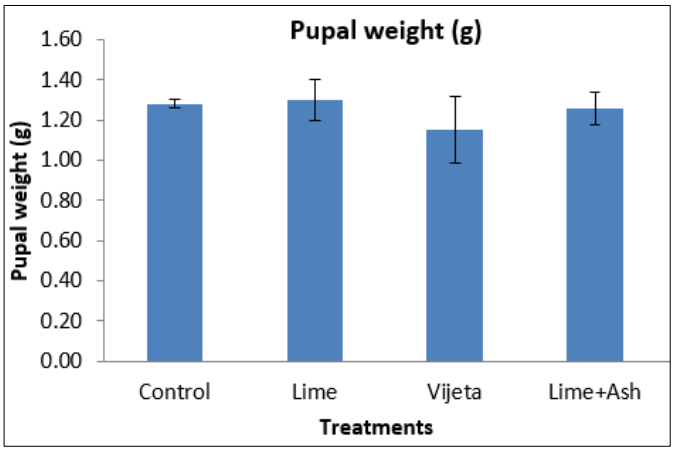

Fig 6: Pupal weight of FC2 X FC1 larvae by using different bed disinfectants

3.7 Changes in relation to shell ratio due to effect of different bed disinfectants

The cocoon shell ratio was also correspondingly affected as that of cocoon and shell weight due to effect of different bed disinfectants at fifth instar larvae in FC1 X FC2. The cocoon shell ratio recorded as 19.16% in control, highest of 34.97% was recorded in the bed disinfectant of Vijeta and least shell ratio of 21.51% was recorded in the population derived from larvae of Lime+Ash, respectively. Concomitantly, 26.07% shell ratio was observed from the cocoons derived from Lime bed disinfectant (Figure 7).

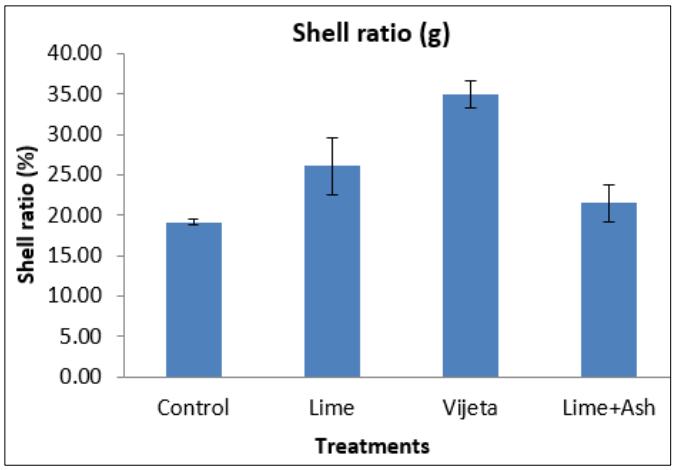

Fig 7: Shell ratio of FC2 X FC1 larvae by using different bed disinfectants

3.8 Changes in relation to pupation rate due to effect of different bed disinfectants

The pupation rate was also correspondingly affected as that of cocoon weight, shell weight and shell ratio due to effect of different bed disinfectants at fifth instar larvae in FC1 X FC2. The pupation rate recorded as 93.23% in control, highest of 95.47% was recorded in the bed disinfectant of Vijeta and least pupation rate of 94.43% was recorded in the population derived from larvae of Lime, respectively. Concomitantly, 94.52% pupation rate was observed from the cocoons derived from Lime+Ash bed disinfectant (Figure 8).

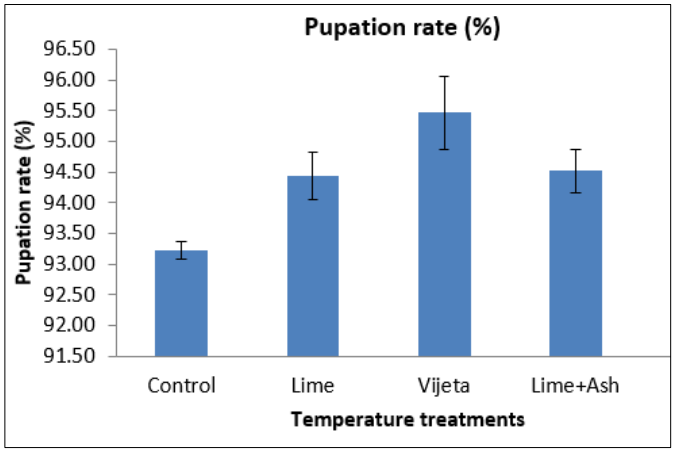

Fig 8: Pupation rate of FC2 X FC1 larvae by using different bed disinfectants

4. Discussion

In accordance with this, the average weight of the larvae measured was 2.63, 2.51, 2.81, and 2.62g respectively, for the Control, Lime, Vijeta and Lime+Ash larvae of FC1 X FC2. However, utilising the bed disinfectant of Vijeta and Lime+Ash resulted in a small improvement of larval weight. It's interesting to note that the Vijeta-derived larvae had a weight increase of 2.81 g compared to the control larvae's weight of 2.63 g. Additionally, compared to the control, bed disinfectant of lime showed the lowest larvae weight of 2.51 g. 32.70 g of larval weight was recorded by Manimegalai and Subramaniam (1999) [7] and Sivaprakasam (1999) [11] reported maximum silkworm larval weight with Vijetha is 35 g. Anonymous (2002) [2] also reported the highest 3.45 g silkworm larval weight while using bed Vijetha is a disinfectant that is superior to other disinfectants. These results are consistent with those of the current investigation. Shashidhar *et al*., 2018 [10] conducted an experiment to study sub-optimal dosages of bed disinfectants on rearing performance of double hybrid (FC1 X FC2) silkworm under sub-tropical condition of Jammu. Better Effective Rate of Rearing, higher pupation rate, higher shell weight was recorded for the silkworms on which disinfection was done. The Control, Lime, Vijeta, and Lime+Ash larvae of FC1 X FC2 correspond to total larval durations of 28.00, 27.00, 26.00, and 27.00 days, respectively. However, the bed disinfectant of Vijeta had the shortest larval lifespan, while the control had the longest. Studies on the effects of several bed disinfectants on the CSR2 X CSR27 silkworm double hybrid were undertaken by Surapwar *et al*., in 2019 [12]. In contrast to the control, Vijetha, Ankush, Vijetha supplement, Labex, Sericillin, and Amruth bed disinfectants were utilised. After every moult, bed cleaning was performed, and bed disinfectants were applied according to treatment guidelines half an hour before feeding resumed. According to the findings, the lowest larval duration was observed when Vijetha bed disinfectant was applied at a rate of 5 g per square foot, which was comparable to the rate at which Labex bed disinfectant was applied during treatment. The highest larval duration was observed in the untreated control. The population formed from Vijeta showed a 91.33% improvement in ERR compared to the control (88%). However, Lime and Lime+Ash's bed disinfectant showed ERR of 88.00 and 90.67%. In an experiment, Vijeta produced the cocoon with the biggest weight, 1.77 g. In comparison to the control, an average cocoon weight of 1.76 and 1.59 g for lime and Lime+ash, respectively, was recorded (1.58 g). In the Vijetha treatment, Manimegalai and Subramaniam (1999) [7] recorded the highest single cocoon weight (1.63 g). Sivaprakasam (1999) [11] noted that a single cocoon treated with Vijetha bed disinfectant weighed 1.6 g. When compared to different disinfectants, Anonymous (2002) [2] found that Vijetha treatment resulted in the largest single cocoon weight (1.684 g). In order to increase the economic return for the viability of mulberry sericulture, Shashi Kanta (2015) [9] analysed a study regarding the use of several disinfectants for better cocoon weight. At CSRTI, Berhampore, Chakrabarty *et al*., 2017 [3] created a brand-new bed disinfectant named Sericillin. Improvement in cocoon quality is highly dependent on cleanliness during silkworm rearing and disinfection treatment to ensure a pathogen-free environment. The Institute has created a disinfectant that works better against infections that affect silkworms. It has been demonstrated that this formulation is superior than others while fighting muscardine. It works just as well against the common silkworm diseases Grasserie, Flacherie, and Pebrine as Labex does. Trials carried out in the Eastern and North-Eastern region over the past 6 years have demonstrated an average cocoon production of more than 4 kg/100 dfls. The control's cocoon shell weighed 0.30 g. However, there has been a noticeable improvement in the shell weight of Vijeta's bed disinfection. In contrast to the control cocoons, which weighed 0.30 g, the bed disinfectants Lime, Vijeta, and Lime+Ash produced cocoons with shell weights of 0.46, 0.62, and 0.34 g respectively. Manimegalai and Subramaniam (1999) [7] reported a maximum single shell weight of 0.24 g, Sivaprakasam (1999) [11] reported a maximum single shell weight of 0.20 g, and Anonymous (2002) [2] reported a

maximum single shell weight of 0.285 g for double hybrid mulberry silkworms using Vijetha bed disinfectant. Interestingly, the pupa's weight, which serves as a measure of its growth, peaked at 1.30 g on day 6 in the population produced from Lime bed disinfectant larvae. In contrast, during the 6th day of the larval stage of FC1 X FC2, 1.15 and 1.26 g of pupal weight were observed from Vijeta and Lime+Ash bed disinfecting compared to control (1.28 g). The population formed from larvae of Lime+Ash had the lowest cocoon shell ratio, 21.51 percent, while the population with the highest shell ratio, 34.97 percent, was reported in the bed disinfectant of Vijeta. Concurrently, a shell ratio of 26.07 percent was seen in cocoons made with lime bed disinfection. Using Vijetha bed disinfectant, Manimegalai and Subramaniam (1999) [7] observed a cocoon shell ratio of 15%. Sivaprakasam (1999) [11] found that the Vijetha treatment had a cocoon shell ratio of 16%. The pupation rate was 93.23% in the control group, 95.47% in the Vijeta bed disinfectant, and 94.43% in the population descended from Lime larvae, respectively. Concurrently, a 94.52 percent pupation rate was seen in cocoons made with the bed disinfectant Lime+Ash. Shashidhar *et al*., in 2018 [10] investigated the effects of sub-optimal bed disinfectant dosages on the performance of double hybrid (FC1 X FC2) silkworm rearing in Jammu's subtropical climate. When compared to other treatments (50, 20 and 0%), the application of Vijetha and Lime at 100 and 75% of the bed disinfectant produced better results in terms of larval weight, ERR, pupation rate, cocoon weight, shell weight, shell ratio, filament length, denier, renditta, and reelability parameters. The treatments with the highest effective rearing and pupation rates were 100 and 75%. Additionally, 100% had the heaviest cocoon weight and the heaviest shell weight, which was followed by 75%. Between the treatments, there were discernible differences. At a concentration of 0.01 percent, sodium hypochlorite (NaOCl) caused the greatest reduction in mortality (17.1%). When lime and vim were combined, the combination of 50% lime and 50% vim showed the greatest mortality decrease (43.6%), matching the results of 40% vim and 60% lime (45.8%). Thus, they appear to be effective in limiting silkworm illnesses and have the potential to be a key element of comprehensive disease management (Kedir Shifa *et al*., 2020) [6]. The aforementioned findings are consistent with those of the recent inquiry.

5. Summary and Conclusion

The practise of rearing silkworms with the goal of creating silk is known as sericulture, also referred to as silk farming. To increase silk output, it is required to develop mulberry cultivars that are extremely prolific as well as disease- and climate-tolerant silkworm races. Silkworms have been raised in farms for a very long time, which has made their bodies more delicate and made them more susceptible to disease. In every major silk-producing country, disease-related losses to the cocoon crop are a typical occurrence. In order to determine how different bed disinfectants affected the commercial characteristics and rearing effectiveness, the bivoltine FC1 X FC2 silkworm hybrid was used. Different treatments of bed disinfectants of lime as a bed sanitizer @5gm/sq.ft, Vijetha to disinfect beds @3gm/sq.ft, lime+ash as a bed disinfectant @5gm/sq.ft and Control were used.Utilizing Vijeta and Lime+Ash's bed disinfectant, however, only slightly increased the weight of the larvae. It's noteworthy to notice that the weight of the Vijeta-derived larvae increased by 2.81 g in comparison to the weight of the control larvae, which was 2.63g.The untreated control group showed the longest larval duration. ERR in the population derived from Vijeta was 91.33% better than in the control group (88%). The ERR for the bed disinfectant from Lime and Lime+Ash, however, was 88.00 and 90.67%.In the rearing home, the natural environmental conditions that occurred when raising silkworm larvae from various bed disinfectants. It's interesting to note that the population derived from Vijeta showed an improvement in ERR of 91.33% compared to the control (88%). However, the bed disinfectant of lime and lime+ash showed ERR of 89.00 and 90.67%. The cocoon shell of the control weighed 0.30 g. The shell weight of Vijeta's bed disinfection has, nevertheless, improved significantly. The bed disinfectants Lime, Vijeta, and Lime+Ash produced cocoons with shell weights of 0.46, 0.62 and 0.34 g respectively, in contrast to the control cocoons, which weighed 0.30 g. It is interesting to note that in the population created from Lime bed disinfectant larvae, the pupa's weight, which acts as a gauge of its growth, peaked at 1.30 g on day 6. In contrast, Vijeta and Lime+Ash bed disinfection were found to produce 1.15 and 1.26 g of pupal weight on the sixth day of the larval stage of FC1 X FC2 compared to control (1.28 g). The population made up of larvae of Lime+Ash had the lowest percentage of cocoon shells (21.51%) whereas the population with the highest percentage (34.97%) was found in Vijeta's bed disinfection. Concurrently, cocoons produced using lime bed disinfection showed a shell ratio of 26.07%.

6. Acknowledgements

Authors would like to acknowledge the Director, Poonch Campus, University of Jammu for providing us the lab facilities.

7. References

1. Acharya A, Sriram S, Sehrawat S, Rahman M, Sehgal D, Gopinathan K. *Bombyxmori* Nucleopolyhedrovirus: Molecular biology and biotechnological applications for large scale synthesis of recombinant proteins. Current Science. 2002;83(4):455-465.
2. Anonymous. Economic survey of Maharashtra; c2001-2002.
3. Chakrabarty S, Saha AK, Kumar SN. Studies on synbiotics (combination of probiotic and prebiotic) induction for control of common diseases of silkworm, *Bombyx mori* L. CSR&TI, CSB, Berhampore (West Bengal); c2017. p. 1-6.
4. Doreswamy C, Govindan R, Devaiah MC, Muniswamappa MV. Deterioration of cocoon traits of silkworm, *Bombyx mori* L. by the synergistic infection with late larval flacherie pathogens. Karnataka Journal of Agricultural Sciences. 2004;17:345-348.
5. Jolly MS. Appropriate Sericulture Techniques. Gitanjali printers, Bangalore; c1987. p. 63-106.
6. Kedir Shifa, Metasebia Terefe, Ahmed Ibrahim, Abiy Tilahun. Evaluation of some Disinfectants against Mulberry Silkworm (*Bombyx mori* L.) (Lepidoptera: Bombycidae) Diseases in Melkassa Agricultural Research Center, Ethiopia. International Journal of Agriculture and Biosciences. 2020;9(5):263-268.
7. Manimegalai S, Subramaniam A. Efficacy of bed

disinfectants and botanicals against Grasserie disease of silkworm *Bombyx mori* L. Proceeding of NST; c1999. p. 338-340.
8. Selvakumar T, Nataraju B, Balavenkatasubbaiah M, Sivaprasad V, Baig M. A report on the prevalence of silkworm diseases and estimated crop loss. In: Advances in Indian Sericulture Research, C.S.R. and T.I., Mysore; c2002. p. 357-357.
9. Shashi Kanta. Method of use of bed disinfectants for enhancing cocoon productivity. International Journal of Innovative Research and Review. 2015;3(2):2347-4424.
10. Shashidhar KR, Thulasiram K, Noorulla Haveri. Effectiveness of bed disinfectants on silkworm diseases and cocoon yield under tropical conditions of Kolar district, Karnataka. Journal of Pharmacognosy and Phytochemistry. 2018;7(5):2720-2724.
11. Sivaprakasam N. Botanical formulation for management of grasserie disease of silkworm, *Bombyx mori* L. Proc. Natl. Sem. Trop. Seric; c1999. p. 335-337.
12. Surapwar PH, Nalwandikar PK, Bhamare VK, Waghmare YM. Effect of different bed disinfectants on economic traits of double hybrid mulberry silkworm (*Bombyx mori* L.) International Journal of Chemical Studies. 2019;7(5):1855-1858.