

REVIEW ARTICLE

Effect of Malabar Neem (*Melia dubia*) leaf extract on the fecundity, incubation period and hatchability of mulberry Silkworm *Bombyx Mori* Linn

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Manuscript details:	ABSTRACT
Received: 27.07.2015 Revised: 20.10.2015 Accepted: 26.11.2015 Published : 30.12.2015 Editor: Dr. Arvind Chavhan Cite this article as: Sanjai Kumar Gupta (2015) Effect of Malabar Neem (<i>Melia dubia</i>) leaf extract on the fecundity, incubation period and hatchability of mulberry Silkworm <i>Bombyx Mori</i> Linn. <i>Int. J. of Life Sciences</i>, 3(4): 409-414. Copyright: © 2015 Author(s), This is an open access article under the terms of the Creative Commons Attribution-Non-Commercial - No Derivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.	The mulberry silkworm <i>Bombyx mori</i> L is one of the most economically significant insects because it produces silk that disrupts several crucial sectors. Silkworm illnesses, including those caused by viral, bacterial, fungal, and protozoan pathogens, have a significant impact on cocoon production. The use of botanicals is thought to be a crucial way to manage silkworm illnesses since the greatest cocoon loss is caused by bacterial and fungal pathogens acting independently. The nutritious meal that mulberry silkworms consume during their youth is utilized in the season of medicating agricultural crops throughout the agrotechnics of mulberry silkworm care by farms, clusters, and specialized farms involved in cocooning in our nation. The 'Maha neem', or Malabar Neem (<i>Melia dubia</i>), is known from ancient literature as a plant with therapeutic and spiritual properties. Maha neem is highly valued for its therapeutic benefits and is an important component of Hindu spiritual rituals. It is extensively used in Ayurveda, Unani, Greek, and Roman medicine. Since silk is a premium commodity with a high demand, improving the quality of silk Fiber is of utmost importance in sericulture. The impact of adding ethanolic extracts of Malabar Neem (<i>Melia dubia</i>) to mulberry leaves on the development, incubation, and hatchability rate of silkworms (<i>Bombyx mori</i> L.) is examined in this study, notably during the egg and egg-laying stage. In comparison to the control group, the supplementation markedly enhanced the incubation time of silkworm eggs and the hatchability of silkworm eggs during the emergence of the first instar larva from the silkworm egg (DFLs). The 5% ethanolic extract showed the most noticeable results when compared to the other concentrations tested. The better incubation and hatchability features of silkworms fed mulberry leaves supplemented with phytochemicals suggested that Malabar Neem extract may be used as a natural growth promoter in sericulture. This study emphasizes the promise of supplementing Malabar Neem as a sustainable, affordable organic agro based method for boosting silkworm production and silk quality, hence benefiting the sericulture industry. Keywords: Malabar Neem plant extract, Fecundity, incubation period, hatchability parameters, DFLs.
	INTRODUCTION New silkworm breeds and mulberry cultivars are being developed through effective research and development activities, with the goal of

producing plants that can thrive in a range of environmental conditions and are resistant to external environmental variables. This is especially crucial given that the geographical distribution of cocoon-producing nations has led to the establishment of scientific hubs devoted to sericulture. These centers concentrate on employing diverse biologically active chemicals, researching the physiology of mulberry silkworms, and implementing contemporary worm feeding techniques to lessen the adverse consequences of shifting natural climate conditions (Das GMR 1950; Etaberi K et al 2004). To this end, several scientific and research studies have been carried out to create specific, nutrient-rich mulberry groves and cultivate healthy mulberry leaves by replicating productive mulberry seedlings. Currently, it is crucial to utilize efficient methods of phytochemicals effect of Malabar Neem (*Melia dubia*) and selection procedures to develop mulberry varieties and hybrids that are suited to the shifting natural climatic conditions in order to produce nutritious mulberry leaves that satisfy the need for seasonal silk worm feeding (Gobena W et al 2015 & Jayprakash rao 1999). The end result will be a decrease in the effects of external defoliator pest causes on cocoon production and the promotion of novel, cutting-edge agricultural technologies, which is a pressing scientific and practical challenge. All participants in the cocoon industry, including silkworm rearers, cluster workers, silk agronomists, mulberry specialists, homemakers, and agricultural specialists, must have knowledge of methods to improve nutrition, correctly identify mulberry diseases, and recognize mulberry leaf poisoning in order to solve this pest problem. The productivity of mulberry trees can be maintained and their leaves can be protected from mulberry silkworms by employing phytochemical-treated methods of control, treatment, and inspection using Malabar Neem (*Melia dubia*) (Jiang Li et al 2015 & Khaliknazarov et al 2015). The goal of this study is to investigate the link between the nutritional status and makeup of the food provided to young mulberry silkworms and the variety and hybrid of the mulberry tree, as well as the effects of defoliator pest disease and poisoning on larval development, productivity, and the activity of the silk gland. The study seeks to increase the yield and quality of farmed cocoons by carefully controlling the food supply for sericulture, as well as the viability, output, and growth dynamics of mulberry silkworms (Murgan K et al 1998 & Manimuthu M et al 2010). This study is unique in that it seeks to improve the exportability of high-

quality cocoon raw materials with high productivity, which can only be accomplished by utilizing the feed base to influence the fecundity, incubation period, and hatchability of 1st instar mulberry silkworm larvae through effective Malabar Neem (*Melia dubia*) phytochemicals treatment spray care. Additionally, the usage of these extracts indirectly improved the biological and technological characteristics, making it possible to utilize them in sericulture to enhance the quantity and quality of the cocoon harvest.

MATERIALS AND METHOD

The research was carried out on the mulberry silkworm (*Bombyx mori* L.), a Pure Mysore × NB4D2 multivoltine DFLs disease-free egg layings that were maintained in plywood trays (23x20x5 cm) at the government college's mulberry garden laboratory media under the best rearing conditions. The eggs were obtained from the silkworm grainage Baharaich, Directorate of Sericulture Uttar Pradesh. Following accepted sericulture procedures (Krishnaswami, 1986) the silkworms were grown on mulberry leaves (*Morus alba*) in a regulated environment. The phytochemicals extract of Malabar Neem (*Melia dubia*) is renowned for its antioxidant and adaptogenic effects. The phytochemicals extract of the Malabar Neem (*Melia dubia*) tree increases the stress resistance of silkworms, especially in extreme environments. This results in continuous silk output and greater cocoon yields (Vidya Devi and Bai 2015). Malabar Neem (*Melia dubia*), an herbal plant, was taken from my college, which is located close to the nursery. The plant leaves were washed with tap water before being rinsed with distilled water. The extracts were made by pulverizing them in an electric mixer and mixing them with distilled water at a weight by volume ratio (1:10). Keep the heat plates at 50–600°C for 5–10 minutes, then in a dark area for 24–42 hours. The stock solution was made using the filtrate obtained by filtering the crushed material solution via a double layer of muslin cloth. The stock solution was pipetted at 0.5 ml and diluted with 5 ml of distilled water to reach a 5% concentration. For silkworm consumption and application to mulberry leaves, a fresh dilution was created from the stock solution, which was kept in the refrigerator (Gobena, et al, 2015). Treatment group silkworms were given mulberry leaves treated with a 5% concentration of Malabar Neem (*Melia dubia*) phytochemicals extract, while control group silkworms were given plant Kanva

mulberry leaves. There were 90 silkworms in each group, and each treatment had three replicates. Fertility: The moths were physically separated after four hours of copulation and then chronically moved to a BOD incubator that was kept at 26±1°C, 80±5% RH, and 12±1 hours of light per day. On the sheet paper, the pregnant ladies deposited their eggs. Open plastic cells were used to protect the egg-laying moths in order to prevent the eggs laid by various female moths from mixing. The female moths' disease freeness was checked separately 24 hours after they laid their eggs. The females were smashed one at a time in a mortar using a pestle, and the blood smears were analyzed for bacterial and protozoan pathogens under a magnification of 15X45. To improve the adhesion of eggs to the cards and surface disinfection, the disease-free laying (DFLs) that were so treated were then rinsed with 2% formalin for 15 minutes. The eggs were subsequently transferred to the same BOD incubator after the egg sheets with eggs laid on were thoroughly washed with running water to remove formalin and the eggs were dried in shade. Thirty normal egg layings (three batches of 10 laying in each batch) were collected for each replicate to establish the fecundity. In this way, the average number of eggs laid by a female moth in each experiment was deemed to be representative. Each experiment was carried out three times. The data collected were statistically analyzed using one-way ANOVA. The incubation period is: The incubation period of eggs was determined using the eggs that were consistently moved from the trial moths to 26±1°C, 80±5RH, and 12±1 hours of daily light. In order to see phytochemicals affect the incubation time of eggs. The incubation period of silkworm eggs was determined for each experimental setup separately in order to evaluate the impact of phytochemicals fortification of leaf extract on the incubation period. From 8 p. m. on the day of decoupling, the average age of the eggs was calculated. There were three repetitions of 10 layings in each replicate. The average time it took for eggs to incubate prior to the release of larvae was determined by averaging the data collected. One-way ANOVA was used to conduct a statistical analysis of the data. The hatchability of eggs was assessed in eggs that had previously been incubated for 12±1 hours a day at 26±1°C and 80±5%RH. On the day of hatching, the eggs undergoing incubation were placed in black boxes during the head pigmentation period and subjected to soft light in the morning. The larvae began to hatch after the incubation period, which lasted

three days. The number of eggs per female moth, the number of unfertilized eggs, and the number of hatched eggs per laying were all counted after full hatching (third day following the start of larval hatching) in order to gather data. For each batch in the trial, the average hatching of ten layings was used as the representative hatchability percentage per laying. Each replicate was counted for thirty layings, or three batches of ten layings each. Every experiment was conducted three times. One-way ANOVA was used to perform a statistical analysis of the data. The hatchability was determined using the following formula:

$$\text{Hatchability (\%)} = \frac{\text{No. of hatched eggs per laying}}{\text{No. of fertilized eggs per laying}} \times 100$$

RESULTS AND DISCUSSION

As shown in (Table & Fig), the Phytochemicals enriched ethanol extracts of mulberry leaves and Malabar Neem (*Melia dubia*) had an impact on the various developmental and growth parameters of the silkworm, such as fecundity rate (No. of egg laying by female silk moth), incubation period, and hatchability percent of egg (Emergence of 1st instar larvae from one developing fertile egg DFLs). With regard to the silkworm's development and growth features, such as fecundity, incubation time, and the hatchability of silk moth eggs, the over shifts are examined. The table demonstrates the impact of phytochemicals derived from the leaf extract of the Malabar Neem (*Melia dubia*) on the larval and developmental stages of the silk worm. The impact of phytochemicals from plant extracts on the fecundity rate of one DFL resulted in 540 eggs, whereas the outcome of development and growth character was an incubation period in control, with 421 numbers of one DFLs. The incubation period for phytochemicals-fortified Malabar Neem (*Melia dubia*) leaf extract is 5.23 days, which is less than the 9.81 days that the incubation period is used as the control reading? Additionally, the phytochemicals in the Malabar Neem (*Melia dubia*) plant extract have a maximum egg hatchability rate of 95.82%, compared to the control hatchability rate of 80.73%. The study discovered that the average growth and development were greater when utilizing phytochemicals from the Malabar Neem (*Melia dubia*) plant extracts than in the control group. This indicates that the plant extract of *Melia dubia*, also known as Malabar Neem, has the potential to modify parameters related to good

development very quickly. In the current study, supplementing phytochemicals with extracts from the Malabar Neem (*Melia dubia*) plant significantly improved silkworm life by enhancing fecundity, incubation time, hatchability, and cocoon creation compared to control development. The phytochemicals extract from ethanolic Malabar Neem (*Melia dubia*) improves growth by extending the incubation period, increasing hatchability, and enhancing the fecundity of the fifth instar. The phytochemicals extract of Malabar Neem (*Melia dubia*) boosts egg production, proving its beneficial effect on silkworm development. These findings suggest that phytochemicals from Malabar Neem (*Melia dubia*) plant extracts are a viable and ecologically sound alternative to synthetic additives in improving silkworm productivity. Local hybrid positive responses that were seen and reported (Singh RP et al. 2002 & Gatea SM et al. 2015) indicated the possibility for improving silkworm rearing in particular agricultural contexts. In accordance with the results of

(Hajam et al 2014), where a 5% concentration of Malabar Neem (*Melia dubia*) phytochemicals resulted in a marked improvement in average fecundity, incubation time, and hatchability when compared to the control group, the current study's findings are consistent with those of (Hajam et al 2014). In this scenario, (Jamroz D et al 2002) demonstrated that embryos that are nourished during the early stages of development will experience increased activity in the gastrointestinal tract and enzymes that break down nutrients. Alternatively, it may be due to the Phytochemicals extract of Malabar Neem (*Melia dubia*) spraying plant extracts on mulberry plant, which acts as a biological antioxidant by interacting with free radicals or primary metabolites produced by pathological bacteria and converting them into less reactive molecules, thereby preventing or slowing the oxidation of biological molecules. Pomegranate peels contain antioxidants, according to (Krishan & Narang 2014) and (Ghazanfari S et al 2014).

Table: 1- Effect of Supplementary Malabar Neem (*Melia dubia*) phytochemicals ethanolic plant extract on different stages Fecundity, incubation period and Hatchability parameters of Silkworm *B mori* L.

Sr. No.	Phytochemicals fortification groups	Fecundity (No. of egg)	Incubation Period (days)	Hatchability of Eggs (%)
1-	Control parameter of mulberry tree leaves	421 ±5.430	9.81 ±0.218	80.73 ±0.987
2-	Phytochemicals treatments Myrrh (<i>Commiphora myrrha</i>) leaf extract	540 ±6.232	5.23 ±0.323	95.82 ±0.642

* $p < 0.01$ F-ratio= $n_1=4$ $n_2=10$ ANOVA F-ratio=12.84

Each value represents mean ±S.D. of three replicates.

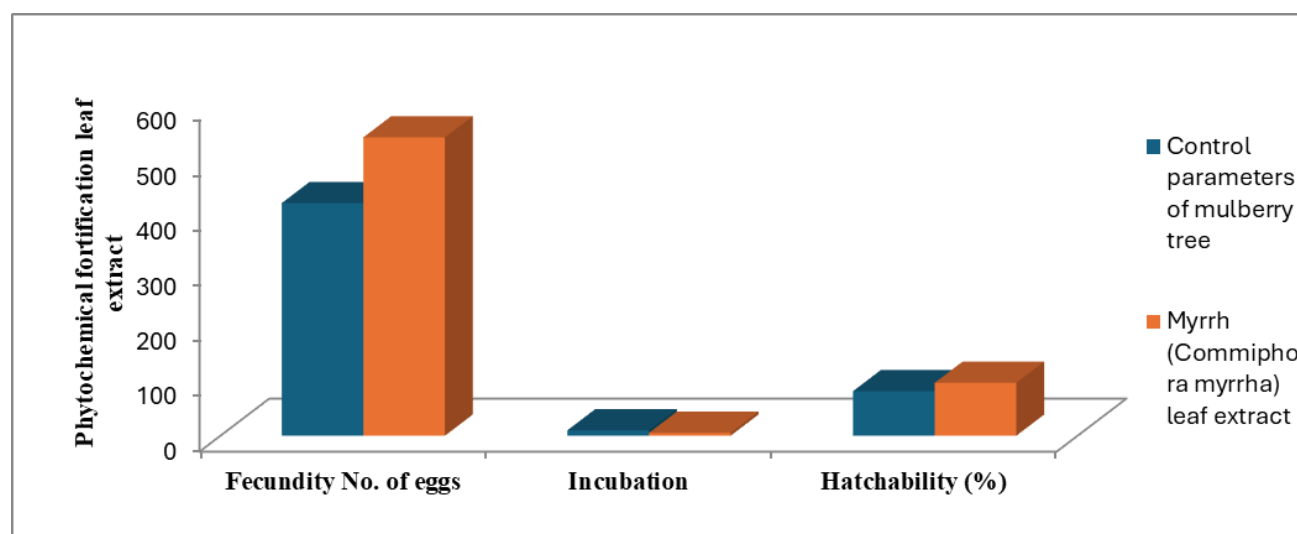


Figure 1: Effect of Malabar Neem (*Melia dubia*) phytochemicals ethanolic plant extract on different stages Fecundity, incubation period and Hatchability parameters of Silkworm *Bombyx mori*

Due to the increased representation of mineral elements during the early stages of embryonic development, the minerals found in plant extracts play a significant role in cellular metabolism and bone growth. This explains the notable weight gain observed in larvae treated with aqueous plant extract. The lower proportion of fatalities in the treatments of spraying eggs with an aqueous extract of silkworm larvae may be explained by the tannins they contain, which efficiently prevent infection by killing the cell membrane of pathogenic bacteria and also block the effective sites of certain enzymes inside the living cells of bacteria that are essential for their growth and activity. This leads to the deposition of proteins that are either in the cell membrane or inside the cell when they penetrate the membrane. It also leads to a reduction in the death rate and the creation of hydrogen bonds between the free phenolic hydroxyl groups, which are indicative of the silkworm's health and vitality (Ghazaleh et al. 2013). According to Reddy et al. (2007), flavonoids and phenols found in silkworm egg powder act as anti-pathogenic microorganisms due to the synergistic interaction of these compounds, which results in the inhibition of pathogenic bacteria. The use of Phytochemicals extract of Malabar Neem (*Melia dubia*) extract significantly enhanced the length of the larvae, the depth of the crypts, and the ratio of egg laying incubation and hatchability rate when compared to the control treatment. The digestive system is supported by bacteria, which aid in maintaining the microbial equilibrium of the intestinal flora and boosting the population of helpful microbes in the gastrointestinal tract. They also provide essential components and aid in the creation of organic acids, which are a source of cells that produce villi (Al-Juboory MSR 2008 & Mahmoud SM 2015). As a result, the length of silkworm larvae was increased, and Phytochemicals extract of Malabar Neem (*Melia dubia*) mathematically improved the weight of the one-day-old hatching egg with plant extract when compared to the control treatment.

CONCLUSION

According to the study, the nutritional content of mulberry leaves has a major impact on the growth, biological markers, and silk gland activity of mulberry silkworms, as well as on the feeding of silkworms with mulberry leaves of varieties with high nutritional value, such as an increase in the productivity index of

total wrapped cocoons. In comparison to the control variant, the study also discovered that feeding the silkworms with infected mulberry leaves resulted in lower larval survival rates, delayed molting, and fewer cocooned worms. Additionally, the output of cocoons from a single box of silkworms was reduced by the lower fecundity rate, shorter incubation time for silkworm eggs, and higher hatchability when compared to the control group. Lastly, the investigation found instances of silkworms eating mulberry leaves that were poisoned or mulberry leaves that were infested by defoliator pests during the various seasonal feeding periods. From the current study, it can be inferred that spraying water or natural extracts from Malabar Neem (*Melia dubia*) on silkworm eggs may increase the fecundity rate and hatchability percentage by lowering the embryonic mortality rate during various incubation periods, which will improve the usage of silkworm eggs for the rearing center of sericulture station. As a result, these phytochemicals from Malabar neem have a potential role in defoliator pest management strategies ranging from mulberry plants to voracious feeding of silkworms. The transition from conventional inorganic farming practices to environmentally beneficial organic farming techniques in order to enhance cocoon output is discussed in this article. The manufacture and composition of phytochemicals from Malabar Neem phytochemical plant extract are in order to promote their use in sericulture.

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