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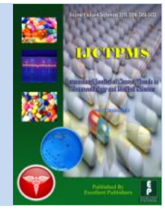

Original Research Article

Effect of Antibiotics Treatment on Larval Development and Economic Cocoon Traits of Mulberry Silkworm (*Bombyx mori*)

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Abstract

An experiment was conducted in the Sericulture laboratory of Pakistan Forest Institute, Peshawar during autumn silkworm rearing season (2015) to determine the effects of antibiotics (Amoxil, streptromycinsulphate) treatment on larval development and economic cocoon traits shell of mulberry silk worm (*Bombyx mori*). The experiment was carried out in completely randomized design with three replications. The study comprised of three treatments i.e., amoxil, streptromycin sulphate @ 0.5% and a control. Observations under considerations were diameter, weight and length of cocoons. The results revealed that maximum diameter (24.91cm) was obtained control treatment while minimum diameter (21.82cm) was resulted for the cocoons treated with amoxil. The cocoon weight was more in Amoxil treatment which was (0.67gm) and lower in (control) which was (0.28g).Highest cocoon length was obtained in streptomycin which was (46.19cm) where as lowest (44.19cm) was recorded in Amoxil. It is concluded from the present findings that amoxil can be used for more cocoon shell weight and streptomycin for more cocoon length.

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Introduction

Silkworm, *Bombyx mori* has been domesticated for silk production for over 4,000 years. Silk is "the queen of fibers" because it is a smooth, shining, fabulous and unique natural fiber produced by silkworms. Nowadays, silkworm is an insect of economic importance to Asian countries like China, India, Thailand, Vietnam and many other developing countries. In Thailand, sericulture is an important environmentally sustainable agro-industry activity practiced for centuries. Thailand is the most international reputation as a producer of high quality silk and silk products. Presently, the Thai silk has become world-famous for its quality and unique character. The popularity of Thai silk among customers in Thailand and in other countries all over the world stems from its distinctive beauty, consummate craftsmanship, soft and smooth texture, iridescent sheen, attractive colors and artistic designs which set it apart from silk elsewhere (Ministry of Agriculture and Cooperative, 2002).

Sericulture is a science of rearing silkworm for commercial production of raw silk and includes the operations, which are required for the production of silk fiber (Karishnaswami et al., 1973). It is estimated that more than 3000 silkworm strains are available all over the world due to various ongoing breeding programs (Thangavelu et al., 2003). The maintenance of pure silkworm genetic resources has become very important for meeting the desired objectives of the breeder for in mediate or long-term utilization in silkworm seed production. For race improvement a good stock of paternal races or lines is necessary because the principal objective of silkworm breeding is the improvident of the gene pool in various characters useful in practical sericulture. It is necessary to maintain the genetic resources in their original form for their rational use in different breeding and other research purposes (Yamaguchi, 2003). In addition to maintenance systematic study of resource material is also very important, not only for classification and characterization of varieties but also for the selection of promising parents to initiate various breeding programs to ensure silkworm seed production on sustainable basis. Evaluation of genetic material also helps in identification of lines with special characters like longer filament length, fine denier, stress resistance, disease resistance, etc. (Li et al., 2009).

Availability of diverse genetic stock gives sample choice for the breeder in selection of initial parents of his desire. Even half of a good silkworm egg laying from a good genetic stock can potentially transform the sericulture scenario to a greater extent (Chandrashekaraiah and Babu, 2003). Most of the damage to sericulture can be attributed directly to silkworm diseases, unfavorable weather conditions and poor harvest of mulberry leaves. Therefore, prevention of silkworm diseases and breeding of a silkworm variety with high productivity are important commercial aspects of sericulture. Although there are several commercial species of silkworms, however, mulberry silkworm, *Bombyx mori* (Lepidoptera: Bombycidae) is the most widely used.

Sericulture or silk production, from the mulberry moth, *B. mori* has a long and colorful history. This insect is the sole living species in its family. Bombycidae and has been domesticated for so long that it probably no longer survives in the wild (Borror and DeLong, 1960). In Pakistan Sericulture is practiced in all the four provinces and Azad and Jammu Kashmir (AJK); however, the main sericulture activities are practiced in AJK and around the irrigated forest plantations (Anonymous, 1990). Besides silk used in manufacturing of cloth, it is also used in making of surgical threads, artificial blood vessel, tire lining, parachute, electric insulating material, oil, protein and artificial vitamins; even its waste material (excreta) is used as artificial diet for animals and as green manure for crops (Ishfaq and Akram, 1999). In textile industry it provided with adequate raw silk, Pakistan can not only save its precious foreign exchange, but can also improve its economy by exporting the surplus commodity. Since the majority of population lives in rural areas including man, women and children can increase their income through rearing of *B. mori* in their spare time. The process of rearing is completed before wheat harvest. Even they can easily get two generations of *B. mori* one after the other (Ishaq and Akram, 1999). Mulberry silkworm adults are creamy white in colour with several faint brownish lines. They do not feed, rarely fly and usually live only for a few days. Mulberry silkworms have complete metamorphosis that is their life cycle passes through four stages, egg, larva, pupa and moth (adult) (Anonymous, 1998). Each female lays 300 to 500 eggs and eggs hatch in about 12 days. The larvae of mulberry silkworm are caterpillars that are about 40 cm long, including their horned tail. They are buff-colored with brown thoracic markings. The adults are moths with a 4.0 cm wingspan. They are also buff-colored, but have thin brown lines on their whole bodies (Herbison-Evans, 1997).

For raw silk production, the pupae are killed, a process called stifling. Before adults emerge, otherwise the emergence of the moths makes the fibers into pieces. Each cocoon is composed of single thread of about 900-1200 m long. About 3000 cocoons are required to make a pound of silk (Borror and Delong, 1960.). All the major pathogenic microbes cause disease in silkworm and the most common among them are nuclear polyhedrosis, bacterial and viral flacherie, muscardine and pebrine. Bacterial flacherie are caused primarily by *Serretia marcesens*, *Streptococcus* sp., and *Staphylococcus* sp. Muscardine is caused normally by *Beauveria bassiana* and *Spicaria prassina*. Pebrine a dreaded uncommon disease is caused by *Nosema bombycis*, and several other microporidians, *Variomorpha*, *Pleistophora*, *Thelophania*, etc. Flacherie is a syndrome associated with bacterial diseases. Diseased/dead silkworms, their faecal matter, contaminated mulberry leaves and rearing appliances act as sources of infection. Wide fluctuation in temperature and humidity with poor quality mulberry leaves are the major predisposing factors for flacherie. During the initial stages of infection the larva becomes lethargic and stops eating. At an advanced stage infection the larva exhibits retarded growth, vomits gut juices and excretes semi solid feces. The larva becomes soft and translucent. Finally the larvae ferments and the inner content turns into a black coloured liquid, which emits foul odors. The other symptoms include flacherie (bacterial) lose appetite, sluggishness of worms with slow growth, shrinkage, swelling of thorax. appearance of brown speeks on skin, straightened appearance of body, oral and anal discharge, liquefaction of inner organs, rupturing of skin and oozing out of foul smelling brown liquid (Samson, 1995). The present study has been aimed with the objectives to determine the effect of antibiotics on silkworm larval development and economic cocoon traits of *B. mori.*

Materials and methods

The experiment was conducted with the objective to study the effects of antibiotics (amoxil, streptomycin sulphate) treatment on larval and economic cocoon traits *B. mori*. The research work was carried out in the Sericulture laboratory of Pakistan Forest Institute, Peshawar during Autumn Silkworm rearing season, 2015. Materials used in the experiment were rearing shed, rearing wooden trays, clearing nets, paraffin paper, cocoon, basket for leaves, feeding basket, mulberry storing box, thermometer, mulberry leaves, chopping tools, sterilizer, sprayer, humidifier, heaters, incubation chamber and black box digital balance and antibiotics. Before starting rearing all the instruments/equipment were disinfected with 2.0 % formalin solution. All the cracks and crevices were sealed in the rearing room. After that all parts of the rearing room including floor, ceilings and walls were sprayed with 2% formalin solution. The room was kept close for 48 hrs at 24±1°C.

Disinfection of eggs

The egg cards were disinfected by dipping in 2.0% formalin solution for 10 minutes. The egg cards were dried at room temperature. After drying, the eggs were incubated at 25^{o}C and 75±5% relative humidity. Then at blue eye stage (after 8 days of start of incubation) eggs were transferred in black box. The eggs were kept in black boxes for 48 hours and then exposed to light for hatching. The egg hatching started immediately after exposure to light and 90% hatching was accomplished within 4 hrs. The neonates were transferred into wooden tray and were feed on mulberry leaves five times daily. The larvae were reared adopting standard rearing protocols.

Preparation of larvae for treatments

After 3rd molt, 150 larvae of hybrid strain 75PO* J-101 were selected at random and sorted into four replications, 25 larvae per replication. There were three treatments of amoxil at the rate of 0.5%, streptromycin at 0.5% and a control. The required dose rates were prepared using distilled water, while in control only distilled water was used. The 10mulberry leaves were dip in the solutions. The treated leaves were dried at room temperature. The larvae after bed cleaning of 1stfeed of 3rdinstar were fed with sprayed leaves. The larvae were reared at 25±2°C with 70±5% relative humidity. The larval mortality was recorded daily, as well as in pupal stage. Besides, economic cocoon characters were recorded. The parameters that were studied in present research are:

Shell weight of cocoon

The cocoon selected randomly to weight and 15cocoons were taken from each bed. The weight was taken through digital weight balance.

Length of cocoon

The length of cocoon was measured with the help of vernier calliper. All the cocoons were selected randomly to measure their lengths.

Diameter of cocoon

The diameter of cocoons was determined with the help of Screw Gauge by randomly 15 selected cocoons.

Results and discussion

To study the effect of antibiotics on larval development and cocoon traits cocoon *B. mori* experiment was carried out in the Sericulture laboratory of Pakistan Forest Institute, Peshawar during Autumn Silkworm rearing season, 2015. The results of parameters are described and discussed below.

Diameter of cocoon (cm)

The diameter of cocoons calculated from control and streptromycin was almost similar i.e., 24.91 and 24.16cm, respectively as compared to amoxil where the diameter was recorded 21.82cm (Table 1).

Table 1. Effect of Antibiotics on larval development and economic cocoon traits of *B. mori* during 2015.

Treatment	Replication	Diameter (cm)	Length (cm)	Weight with floss (mg)	Weight without floss (mg)	Shell weight (mg)	Cocoon shell ratio (%)
Amoxil	1	13.82	28.82	0.82	0.81	0.15	17.64
	2	16.01	30.75	1.12	1.11	1.11	99.10
Mean		21.82	44.19	1.38	1.36	0.67	67.19
Streptomycin sulphate	1	15.24	30.34	1.12	1.50	0.21	17.85
	2	17.84	31.71	1.51	1.08	0.24	20.86
Mean		24.16	46.19	1.87	2.04	0.33	28.28
Control	1	17.13	30.61	1.13	1.12	0.18	15.92
	2	15.57	29.39	1.00	1	0.21	21
Means		24.91	44.69	1.56	1.56	0.28	28.96

Length of cocoon (cm)

The results in Table 1 show that more length (46.19) was obtained in streptromycin treatment and lower value was recorded in treatment amoxil which was 44.19. In control the cocoon length was 44.69cm.

Weight of cocoon and cocoon shell ratio

The data recorded regarding weight of cocoons are described in Table 1. Data regarding weight of shell showed little effect of amoxil treatment. The highest mean weight of cocoon was recorded in amoxil treatment i.e., 0.67 while the lowest in control which was recorded 0.28 mg. Data in Table 1 further indicate that cocoon shell ratio was recorded more (67.19) in amoxil treatment. The cocoon shell ratio recorded in streptromycin and control was 28.28 and 28.96 respectively. Diameter of cocoons was more in control and streptomycin sulphate and found less in amoxil but length of cocoon was recorded more in Streptomycin sulphate than amoxil and control treatment. Result further indicated that weight of cocoon and cocoon shell ratio was more in amoxil and less in Streptomycin and control treatment. The reason may be due to the effect of amoxil against diseases that gives more cocoon weight and cocoon shell ratio.

Conclusion

It can be concluded from the present experiment that chemical (amoxil) treatment has more effect on cocoon shell ratio as compared to streptomycin.

Recommendations

On the basis of the study findings it is recommended that amoxil treatment @ 0.5% should be used for getting more shell weight and shell ratio.

Conflict of interest statement

Authors declare that they have no conflict of interest.

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