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Improving mulberry silkworm *Bombyx mori* L. rearing by using some antibiotics.

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Abstract

The present study aimed to investigate the impact of using three antibiotics on mulberry silkworm *Bombyx mori* L. were investigated. Those antibiotics were Ibidroxil (250mg) containing cefadroxil monohydrate, Cefaclor (250mg) containing cefaclor and Rame-dinir (250 mg) active ingredient was cefdinir. Three concentrations of each antibiotic were prepared (10,50 and 100mg).

Mulberry leaves soaked in each concentration and introduced to the 4th instar larvae and continuos till to matured larvae. Nineteen economic characters were studied. Insignificant differences were recorded in all treatments for all characters under study except FD and TD. Lowest average values were recorded for control followed by blank treatment. Highest averages were registered for ibidroxil followed by cefaclor and Rame-dinir treatments.The best averages were observed for highest concentration 100 mg followed by 50 mg and 10 mg. So that, the application by any concentration for all antibiotic under study was enhanced the economic characters of silkworm, *Bombyx mori* L.

Keywords: Mulberry silkworm, Rearing, Antibiotics, Economics characters

Introduction

Silkworm, *Bombyx mori* L. is a monophagous insect reared-only on mulberry leaves during its larval stages of its life cycle(**Kumar and Prashanth, 2018)**.It is an important economic insect is being used as a tool to convert mulberry leaf protein into silk. The utilization of silkworm for the production of natural silk in the form of cocoons has been exploited worldwide **(Shruti *et al.* 2019).**

One major of challenges in silkworm rearing is its susceptibility to a number of diseases. Silkworm, *Bombyx mori* was very sensitive to various diseases because of itswide spread over about forty-four centuries. These diseases caused by microsporodia, bacteria, viruses and fungi **(Doresway *et al.* 2004).**

Diseases management of mulberry silkworm considered one of the most necessary items of successful silkworm rearing for raising yield and quality of cocoons. Suitable disinfection of the rearing room, rearing tools and rearing bed help in the protection and control the silkworm diseases and maintains hygiene for cocoon production **.(Liu and Zhong 1988;Sengupta *et al.*1990; and Babu *et al.*2009).**

Inall leading diseases widespread in silk producing countries caused losses estimated to be about 30 percent of total loss **(Selvakumar *et al.*2002).** Indian sericulture has been loss in crop due to silkworm diseases by different pathogens viz., viruses, fungi, bacteria and microsporodia. Unsuitable disinfection and unhygienic rearing conditions lead to this infection by various silkworm diseases**.(Selvakumar *et al.*2002; Swathi *et al.*2014; andRasool *et al.*2018).**

Every year the losses of cocoon in Egypt ranged between 38- 46% because of diseases infections, rearing procedures and other factors. Improving silkworm rearing technique is very important to increase cocoon crops quantity and quality. Consequently, the profit and return will be raise **(Ghazy *et al.* 2020).**

The aim of this experiment is increase the cocoon crops as well as decrease the mortality percentage. Inaddition, enhancement the silkworm economic characters using some antibiotics .

Materials and Methods

Mulberry *Morus alba* var Kokuso-27 used for feeding silkworm larvae. Chopped leaves were offered to young silkworm. Whole mulberry leaves offered for grown silkworm three times daily. Wet foam strips and polyethene sheets used as bottom and cover for young instars **(Ghazy, 2008)**.Collapsible farms were provided to mature silkworm for spinning cocoons. Silkworm larvae were reared under normal conditions of temperature 22.54± 1.606 and relative humidity 60.27±6.35%. Silkworm eggs were

obtained from Agricultural Research Center –Giza Egypt.

Three antibiotics were investigated

1- Ibidroxil (250mg) containing cefadroxil monohydrate manufactured by smithkline – Giza Egypt for GlaxoSmithKline, Cairo – Egypt.
2- Cefaclor (250mg) containing cefaclor manufactured by Ranbaxy Egypt.
3- Rame-dinir (250mg) active ingredient was cefdinir, manufactured by tenth Ramadan for pharmaceutical industries and diagnostic reagents.It coded as Ibidroxil, Cefaclor and Rame-dinir , respectively.

Three concentrations of each antibiotic were prepared. Each concentration represented by three replicates. These concentrations were 10, 50and 100 mg per liter. Distilled water was used for diluting and preparing different concentrations. Also treatment with distilled water this treatment was blank treatment. In addition to non- treated treatment represented the control treatment.

Mulberry was soaked in each concentration for thirty minutes. Treated leaves were exposed to electrical fan to drying the leaves. Treatments were started from beginning of fourth to matured larvae.

Immature larval weight (ImW), mature larval weight (MW), fifth Larval instars duration (FD), total Larval duration (TD) were recorded.

Percentage of larval mortality (LM) was registered during 5^{th} instars by using formula of **Megalla formula (1984).**And also, the fresh cocoon weight (CW), cocoon shell weight (CSW), pupal weight (PW), cocoon shell ratio (CSR), cocoon per liter (C/L) and cocooning percentage (CP) were registered.

The pupation ratio (PR) was calculated according to the following formula of **Goudar and Kaliwal (2000):**

$$\textbf{Pupation ratio}(\%) = \frac{\text{Number of healthy pupae}}{\text{Correct basic number of examined}} x100$$

Estimation of silk productivity (SP) was adopted by the following equation of **Chattopadhyay *et al.* (1995):**

$$\textbf{Silk productivity}\ (\textbf{cg/day}) = \frac{\text{Cocoons shell weight (cg)}}{\text{Fifth instar duration (day)}}$$

Where cg: Centigram

Hatching percentage (HP), fecundity (Fecun),Fertility percentage (Fertil), Length of filament (LF) , weight of silk filament (FW) and Size of silk filament (SF) were observed.

Statistical analysis

Statistic analyzed were used the program **Costat software**.(1988)for all data under investigation.

Results and Discussion

Data in Table.(1). show the effect of antibiotics treatments concentration on characters on *Bombyx mori* L. There were no significant differences were appeared for all characters except CP and C/L traits.

All concentrations of treatments were better than blank and control. Concentration 100 mg of all treatments was the best for all traits under investigation.

These results are coincidences with those founded by **Savithri (2007)** who recorded that, using antibiotic improving general health of Silkworm, in reducing their mortality due to bacterial infection and in improving the economic parameters in infected worm by reverting them to words the d condition reveals that pre-treatment with antibiotic could be an effective guard for prevention ahealthy ones. Better performance under post-inoculated condition compared to the pre-inoculatend/or control of bacterial disease. In addition to this, the antibiotics improved the performance of the healthy larvae at the same time the antibiotics had no adverse effects, antibiotics mat be suggested for regular use in the rearing practices irrespective of the incidence of disease or its absence for batter rearing performance and economic productivity.

Table 1. Effect of antibiotic treatments and its concentration on the characters of mulberry silkworm, *Bombyx mori* L.

characters / Treatments		ImW	MW	FD (day)	TD (day)	CP (%)	LM (%)	C/L (No)	PR (%)	Fecun (No.of eggs)	Fertil (%)	HP (%)	FW	FL	FS
Ibidroxil	10 mg	0.968	2.985	9.580	30.580	74.333	17.000	96.800	87.000	345.000	94.070	95.090	0.172	852.100	1.828
	50 mg	0.971	3.105	9.540	30.540	77.667	11.667	94.800	89.000	347.000	95.230	95.980	0.176	857.000	1.857
	100 mg	0.978	3.165	9.500	30.500	86.333	11.000	84.000	92.000	395.000	96.400	97.710	0.179	865.000	1.870
Cefaclor	10 mg	0.934	2.908	10.600	31.600	61.000	19.667	98.800	82.000	342.600	89.620	93.780	0.152	795.500	1.728
	50 mg	0.963	3.034	10.580	31.580	62.667	15.000	97.600	81.000	352.000	90.910	94.210	0.169	836.500	1.825
	100	0.9	3.0	10.	31.	78.33	16.	96.4	84.	365.	92.	94.	0.1	847.	1.8

	mg	72	75	560	560	3	667	00	000	000	760	760	70	000	26
Rame-dinir	10 mg	0.931	2.769	10.650	31.650	62.667	28.667	98.800	78.000	301.300	85.050	92.530	0.153	804.000	1.705
	50 mg	0.941	2.881	10.670	31.670	64.000	25.000	97.600	82.000	300.200	88.280	93.400	0.158	826.500	1.711
	100 mg	0.964	2.917	10.630	31.630	66.667	21.000	95.200	82.000	330.800	90.270	94.100	0.168	849.000	1.787
Blank		0.888	2.714	10.770	31.770	39.667	36.667	100.800	70.000	248.900	84.450	83.230	0.125	728.000	1.545
Control		0.840	2.323	10.833	32.160	36.333	39.666	104.800	68.000	245.100	80.850	79.930	0.121	727.200	1.531
F Treatments X Concentrations		0.371	0.894	0.002	4.330	12.308**	1.071	4.422**	0.347	1.110	0.515	0.480	0.928	0.370	0.319
LSD		-	-	-	-	3.475	-	2.591	-	-	-	-	-	-	-

Immature larval weight (ImW), mature larval weight (MW), fifth Larval instars duration (FD), total Larval duration (TD), cocooning percentage (CP), larval mortality (LM), cocoon per liter (C/L), pupation ratio (PR), fecundity (Fecun),Fertility percentage (Fertil), Hatching percentage (HP), weight of silk filament (FW), Length of filament (LF) , and Size of silk filament (SF) .

Data in Table.(2). show the effect of antibiotic treatments concentration on technological characters of *Bombyx mori* L. Highly significant differences were observed for the interactions between treatments and concentrations. All concentrations for all treatments were better than blank and control treatments. The concentration 100 mg was the best concentration for all treatments under investigations. Treatment Ibidroxil was the best treatment for all concentrations followed by cefaclor and Rame-dinir treatments.

The previous results are compatible with the findings of **IqraRafiq *et al.*, (2021a)**Who demonstrated that, among the three antibiotics evaluated on silkworm *Bombyx mori* L. ,ceftiofur sodium showed best results followed by oxytetracycline and enroflaxcin. It was found that improved results were obtained with an increase in concentration of an antibiotic, ceftiofur sodium (0.15%) showed significantly improved results in economic parameters like cocoon characters,cocoon yield, average filament length, raw silk percentage and filament denier. So, present investigation reflected that antibiotics have the potential to be used for enhancing the cocoon and raw silk production.

Table 2. Effect of antibiotic treatments and its concentration on the characters of mulberry silkworm, *Bombyx mori* L.

characters Treatments		FCW	CSW	PW	CSR	SP
Ibidroxil	**10mg**	1.349	0.261	1.090	19.420	2.727
	50mg	1.354	0.266	1.089	19.804	2.790
	100mg	1.375	0.271	1.095	19.942	2.855
Cefaclor	**10mg**	1.279	0.227	1.034	17.884	2.150
	50mg	1.300	0.233	1.056	17.796	2.191
	100mg	1.363	0.238	1.066	18.114	2.257
Rame-dinir	**10mg**	1.230	0.200	0.996	17.134	1.972
	50mg	1.198	0.209	0.983	16.841	1.888
	100mg	1.235	0.213	1.014	17.366	2.009
blank		1.122	0.179	0.945	16.019	1.664
control		1.075	0.159	0.893	14.882	1.486
F Treatments x Concentrations		13.429**	92.846**	42.761**	29.942**	143.997**
LSD		0.038	0.009	0.034	0.559	0.088

Fresh cocoon weight (FCW), cocoon shell weight (CSW), pupal weight (PW), cocoon shell ratio (CSR), and silk productivity (SP).

Data in Table (3). show effect of antibiotic treatments , Concentration and the Sex individuals on technological characters of mulberry silkworm, *Bombyx mori* L. The significance between treatments, concentrations and sexes were highly. All concentrations for all treatments are better than blank and control. All concentrations of Ibidroxil treatment were better than other treatments for females and males. Concentrations 100 mg of all treatments is the best concentration for both sexes.

These results are coincidence with those founded by **Rahmathulla, &Nayak,. (2017)and IqraRafiq *et al.*, (2021b)**who reported that, it was found that improved results were obtained with an increase in concentration of an antibiotic showed significantly improved results in economic parameters like cocoon characters, cocoon yield, average filament length, raw silk percentage and filament denier. So, present investigation reflected that antibiotics have the potential to be used for enhancing the cocoon and raw silk production.

Table 3. Effect of antibiotic treatments, concentration and the sex individuals on technological characters of mulberry silkworm, *Bombyx mori* L.

Characters		FCW		CSW		PW		CSR		SP	
Treatments		**female**	**male**	**female**	**male**	**female**	**male**	**female**	**male**	**female**	**male**
Ibidroxil	**10mg**	1.484	1.215	0.281	0.241	1.212	0.968	19.033	19.808	2.936	2.518
	50mg	1.490	1.218	0.283	0.250	1.214	0.965	19.052	20.557	2.963	2.618
	100mg	1.518	1.223	0.291	0.252	1.219	0.972	19.227	20.658	3.060	2.651
Cefaclor	**10mg**	1.393	1.165	0.247	0.208	1.160	0.908	17.760	18.009	2.331	1.969
	50mg	1.407	1.194	0.251	0.216	1.169	0.944	17.848	18.109	2.336	2.046
	100mg	1.425	1.203	0.257	0.219	1.174	0.958	17.947	18.281	2.435	2.079
Rame-dinir	**10mg**	1.268	1.192	0.203	0.197	1.053	0.940	16.903	17.365	1.995	1.950
	50mg	1.218	1.179	0.212	0.207	1.007	0.959	16.818	16.865	1.947	1.830
	100mg	1.275	1.195	0.217	0.209	1.075	0.954	17.047	17.685	2.050	1.968
blank		1.132	1.113	0.177	0.181	0.950	0.939	15.655	16.384	1.646	1.683
Control		1.086	1.064	0.154	0.164	0.912	0.874	14.269	15.495	1.422	1.551
F Treatments X Concentrations X Sexes		4.036**		29.452**		13.532**		7.691**		45.941**	
LSD		0.055		0.012		0.049		0.791		0.125	

fresh cocoon weight (FCW), cocoon shell weight (CSW), pupal weight (PW), cocoon shell ratio (CSR), and silk productivity (SP).

Conclusion

Three antibiotics were selected for investigation. These were Ibidroxil, Cefaclor and Rame-dinir. Three concentrations of each antibiotic were used. Results indicated that, insignificant differences were recorded in all treatments for all characters under study except FD and TD. Lowest average values were recorded for control followed by blank treatment. Highest average were registered for Ibidroxil followed by Cefaclor and Rame-dinir treatments. The best averages were observed for highest concentration 100 mg followed by 50 mg and 10 mg.So that, the application by any concentration for all antibiotic under study was enhanced the economic characters of silkworm *Bombyx mori* L.

References

Babu, K. R.; Ramakrishna, S., Reddy, Y. H. K.; Lakshmi, G.; Naidu N. V.;Basha, S. S.(2009). Metabolic alterations and molecular mechanism in silkworm larvae during viral infection: A review. Africa Journal of Biotechnology , 8:899-907.

Chattopadhyay, S.; Das, S. K.; Roy, G. C.; Sen, S. K. and Sinha, S. S. (1995):Heterosis analysis on silkproductivity of three-way crosses in *Bombyx mori* L. Sericologia, 35(3):549 – 551.

Costatsoftware. (1988). Microcomputer program analysis, CoHort software, Berkely,CA,USA.

Doresway, C.;Govindan, R.;Devaiah, M. C.;Muniswamappa, M. V. (2004). Deterioration of cocoon traits of silkworm, *Bombyx mori*.L. by the synergistic infection with late larval flacherie pathogens.

Karnataka Journal of Agricultural Science , 17:345-348.

Ghazy,M. U.(2008). Rearing first three instars of mulberry silkworm *Bombyx mori* L., under polythene cover. Bull. Ent. Soc. Egypt , 85:271-279.

Ghazy,M. U.;Ghada, M. A.;Tahia, A. F. (2020). Improving mulberry silkworm rearing using powders of lime and wood ash and its effects on productivity. International Journal of Entomology Research, 5(3): 106-109.

Goudar, K. S. and Kaliwal, B. B. (2000). Effect of hydrochortison on the economic parameters of the Domestic silkworm, *Bombyx mori* L. InternationalJournalEntomology, 1(1): 41 – 45.

IqraRafiq, Z. I.;Buhroo, K. A.;Sahaf, B. A. ;Padder, N. A.;Ganie, S. A.; Mir, M. F.;Baqual, Shahina A.;Nagoo and Sabiha Ashraf (2021a). Effect of Antibiotics on the Rearing Performance of Silkworm *Bombyx mori* L. International journal of Current Microbiology and Applied sciences, 10(03):1-7.

IqraRafiq, Z. I.; Buhroo,K. A.; Sahaf, N. A.Ganie and MF Baqual (2021 b).Role of antibiotics with reference to growth and development of silkworm *Bombyx mori*L. The Pharma Innovation Journal,10(3): 150-154.

Kumar, M. N. and Prashanth, J. (2018). Influence of mulberry leaf with soyabean flour supplemention on the economic traits and amino transferases activity in *Bombyx mori* L. International Journal of Zoology Studies,3(2): 59-64.

Liu, S. X. and Zhong,W. B.(1988).The research channels in the prevention & control of silkworm diseases: review. Sericologia, 29(3):287-295.

Megalla, A.E. (1984). Effect of certain dietary constituents on silkworm. ph. D. Thesis Faculty Agriculture Ain Shams University,Egypt.

Rahmathulla, V. K. &Nayak, P.(2017).Effect of antibiotic administration on growth and development of silk gland in mulberry silkworm (*Bombyx mori* L.).Munis Entomology& Zoology, 12 (1): 41-49.

Rasool, S., Ganie, N. A.;Wani, M. Y.; Dar, K. A.; Khan, K. A.(2018). Evaluation of a suitable silkworm bed disinfectant against silkworm diseases and survivability under temperate conditions of Kashmir. International Journal of Chemical Studies , 6(1):1571-1574.

Savithri, G. (2007). In vivo effect of antibiotics on silkworm *Bombyx mori*L. Infected with *Bacillus Coagulans* International. Journal Industrial Entomology,1(9):9-16.

Selvakumar, T. B.;Nataraju, M.;Balavenkata, S.;Sivaprasad, V. andBaig, M.A .(2002). Report on the Prevalence of silkworm bed disinfectant management in silkworm crops. Proceedings of the National Conference on Strategies for Sericulture Research and Development, November 16-18, Central Sericultural Research and Training Institute, Mysore, India.

Sengupta, K; Kumar, P;Baig, M,;Govindan, S.(1990). Diseases of mulberry silkworm and their control. In Hand book on pest and disease control of mulberry and silkworm, ESCAP Publications, Bangalore: 52-55.

Shruti,Ashoka,J.;Hadimani,D.K.;Sreenivas, A.G.; and Beladhadi,R.V.(2019). Economics of probiotic feed supplementation to mulberry silkworm. Journal of Pharmacognosy and Phytochemistry, 8(6): 749-753.

Swathi, H. C.;Vijayendra, M.;Nagaraj, S. B.(2014). Revalidation of bed disinfectant practices followed by farmers in the rearing of silkworm Bombyx mori L. Journal of Agriculture and Veterinary Science, 7:1-7.