EFFECT OF *BEAUVERIA BASSIANA* INFECTION AND SUBSEQUENT DUSTING OF PLANT POWDER ON LARVAL WEIGHT IN PM AND CSR2 *B. MORI* L.

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Abstract :

In the present work evaluation of plant powder based on larval weight parameter of silkworm, *Bombyx mori* L. PM and CSR2 were recorded. The effect of plant powder dusting on *Beauveria bassiana* inoculated groups which was more or less similar with control group from 3rd day to spinning of larvae. Due to dusting of plant powder high larval weight was also observed as compared to control group.

Keywords : Bombyx mori, Beauveria bassiana, larval weight

Introduction :

Sericulture has attained unique status as an important cash crop in several states in India. However, despite the best efforts and implementation of modern techniques, the overall return from the sericultural activities is quite discouraging, mainly due to the incidence of various diseases like Protozoan, Bacterial, Viral, and Fungal. High temperature and humidity prevalent in tropical regions is conductive to proliferation of these diseases.

The abiotic or environmental factors such as temperature, relative humidity, photoperiod etc. have direct effects on health of silkworm during its larval stage and unfavorable weather conditions that lead to poor harvest of mulberry. The abiotic factors affect the growth and development of silkworm and predispose the silkworm to the biotic causes i.e. infectious diseases. The biotic factors responsible for low cocoon crop production are the silkworm diseases caused by Protozoan, Bacterial, Viral and Fungal (Jhanshi and Kaiser, 2002).

It is well-known that silkworms are exposed to infectious diseases during larval stage; multivoltine breeds such as pure Mysore are less susceptible to diseases compared to bivoltine breeds. In India, the annual crop loss due to disease has been estimated to be around 35 - 40%. In Karnataka, 5-20% of crop loss occurs due to muscardine, in that more than 20% of Chawki worms suffer from muscardine, followed by 5% due to grassarie and 7.3% due to pebrine. The cocoon crop loss due to flacherie disease

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alone contributes 20-40%. It is well known that, all disease causing pathogens attack silkworm during early or chawki stage and the bad effects are manifested during late stage (Dinesh, 1995). Out of 5-6 crops per year at least two cocoon crops are usually lost due to diseases. Outbreak of disease is major problem for progress of sericulture industry in India (Dinesh, 1995).

Now days the efforts were made to promote the use of botanicals as possible alternatives to treat infectious diseases (Mohsenzadeh, 2007; Jazani *et al.,* 2009; Chanda, 2011). The natural products were found to possess promising antimicrobial activities when applied alone or in combination with conventional antimicrobial drug (Jazani, 2009). (Kumar *et al*., 2009) and Manimeghalai *et al.,* (2000) used plant products and succeeded to grasserie disease (caused by nuclear polyhedrosis virus) in mulberry silkworm, *Bombyx mori* L .

The present work has been undertaken for the management of the fungal disease causing damage to silkworm. The plants powder used for management of disease are having antimicrobial activity which shows the positive results.

MATERIAL AND METHODS

1) Experimental animals: The disease free layings of popular pure multivoltine race Pure Mysore (PM) and Bivoltine CSR2*B. mori* L. used in present study and was obtained from the Government sericulture grainage center, Shahupuri, Kolhapur, for laboratory rearing. The larvae were reared as per the method of Krishnaswamy (1978, 1979).

2) Antifungal plants: For the present work, the plants *Curcuma longa, Argemone mexicana, Clerodendrum multiflorum* were selected on the basis of earlier reports and by arranging preliminary screening experiments for plant powder.

RESULT AND DISCUSSION

Effect of the inoculation of *B. bassiana* and subsequent dusting of plant powder effects on larval weight of PM and CSR2 larvae were studied. The effect of inoculation and subsequent dusting of plant powder on PM and CSR2 larval weight were recorded from 1st day of 5th instar to 7th day of 5th instar which are shown in **Table No. 1.**

In the control groups of PM larval weight was 3.53gm and CSR2 larval weight 7.41gm. In inoculated group larval weight of PM was 3.56gm and CSR2 was 7.40gm. The dustings of plant powder were used to study the effects on inoculation with *B. bassiana* on larval weight of both races. The PM larvae were dusted with *C. longa* plant powder showed 3.56gm larval weight while, CSR2 larvae showed 7.11gm larval weight. The dusting of *A. mexicana* on larvae of PM resulted 3.70gm larval weight and in CSR2 was 7.10gm. The dusting of plant powder of *C. multiflorum* on 1st day of inoculation with fungus showed larval

weight in PM 3.50gm and in CSR2 7.04gm. These weights were before giving the treatments due to which the minor variations existed in natural weights of the normal population of the larvae.

On 2nd day of infection with *B. bassiana* the control groups showed larval weight in PM 4.53gm and in CSR2 10.04gm. In the inoculated groups of PM and CSR2 the recorded larval weight were 4.37gm and 8.34gm respectively. The dusting of plant powder *C. longa* used against *B. bassiana* in PM and CSR2 resulted in to larval weight as 4.47gm and 10.03gm respectively. In *A. mexicana* dusting groups of larvae of PM resulted in to 4.43gm larval weight and in CSR2 larval weight was 9.25gms.

The inoculated group of PM showed decreased larval weight by 3.61% while in CSR2 the larval weight also decreased by 16.90%. Dusting of *C. longa* after inoculation of *B. bassiana* in the larval weight observed non significant change in PM and CSR2 races with 1.41% and 0.16% decrease in their weights respectively. The dusting of *A. mexicana* plant powder showed 2.07% decreased larval weight in PM and in CSR2 the decrease was recorded by 9.63%. The dusting of *C. mulitflorum* resulted in to decreased larval weight in PM 2.20% and in CSR2 race by 7.86%.

The above record showed that, the inoculation of fungus *B. bassiana* on the 2nd day of inoculation in PM and CSR2 affects the larval weights. The dusting of antimicrobial plant powders of *C. longa, A. mexicana and C. multiflorum* helps in improving larval weight in PM race and CSR2 race than the inoculated group in both races.

The effect of *B. bassiana* inoculation and subsequent dusting of plant powder on larval weight in PM and CSR2 were studied on the 3rd day of experiment. The control group of both the races larval weights showed 5.03gm and 16.37gm in PM and CSR2 respectively. The inoculated group by fungus *B. bassiana* resulted in to decreased larval weight in PM (4.42gm) and in CSR2 (10.35gm). Dusting of *C. longa* plant powder affects the larval weights of PM 5.02gm and CSR2 was 16.18gm. In group of dusted with of *A. mexicana* showed larval weight in PM 5.12gm and in CSR2 14.47gm. The dusting of *C. multiflorum* powder after inoculation of *B. bassiana* showed larval weights of PM and CSR2 were 5.07 gm and 14.14gm respectively.

In PM dusting of *C. multiflorum and A. mexicana* resulted into the minor increased larval weight, while *C. longa* showed slight decrease in larval weight than the control. In CSR2 all groups of dusting antimicrobial plant powder showed non-significantly decrease in larval weight.

On the 4th day of post inoculation of *B. bassiana* in PM control group showed 8.65gm larval weight while in CSR2 larval weight was 20.69gm. The inoculated group of larvae, weight of PM

group was 6.29gm and CSR2 group was 12.81gm. The dusting of *C. longa* plant powder resulted in to increased PM larval weight (9.603gm). In CSR2 dusting of *C. longa* plant powder showed increased larval weight (22.90gm) than the control group during experimentation. In PM and CSR2 races dusting of *A. mexicana* reported 8.82gm and 19.87gm larval weight respectively. The larval weight record in PM race was 8.91 gm and in CSR2 race was 19.033gm when dusting of *C. multiflorum* was done.

On the 4th day *B. bassiana* inoculated group of PM showed decreased larval weight by 27.20% while in CSR2 race larval weight was decreased by 38.09%. The dusting of *C. longa* powder recorded increased larval weight by PM (11.01%) and CSR2 (10.67%). Dusting of *A. mexicana* on PM larvae showed increased larval weight by 1.96%. The dusting of *A. mexicana* in CSR2 showed non-significant decreased larval weight by 3.96%. In *C. multiflorum* powder dusted group of PM recorded non-significantly increased larval weight by 3.04% and in CSR2 races recorded decreased larval weight by 8.03%

On the 5th day of treatment larvae of control group of PM showed weight 9.63gm and in CSR2 weight was 24.49gm on fifth day fifth instar. The *B. bassiana* inoculated larval weight was 7.47gm in PM and in CSR2 was 14.44gm. Dusting of *C. longa* powder showed 10.43gm larval weight in PM and 24.89 gm larval weight in CSR2. Dusting of *A. mexicana* recorded 10.02gm larval weight in PM and 22.95gm larval weight was observed in CSR2. When *C. multiflorum* plant powder was used for dusting in PM race 9.33gm was observed larval weight while in CSR2 larval weight was 23.18gm.

Due to dusting of *C. longa* after inoculation of fungus *B. bassiana* on the 5th day larval weight of PM increased by 8.12% while in CSR2 the larval weight was increased by 1.84%. Dusting of *A. mexicana* in PM race observed that increased in larval weight by 3.83% and in CSR2 larval weight was decreased by 6.09%. The dusting of *C. multiflorum* on PM larvae resulted in decreased larval weight by 3.34% and in CSR2 it was 5.18%.

After inoculation of fungus *B. bassiana* on the 6th day of treatment 23.25% reduction of body weight in larvae was recorded in PM race. The reduction of larval body weight by 38.40% due to inoculation of *B. bassiana* in CSR2 race was recorded. Dusting of *C. longa* increased the larval weight by 10.94% in PM and CSR2 larval weight decreased I nsignificantly by 0.92%. Dusting of *A. mexicana* increased larval weight by 1.45% in PM and decreased larval weight by 6.80% in CSR2 was recorded. In PM larval weight minor increased by dusting of *C. multiflorum* while in CSR2 it was decreased by 8.69%.

The present observations revealed that in all the groups due to dusting plant

powders improves the larval weight in PM which was comparable to the control group. In CSR2 results were also on the similar line as observed in PM race.

The control group of PM larval weight was 12.22gm and CSR2 was 27.87gm on 7th day of inoculation experiment. The inoculated group of PM, larval weight was 8.03gm and 17.52gm in CSR2. When *C. longa* dusting was done against inoculation of *B. bassiana* in PM recorded larval weight was 13.52gm while in CSR2 larval weight was 27.23gm. Dusting of *A. mexicana* on PM larvae resulted in 11.89gm larvae weight and CSR2 showed 25.09gm weight. The dusting of *C. multiflorum* in PM race larval weight recorded was 12.78gm while in CSR2 was 25.99gm.

The dusting of antimicrobial plant powders was done against fungus *B. bassiana* in PM and CSR2 races. The inoculated group on the 7th day showed decreased larval weight by 34.26% in PM and in CSR2 race by 37.13%. The dusting of *C. longa* powder increased the larval weight in both PM and CSR2 races. The dusting of *A. mexicana* powder affects the larval weight by 2.70% in PM and CSR2 by 9.97% less. Dusting of *C. multiflorum* showed increased larval weight by 4.75% in PM and in CSR2 recorded decreased larval weight by 6.74%.

The above observation indicates that, on the 7th day of experiment dusting of antimicrobial plant powder of *C. multiflorum* and *C. longa* showed increased larval weight percentage while *A. mexicana* dusting decreased the weight in PM race. In CSR2 race in all group of dusting plant powder resulted in to decreased larval weight percentage as compare to control groups.

The plant products are gaining prominence as antimicrobial agent due to their ecofriendly nature in the treatment of pathogenic diseases. Due the application of plant extract, orally and through dusting of their powders *C. longa, A. mexicana, C. multiflorum* and *B. spectabilis* reduced the mortality caused by the muscardine. Natural plant products are being used by many researchers to control various pathogenic diseases of silkworm (Manimegalai *et al.,* 2010; Kumar *et al.,* 2009). The Murugan *et al.,* (1999) observed the similar results due to application of aqueous extracts of *L. camara, A. indica C. inermae* and *C. sparciflorus* increased the larval, cocoon, silk weight and silk filament length in silkworm *B. mori.* Similar results were also reported by Jayprakash Rao (1998), that maximum larval weight and cocoon characters in case of Eri silkworm due to foliar supplementation of 10% extractives of *Amaranthus spinosus*, *Tridex procumbace* and *parthnium hysterophorus*. The observations of the present study as per the observations of Patil *et al.,* (1997), who observed that the larval weight, cocoon weight, shell weight, shell ratio, effective rate of rearing and fecundity get improved when mulberry leaves to *B. mori* larvae supplemented with *Parthenium* extractives in 1:20 ratio.

Therefore, in the present study plants products used were *C. longa, A. mexicana, C. multiflorum* having the antifungal activity, due to the presence of secondary metabolites found to be useful in reduction of mortality caused by *B. bassina,* having in the improvement in the cocoon yield by saving the silkworm crop over 70%.

Table No. 1: Effect of *B. bassiana* infection and subsequent dusting of plant powder on larval weight (gm) in PM and CSR2 *B. mori* L.

DAYS	RACE	GROUPS (Weight of 10 larvae in gm)				
		CONTROL	INOCULATED	*C. LONGA*	*A. MEXICANA*	*C. MULTIFLORUM*
1	PM	3.537 ± 0.280	3.567 ± 0.050	3.567 ± 0.321	3.707 ± 0.076	3.503 ± 0.050
	CSR2	7.413 ± 0.376	7.400 ± 0.658	7.117 ± 0.291	7.100 ± 0.472	7.040 ± 0.733
2	PM	4.537 ± 0.040	4.373 ± 0.162 **(-3.61)** NS	4.473 ± 0.117 **(-1.41)** NS	4.443 ± 0.185 **(-2.07)** NS	4.437 ± 0.047 **(-2.20)** NS
	CSR2	10.040 ± 0.233	8.343 ± 0.501 **(-16.90)** **	10.023 ± 0.734 **(-0.16)** NS	9.073 ± 0.076 **(-9.63)** NS	9.250 ± 0.484 **(-7.86)** NS
3	PM	5.033 ± 0.051	4.427 ± 0.480 **(-12.04)** NS	5.027 ± 0.080 **(-0.11)** NS	5.123 ± 0.188 **(+1.78)** NS	5.077 ± 0.134 **(+0.87)** NS
	CSR2	16.370 ± 0.445	10.350 ± 0.548 **(-36.77)** ***	16.187 ± 1.577 **(-1.11)** NS	14.470 ± 0.536 **(-11.60)** NS	14.140 ± 0.369 **(-13.62)** *
4	PM	8.650 ± 0.201	6.297 ± 0.439 **(-27.20)** ***	9.603 ± 0.155 **(+11.01)** **	8.820 ± 0.075 **(+1.96)** NS	8.913 ± 0.159 **(+3.04)** NS
	CSR2	20.697 ± 1.127	12.813 ± 0.315 **(-38.09)** ***	22.907 ± 0.850 **(+10.67)** *	19.877 ± 0.111 **(-3.96)** NS	19.033 ± 0.040 **(-8.03)** NS
5	PM	9.653 ± 0.235	7.473 ± 0.232 **(-22.58)** ***	10.437 ± 0.367 **(+8.12)** NS	10.023 ± 0.829 **(+3.83)** NS	9.330 ± 0.087 **(-3.34)** NS
	CSR2	24.447 ± 0.682	14.44 ± 0.630 **(-40.93)** ***	24.897 ± 1.747 **(+1.84)** NS	22.957 ± 1.116 **(-6.09)** NS	23.180 ± 1.730 **(-5.18)** NS
6	PM	10.537 ± 0.215	8.087 ± 0.881 **(-23.25)** ***	11.690 ± 0.331 **(+10.94)** NS	10.690 ± 0.223 **(+1.45)** NS	10.593 ± 0.055 **(+0.53)** NS
	CSR2	26.497 ± 0.770	16.320 ± 0.481 **(-38.40)** ***	26.253 ± 0.439 **(-0.92)** NS	24.693 ± 0.350 **(-6.80)** *	24.193 ± 0.740 **(-8.69)** **
7	PM	12.220 ± 0.192	8.033 ± 0.387 **(-34.26)** ***	13.527 ± 0.312 **(+10.69)** ***	11.890 ± 0.120 **(-2.70)** NS	12.780 ± 0.147 **(+4.75)** NS
	CSR2	27.870 ± 0.932	17.520 ± 0.675 **(-37.13)** ***	27.230 ± 0.654 **(-2.29)** NS	25.090 ± 0.786 **(-9.97)** *	25.990 ± 0.756 **(-6.74)** **

*Values with ± indicate mean with standard deviation, '+' and ' –' indicate percent increase and decrease *, **, *** and NS indicates the significance level P < 0.05, P < 0.01, P < 0.001 and P < 0.05 respective*

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