

## EFFECT OF PARAFORMALDEHYDE, BENZOIC ACID WITH LIME AS BED DISINFECTANT FOR PREVENTION OF DISEASES IN SILKWORM, *Bombyx mori* L.

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The effect of paraformaldehyde and benzoic acid with lime at different concentrations as bed disinfectant for disease control in silkworm race KGL was studied by dusting the chemical uniformly on the bed daily once in the morning before first feeding. The disinfectants were dusted in different patterns from first stage upto cocoon formation. It was observed that dusting of paraformaldehyde 2 percent and benzoic acid 2 percent with lime from III stage upto cocoon formation was effective in controlling grasserie disease and also in improving the economic characters of silkworm.

The silkworms are highly susceptible to various diseases. The diseases commonly met with are flacherie, grasserie and pebrine while muscardine occurs rarely in Tamil Nadu. Due to diseases, the total crop loss ranged from 30 to 40 per cent in India (Vaidya, 1960). Noamani and Mukherjee (1975) stated that average mortality due to various diseases ranged from 35.71 to 44.71 per cent and out of that the maximum was due to flacherie followed by gattine and grasserie.

Popzol a chemical in powder form was used to control almost all the diseases affecting silkworm in Korea, muscardine in Japan and grasserie in West Bengal (Noamani and Mukherjee, 1975). Formalin was used to control various diseases (Steinhaus, 1948, Thomson and Steinhaus, 1950, Ignoffo and Gracia, 1968, and Vail *et al.*, 1968). This paper deals with the performance of

different concentrations of paraformaldehyde and benzoic acid with lime as bed disinfectant for the prevention of diseases in silkworm, *Bombyx mori* L.

### MATERIALS AND METHODS

An experiment was conducted by using multivoltine local race (KGL) silkworms. The worms were fed with Kanva-2 variety mulberry leaves. There were five treatments viz.,

T<sub>1</sub> - Paraformaldehyde 1% + benzoic acid 1% + lime 98%

T<sub>2</sub> - Paraformaldehyde 1% + benzoic acid 2% + lime 97%

T<sub>3</sub> - Paraformaldehyde 2% + benzoic acid 1% + lime 97%

T<sub>4</sub> - Paraformaldehyde 2% + benzoic acid 2% + lime 96%

T<sub>5</sub> - Control

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The disinfectants were dusted daily once on the rearing bed before first feeding in the following pattern.

1. From I stage upto cocoon formation.
2. From II stage upto cocoon formation.
3. From III stage upto cocoon formation.
4. From IV stage upto cocoon formation.
5. From V stage upto cocoon formation.

Each treatment was replicated three times and each replication consisted of 100 worms. The number of worms affected by diseases was noted daily. Data on larval length and larval weight before spinning were noted by selecting five larvae at random in each replication. So also the cocoon length, cocoon width, cocoon weight, shell weight, filament length and silk weight were recorded by selecting 5 cocoons at random from each replication. All the data were subjected to analysis of variance.

## RESULTES AND DISCUSSION

The incidence of grasserie was totally absent in paraformaldehyde 2% + benzoic acid 2% + lime 96% dusting (Table 1). In the remaining treatments, the incidence of grasserie ranged from 1 to 2 per cent as against 25 per cent in the control. Among the various treatments, the incidence

of flacherie ranged from 2 to 12 per cent as against 15 per cent in control. The control of grasserie might be due to paraformaldehyde which suppressed the virulence of the virus over a prolonged period at high concentration. Similar results were reported by Noamani and Mukherjee (1975) who have stated that papzol mixture was effective in reducing infection due to grasserie from 100 per cent to 57.4 per cent while in the case of flacherie it showed in consistency. Vail *et al.* (1968) stated that the activity of polyhedral inclusion bodies was reduced when formalin was used in the media.

The maximum larval length (4.886 cm) and larval weight (1.72 g) were noted in paraformaldehyde 2% + benzoic acid 2% + lime 96% dusting from III stage upto cocoon formation (Table 2). Higher cocoon weight (0.804 g) and shall weight (104 mg) were recorded in paraformaldehyde 1% + benzoic acid 2% with lime 97% dusting from IV stage upto cocoon formation and paraformaldehyde 2% + benzoic acid 1% with lime 97% dusting from IV stage upto cocoon formation respectively. The larval growth and cocoon production were high in higher concentration of the treatment. This might be due to the control of polyhedrosis virus by the chemical. Ingnoffo and Garcia (1968, also reported that formalin at high concentrations (0.8 to 1.0 mg/ml) was useful in preventing or eliminating viral infection from insect rearing stocks

Table 1 Effect of paraformaldehyde, and benzoic acid with lime as bed disinfectant for prevention of disease in silkworms (Data represents the mean of three replications)

Pattern	Grasserie					Flacherie					Mean	Remarks
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>		
From I stage upto Cocoon formation	1	-	1	-	25	12	8	3	10	15	9.6	A=NS BX=1.822
From II stage upto Cocoon formation	-	-	1	-	25	10	5	8	2	16	8.2	CX=2.114
From III stage upto Cocoon formation	-	-	-	-	25	10	10	11	3	14	9.6	
From IV stage upto Cocoon formation	3	-	-	-	25	12	5	6	10	14	9.4	
From V stage upto Cocoon formation	1	1	2	-	25	12	10	11	12	16	12.2	
Mean	-	-	-	-	-	11.2	7.6	7.8	7.4	15		

T<sub>1</sub> - Paraformaldehyde 1% + Benzoic acid 1% + lime 98%  
 T<sub>2</sub> - Paraformaldehyde 1% + Benzoic acid 2% + lime 97%  
 T<sub>3</sub> - Paraformaldehyde 2% + Benzoic acid 1% + lime 97%  
 T<sub>4</sub> - Paraformaldehyde 2% + Benzoic acid 2% + lime 96%  
 T<sub>5</sub> - Control

A - Pattern, B - Treatment, C - Treatment X Pattern, N.S. - Not significant

Table 2 Effect of paraformaldehyde and benzoic acid with lime as bed disinfectant for prevention of diseases in mulberry silkworm, *Bombyx mori* L.—Data on larval, cocoon and silk characters (Data represent the mean of three replications)

Characters	1	2	3	Treatments					Mean	Significance
				T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>		
Av. Larval length (cm)	1	3,846	4,360	4,426	4,406	3,853	4,178	A <sup>x</sup> =0.183		
	2	3,833	4,420	4,310	4,633	3,803	4,216	B <sup>x</sup> =0.813		
	3	4,713	4,760	4,720	4,885	3,853	4,586	C=N. S.		
	4	4,506	4,320	4,240	4,466	3,853	4,273			
	5	4,286	4,380	4,070	4,420	3,853	4,202			
	Mean	4,237	4,448	4,359	4,562	3,385	—			
Av. Larval weight (g)	1	1.24	1.23	1.36	1.40	1.297	1.305	A <sup>x</sup> =0.048		
	2	1.24	1.26	1.26	1.21	1.297	1.253	B <sup>x</sup> =0.048		
	3	1.24	1.35	1.40	1.72	1.297	1.401	C <sup>x</sup> =0.107		
	4	1.27	1.15	1.39	1.33	1.297	1.287			
	5	1.00	1.04	1.09	1.29	1.297	1.143			
	Mean	1.198	1.206	1.300	1.350	1.297	—			
Av. Shell weight (mgm)	1	71.3	58.6	71.3	74.6	79.0	70.96	A <sup>x</sup> =1.40		
	2	60.6	76.6	60.0	82.6	79.0	71.76	B <sup>x</sup> =1.40		
	3	91.3	88.6	74.6	96.6	79.0	86.02	C <sup>x</sup> =3.00		
	4	77.6	64.6	104.0	71.3	79.0	85.30			
	5	72.0	67.3	93.88	71.3	79.0	76.68			
	Mean	74.56	77.15	80.74	79.23	79.0	—			
Av. Cocoon weight (g)	1	0.694	0.781	0.714	0.739	0.790	0.7436	A <sup>x</sup> =0.0186		
	2	0.770	0.756	0.714	0.733	0.790	0.7526	B <sup>x</sup> =0.0106		
	3	0.797	0.754	0.739	0.803	0.790	0.7768	C <sup>x</sup> =0.0419		
	4	0.776	0.804	0.768	0.720	0.760	0.7716			
	5	6.754	0.741	0.752	0.730	0.790	0.7534			
	Mean	0.758	0.767	0.737	0.745	0.790	—			

	1	2	3	4	5	6	7	8	9
Av. Filament length (M)									
1		363.7	313.3	377.0	441.8	398.3	378.82	A <sup>x</sup> = 10.50	
2		327.7	382.0	315.0	428.0	398.3	370.40	B = 10.50	
3		335.7	485.7	343.0	511.7	398.3	414.88	C <sup>x</sup> = 33.97	
4		321.0	315.0	501.0	389.0	398.3	385.06		
5		300.3	309.0	348.3	338.8	398.3	338.94		
Mean		329.68	351.20	375.86	422.06	398.3			
Av. Silk weight (mg)									
1		70.3	62.2	67.6	80.3	73.5	70.78	A <sup>x</sup> = 4.43	
2		63.3	83.0	62.6	83.0	73.5	72.68	B <sup>x</sup> = 4.43	
3		63.6	94.3	96.8	98.5	73.5	78.88	C = N.S.	
4		64.2	61.5	102.5	70.2	73.5	74.38		
5		62.8	58.6	58.6	71.2	73.5	66.94		
Mean		64.84	71.46	74.22	79.64	73.5			

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PATTERN

1. From I Stage upto cocoon formation
2. From II Stage upto cocoon formation
3. From III Stage upto cocoon formation
4. From IV Stage upto cocoon formation
5. From V Stage upto cocoon formation

TREATMENTS

T <sub>1</sub>	Paraformaldehyde 1% + Benzoic acid 1% + lime 98%	A	:	Pattern
T <sub>2</sub>	Paraformaldehyde 1% + Benzoic acid 2% + lime 97%	B	:	Treatments
T <sub>3</sub>	Paraformaldehyde 2% + Benzoic acid 1% + lime 97%	C	:	Pattern X Treatment
T <sub>4</sub>	Paraformaldehyde 2% + Benzoic acid 2% + lime 96%	NS	:	Not Significant
T <sub>5</sub>	Control			

The maximum filament length (511.7 m) and silk weight (102.5 mg) were noted in paraformaldehyde 2% + benzoic acid 2% with lime 96% dusting from III stage upto cocoon formation and paraformaldehyde 2% + benzoic acid 1% with lime 97% dusting from IV stage upto cocoon formation respectively. Increase in filament length and silk weight in higher concentrations of paraformaldehyde was noted. This might be due to the healthy condition of the larvae during the rearing time. Noamani and Mukherjee (1975) also stated that there was no adverse effect on the health of the larvae and cocoon characters due to the application of papzol mixture. Formalin was used to inactivate virus and also for surface sterilization to protect the eggs from bacterial and viral infection (Steinhaus, 1948 and Thompson and Steinhaus, 1950).

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