

BIOEFFICACY OF *Curcuma longa* AS BED DISINFECTANT ON BIOLOGICAL PARAMETERS IN SILKWORM *Bombyx mori* L. (Lepidoptera : Bombycidae)

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ABSTRACT

Efficacy of turmeric rhizome powder as bed disinfectant on nutritional parameters such as larval weight, larval duration, amount of ingesta, digesta and cocoon parameters such as cocoon weight, pupal weight, shell weight and percentage and filament length has been studied in silkworm. The bed was dusted with powder after each moult, half an hour before feeding, also on trays and chandrikas. The dust at low dose level resulted in disease reduction and enhancement of economical characters.

Key words : Efficacy, Turmeric, Nutritional and Cocoon parameters, Disease reduction.

Sericulture is an agrobased labour intensive industry. Among the life cycle, larval stage is most important for the fact that the end product (cocoon) is dependent on the quantity and quality of leaves ingested.

Disease is one of the most harmful effects in silkworm rearing. The average annual loss due to disease in India was around 30%. In *B.mori*, the four types of disease found are protozoan, bacterial, viral and fungal (Ganga and Sulochana Chetty, 1995). While many chemical bed disinfectants are used for control of diseases but some cause concern due to their ecological incompatibility, non biodegradable nature, maximum residual toxicity, prolongation of incubation period of micro organisms and adverse effects on human health and non target organism. It is also found that the bacteria has also presently developed resistance against antibacterial drugs. Hence, an attempt had been made to know the effect of exogenous dust of *C. longa* on disease control and economic traits.

MATERIALS AND METHODS

Fresh mature (4-8 weeks old) rhizome of *C. longa* were harvested randomly from plants growing on the outskirts of Warangal and shade dried for a month, afterwards grounded to a fine powder and stored properly. The Kolar Gold eggs from Vijayawada grainage were used for the experiment with four replications of hundred larvae each and the experiment was repeated for two

successive years. The technology followed was as recommended by Krishnaswami, (1978). In II stage, larvae were fed with a fixed load of polyhedral which were extracted from the infected larvae (0.25 ml of polyhedral suspension containing 10,000 polyhedral / ml) and the suspension was uniformly smeared on mulberry leaves, given as a first feed. The number of polyhedra in the obtained virus suspension were counted using a haemocytometer in a phase contrast microscope.

Turmeric powder was dusted using muslin cloth after 1st, 2nd, 3rd and 4th moults before resuming the feed, while during 5th instar dusting was done daily once after bed cleaning. Even rearing trays and chandrika's were dusted with powder as precautionary measures. The estimated quantity of disinfectant dusted during the different instars were as follows :

I - Batch (Low dose)

100 mg / 100 larvae – after 1st moult / 0.035 sq. ft.
187.5 mg / 100 larvae – after IInd moult / 0.1055 sq.ft.
687.5 mg / 100 larvae – after IIIrd moult / 0.263 sq.ft.
1875 mg / 100 larvae – after IVth moult / 0.525 sq.ft.
1875 mg / 100 larvae – after Vth instar daily / 0.525 – 1 sq.ft.

II - Batch (High dose)

200 mg / 100 larvae – after Ist moult / 0.035 sq.ft.
375 mg / 100 larvae – after IInd moult / 0.1055 sq.ft.
1375 mg / 100 larvae – after IIIrd moult / 0.263 sq.ft.
3750 mg / 100 larvae – after IVth moult / 0.525 sq.ft.
3750 mg / 100 larvae – after Vth instar daily / 0.525- 1 sq.ft.

Table 1 : Effect of *Curcuma longa* as bed disinfectant on Vinstar silkworm.

Treatment/Dosage	Mortality due to disease							No. of larvae dead	No. of cocoons harvested
	1 st day	2 nd day	3 rd day	4 th day	5 th day	6 th day	After mounting		
Turmeric rhizome powder (low dose)	--	--	--	2	1	2	1	6	94
Turmeric rhizome powder (high dose)	4	9	4	12	7	6	11	53	47
Normal worms	--	1	3	2	3	9	5	23	77

Table 2 : Effect of *Curcuma longa* as bed disinfectant in management of diseases in *B. mori*

Treatment	% Mortality due to diseases	% Reduction over control
Turmeric rhizome powder (low dose)	6	17
Turmeric rhizome powder (high dose)	53	-30
Control	23	--

A control was also maintained where no dusting treatment was given after polyhedral inoculation through leaf. Observations were on larval weight, ERR%, mortality due to disease and economical characters.

RESULTS AND DISCUSSION

Effect of turmeric in management of diseases:

The results of the laboratory experiments showed that turmeric powder at lower concentration resulted in 17% reduction in disease whereas the larval mortality rate due to bacterial disease was 53% in batch-II higher concentration as shown in Table 1 and 2. (may be due to higher sample concentration and activity of the product)

Effect of Curcuma longa as bed disinfectant on larval weights:

The highest larval weight of 39.29 gm was obtained at lower dose as compared to higher dose (Table 3).

Effect of Curcuma longa as bed disinfectant on larval characters:

It is noted from the experiments that at lower dose level, the total leaf consumed was 2300 gms when compared to feed consumed at higher dose (2170 gms). The total rearing period has increased by 3 days at higher dose in comparison to lower dose (Table 4).

Effect of Curcuma longa as bed disinfectant on economical characters of silkworm:

At higher concentration, the mortality rate is significant which has been witnessed in the low cocoon harvest, cocoon weight and other economical characters (Table 5). Whereas at lower dose, the cocoon harvested was high followed by significant increase in cocoon weight, shell weight, silk ratio percentage and filament length. From these observation it is clearly implied that the effect of phytochemical is significant on the silkworm but primarily having lethal effect at high dose level while at lower dosage level there was increase in larval and cocoon characters.

The results of the laboratory experiments revealed that dusting of *C. longa* powder on silkworms during four moults and fifth instar resulted in disease reduction in both treatments. Rhizome of *C. longa* has been used in Indian system of medicine as an antiseptic, carminative, stomachic, appetizer and is also an insect growth regulators (Nigam, 1991). When used in higher concentrations they are detrimental to insect but useful at low concentrations particularly for productive insects.

The antimicrobial potency of *C. longa* at lower level may be due to curcuminoids which consists of a mixture of compounds known as curcumin and its derivatives these compounds are diary heptanoid compound.

Natural curcumin, a polyphenol compound contains curcumin I, curcumin II and curcumin III (Trease and Even text). These allelochemicals are detrimental to microbes, so the insect ingesting the chemical survives better (Beranbaum, 1998).

Dust of *L. camara* and *Clerodendron inermae* 5% has increased silk and fecundity (Mamadapur, 1994 and Santosh Kumar, 1997). The effect of bed disinfectant in enhancing the economical characters are in confirmation with reports of Gowda, (1991) Umesh, (1994) and Manimegalal, (2000) who reported the treatment of silkworms with botanicals is *P. coryleifolia* and *T.*

Table 3 : Effect of *Curcuma longa* as bed disinfectant on larval weight from III to V instar.

Treatment / Dosage	III Instar Max. Weight of the larvae (gm)		IV Instar Max. weight of the larvae (gm)		V Instar		
	Initial Weight	Final Weight	Initial Weight	Final Weight	Max. weight of the larvae at beginning of instar (gm)	Max. weight of the larvae at middle of instar (gm)	Max. weight of the larvae at the time of mounting (gm)
Tumeric rhizome powder (low dose)	0.799	1.780	6.518	8.910	11.506	24.278	39.266
Turmeric rhizome powder (high dose)	0.745	1.501	5.656	7.173	8.363	18.817	29.172
Control	0.695	1.404	6.157	7.011	8.955	21.615	32.155

Table 4 : Effect of *Curcuma longa* as bed disinfectant on larval characters.

Treatment / Dosage	Leaf consumed (gm)	Maximum larval weight during V instar (gm)	Total rearing period days : hours	Feeding period days : hours	Moulting period days : hours	E.R.R. %
Tumeric rhizome powder (low dose)	2300	39.266	22:22	19:2	3:20	94
Turmeric rhizome powder (high dose)	2170	27.172	25:22	22:02	3:20	47
Control	2143	33:155	25:03	21:3	4:0	77

Table 5 : Effect of *Curcuma longa* on economical characters of silkworm *B.mori*

Treatment	No. of cocoons harvested (100)	Total weight of cocoons (gm)	Average floss weight (gm)	Average cocoon weight (gm)	Average pupal weight (gm)	Average shell weight (gm)	Average silk ratio (%)	Average filament length (m)
Tumeric rhizome powder (low dose)	94	196	0.038	1.860	1.515	0.345	18.548	951.75
Turmeric rhizome powder (high dose)	47	90	0.032	1.800	1.517	0.293	16.278	753.00
Control	77	131	0.032	1.733	1.455	0.278	16.041	649.00

terrestris.

The digestive stimulation action of turmeric may be probably playing an important role in fat digestion and there by enhanced the midgut enzymes activity in silkworm Khanna, (1999) and Kalpana, 2004.

The probable reason for increase in the larval weight might be due to stimulation of metabolic activity in the larvae and thereby increase in the larval weight. The increase in cocoon traits may be attributed to stimulatory effect of *C. longa* on protein synthesis in silk gland during larval period leading to increase in cocoon paraments. Thus *C. longa* a commonly available spice can be commercially exploited for better silkworm growth and enhancement of economical characters.

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