

## **Bio-Inoculants to Mulberry and Their Impact on Nature and Spread of *BmCPV***

N. S. VIKRAM, R. N. BHASKAR<sup>1\*</sup>, CHIKKALINGAIAH  
 AND RAMAKRISHNA NAIKA

*University of Agricultural Sciences, Bangalore 560065, India*

<sup>1</sup>*College of Sericulture, Chintamani 563125, Karnataka, India*

\*Correspondence

### **Abstract**

The combined effect of bio-inoculants and *BmCPV* infection on fourth and fifth instar larval weight revealed significant results. The increased concentration of *BmCPV* ( $10^{-1}$ ,  $10^{-2}$  and  $10^{-3}$ ) increased larval weight from 4.86 to 5.00 g/10 larvae which were recorded for  $10^{-1}$  and  $10^{-3}$  dilutions, respectively. The trend was same even among different treatments. However, maximum of 5.19 g/10 fourth instar larval weight was recorded for  $T_1$  treatment which was found to be superior to  $T_4$  (5.18 g/10),  $T_2$  (5.11 g/10) and  $T_3$  (5.07 g/10). The treatment from  $T_4$  to  $T_7$  exerted the same trend on larval weight which ranged from 4.82 to 4.93 g/10 compared to local check (4.26 g/10). However, the effect of bio-inoculants i.e.,  $T_2 + Trichoderma harzianum$  and  $T_3 + Trichoderma harzianum$  showed 28.80 and 28.25 g/10 of fifth instar larval weight which were closely related to  $T_1$  (28.87 g/10) and  $T_2$  (28.70 g/10). The remaining treatments  $T_6$  and  $T_7$  without bio-inoculants recorded decreased larval weight of 28.52 and 28.00 g/10 which were significantly higher than that of local check (27.93 g/10). Even in fifth instar *BmCPV* inoculated batches recorded increased larval weight with increased dilution of 28.46 to 28.81 g/10.

**Key words :** Bio-inoculants, *BmCPV*, Larval weight, Mulberry.

Biofertilizers are commonly called as microbial inoculants which are capable of mobilizing important nutritional elements in the soil from non-usable to usable form by the crop plants through their biological processes. Biofertilizers are used extensively as an eco-friendly approach to minimize the use of chemical fertilizers and they improve soil fertility status and enhance the crop production by their biological activity in the rhizosphere. The biological N fixing bacteria *Azotobacter* represents the main group of aerobic, free living nitrogen fixing bacteria which depend on the energy derived from degradation of plant residue. They are known to occur in various ecosystems, including cultivated and uncultivated soils, rhizosphere, rhizoplanes, phyllosphere of plants and aquatic environment. Besides, nitrogen fixing *Azotobacter* are also known to synthesize growth and ensures availability of other micro-nutrients required for growth and development of mulberry plants and also observed the improvement of larval weight due to *Azotobacter* application, other rearing parameters includes economic characters of cocoon were not affected even after 50% reduction in the chemical fertilizer application in mulberry cultivation (1). Cytoplas-

mic polyhedrosis virus of silkworm *Bombyx mori* L (*BmCPV*) is known to cause flacheric. Its incidence has been reported to be 27.76% in Karnataka, out of the total loss of cocoon crop in India, 71% was due to flacheric (2). Flacheric may be due to the viruses, bacterial and physiological abnormalities. The effect of bio-inoculated mulberry leaves and its effect on larval weight of PM × CS<sub>2</sub> IV and V instar with *BmCPV* inoculation were studied.

### **Methods**

The laboratory experiment was laid out in factorial complete randomized design for IV and V instar worms (with *BmCPV* inoculation) with eight treatments and three replications (Table 1). Ten larvae of IV and V instars were randomly selected from each treatment replication wise at the end of both instar and their weight was recorded using electronic balance g/10. The average larval weight was calculated.

### **Results and Discussion**

The combined effect of bio-inoculants to mul-

**Table 1.** Treatment details used for field experiment. \*R. NPK : Recommended nitrogen, phosphorus and potash (100 : 50 : 50 kg/ha/y). \*\*R. FYM : Recommended farm yard manure (12 MT/ha/y), \*\*\*R. K : Recommended potash.

Treatments	
1	Standard check : R. NPK* + R. FYM**
2	75% NP through chemical fertilizers + 25% NP through <i>Aspergillus awamori</i> and <i>Azotobacter</i> sp.+ R. FYM + R. K. ***
3	50% NP through chemical fertilizers + 50% NP through <i>A. awamori</i> and <i>Azotobacter</i> sp. + R. FYM+R. K
4	75% NP through chemical fertilizers + 25% NP through <i>A. awamori</i> , <i>Azotobacter</i> sp. and <i>Trichoderma harzianum</i> + R. FYM + R. K.
5	50% NP through chemical fertilizers + 50% NP through <i>A. awamori</i> , <i>Azotobacter</i> sp. and <i>T. harzianum</i> + R. FYM + R. K.
6	R. NPK only through FYM
7	R. NPK only through chemical fertilizers
8	Control : No application of any fertilizer

berry and *BmCPV* infection on IV instar larval weight (g/10) revealed significant differences. Among treatments experimented  $T_1$  (recommended NPK + recommended FYM) registered significantly higher IV instar larval weight (5.19 g/10) than that of other treatments with bio-inoculants. The effect due to bio-inoculants and *BmCPV* development reported significantly varied larval weight from 4.86 to 5.00 g/10 in  $10^{-1}$  to  $10^{-3}$  dilutions lots. However, the other treatment combinations  $T_2 + T. harzianum$  and  $T_3 + T. harzianum$  too registered comparatively higher larval weight compared to local check (4.26 g/10) (Table 2). Further, the effect of bio-inoculants i.e.,  $T_2 + Trichoderma harzianum$  and  $T_3 + Trichoderma harzianum$  recorded 28.80 and 28.25 g/10 of fifth in-

star larval weight which were closely related to  $T_1$  (28.87 g/10) and  $T_2$  (28.70 g/10). The remaining treatments  $T_6$  and  $T_7$  without bio-inoculants recorded decreased larval weight of 28.52 and 28.00 g/10 which were significantly higher than that of local check (27.93 g/10).

Larval weight in IV instar was maximum (5.19) at  $T_1$  and minimum (4.26 g/10) at  $T_8$ . As decrease in the *BmCPV* dilution concentration, increase of larval weight was recorded from 4.86 to 5.00 g/10. In line with the present study, Kurose (3) emphasized the mineral supplementation for improved quality leaf which plays a vital role in the larval development and cocoon characters compared with SSP (2.71 g). This may be due to the reason that the treatments have

**Table 2.** Combined effect of bio-inoculants to mulberry and *BmCPV* infection on V instar larval weight (g/10) of silkworm, *B. mori* L. (PM × CSR<sub>2</sub>).

Treatments	IV Instar inoculated batch <i>BmCPV</i> viral dilutions				V Instar inoculated batch <i>BmCPV</i> viral dilutions			
	$10^{-1}$	$10^{-2}$	$10^{-3}$	Mean	$10^{-1}$	$10^{-2}$	$10^{-3}$	Mean
$T_1$	29.62	29.88	30.11	28.87	28.93	29.56	30.19	29.56
$T_2$	28.55	28.75	28.85	28.70	27.63	28.20	28.64	28.16
$T_3$	28.25	28.72	28.75	28.57	27.19	28.02	28.59	27.93
$T_4$	28.54	28.74	29.03	28.80	28.80	29.55	30.05	29.47
$T_5$	28.12	28.30	28.34	28.25	27.09	27.20	27.30	27.19
$T_6$	28.31	29.00	28.66	28.52	27.12	27.22	27.37	27.23
$T_7$	28.40	28.65	28.73	28.00	27.11	27.26	27.39	27.25
$T_8$	27.84	27.95	28.00	27.93	27.03	27.15	27.22	27.13
Mean	28.46	28.70	28.81		27.61	28.02	28.34	
Test of significance	<i>F</i> test	SE ±	CD 0.05%		<i>F</i> test	SE ±	CD 0.05%	
Concentration	*	0.028	0.082		*	0.033	0.095	
Treatment	*	0.047	0.134		*	0.054	0.156	
Interaction	NS	0.081			*	0.095	0.270	

greatly influenced the quality of leaf through increased uptake of nutrients. Application of 50% N and urea to mulberry and rearing the hybrid CSR<sub>2</sub> × CSR<sub>4</sub> recorded maximum larval weight (3.713 g) over PM × NB<sub>2</sub>D<sub>2</sub> (3.404 g). The increased larval weight might be due to the reason that the sources of nutrients have greatly influenced the uptake of macro and secondary nutrients which in turn increased the leaf quality. Similar results have been reported by many workers (4—6).

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