

A Comparative study and analysis of Susceptibility of fruit fly *Bactrocera Correcta Bezzi* to Entomopathogenic microorganisms

Dr. Sunita Arya¹, Dr. Rajesh Kr Dubey²

¹Associate Prof, Department of Zoology, DG P.G. College, Kanpur (U.P.) India

²Director, UGC-HRDC, JNVU, Jodhpur, Rajasthan, India

ABSTRACT: Guava fruit fly (*Bactrocera correcta* Bezzi) used to cause serious damage to the guava crop orchards. It was observed a brightly coloured brown and yellow fly approximately 6.0mm in length. Its wings have a yellow spot. The study was carried out in R.B.D. with three replications at Dayanand Girls Post Graduate College, Kanpur and farmers field of riverbed area of Ganga during 2010-2013. For raising nucleus culture, maggot of *B. correcta* were collected from infested fruit and reared in the laboratory. For the bioefficacy tests. Conidia were harvested from 10 days old culture. Prior to use the culture was washed from the surface of the plates using 100ml of sterile distilled water containing 0.02% tween 80[®] under aseptic conditions by gentle scrubbing with a sterile infection loop. The seven concentrations of each entomopathogenous fungus were used. Field trial was conducted during rainy season, each guava tree was considered as single treatment. Fruit fly adult population was recorded at 5, 10 and 15 days after application of treatments with the help of methyl eugenol based trap.

KEYWORDS: *Beauveria bassiana*, *Metarhizium anisopliae*, Chlorpyrifos, fruit fly.

I. INTRODUCTION

Oriental fruit fly (*Bactrocera Correcta*) damage to fruit fly puncturing the skin of fruit with their ovipositor used to lay a bunch of eggs about 6.0 mm below the surface of skin. Subsequently larvae developed which reduce the quality and quantity of fruit. Fruit bagging, protein bait spraying, methyl eugenol trap, sterile male release and application of insecticides are main component of integrated pest management system of fruit fly. However, indiscriminate use of broad spectrum insecticides for the control of fruit fly, has not only resulted the mortality of this pest, but also hazards to environment and human beings. To reduce the fly population, the control of late larval and pupal stage can be the alternative way of management. The soil application of entomopathogenic fungi may be the possible and effective way of management of this noxious pest. Therefore, the present study was conducted to evaluate the bioefficacy of Entomopathogenic fungi against *Bactrocera Correcta* in laboratory as well as in field condition.

II. MATERIALS AND METHODS

The study was conducted at D.G.P.G. College, Kanpur and guava orchards of river bed area of Ganga to evaluate the bioefficacy of *B. bassiana* and *M. anisopliae* against *Bactrocera Correcta* infesting guava. For raising nucleus culture, maggot of *Bactrocera Correcta* were collected from infested fruit and reared in the laboratory. For the bioefficacy tests, conidia were harvested from 10 day old culture, prior to use the culture was washed from the surface of the plates using 100 ml of sterile distilled water containing 0.02% tween 80[®] under aseptic conditions by gentle scrubbing with a sterile infection loop. The seven concentration of each entomogenous fungus were used after assessing the number of conidia in the suspension with as improved Neubaur Weber, England Haemocytometer. Conidial suspension with 2 ml volume was sprayed on 10 maggots in a Petri plate (9 cm dia.) lined with a filter paper by using a hand atomizer. After air drying, the treated maggots were carefully transferred to individual sterile round plastic vials containing fresh piece

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of fruit that was washed with sterile distilled water. Maggots were maintained in an incubator at $27 \pm 1^{\circ}\text{C}$ and $95 \pm 5\%$ RH. The observation on mortality were taken at 12 hrs interval.

Field trial was conducted during rainy season of 2010-2011 in RBD with three replications. There were 8 treatments including control. Each guava tree was considered as single treatment. Treatments were applied in soil along with the compost near the trunk of tree up to the one meter diameter. The control plot were sprayed with water along with the compost. Fruit fly adult population was recorded before, 10 and 15 days after application of treatments with the help of installed methyl eugenol based trap. The whole tree was covered with the muslin cloth to avoid fruit fly migration.

III. RESULTS AND DISCUSSION

Results revealed that on 5th day of treatment, 8.9% mortality of maggots was found due to *B. bassiana* @ 7.6×10^8 Conidia ml⁻¹, however, lower concentrations showed no mortality. After 10 days of treatment, the highest concentration of white muscardine fungus (7.6×10^8 Conidia ml⁻¹) showed only 22.0% mortality of maggots. In case of *M. anisopliae*, % mortality of maggots ranged from 0.0 to 13.0 after 5 days of inoculation, caused 29.9% mortality at highest concentration (2.3×10^8 conidia ml⁻¹) after 10 days of treatment. The results revealed that both entomogenous fungi were not found more effective against maggots of *Bactrocera Correcta* under laboratory conditions. Purwar and Sachan (2005) and Bhatt and Kanaujia (2010) also tested entomopathogenic fungi against *Spodoptera litura* and *Spilarctia obliqua* and reported low toxicity. Mahmoud (2009) reported that *M. anisopliae* gave higher adult mortality of *B. zonata* than *B. bassiana* and *L. muscarium*, reaching 94.4% in males and 76.8% in female in contact bioassay test and *M. anisopliae* killed 50% population in 6.23 - 8.93 days. Whereas *B. bassiana* killed 10.83 - 12.69 days. Sridevi *et al.* (2004) reported that the larval mortality of *Helicoverpa armigera* in different treatments of *Bacillus thuringiensis* var. Kurstaki, *B. bassiana* and their combinations differed significantly. The individual treatments of *B. bassiana* at 1.6×10^5 and 2.5×10^5 conidia ml⁻¹ resulted 60.4 and 75.3% larval mortality, respectively. Pathogenicity of entomogenous fungi against lepidopterous insect pest were also evaluated (Jalali and Singh, 2003; Bhatt *et al.*, 2010).

After 10 days of spraying of different entomopathogenic fungi and insecticide in 2010 in field, the % reduction in adult emergence of *Bactrocera Correcta* varied from 14.80 (*B. bassiana* @ 2.0×10^8 conidia ml⁻¹) to 70.46 (Chlorpyrifos, 20 EC) while in 2011, it ranged from 18.83 (*B. bassiana* @ 2.0×10^8 conidia ml⁻¹) to 53.95 (Chlorpyrifos 20 EC). On the basis of pooled mean data, significant differences were observed among the treatments. The highest concentration of *M. anisopliae* (29.02) showed significant reduction in adult emergence of *Bactrocera Correcta* than other treatments except Chlorpyrifos 20 EC treated plot (62.20). The results indicated that the population of *Bactrocera Correcta* increased gradually in control plot. Based on the observations taken after 15 days of spraying, maximum % reduction in adult emergence was in Chlorpyrifos 20 EC (74.88) treated plot and minimum was in *B. bassiana* @ 2×10^8 Conidia ml⁻¹ (22.52) treated plot. It is evident that Chlorpyrifos 20 EC could be considered more effective to manage the fruit fly population by killing late larva and Pupa followed by *M. anisopliae* @ 2×10^{10} conidia ml⁻¹. On the basis of two year pooled mean data, among the entomogenous fungi maximum % reduction in adult emergence of *Bactrocera Correcta* was observed in *M. anisopliae* @ 2×10^{10} Conidia ml⁻¹ (35.28) after 15 days of spraying. However, all treatments were not significantly different from one another except chlorpyrifos 20 EC. Arya (2012) also studied the insect pests problem of guava in riverbed area of Ganga. The results exhibited no entomopathogenic fungi reduced the adult emergence of *Bactrocera Correcta* more than 50% in field condition. Bhatt *et al.* (2010) reported that *B. bassiana* proved most promising against the group of *Aeoleshes sosta* followed by *B. brongniartii* and *M. anisopliae*. Some studies also suggested that entomogenous fungi can be used with other components of IPM like botanicals host plant relationship and insecticides (Isaiah *et al.*, 2005, Haseeb, 2007; Manto and Yadav, 2010; Amutha and Banu, 2012). On the basis of above results, it is apparent that both the fungi were not found more effective against *Bactrocera Correcta*. However, more studies are needed for the use of entomopathogenic fungi with botanicals, bioagents or insecticides in integrated approach against *Bactrocera Correcta* in guava orchards.

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Table 1 : Efficacy of Entomopathogenic fungi against maggot of *Bactrocera Correcta*.

Conc. (Conidia ml ⁻¹)	<i>Beauveria bassiana</i>			Conc. (Conidia ml ⁻¹)	<i>Metarhizium anisopliae</i>		
	Mean% mortality (days after treatment)				Mean% mortality (days after treatment)		
	5	7	10		5	7	10
7.6x10 ⁸	8.9	17.7	22.0	2.3 x 10 ⁸	13.0	17.7	29.9
7.6x10 ⁷	0.0	10.0	17.8	2.3 x 10 ⁷	7.8	14.3	17.7
7.6x10 ⁶	0.0	6.7	16.7	2.3 x 10 ⁶	4.1	4.8	11.0
7.6x10 ⁵	0.0	6.7	6.8	2.3 x 10 ⁵	4.1	4.8	6.8
7.6x10 ⁴	0.0	3.3	6.8	2.3 x 10 ⁴	0.0	4.8	4.8
7.6x10 ³	0.0	0.0	3.5	2.3 x 10 ³	0.0	0.0	0.0
Control	0.0	0.00	0.00	Control	0.0	0.0	0.0
SE M _±	1.27	2.57	2.93	SE M _±	2.18	2.82	3.53
CD (P=0.05)	3.92	7.68	8.61	CD (P=0.05)	6.61	8.54	8.64

Table 2: Field Efficacy of Entomopathogenic fungi against *Bactrocera Correcta* on guava

Treatments	Conc. (Conidia ml ⁻¹)	Average adult emergence of <i>Bactrocera Correcta</i>					
		10 days of ferinoculation			15 days of ferinoculation		
		2010	2011	Mean	2010	2011	Mean

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<i>Beauveria bassiana</i>	2.0x10 ¹⁰	21.06 (27.28)	25.27 (30.14)	23.16 (28.74)	29.53 (32.90)	28.97 (32.52)	29.25 (32.74)
	2.0x10 ⁹	18.07 (24.93)	22.56 (28.07)	20.32 (26.55)	22.00 (27.93)	28.32 (32.08)	25.16 (30.07)
	2.0x10 ⁸	14.80 (21.75)	18.83 (24.51)	16.82 (22.29)	17.19 (23.80)	27.86 (30.95)	22.52 (26.96)
<i>Metarhizium anisopliae</i>	2.0x10 ¹⁰	23.58 (28.34)	34.45 (35.78)	29.02 (31.95)	38.64 (38.42)	31.92 (34.49)	35.28 (30.43)
	2.0x10 ⁹	15.46 (22.78)	21.75 (27.78)	18.59 (25.49)	24.52 (29.63)	31.35 (33.99)	27.94 (31.91)
	2.0x10 ⁸	17.17 (22.91)	24.46 (29.48)	20.31 (26.75)	22.43 (27.81)	28.65 (32.20)	25.55 (30.55)
<i>Chlorpyrifos</i>	0.2%	70.46 (56.95)	53.95 (46.90)	62.20 (50.89)	82.62 (64.93)	67.14 (53.94)	74.88 (59.04)
Control		+50.70 (45.40)	+69.66 (56.58)	+60.18 (50.88)	+74.65 (59.77)	+85.69 (68.29)	+80.17 (63.61)
SE M _±		3.65 (2.74)	3.33 (2.33)	2.34 (1.56)	2.85 (2.70)	3.57 (2.50)	1.53 (1.05)
CD (P=0.5)		11.03 (8.28)	10.17 (70.4)	6.79 (4.69)	8.69 (6.25)	10.86 (7.62)	4.70 (3.40)

Note: - Parentheses values are angular transformed + indicated the % increase in fruit fly population.