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Effect of entomopathogenic fungi on different stages of *Calopepla leayana* Latr. (Chrysomelidae:Coleoptera), a major defoliator of *Gmelina arborea* (Roxb.) (Verbinaceae)

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The Gamhar, *Gmelina arborea* (Roxb.) is a commercially important fast growing multipurpose verbinaceous tree species in northeastern region of India. *Calopepla leayana* Latr. is the most destructive defoliator and is known to destroy more than 2000 acres of young plantations in a single year (Browne, 1968). In northeast India, monocultures of these species have been abandoned in past because of this pest (Ahamad, 1982). Earlier insecticides were thought to be panacea for an insect attack and used indiscriminately in controlling pest populations. Their deleterious effects on the environment and ecosystem when brought into light have limited their use especially in forestry. Application of microbial control is safe in the plantations and nurseries (Mohamed Ali *et al.,* 1992). In India, very little work has been done on use of pathogens, especially mycopathogens in forestry sector. Sankaran *et al.* (1989) reported effective control of adults and larvae of *C. leayana* with single dose of *B. bassiana* (1×10^5 spores/ml) irrespective of larval instars. So the present work was carried out to study the effect of two entomopathogenic fungi *Beauveria bassiana* and *Metarhyzium anisopliae* on different larval stages and adults of *C. leayana.* The experiment was conducted in the laboratory during April 2004 to September 2005. Newly hatched Ist, IInd, IIIrd, IVth , Vth instar larvae and adults were used. The fungal pathogens viz., *B. bassiana* and *M. anisopliae* were isolated form diseased adults of rice hispa*, Dicladispa* armigera (Olivier) (Coleoptera, Chrysomelidae) and *C. leayana* respectively (both the fungi were identified by Dr. A. N. Singh, Scientist (Pathologist) Forest Research Institute, Dehradun). They were cultured on Potato Dextrose Agar (PDA) medium. Spores were harvested in 0.1%

Tween – 80 solution in double distilled water. Concentration of spores/ml in the stock solution was determined by haemosytometer method. Different concentrations of spore suspension, as used in the experiment were made from the stock solution. The freshly prepared spore suspensions were sprayed on I-V larval instars and adults. Five treatments (0, 1, 2.5, 5 & 10 % of $1x10^9$ spores/ml of *B. bassiana* and *M. anisopliae*)) were given to each stage. Control where (0% spore suspension) 0.1% Tween – 80 solution in sterile double distilled water was used. Each treatment was replicated five times in a Completely Randomised Design (CRD) having 20 insects in each replicate. Observations were taken at every 24 hrs interval for the mortality of insects. Cause of death was confirmed with mycelial growth on the cadavers by visual observation. The mortality data obtained were converted into percent mortality by using Abbot's formula. The values obtained were tested through ANOVA using SPSS 10.1 software for ascertaining treatment differences.

The pathogenecity studies showed differential percent mortality with respect to different concentrations of the spore suspension (Table 1.). Both the fungi were found to be significantly pathogenic to *C. leyanana* causing white and green muscardine disease respectively. The similar disease condition was reported by Sandhu *et al*., (1993) on teak pest, *Hyblaea purea*. The results clearly indicate the effective role of *B. bassiana* and *M. anisopliae* in causing the mortality to both larvae and adults of *C.leayana.* It is evident from the results that *B. bassiana* was more pathogenic to the pest as compared to *M. anisopliae*. However, all the four fungal treatments were found highly significant to the control. The susceptibility of larvae and adults was negatively associated with the age and positively associated with the fungal spore concentration. In all the stages from I instar to adult, the highest mortality was observed in 10% of $1x10^9$ spores/ml concentration of *B. bassiana* (table 1.). Larvae of I instar have shown highest mortality, which gradually decreased with the increase in age or decrease in the concentration of fungal spores. Similar observations was also made by Sankaran (1989) with *B. bassiana* at concentrations of $1x10^5$ spores/ml. Based on the present study, it is suggested that both the fungi were attractive/potential candidates for inclusion in ecofriendly pest management of *C. leayana*.

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Table 1. Effect of different concentrations of *B. bassiana* and *M. anisopliae* on different stages of *C. leayana*.

Concentration of 1x10^9 spores/ml stock	**Mortality (%)**					
	Larval instars					**Adult**
	I	**II**	**III**	**IV**	**V**	
			Beauveria bassiana			
0 (control)	19±4.18a	13±2.73a	11±6.51a	7±5.7a	3±4.47a	5±3.53a
1	57±5.70b (23.67)	50±3.53b (24)	46±6.51b (22.09)	40±5.34b (22.50)	34±4.18b (25.18)	28±4.47b (10.14)
2.5	66±9.61b (37.21)	60±7.90c (38.33)	57±8.36c (37.70)	49±12.94b (34.71)	43±5.70c (36.02)	38±10.36c (24.84)
5	78±11.51c (53.64)	71±4.18d (52.69)	65±7.90c (48.08)	58±2.73c (45.93)	52±5.70d (46.23)	42±4.47c (30.10)
10	96±4.18d (76.21)	92±5.70e (77.87)	85±6.12d (72.06)	71±9.61c (61.14)	67±4.47e (62.52)	61±7.41d (52.80)
			Metarhyzium anisopliae			
0 (control)	19±4.18a	13±2.73a	11±6.51	7±5.7a	3±4.47a	5±3.53a
1	54±4.18b (18.18)	45±3.53b (16.11)	41±4.18b (14.17)	34±4.18b (13.41)	28±6.70b (17.29)	23±5.70b (1.26)
2.5	62±5.70b (31.35)	57±8.36c (34.19)	51±4.18c (29.43)	45±7.90c (29.44)	40±5c (32.50)	37±7.58c (23.49)
5	73±10.36c (46.97)	67±7.58d (47.60)	62±5.70d (44.26)	56±4.18d (43.50)	48±4.47d (41.75)	44±2.23cd (32.64)
10	91±4.18d (70.12)	87±5.70e (72.06)	76±9.61e (61.53)	64±6.51e (53.06)	56±7.41e (50.64)	48±9.08d (37.58)

All values are mean ± SD of five replicates with 20 insects in each replicate (total 100 insects), values followed by the same alphabets are not significantly different at $P<0.05$ (DMRT). Figures in the parenthesis are adjusted mortality (%) based on control
(Percent mortality in experiment-Percent mortality in control / percent mortality in experiment * 100)