

Efficacy of Fungi *Metarhizium anisopliae* and *Beauveria bassiana* against the Larval Growth of the *Aedes aegypti*

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Abstract

The entomopathogenic fungi *Metarhizium anisopliae* and *Beauveria bassiana* have demonstrated its efficacy against mosquito species in the laboratory. The virulence of *Metarhizium anisopliae* and *Beauveria bassiana* was tested against 4th instar larvae of *Aedes aegypti* using different concentration of fungi from 0.5 ml to 3.5 ml (5% to 35%). The larval mortalities were observed for 2 days. The results showed that mortality of mosquito larvae treated with the different fungal concentration varies from 0 % to 100% in case of *Metarhizium anisopliae* and 0% to 90% in case of *Beauveria bassiana*. No mortality was observed in the control. Larvae mortality increased with increasing concentration and increasing time. 50% mortality was observed at 2.5 ml that is 25% concentration in both the fungus after 24 hour and after 48 hour. In *Metarhizium anisopliae* 50% mortality was observed at 17.2 % and in case of *Beauveria bassiana* 50% mortality was observed at 20%. The results indicate that *Metarhizium anisopliae* and *Beauveria bassiana* has the potential to be a control agent for *Aedes aegypti* causative agent of dengue.

KEYWORDS: *Metarhizium anisopliae*, *Beauveria bassiana* and *Aedes aegypti*

Introduction

In today's century diseases are hastily becoming part of every single individual life. One such lethal disease is Dengue. Dengue fever has developed an important public health problem as the number of recounting cases continue to increase, especially with more severe of the disease, dengue fever and dengue shock syndrome, or with abnormal manifestations such as central nervous system involvement (J. Deepa et al., 2015). *Aedes aegypti* is generally known as a vector for arboviruses responsible for dengue. The dengue fever incidence has increased fourfold since 1970 and nearly half the world's population is now at risk. In 1990, almost 30% of the world population,

1.5 billion people, lived in regions wherever the estimated risk of dengue transmission was greater than 50%.

Dengue is transmitted by the *Aedes aegypti* mosquitoes. This mosquito belongs to family Culicidae having white marking on its legs and a marking in the form of a lyre on the upper surface of the thorax. The mosquitoes originally came from Africa where it is found in greatest abundance and then spread all over the world especially in tropical countries. The passive migration of this mosquito has created many problems in terms of dengue outbreak in many tropical countries. These mosquitoes are domestic breeder and breed in domestic a pre domestic water container. These mosquitoes have four

distinct stages in their life cycle egg, larvae, pupa, and adult. The insect take 10-15 days to complete their life cycle. The female mosquitoes are mostly vector of the dengue virus.

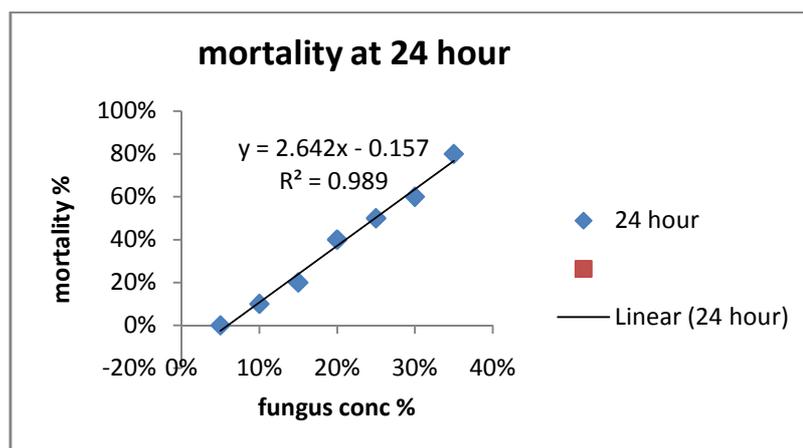
Material and Methodology

The experiment was conducted in the zoology research laboratory of Modern college, Ganeshkhind, Pune. For rearing of mosquitoes larvae pure tap water was taken and boiled to maintain the temperature of water around $27 \text{ }^{\circ}\text{C} \pm 2 \text{ }^{\circ}\text{C}$. (Hashmat Imam, Zarnigar, GhulamuddinSofi, and Aziz Seikh., 2014) After 7-9 days 4th instar larvae were collected from the container for the further experiment. . Three batches

of culture were prepared again using same condition and were frequently under observation after the first successful culture.

Liquid broth of fungus *Metarizhiumanisopliae* and *Beauveria bassinia*, procured from, Ashwamedh agritech farm. Kopargaon was cultured on PDA (potato dextrose agar) medium, which is the ideal medium for fungus culture. Both the fungus was cultured on potato dextrose medium. assay was conducted three times. Larvae mortality was evaluated on a daily basis of 2 day that is 48 hours. (O.Benserradj and I.Mihoubi 2014.)

Results and Discussion



Graph showing mortality % vs. fungus concentration at 24 hour. As concentration increases the mortality increases. At 24 hour the highest mortality observed was 80% and 50 % mortality is seen at 25 % fungal concentration.

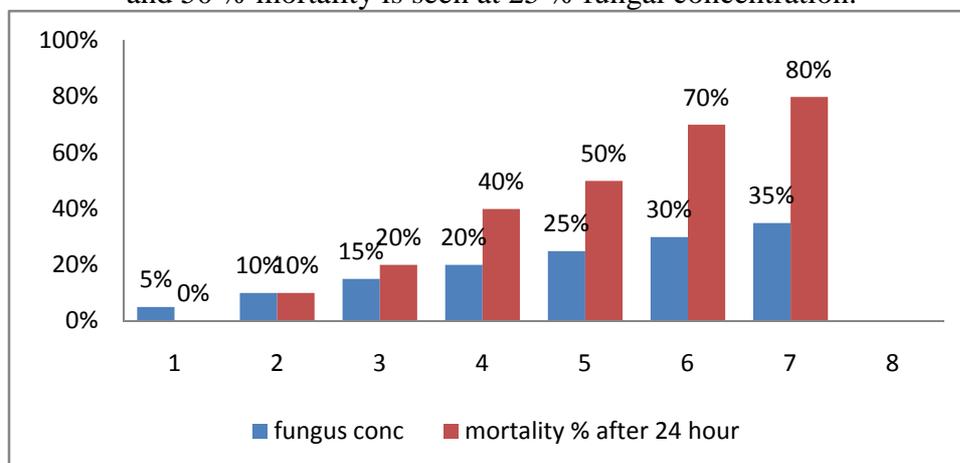


Fig. Graph showing the efficacy of *Beauveria bassinia* against mosquito larvae at 24hr.

The efficacy of *Metarizhiumanisopliae* and *Beauveriabassinia* was assessed against 4th instar larvae of *Aedesaegypti* at various fungal concentrations 0.5ml to 3.5 ml (5% to 35%) in different time period. When the above seven concentrations of fungus were applied on 4th instar larvae, it was observed that mortality increased as the concentration as well as time period increased. Both the fungus showed different mortality at different concentration. The percentage mortality of mosquito larvae tested against *Metarizhiumanisopliae* varied from 0% to 100% and the percentage mortality that of *Beauveriabassinia* varied from 0 % to 90%. Maximum mortality was observed at highest applied dose of 35% and 0% mortality was observed with lowest dose level of 5%. As the time period increased along with the concentration mortality also increased up to 100%.

Regarding the efficacy of *Metarizhiumanisopliae* against mosquito larvae, it was found that LC 50 value was 25% after 24 hour. Moreover after 48 hour, the LC 50 value was 17.2%. Regarding the efficacy of *Beauveriabassinia* against mosquito larvae, it was found that LC 50 value was 25 % after 24 hour. Moreover after 48 hour, the LC 50 value was 20 %.

Metarizhium and *Beauveria* are the most common entomopathogenic fungi with worldwide distribution. These are soil –borne species and are commonly used as bio pesticides to control various pests.

Many studies have shown the potential of *Metarizhiumanisopliae* and *Beauveriabassinia* as a mosquito control agent. Researchers observed effects of *Metarizhium* fungus on larvae of *Anopheles*

stephensi, *Culex pipiens*, and *Culex restuans* (Roberts, 1970; Roberts, 1974). *Beauveria* is also used in the control of malaria-transmitting mosquitos as an insecticide; the spores are sprayed on affected crops as an emulsified suspension or wetttable powder or applied to mosquito nets as a mosquito control agent.

The present experiment was carried out for the evaluation of isolated fungus *M.anisopliae* and *B.bassinia* against *Aedesaegypti* larvae as immature vectors which are the most perfect stage for the bio-control agents. In my work of the virulence of *M. anisopliae* and *B. bassinia* against larvae *Aedes aegypti*, a significant mortality was observed. Indeed the mortality of mosquito larvae reached 100% in case of *M.anisopliae* and 90% in case of *B.bassinia*. These results are similar to the work of Melanie, Z.D. Aliana, N. Anggriani, and A.K. Supriatn (2015) who reported more than 90% mortality on both larvae and imago of *Aedesaegypti* of both the fungi at 10⁻¹ concentration. Also, the percentage larval mortality was enhanced significantly when increasing concentration and time. The fungus isolates take time to kill different mosquito species but that depending upon the dose and fungus strain.

A number of entomopathogenic fungi have been used successfully to control mosquito vector. The fungi have ability to directly infest the host they infest the host by penetrating into the cuticle and after entering the body the conidia multiply which slowly damage the whole body of the pest or vector.

Acknowledgement: The author is thankful to the student Riyasinha, Principal of modern college and Director Dr.D.R.Wackchoure and Dr.S.G.Deshpande of Ashwamedh

agrotech kopargaon for Providing necessary culture and lab facilities

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