

Identification of strains highly efficacious against *Aedes*, *Anopheles* and *Culex* larvae.



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Introduction

Mosquitoes of the genera *Aedes*, *Anopheles* and *Culex* are arthropod vectors of human and animal diseases worldwide and are increasing in importance due to their recent establishment in areas previously unrecorded within Europe^[1]

There are few aquatic habitats that do not lend themselves as a breeding site, often resulting in overlapping habitat range of these three genera^[2]

Insect pathogenic fungi belonging to the genus *Metarhizium* have been developed to control a wide range of arthropods, including pests of crops and vectors of human and animal diseases^[3-4]

Selection of a strain of *Metarhizium* that is stable and highly efficacious against all important mosquito genera will reduce both registration and application costs.

Methods

A series of experiments were conducted to determine whether larval susceptibility to fungal infection was influenced by: **1) genera, 2) developmental stage, 3) fungal strain/species, 4) conidia concentration and 5) application of conidia.**

Mortalities were compared of early and late larval stages of *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus* exposed to different concentrations (1×10^5 - 1×10^7 conidia mL⁻¹) of *M. anisopliae* and *M. brunneum*.

Metarhizium was either applied as a dry dust powder, suspended in 0.03% aqueous tween or as heat killed conidia. Ten larvae of either early or late instar were inoculated with 100 mL of spore suspension or conidia dusted evenly over water. Larval mortality was recorded daily for 12 days.

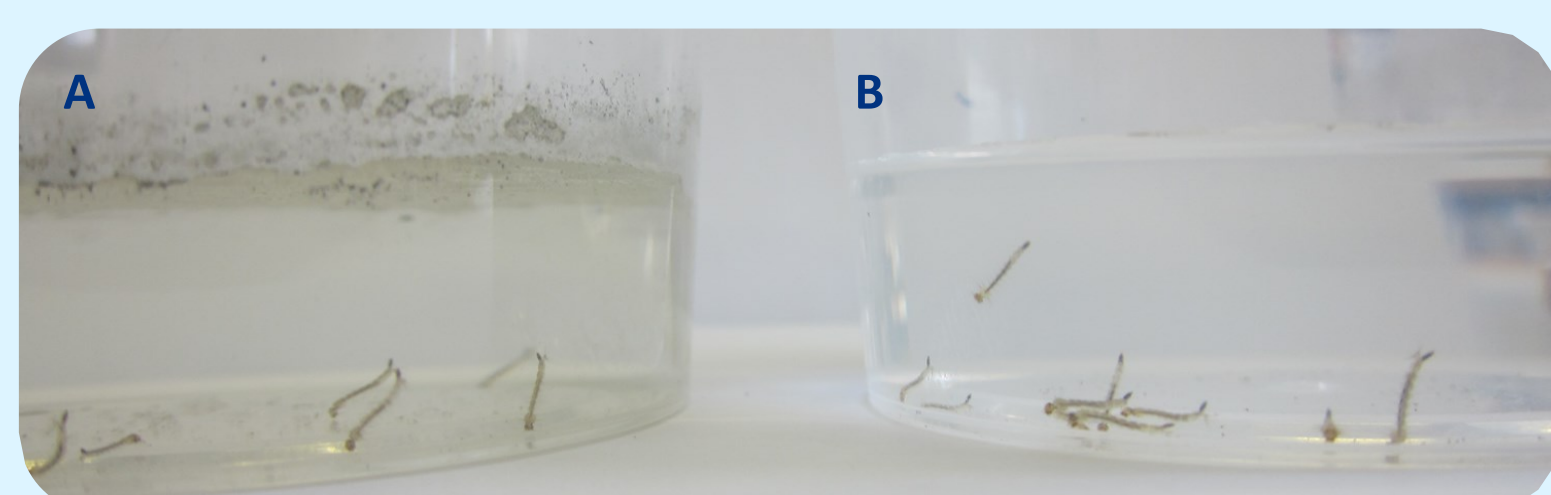


Fig 1: *Metarhizium* applied to late instar *Ae. aegypti*. A = Dry spores, B = Spore suspension

Mosquitoes



Results

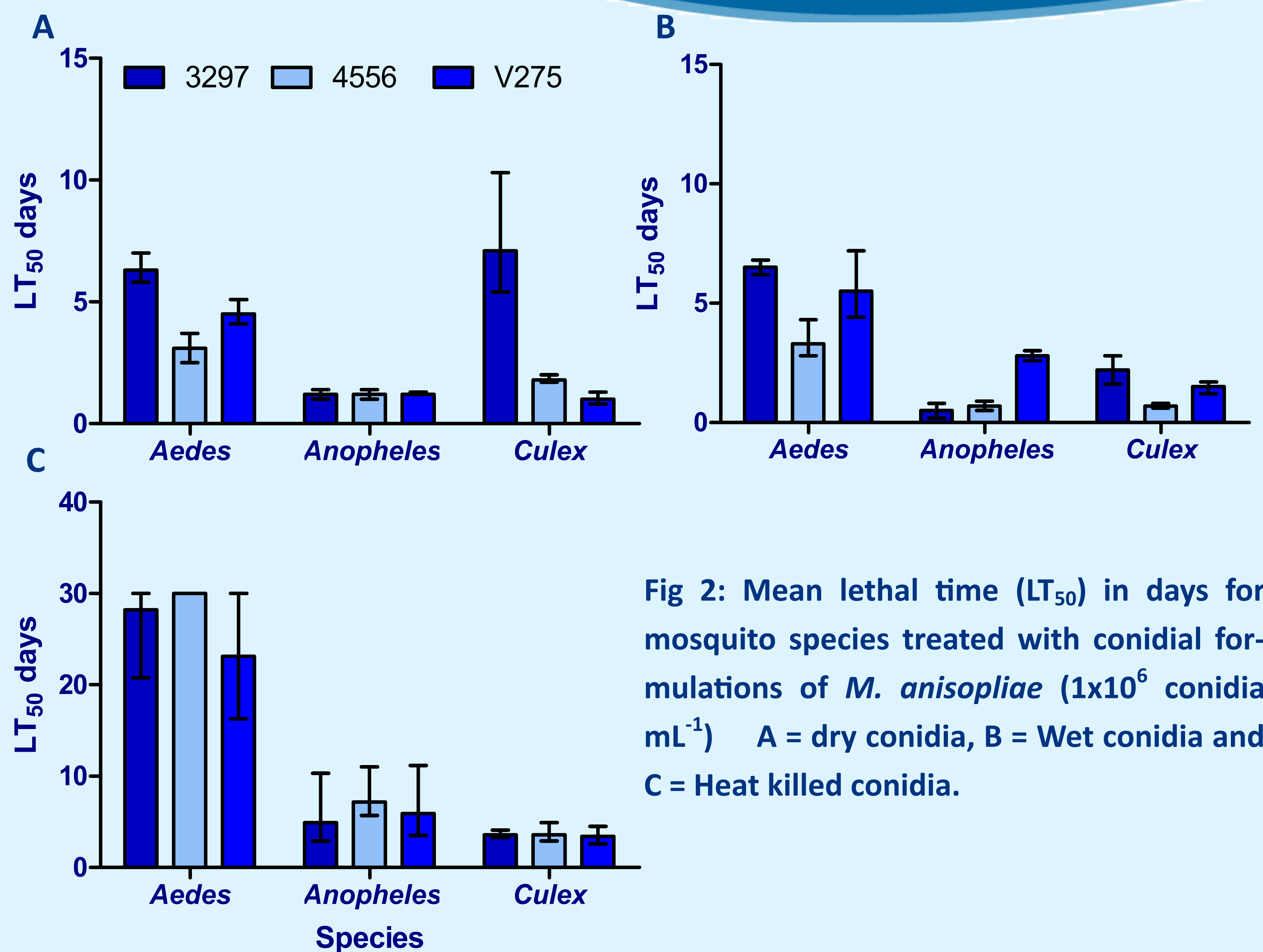


Fig 2: Mean lethal time (LT₅₀) in days for mosquito species treated with conidial formulations of *M. anisopliae* (1×10^6 conidia mL⁻¹) A = dry conidia, B = Wet conidia and C = Heat killed conidia.

- Dry and wet conidia had significantly lower LT₅₀ values than heat killed conidia [$F_{(2,60)} = 189.49$; $p < 0.001$]
- Application method did not significantly affect mortality [$F_{(2,62)} = 0.36$; $p = 0.697$]
- *Cx. quinquefasciatus* and *An. stephensi* were **more susceptible** to *Metarhizium* strains than *Ae. aegypti* [$F_{(2,60)} = 93.44$; $p < 0.001$]
- *M. anisopliae* ARSEF 4556 was **more virulent**, against all three mosquito species, than *M. brunneum* ARSEF 3297 and *M. anisopliae* V275 [$F_{(4,60)} = 3.92$; $p < 0.007$]

Conclusions

- **All three** strains were **pathogenic** to mosquito larvae independent of genus and larval developmental stage.
- **ARSEF 4556** was the **most aggressive** strain, killing *Anopheles* and *Culex* larvae within 24hr, *Aedes* less susceptible than either *Culex* or *Anopheles*.
- Both early and late larval stages were equally susceptible—providing a greater window of opportunity for control.
- Mortality is dose dependent, however, in this study, significant control was achieved at 1×10^6 conidia mL⁻¹, suggesting the fungus would be efficacious even when diluted in the water due to climatic and biotic factors.

References

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