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# Coffee and its waste repel gravid *Aedes albopictus* females and inhibit the development of their embryos

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## Abstract

**Background:** Dengue is a prevalent arboviral disease and the development of insecticide resistance among its vectors impedes endeavors to control it. Coffee is drunk by millions of people daily worldwide, which is associated with the discarding of large amounts of waste. Coffee and its waste contain large amounts of chemicals many of which are highly toxic and none of which have a history of resistance in mosquitoes. Once in solution, coffee is brownish in colour, resembling leaf infusion, which is highly attractive to gravid mosquitoes. To anticipate the environmental issues related to the increasing popularity of coffee as a drink, and also to combat insecticide resistance, we explored the deterrence potentials of coffee leachates against the ovipositing and embryonic stages of the dengue vector, *Aedes albopictus*.

**Methods:** In a series of choice, no-choice, and embryo toxicity bioassays, we examined changes in the ovipositional behaviours and larval eclosion of *Ae. albopictus* in response to coffee extracts at different concentrations.

**Results:** Oviposition responses were extremely low when ovicups holding highly concentrated extract (HCE) of coffee were the only oviposition sites. Gravid females retained increased numbers of mature eggs until 5 days post-blood feeding. When provided an opportunity to oviposit in cups containing coffee extracts and with water, egg deposition occurred at lower rates in those containing coffee, and HCE cups were far less attractive to females than those containing water only. Females that successfully developed in a coffee environment preferentially oviposited in such cups when in competition with preferred oviposition sites (water cups), but this trait did not continue into the fourth generation. Larval eclosion occurred at lower rates among eggs that matured in a coffee environment, especially among those that were maintained on HCE-moistened substrates.

**Conclusions:** The observations of the present study indicate a pronounced vulnerability of *Ae. albopictus* to the presence of coffee in its habitats during the early phases of its life cycle. The observations that coffee repels gravid females and inhibits larval eclosion provide novel possibilities in the search for novel oviposition deterrents and anti-larval eclosion agents against dengue vectors.

**Keywords:** *Aedes albopictus*, Coffee, Oviposition, Embryonation, Egg hatching

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