

Resistance of *Aedes aegypti* (Diptera: Culicidae) Populations to Deltamethrin, Permethrin, and Temephos in Cambodia



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Key messages

- All field populations showed phenotypic resistance to temephos compared with the sensitive strain.
- *Ae Aegypti* adult populations were all highly resistant to permethrin and seven out of eight populations showed resistance to deltamethrin.
- Innovative vector control tools are needed to replace ineffective pesticides in Cambodia.

Introduction

Knowledge on the extent, distribution and mechanisms of insecticide resistance is essential for successful insecticide-based dengue control interventions. Here, we report the resistance profile of the dengue vector, *Aedes aegypti* to commonly used insecticides in Cambodia.

Methods

This study characterised the insecticide resistance status of eight populations of *Ae. aegypti* from four different geographical areas. Urban and rural villages were selected as collection points within each area. Villages were selected by the National Dengue Control Programme according to geographical representation, dengue incidence, and recent use of temephos (within the previous two years). The susceptibility of *Ae. aegypti* to temephos, permethrin, and deltamethrin was evaluated in accordance with World Health Organization "Monitoring and managing insecticide resistance in *Aedes* mosquito populations" protocol. Field populations were compared with the United States Department of Agriculture's susceptible strain.

Results

All the field populations showed resistance to temephos when compared with the sensitive strain, with resistance ratio 50 (RR) varying from 3.3 to 33.78 and RR90 from 4.2 to 47, demonstrating an installed and generalised resistance of larvae to temephos in Cambodia. *Ae aegypti* adult populations were highly resistant to permethrin regardless of province or rural/urban classification, with an average mortality of 0.02 percent. Seven of the eight field populations showed resistance to deltamethrin.

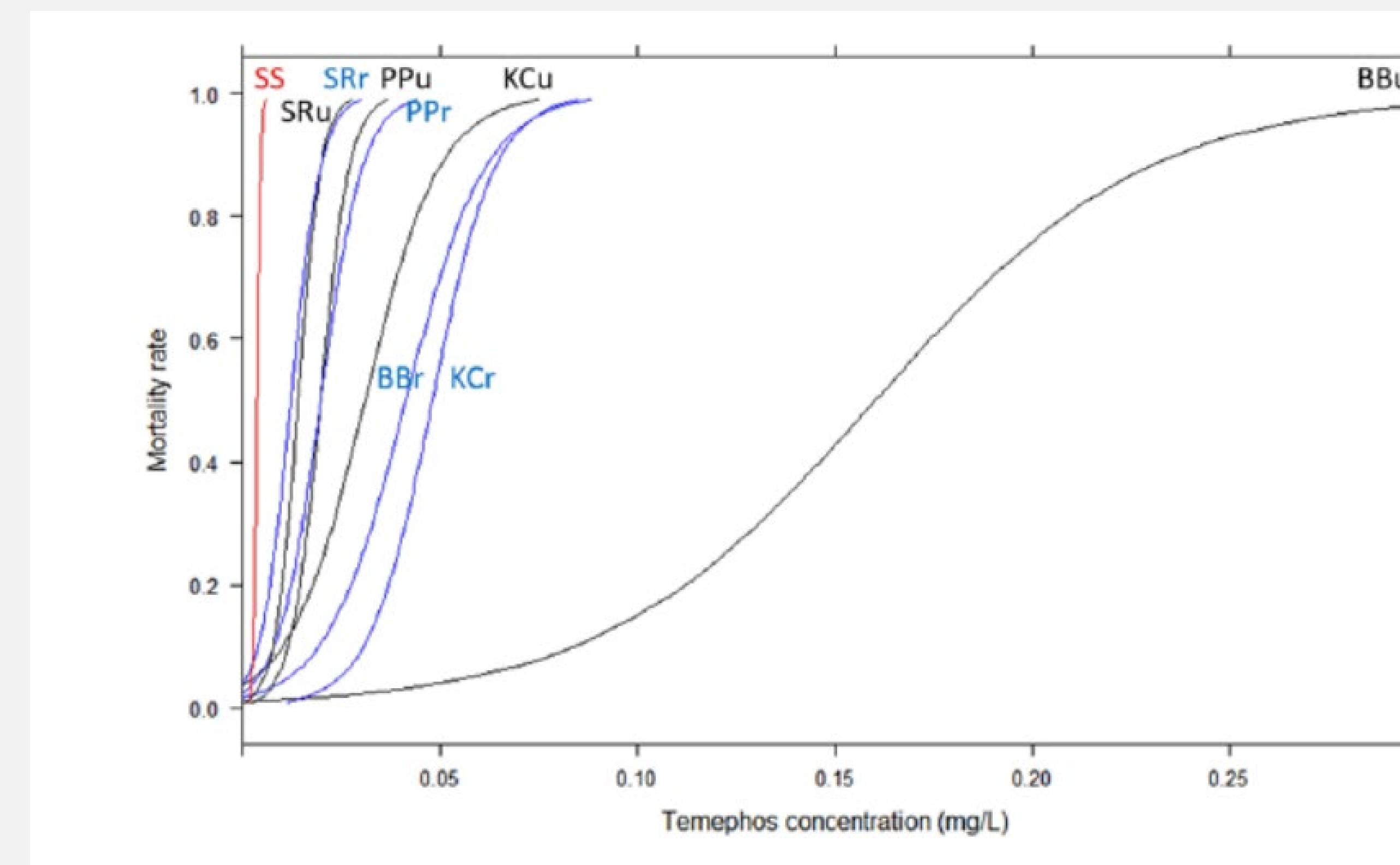


Figure 1: Mortality rate of *Aedes aegypti* larvae to temephos in the four provinces. The four urban populations are represented in black, the rural populations in blue. The red line is the Sensitive strain (SS). BB Battambang, KC Kampong Chan, SR Siem Reap, PP Phnom Penh. The small letters - "r" and "u" represent rural and urban areas, respectively.

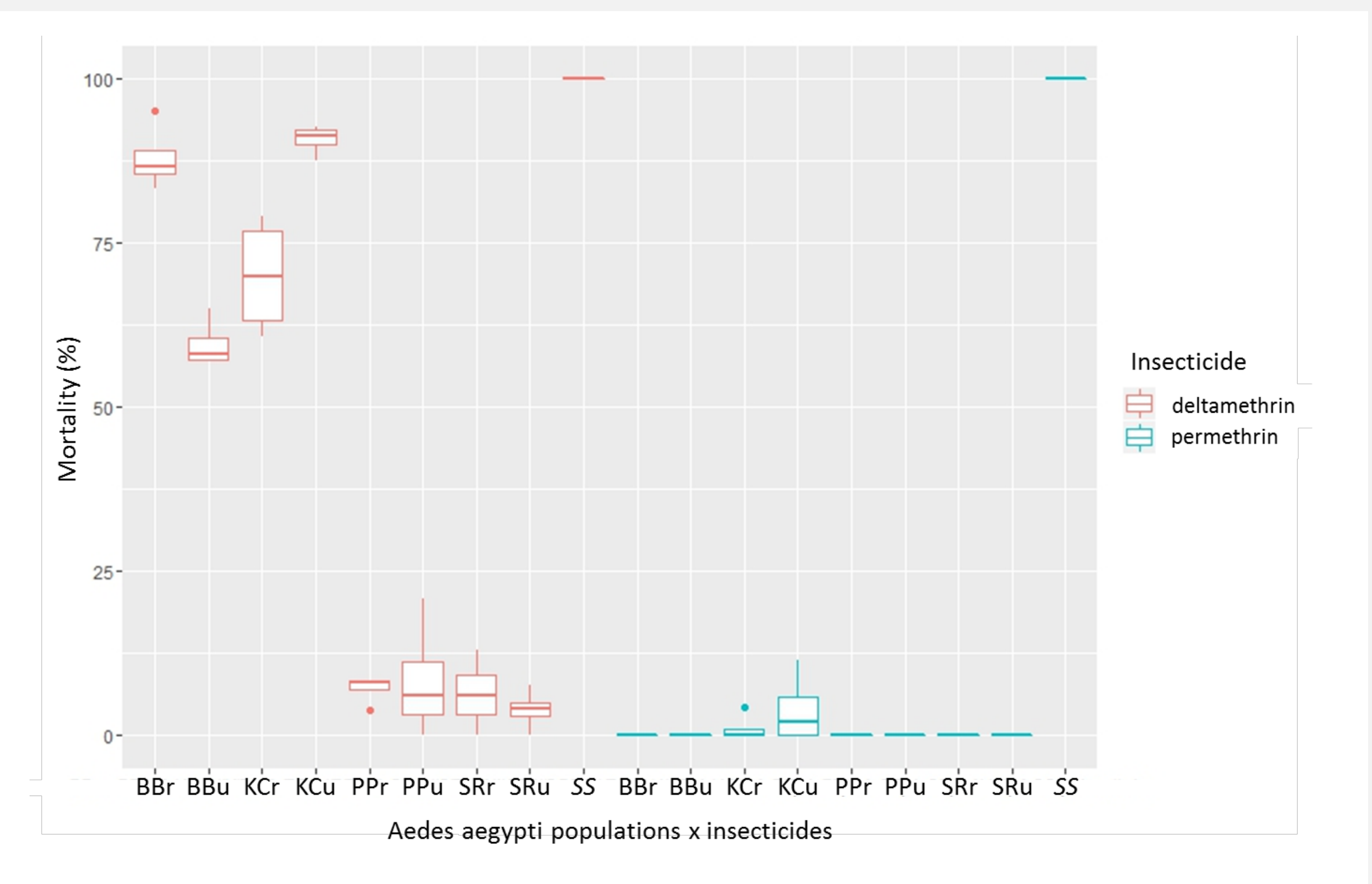


Figure 2: Mortality of *Aedes aegypti* populations to Deltamethrin and Permethrin. BB represents Battambang; KC Kampong Cham; PP Phnom Penh; SR Siem Reap; SS USDA Sensitive Strain. The small letters - "r" and "u" represent rural and urban areas, respectively.



Team members searching for immature mosquitoes

Conclusion

From a regional point of view, it seems essential that control methods are changed and temephos is replaced with another intervention. These results are alarming for dengue vector control, as widespread resistance may compromise the entomological impact of larval control operations. Finally, and perhaps most worrying, it seems that in the event of an epidemic, the adulticides used in the Southeast Asia region are no longer effective. Innovative vector control tools are needed to replace ineffective pesticides in Cambodia.

Acknowledgements

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was supported by UK Department for International Development (DFID) through the Programme Partnership Arrangement (Award number: 40097745).