



# Discovery of an oviposition attractant for malaria vectors of the *Anopheles gambiae* species complex paves the way for novel surveillance and control tools

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## INTRODUCTION

Long-lasting insecticidal nets (LLINs) and indoor residual sprays (IRS) are the gold standard tools for malaria vector control in sub-Saharan Africa. However, to deal with residual malaria transmission sustained by mosquito populations that resist insecticides and bite or rest outdoors, supplementary tools that target malaria vectors outdoors have become a research priority (Killeen, 2014). This study tested the hypothesis that we can identify chemicals that guide gravid females of the *Anopheles gambiae* mosquito complex and combine them with traps to kill mosquitoes outdoors.

## METHODS

- Headspace collections were done with soil infusions and autoclaved soil infusions previously described (Herrera-Varela et al. 2014; Okal et al. 2015);
- Volatile chemicals analysed with gas-chromatography mass-spectrometry; one volatile identified and evaluated in semi-field system with modified BG sentinel trap (a);
- Field tests in western Kenya, in Kaugege location, 200m from the shore of Lake Victoria;
- Three sites within the vicinity of houses, but 70 – 500 m apart;
- Three types of traps set in parallel: (a) modified BG Sentinel trap, (b) OviART gravid mosquito trap, (c) ring of electrocuting nets;
- Randomised block design;
- Half of each trap type treated with 5 ppm of cedrol in lake water;
- Traps run overnight;
- Three rounds implemented, 24 trap nights;
- Analysed with Generalized Linear Models.

## CONCLUSION

As *Anopheles gambiae* species use attractive chemical cues when orienting towards oviposition sites, we can exploit these chemical cues to trap female malaria mosquitoes outdoors.

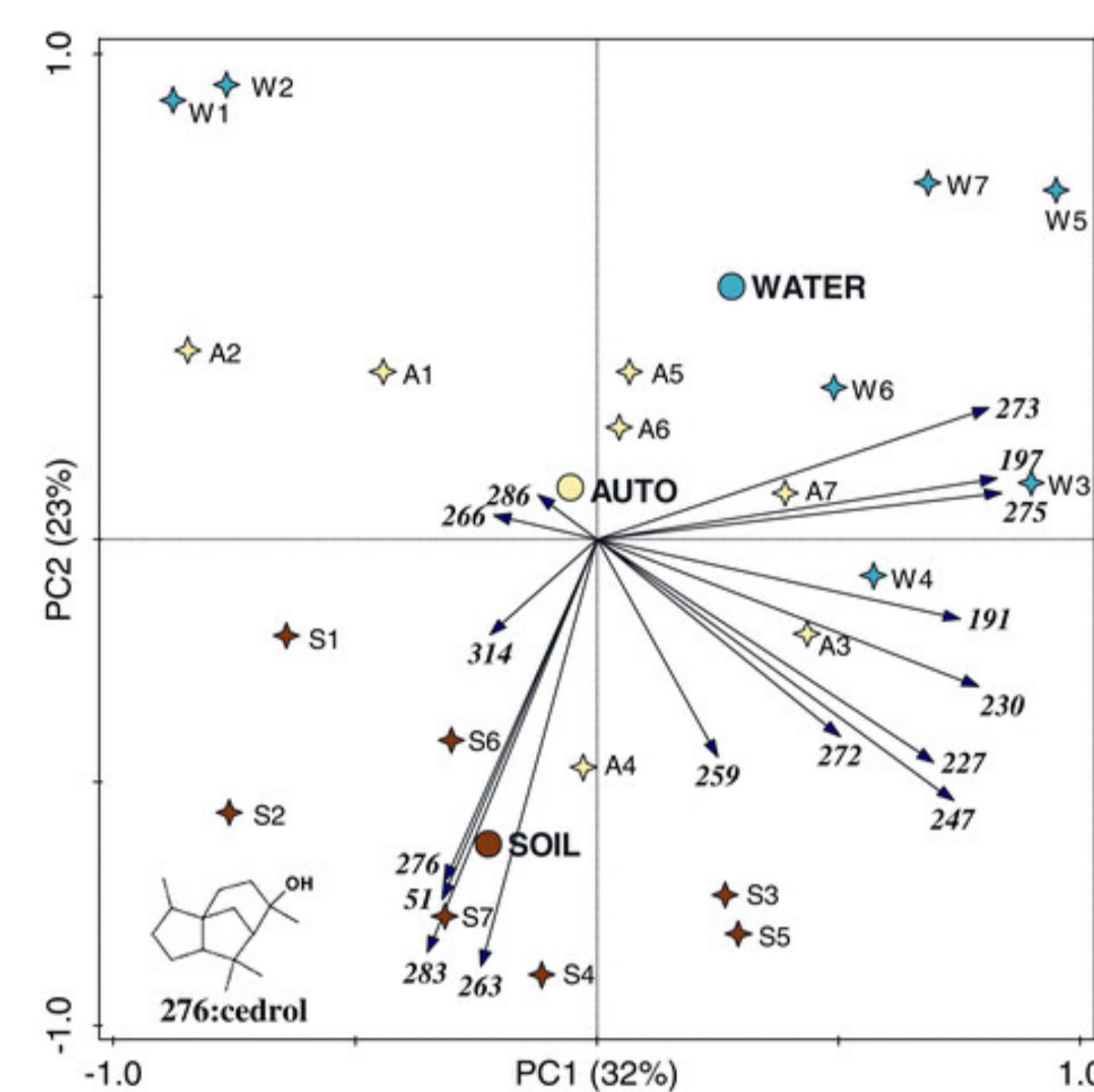
## IMPACT

The discovery of cedrol and demonstration of its trapping efficacy is an important breakthrough for targeting gravid members of the *An. gambiae* complex. It provides for the development of multiple ways for targeting residual malaria transmission in areas where current gold-standard indoor vector control interventions are applied at full coverage, but are not enough to eliminate malaria.

## OBJECTIVE

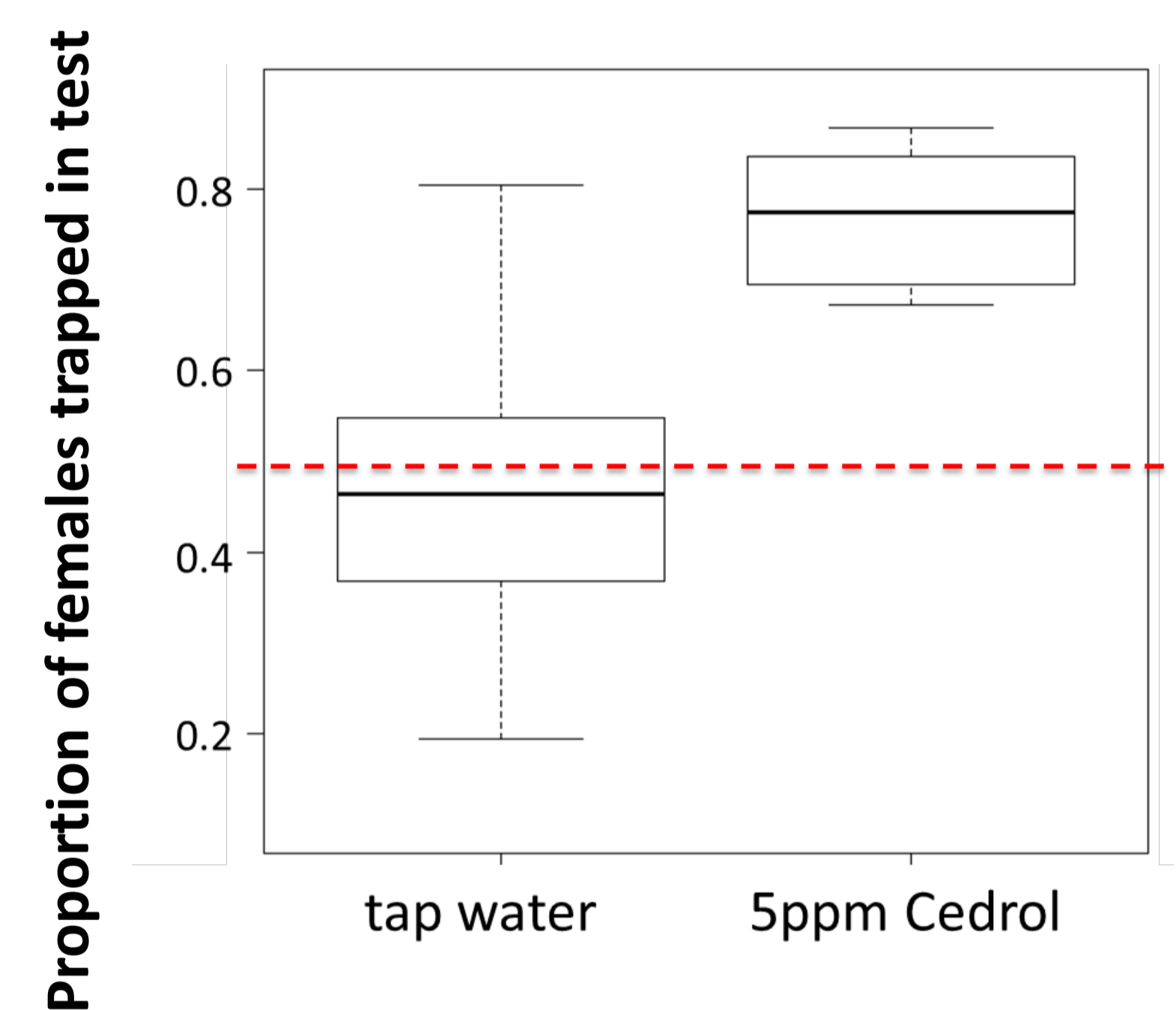
To develop and evaluate an odour-baited trapping tool for gravid mosquitoes of the *Anopheles gambiae* species complex.

## RESULTS

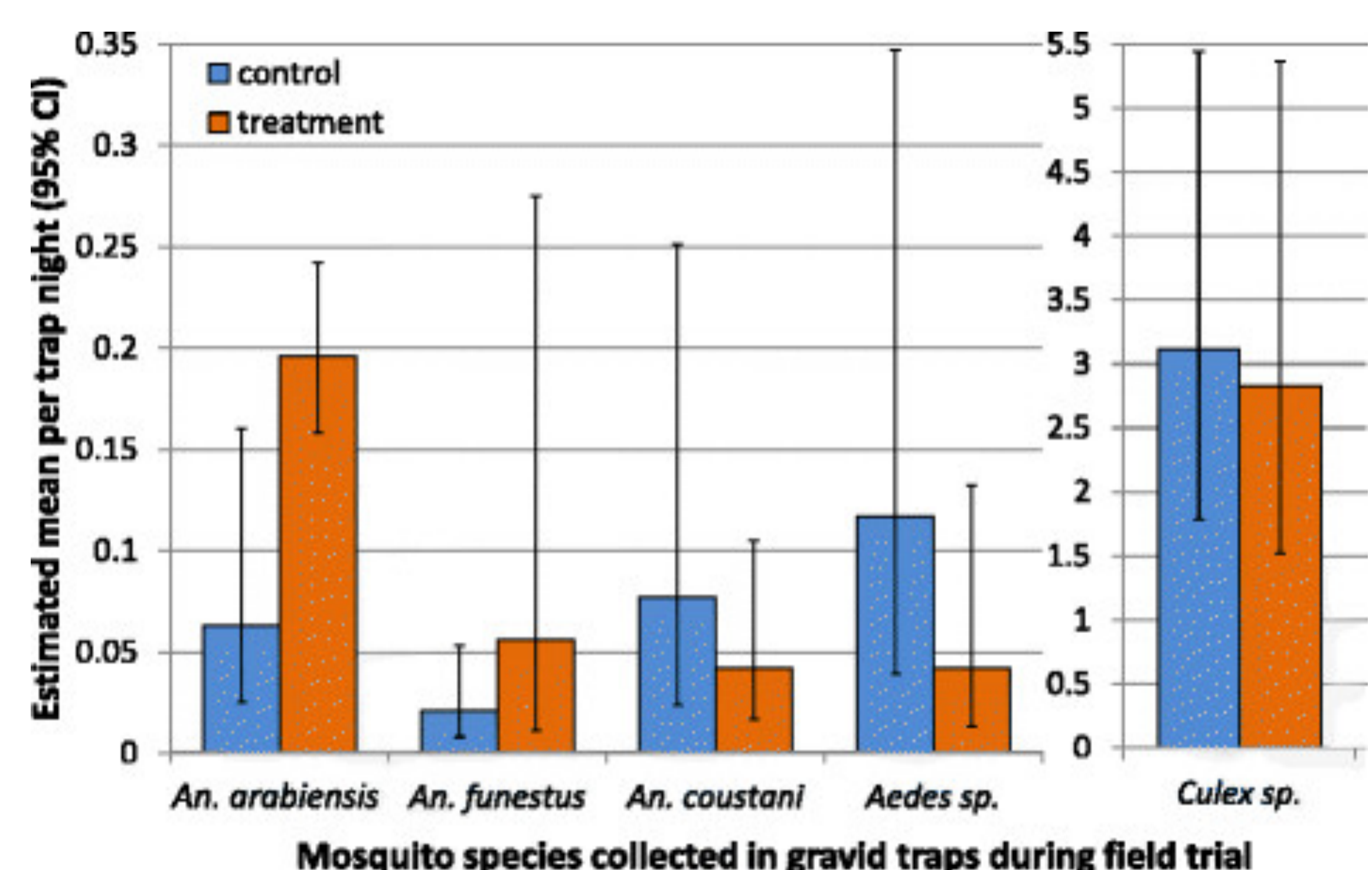


Headspace collection and GC-MS analysis revealed four compounds (51, 263, 276, and 283) grouping closely with the soil infusion samples that had previously been shown to attract gravid females (Herrera-Varela et al., 2014) as compared to the same infusion autoclaved. We identified one of the volatiles, ID 276, as cedrol.

*Anopheles gambiae* s.s. were two times more likely to approach modified BG sentinel traps in the semi-field tests when water with 5ppm cedrol was provided than in water only [Odds ratio (OR) 1.9, 95% confidence interval (CI) 1.6–2.3].



Under natural field conditions, traps with 5ppm cedrol were three times more likely to trap *Anopheles arabiensis* than traps with water only (OR 3.3, 95% CI 1.4-7.9).



## REFERENCES

- Herrera-Varela M., Lindh J., Lindsay S.W. and Fillinger U. (2014) Habitat discrimination by gravid *Anopheles gambiae* sensu lato - a push-pull system. *Malaria Journal* 13, 133.
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- Okal M.N., Herrera-Varela M., Ouma P., Torto B., Lindsay S.W., Lindh J.M. and Fillinger U. (2015) Analysing chemical attraction of gravid *Anopheles gambiae* sensu stricto with modified BG-Sentinel traps. *Parasites & Vectors* 8, 301.

