



Exploiting egg-induced plant signalling for stemborer management

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INTRODUCTION

- Maize (*Zea mays* L.) is the major staple food and cash crop for millions of people in sub-Saharan Africa.
- Stemborers are devastating pests of maize in the region causing yield losses of up to 88%.
- Exploiting egg-induced plant defence may lead to developing cost-effective and environmentally benign approaches of stemborer control that are appropriate to resource-poor African farmers.

OBJECTIVES

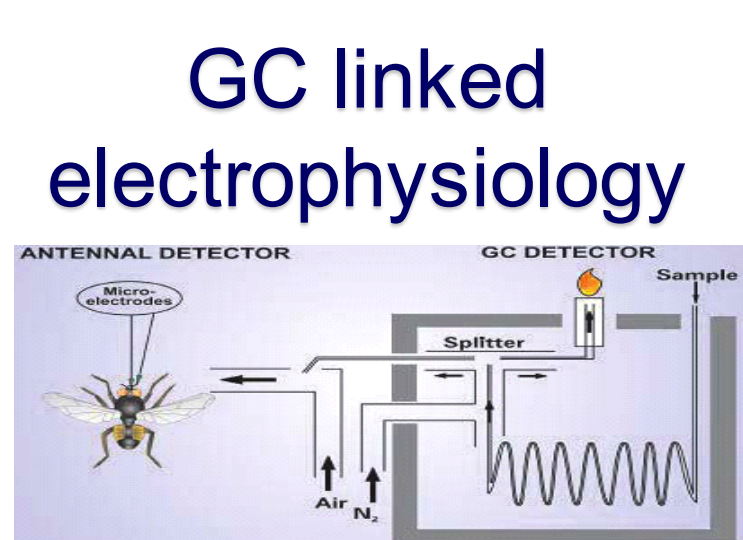
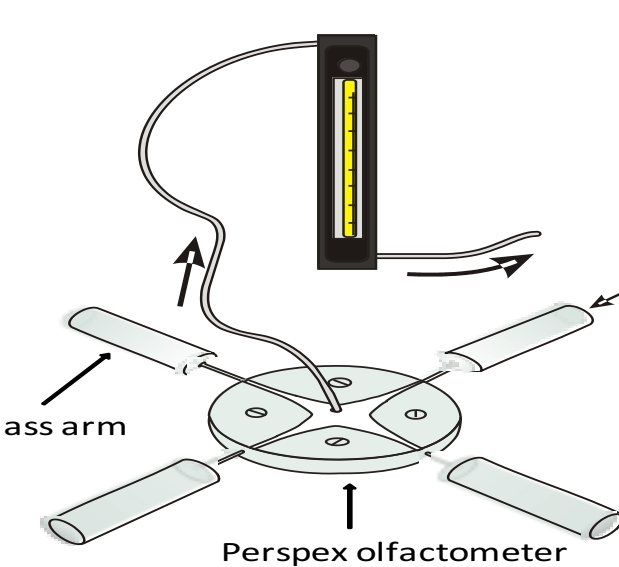
- To determine changes in the profile of volatiles that diverse maize cultivars emit when stemborers deposit eggs on them.
- To determine effects of egg-induced plant volatile on the behaviour of key egg and larval parasitoids.
- To identify biologically-active components responsible for any observed behavioural responses in the parasitoids.

METHODS

Headspace sampling
(collection of volatiles)



Bioassay (naturals)



Bioassay
(synthetics)

GC & GC-MS Analysis
Identification &
quantification of bioactive
compounds

IMPACT

Discovery of novel defence trait on certain maize landraces that could be bred into cereal cultivars with other favourable agronomic characteristics, to provide better crop resistance against stemborer attack, will help reduce hunger and poverty, as stemborers infest about 50% of the agricultural land in sub-Saharan Africa, affecting the lives of nearly 300 million people, and causing yield losses of ~\$ 1.5 billion per annum.

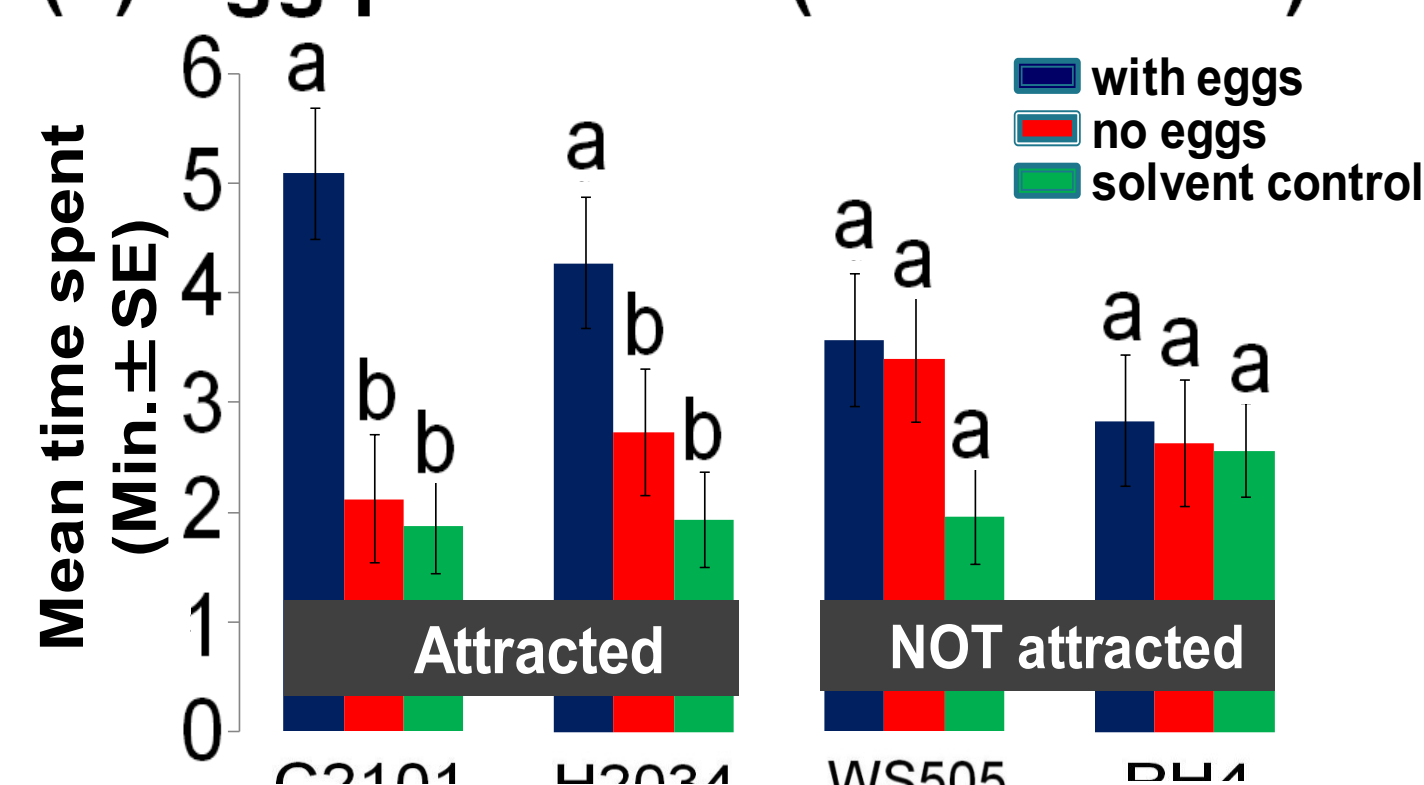
CONCLUSIONS

- Early herbivory induces changes in the volatile profile of certain maize landraces, and attracts key natural enemies (parasitoids).
- Indirect defence response that oviposition elicits may have been lost in the commercial varieties tested.
- Potential exists to improve crop defence by introgressing the indirect defence traits from landraces into mainstream maize cultivars.

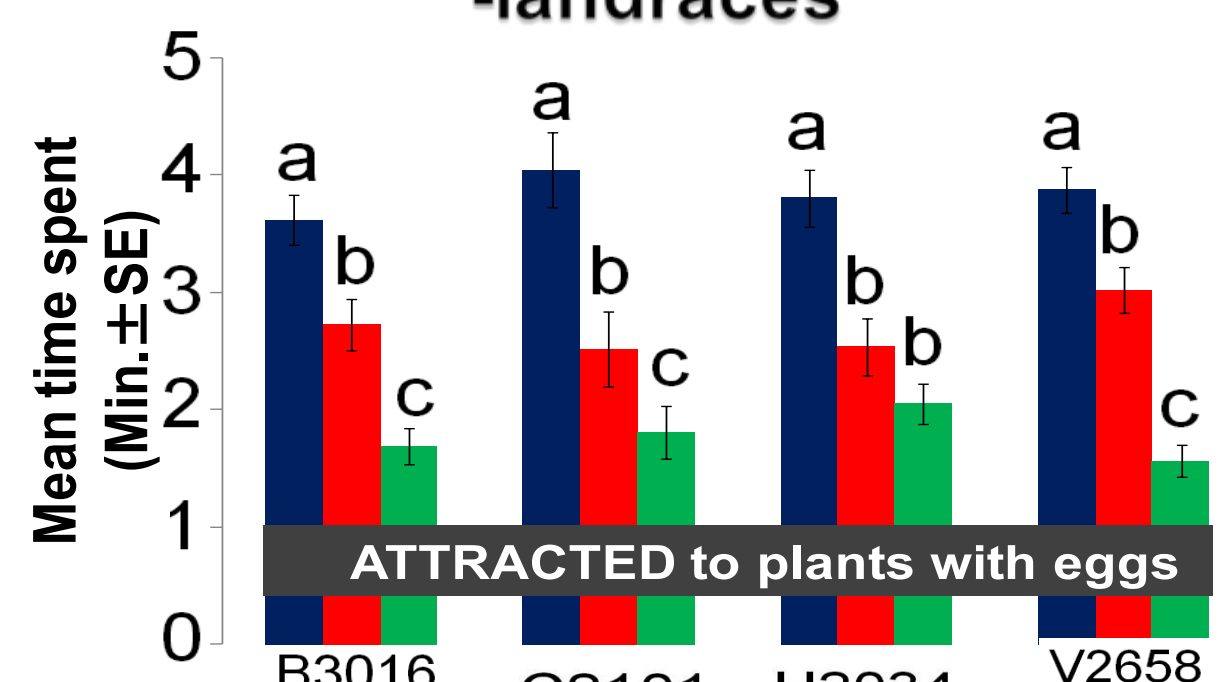
RESULTS

BEHAVIOURAL STUDY

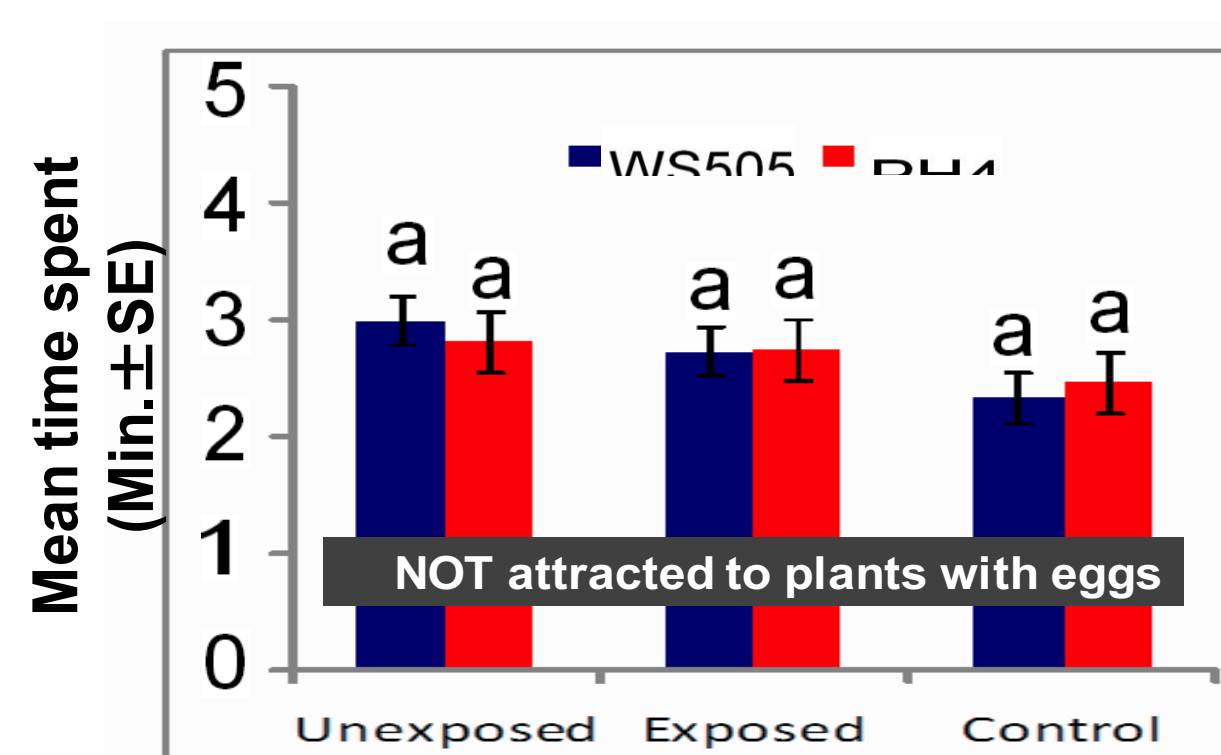
(a) Egg parasitoid (*T. bournieri*)



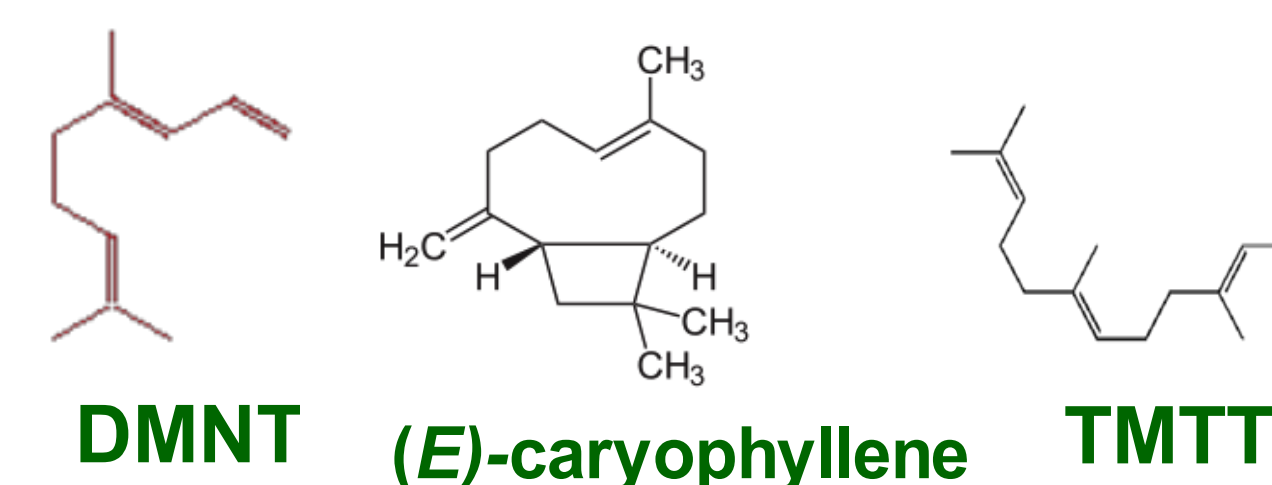
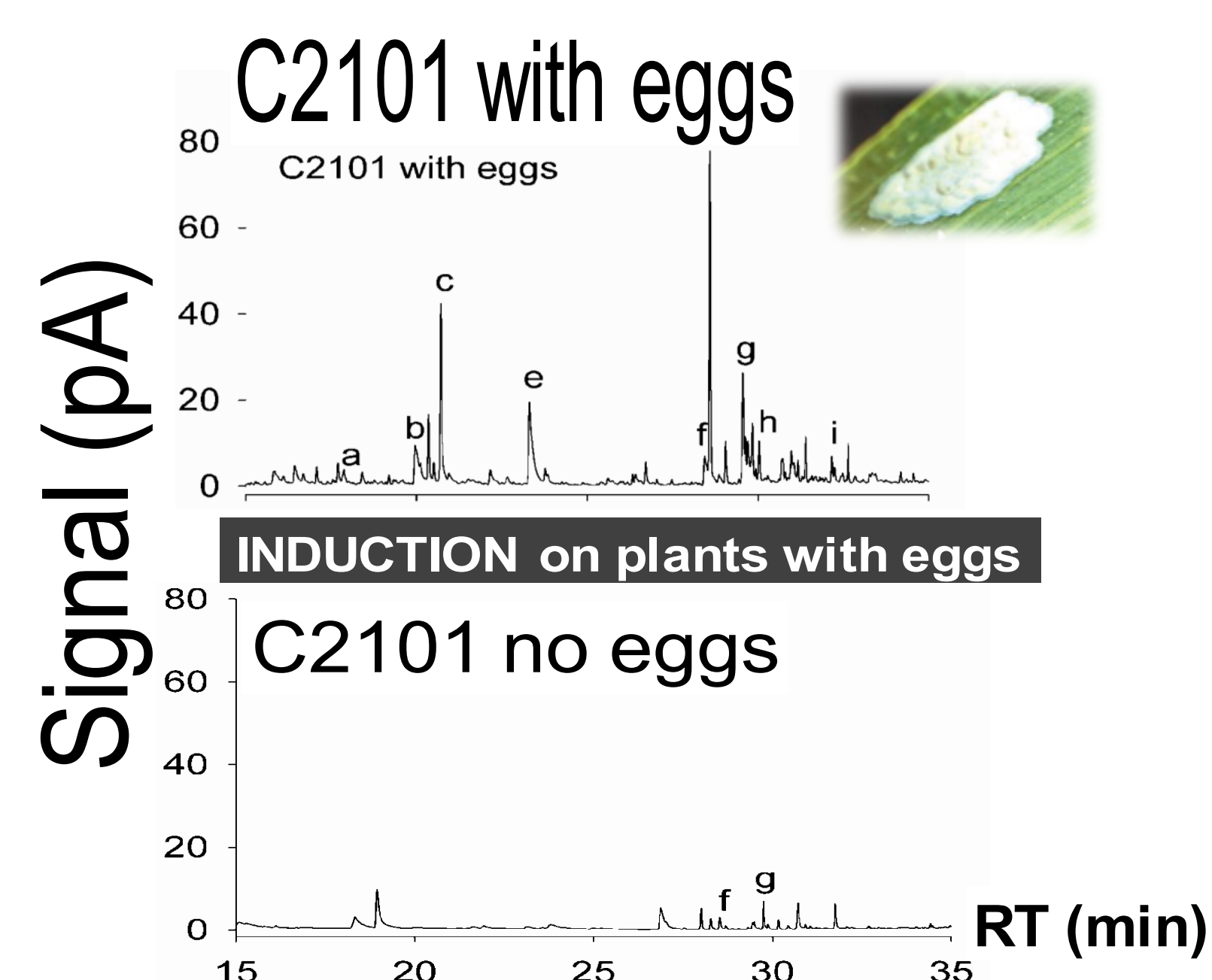
(b) Larval Parasitoids (*C. sesamiae*) -landraces



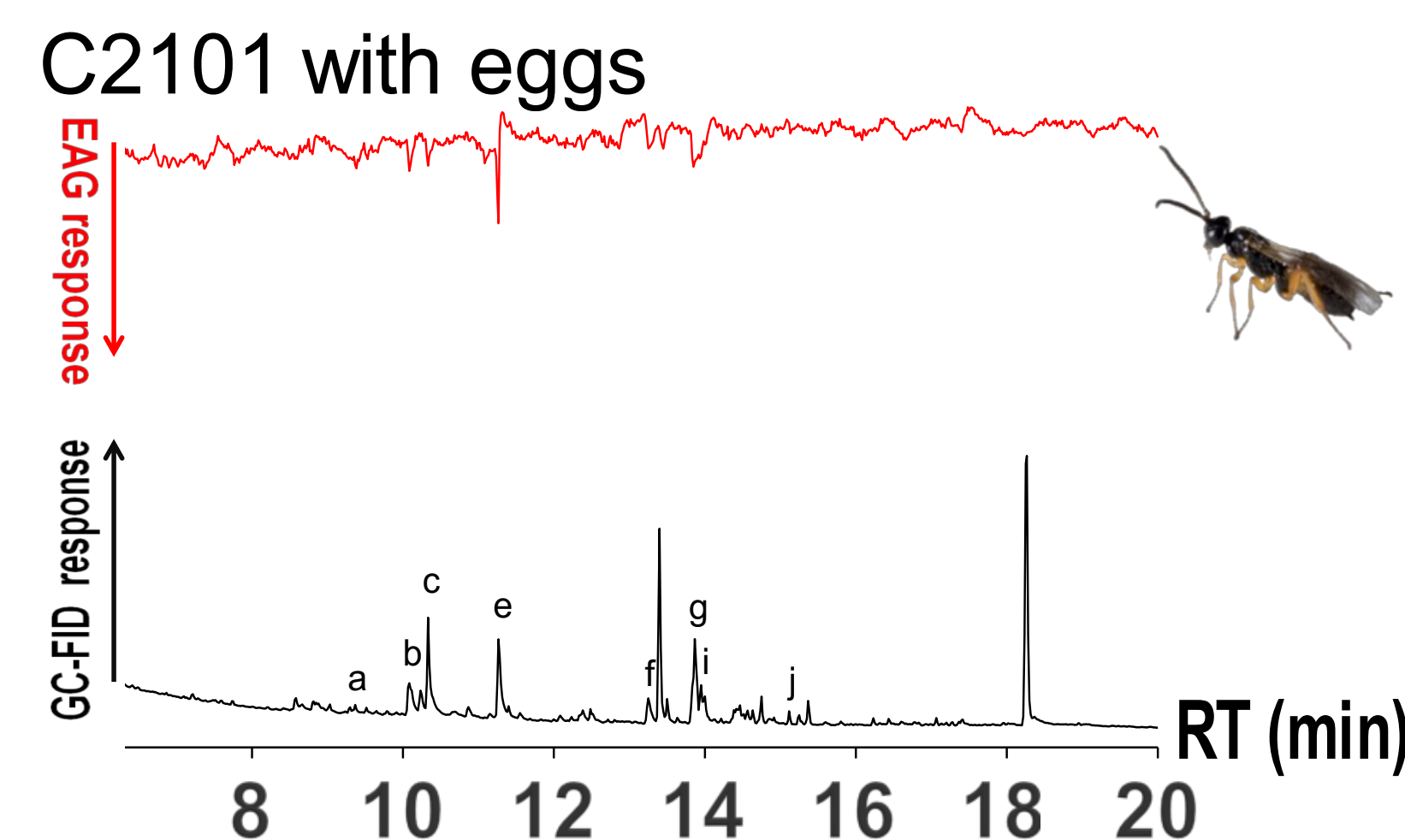
(c) Larval Parasitoids (*C. sesamiae*) -commercial



GC-MS ANALYSIS



GC-EAG ANALYSIS



REFERENCES

Tamiru A., Bruce T.J.A., Midega C.A.O., Woodcock C.M., Birkett M.A., Pickett J.A. and Khan Z.R. (2012) Oviposition induced volatile emissions from African smallholder farmers' maize varieties. *Journal of Chemical Ecology* 38, 231–234.

Tamiru A., Bruce T. J. A., Woodcock C. M., Caulfield J. C., Midega C. A.O., Ogot C. K. P. O., Mayon P., Birkett M. A., Pickett J. A. and Khan Z. R. (2011) Maize landraces recruit egg and larval parasitoids in response to egg deposition by a herbivore. *Ecology Letters* 14, 1075–1083.