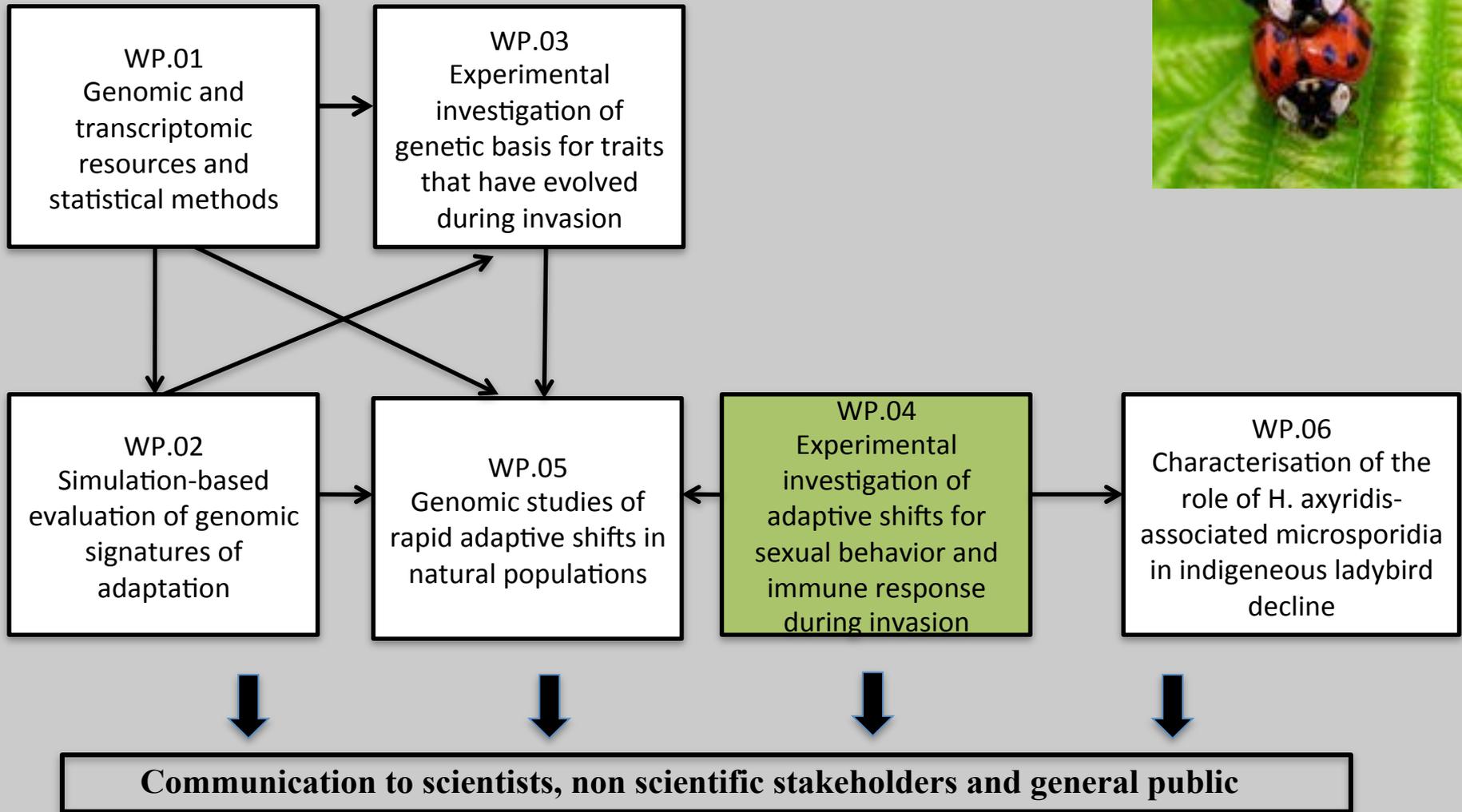


EXOTIC

EXperimentally **O**rientated genomics to **T**ackle
Insects' adaptive **C**hallenges during bioinvasions

François Verheggen

Entomologie fonctionnelle et évolutive
Gembloux Agro-Bio Tech, Université de Liège (Belgique)



Hypothesis

Developing an efficient communication to encounter mates improves the invasive success



Where are you
dear?

I am here honey

Hypothesis

Developing an efficient communication to encounter mates improves the invasive success

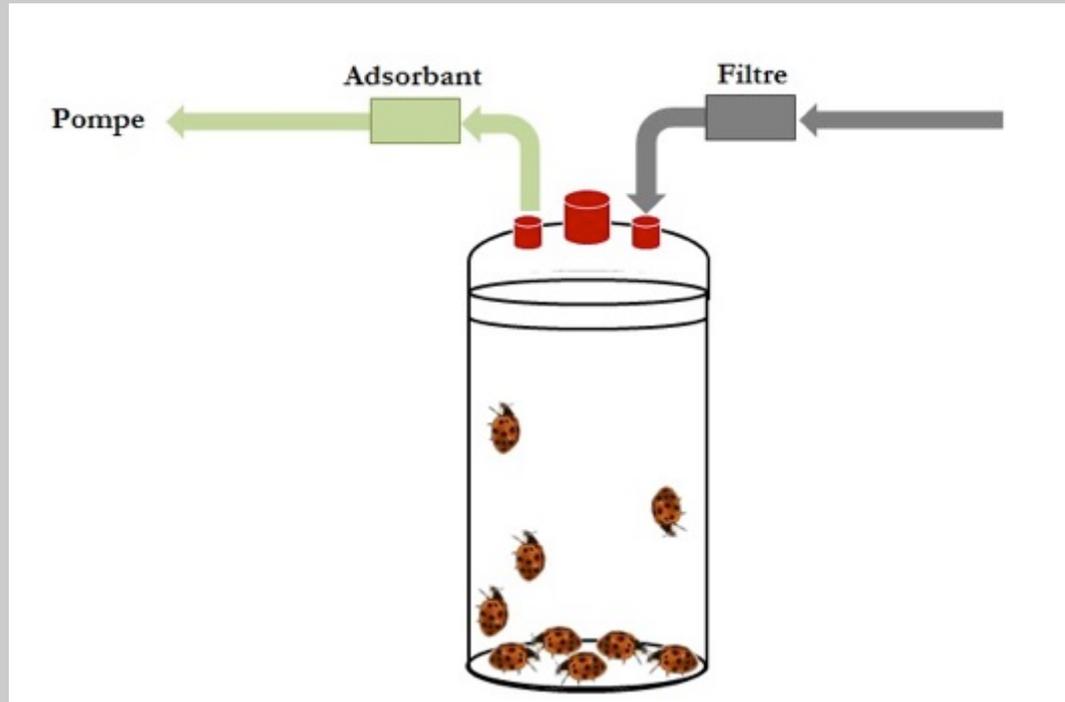
1. **Chemistry** : Pheromone collection, identification and quantification
2. **Behavior** : Demonstrate the behavioral activity of the identified chemicals
3. **Strains comparisons** : Show potential differences among strains



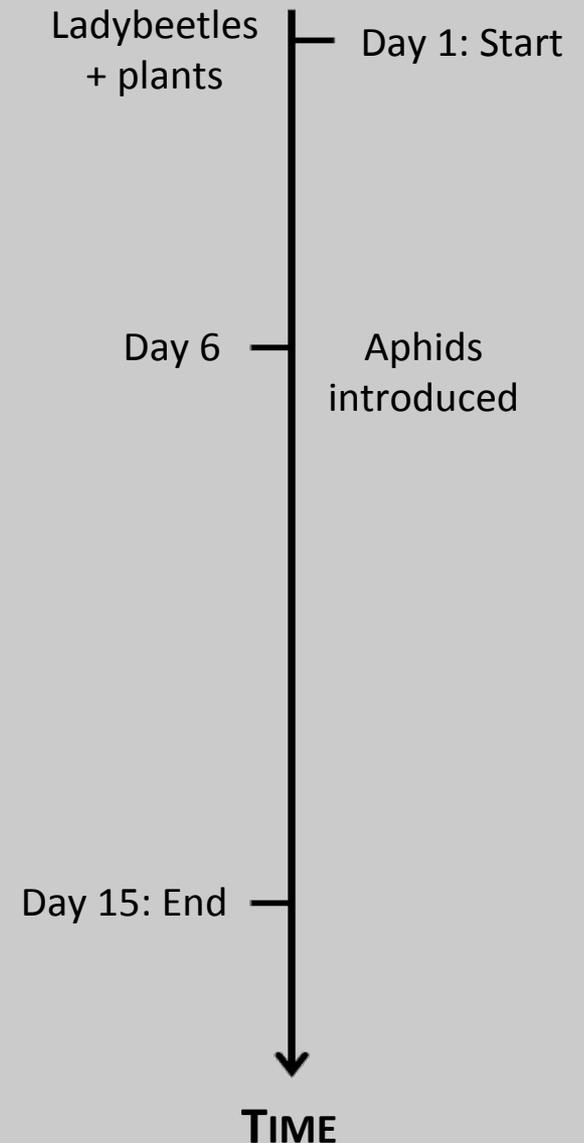
B. Fassotte



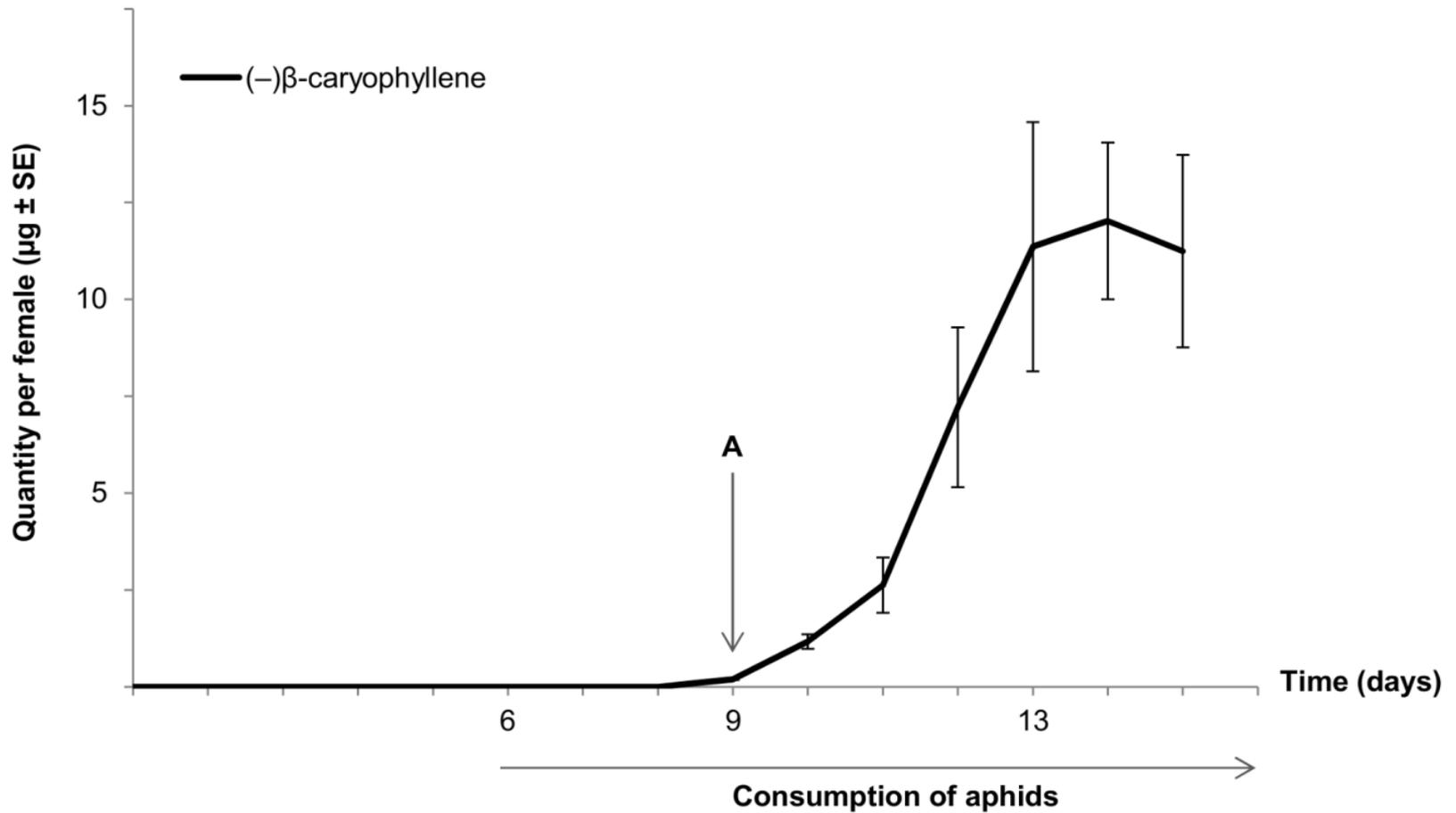
1. Collect and identify the volatile organic chemicals released



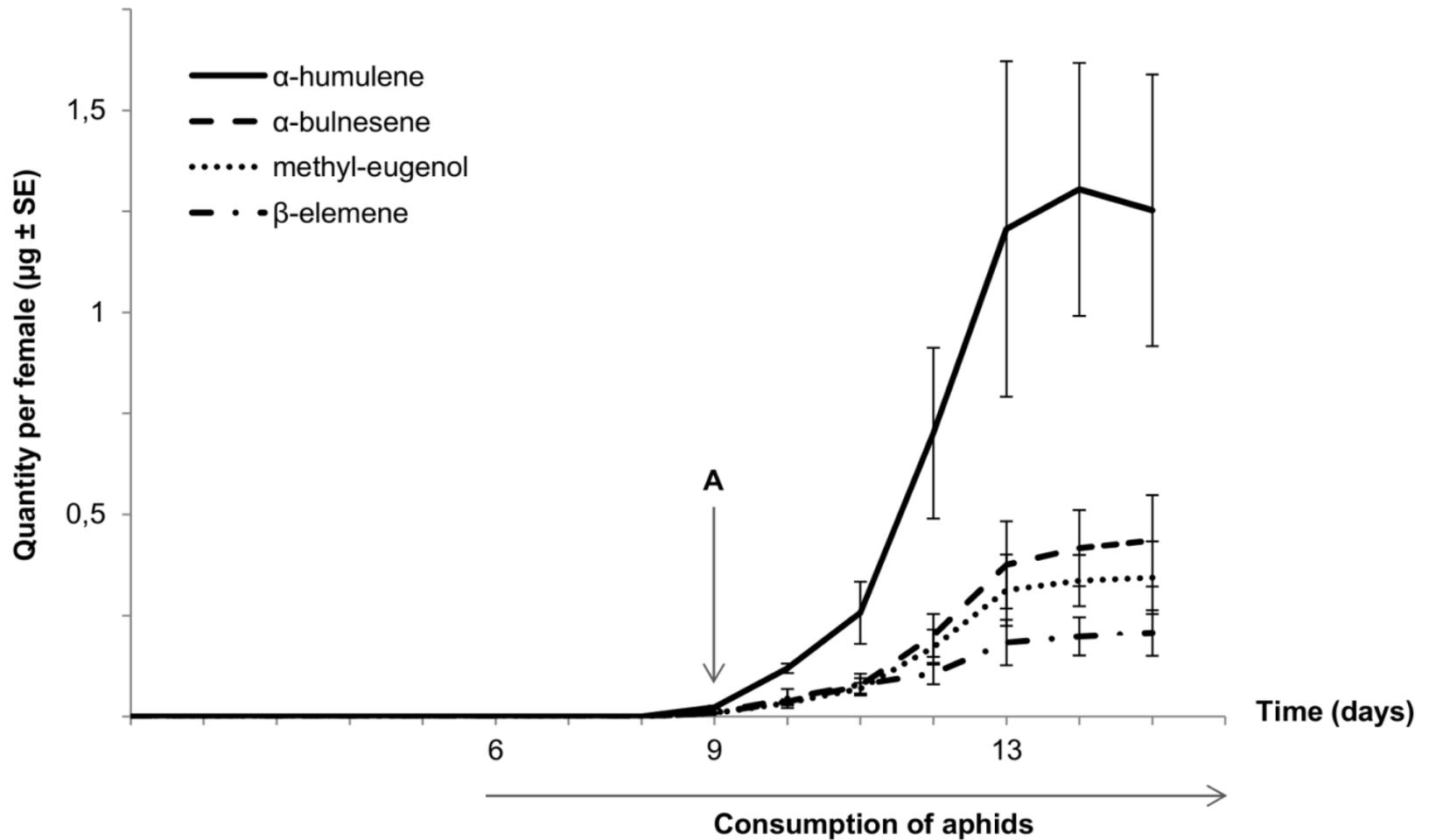
Sex pheromone emissions



1. Collect and identify the volatile organic chemicals released



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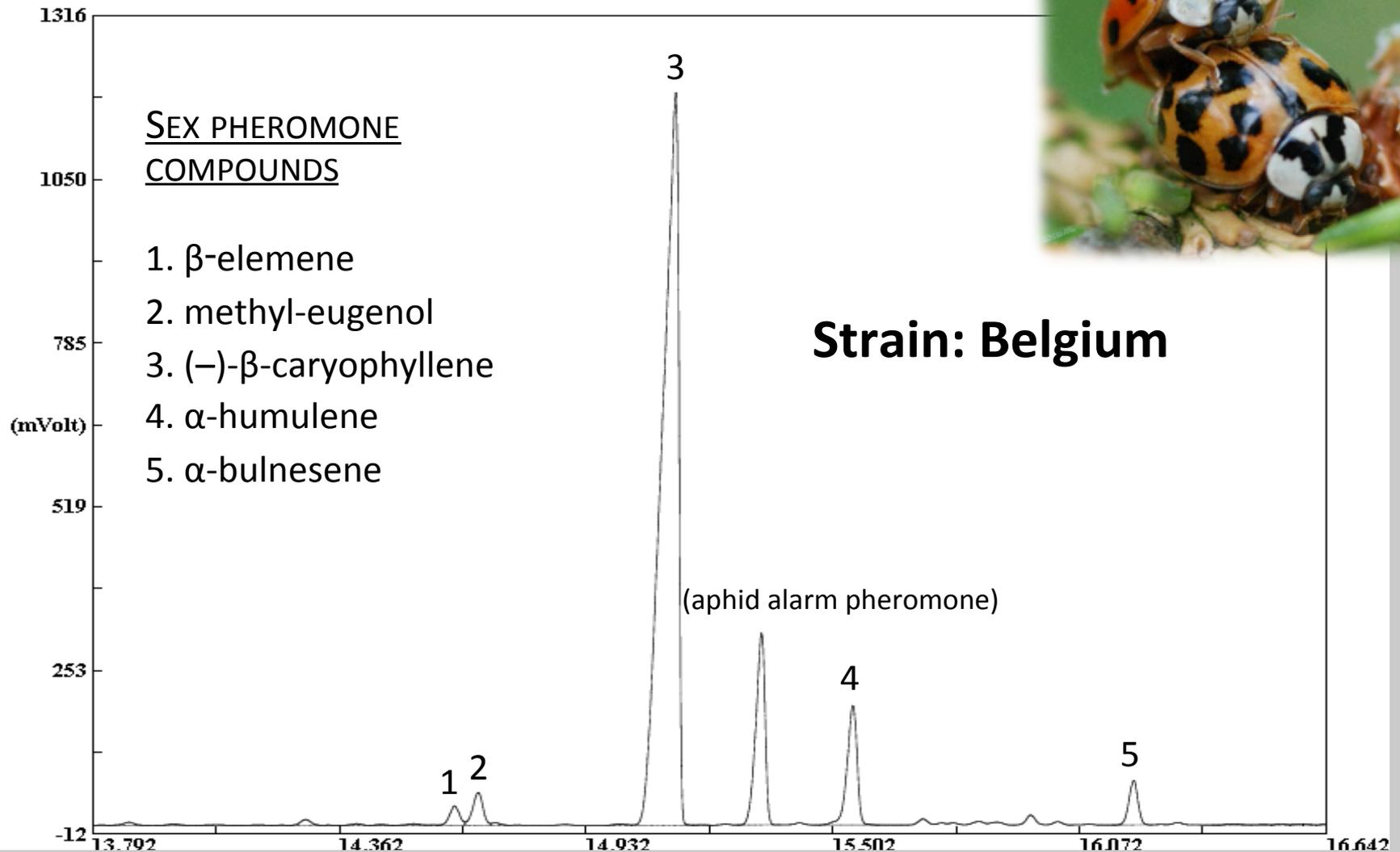


1. Collect and identify the volatile organic chemicals released

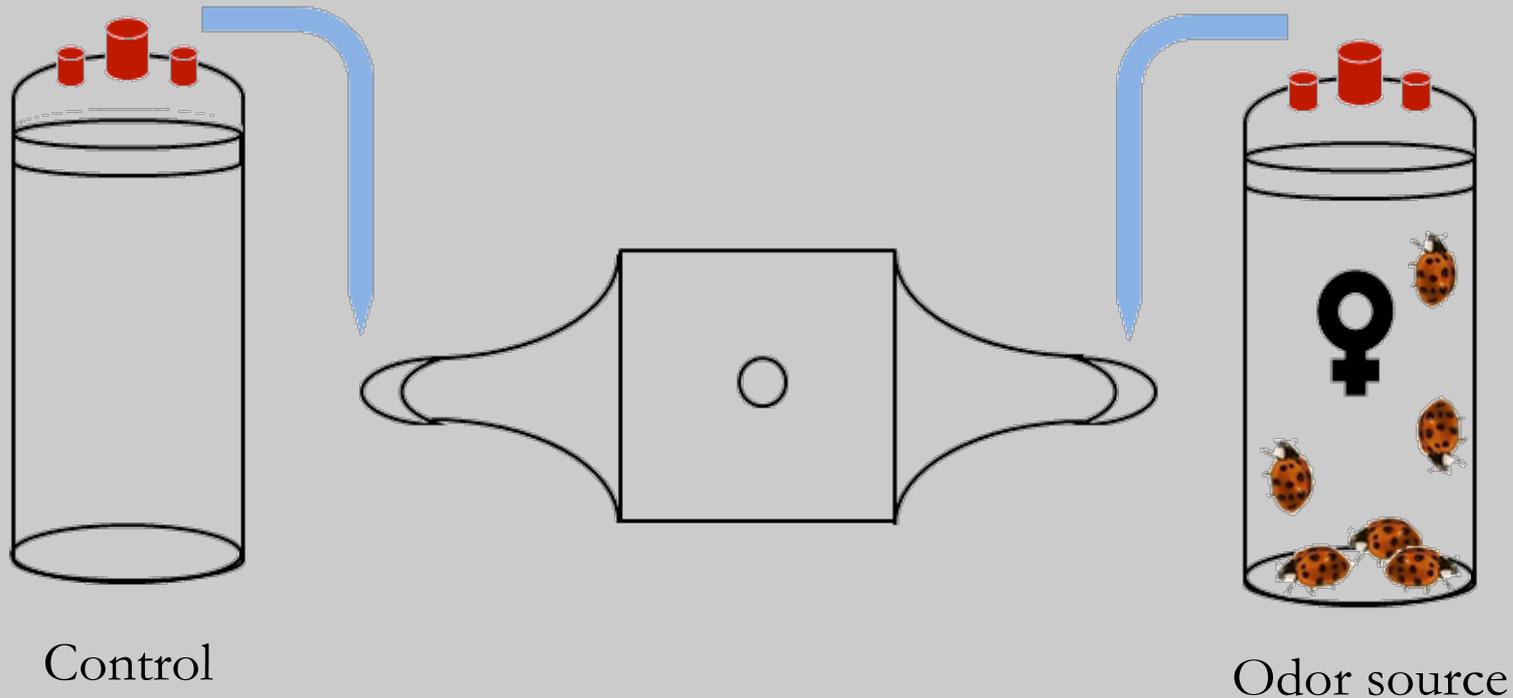


Sex pheromone content in the beetles

1. Collect and identify the volatile organic chemicals released

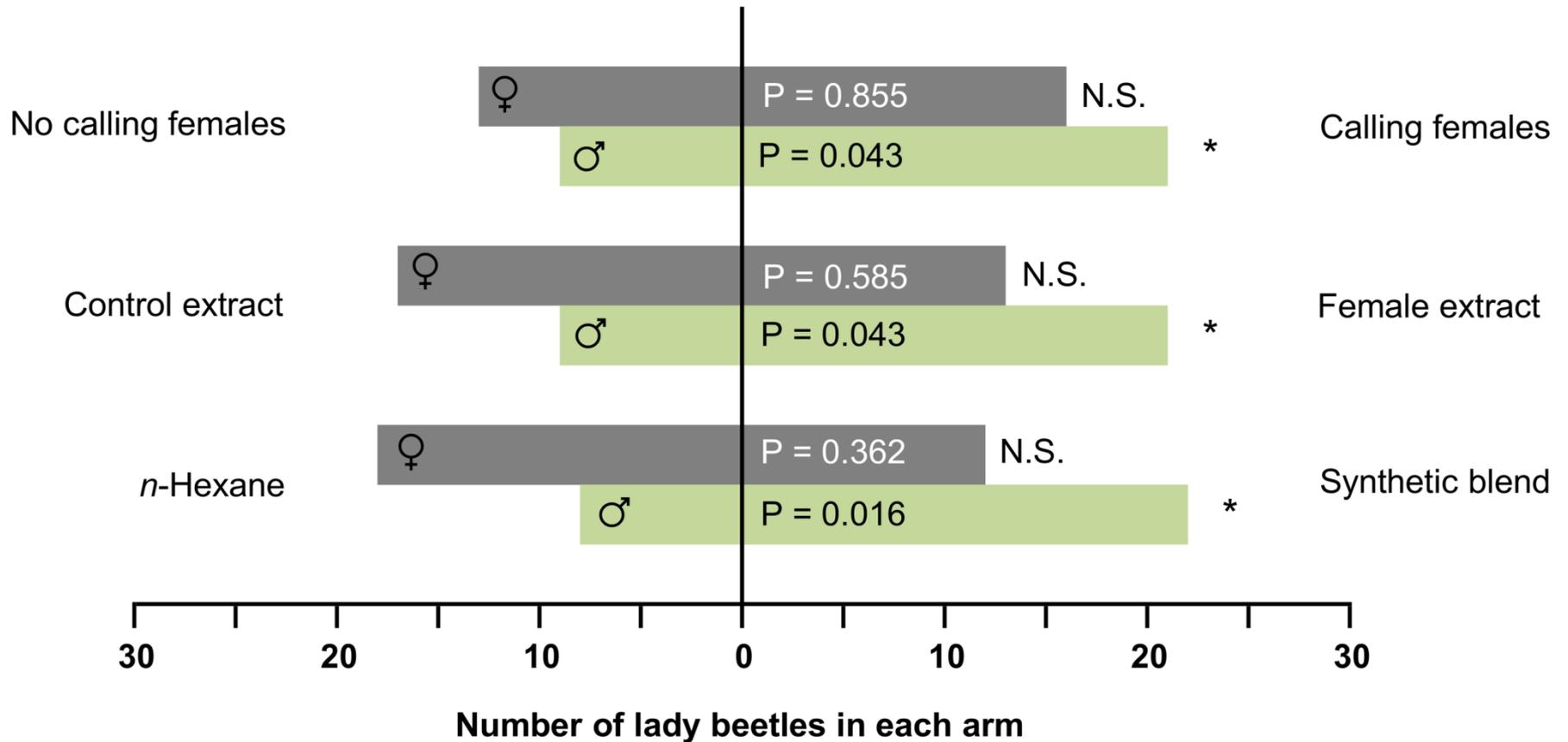


2. Demonstrate the behavioral activity of the identified chemicals



1. Female ladybeetles (+ aphids and plants)
2. Crushed female ladybeetles
3. Synthetic blend of the sex pheromone
4. Each individual chemicals

2. Demonstrate the behavioral activity of the identified chemicals





RESEARCH ARTICLE

First Evidence of a Volatile Sex Pheromone in Lady Beetles

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Abstract

To date, volatile sex pheromones have not been identified in the Coccinellidae family; yet, various studies have suggested that such semiochemicals exist. Here, we collected volatile chemicals released by virgin females of the multicolored Asian lady beetle, *Harmonia axyridis* (Pallas), which were either allowed or not allowed to feed on aphids. Virgin females in the presence of aphids, exhibited "calling behavior", which is commonly associated with the emission of a sex pheromone in several Coleoptera species. These calling females were found to release a blend of volatile compounds that is involved in the remote attraction (i.e., from a distance) of males. Gas Chromatography-Mass Spectrometry (GC-MS) analyses revealed that (-)- β -caryophyllene was the major constituent of the volatile blend (ranging from 80 to 86%), with four other chemical components also being present; β -elemene, methyl-eugenol, α -humulene, and α -bulnesene. In a second set of experiments, the emission of the five constituents identified from the blend was quantified daily over a 9-day period after exposure to aphids. We found that the quantity of all five chemicals significantly increased across the experimental period. Finally, we evaluated the activity of a synthetic blend of these chemicals by performing bioassays which demonstrated the same attractive effect in males only. The results confirm that female *H. axyridis* produce a volatile sex pheromone. These findings have potential in the development of more specific and efficient biological pest-control management methods aimed at manipulating the behavior of this invasive lady beetle.

OPEN ACCESS

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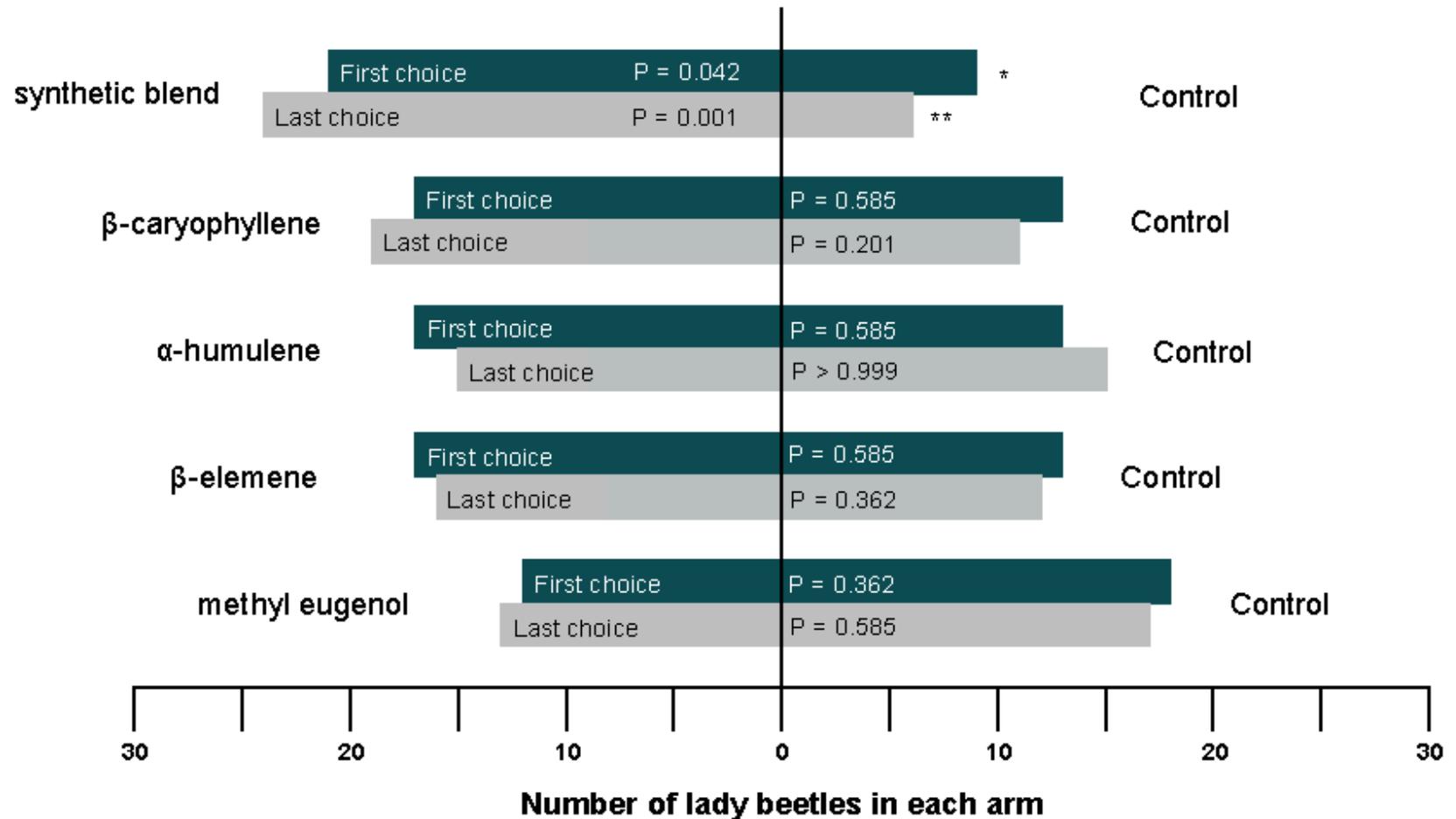
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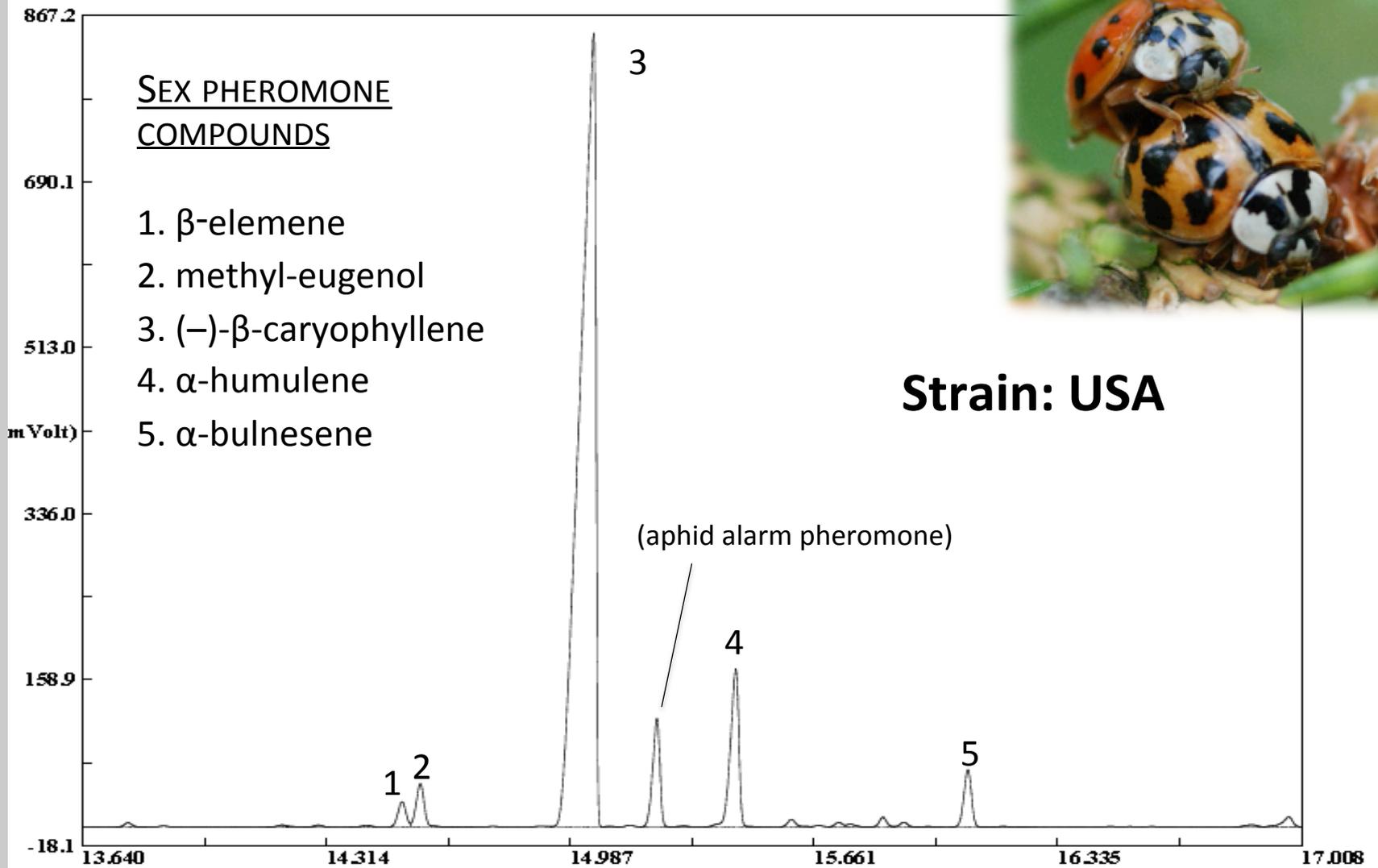
Data Availability: The authors confirm that all data underlying the findings are fully available without restriction. All relevant data are within the paper and its Supporting Information files.

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2. Demonstrate the behavioral activity of the identified chemicals



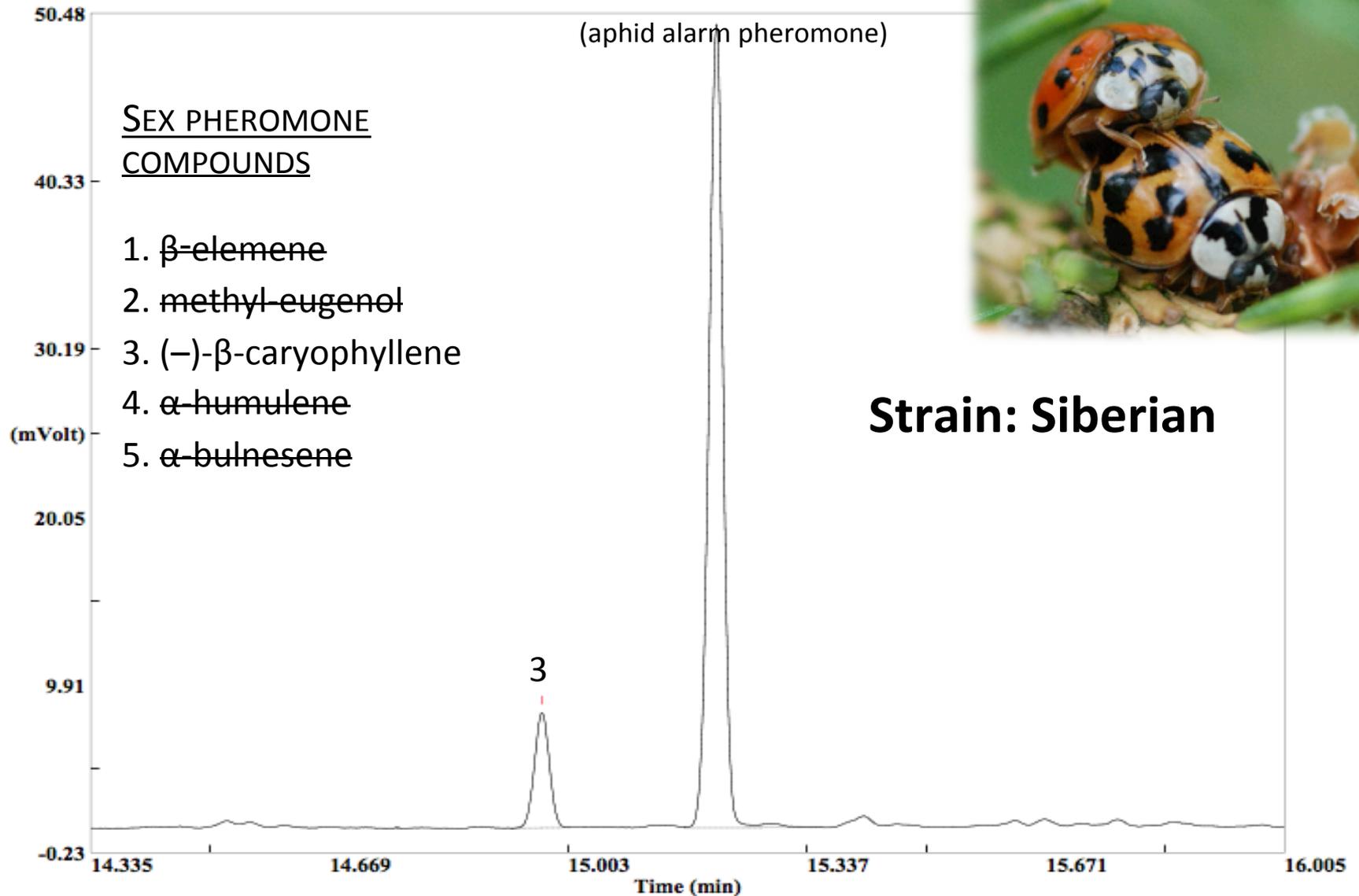
3. Show potential differences among strains



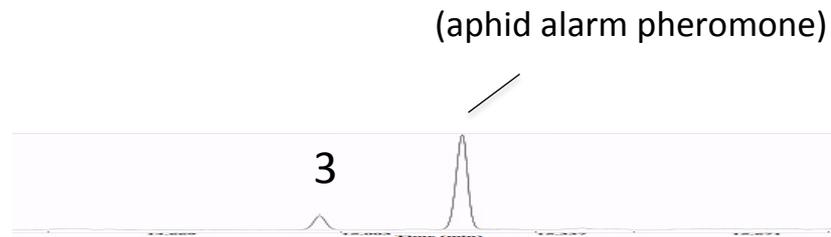
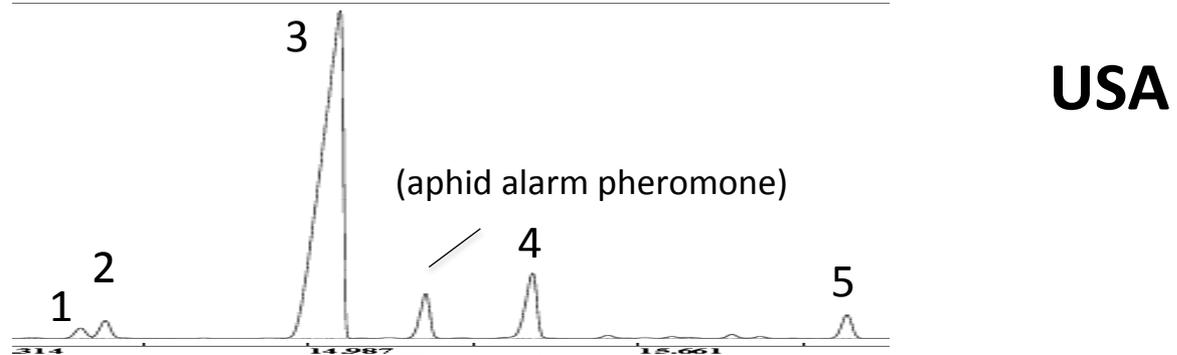
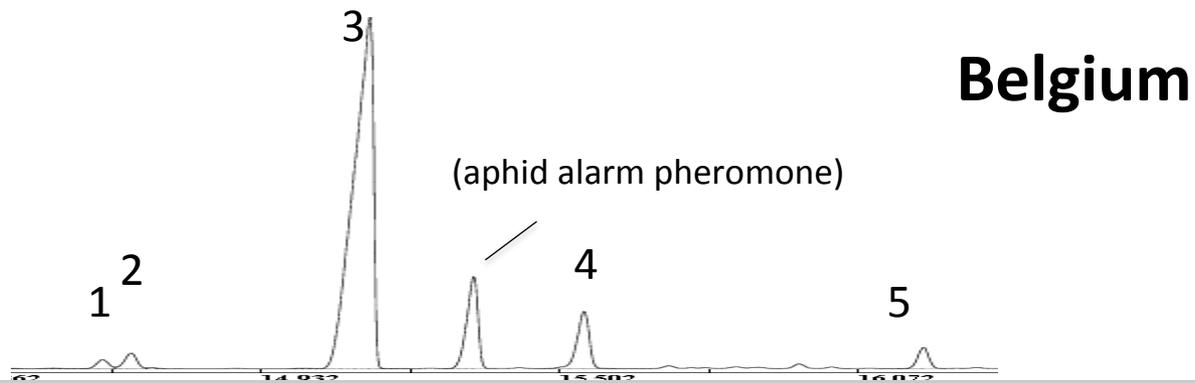
3. Show potential differences among strains



Strain: Siberian

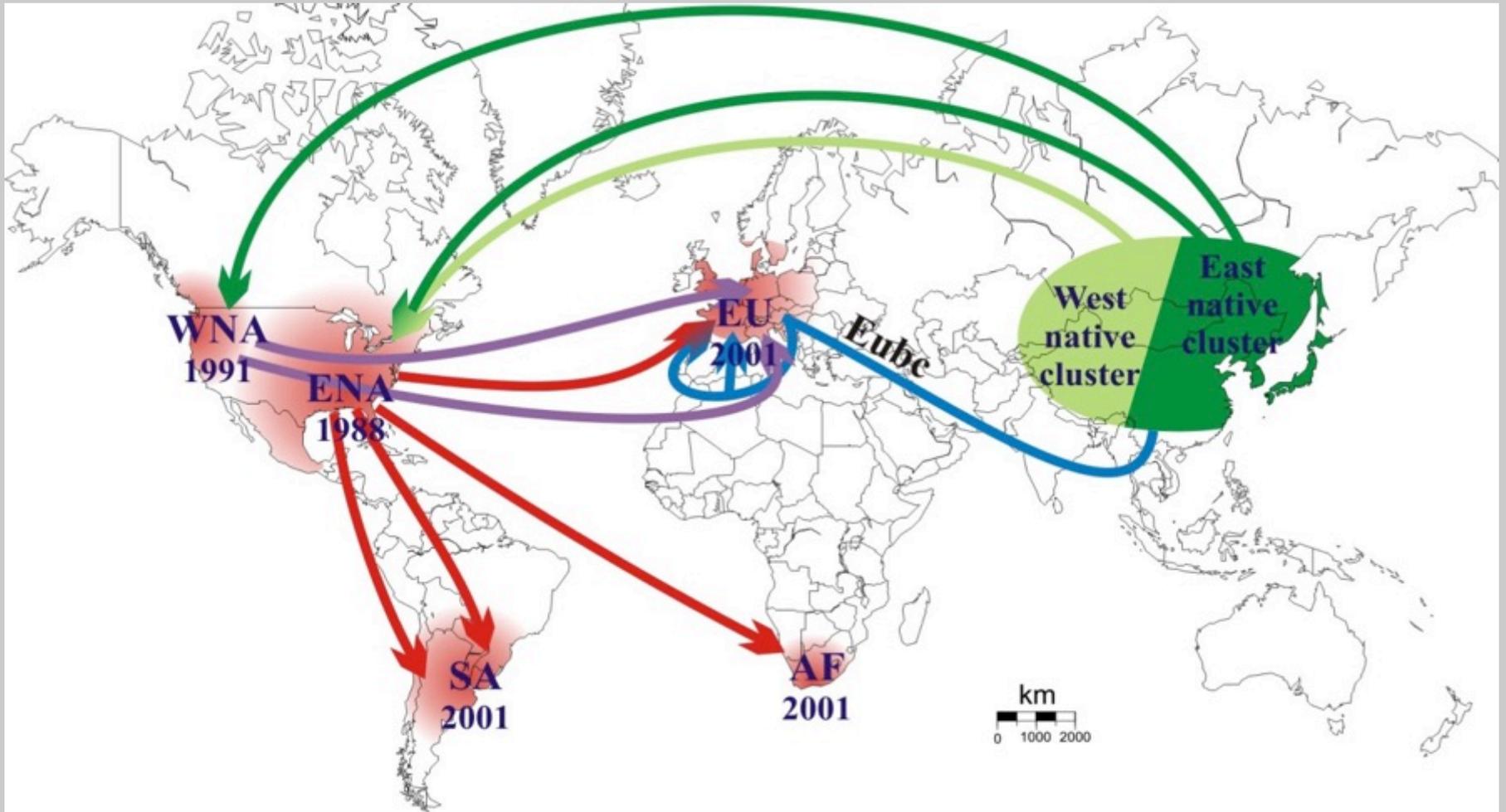


3. Show potential differences among strains



Available strains in Gembloux

Strains	Origin	Individuals	Sex pheromone
Belgium	Gembloux Bérénice Fassotte	< 150	
USA	? Arnaud Estoup	< 60	
Jilin	? Arnaud Estoup	0	
Tai'an	China Frédéric Francis	< 150	May 2015 (pupae)
Pekin	China Frédéric Francis	< 30	
Siberian	Arnaud Estoup	< 50	





**Bérénice
FASSOTTE**