Impact of climate change on "aphids - natural enemies" relationship

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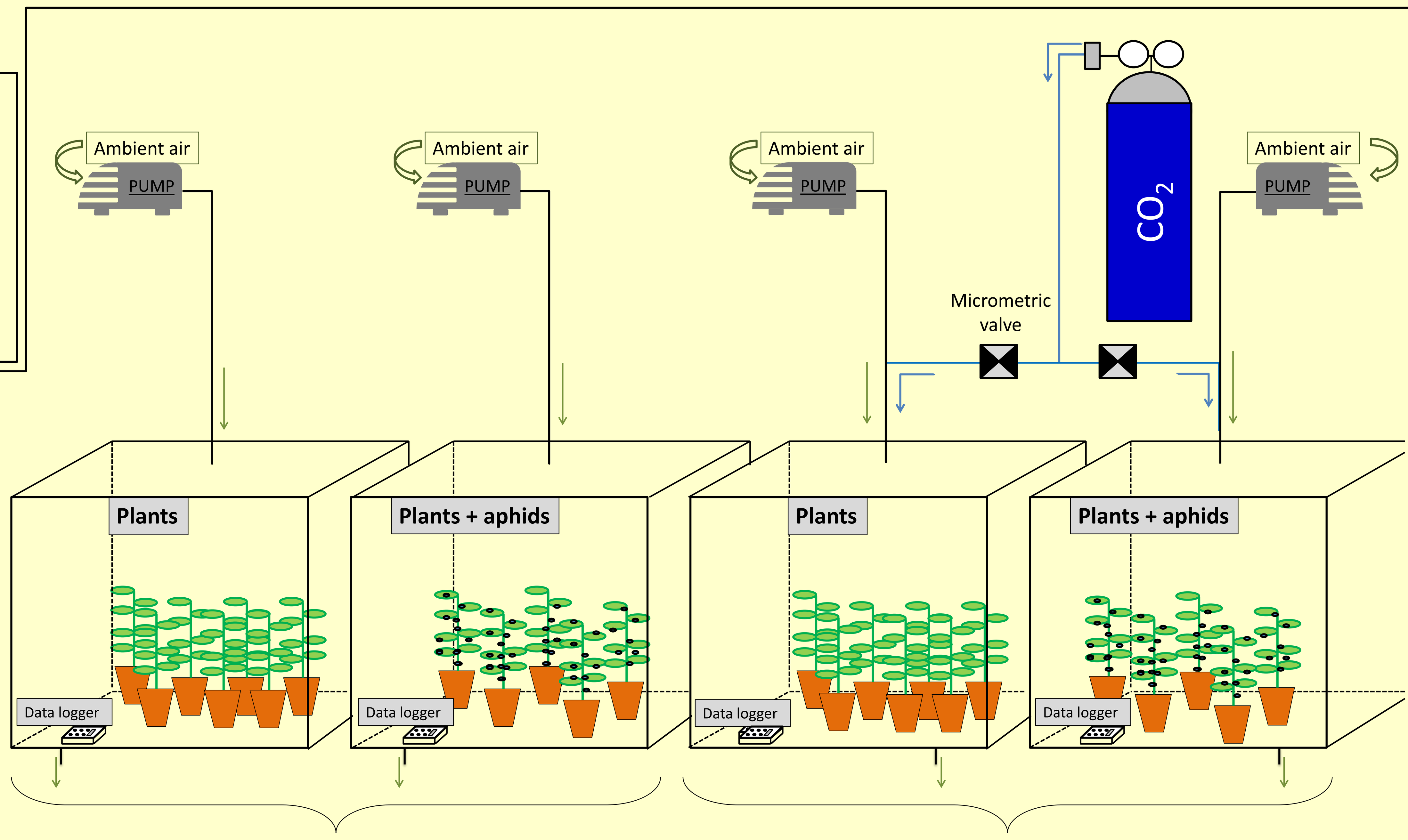
Introduction:

The atmospheric carbon dioxide (CO_2) concentration is continuously increasing since the beginning of the industrial era, and is expected to double by the end of the 21st century. This climate change may affect ecological interactions, and disrupt equilibrium in crop productions, enhancing the risk of pest outbreaks.

Aphids are major agricultural pest, and the understanding of their adaptations to a changing world is decisive for a sustainable crop protection. Here, we focused on the impact of an elevated CO_2 concentration on the emission of alarm pheromone by aphids, which rules important ecological interactions between aphids themselves, but also between aphids and their natural enemies.

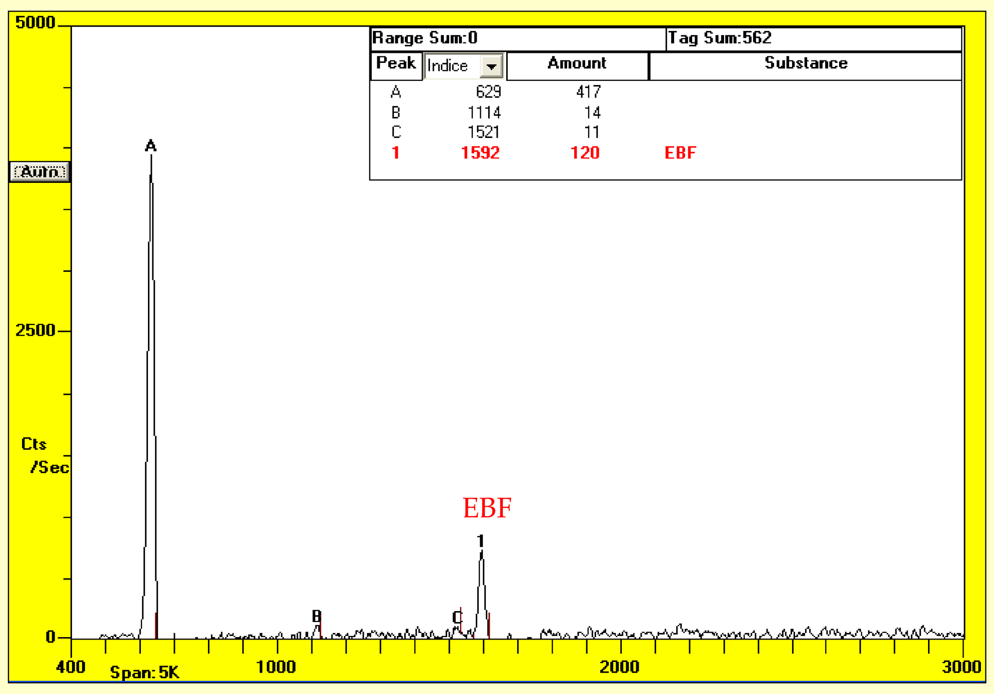
So, will this increase in atmospheric CO_2 concentration affect interactions between aphids and their natural enemies ?

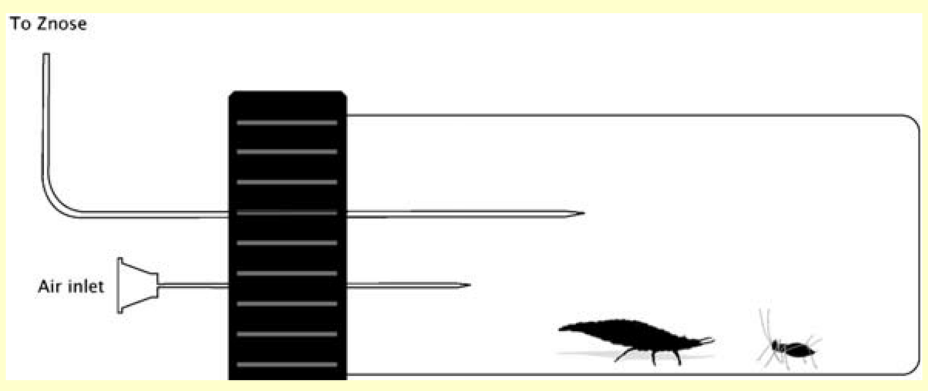


Ambient CO_2 concentration (≈ 400ppm) **Elevated CO_2 concentration**(≈ ambient + 350ppm)

Insect rearing:

The aphids *Acyrthosiphon pisum* Harris and their host plants *Vicia faba* (L.) are reared in plexiglas® chambers, where climatic parameters are controlled. Only the carbon dioxide concentration differs between control and experimental groups.





From Schwartzberg *et al.*, 2008 - J. Chem. Ecol.

Pheromone analysis:

The only chemical component of the aphid alarm pheromone is the (*E*)-β-farnesene (EBF). This pheromone is emitted once an aphid is bitten by a predator, to alert conspecifics about a threat in the vicinity. Using a zNose™ (fast GC analyzer), the quantity of EBF emitted is measured each 2 minutes after the attack.

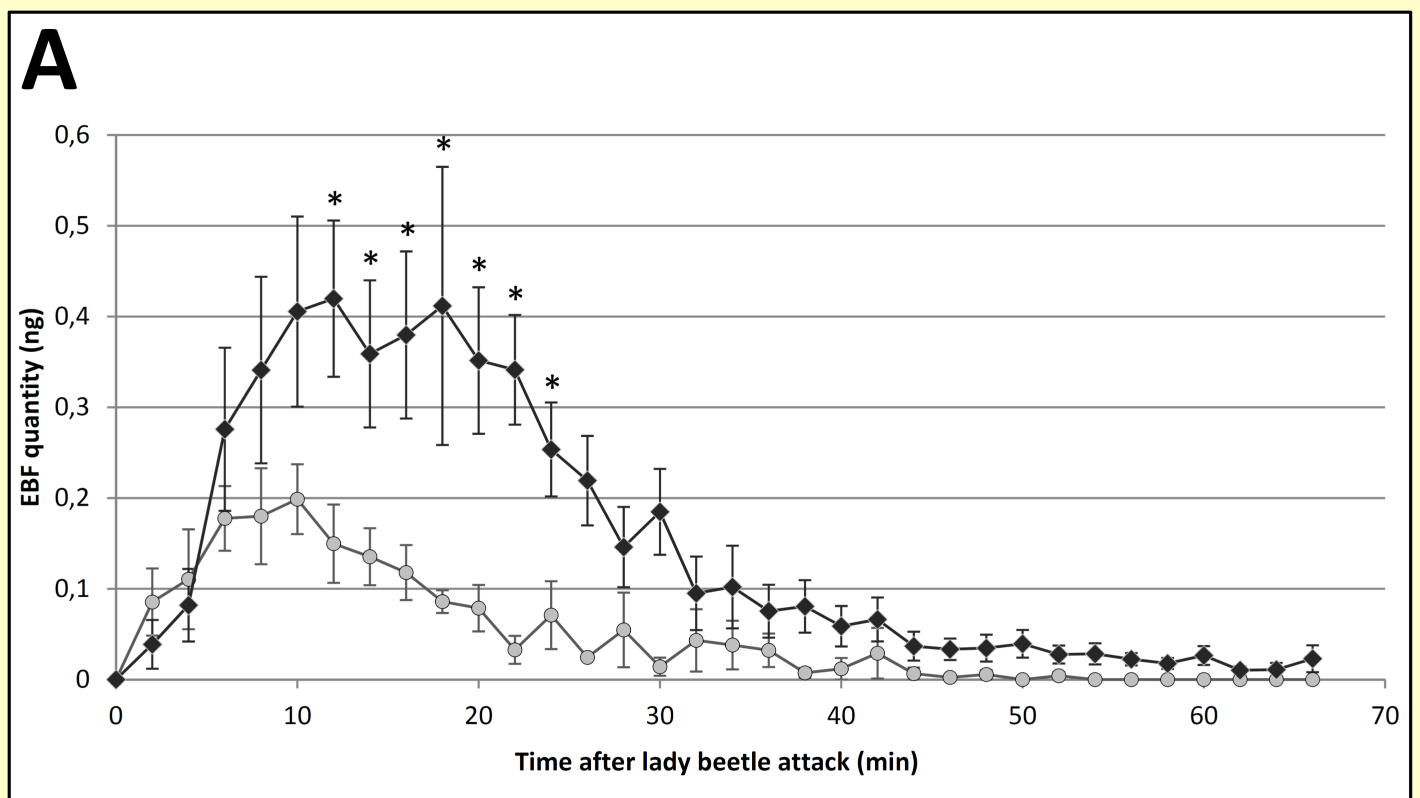
Results:

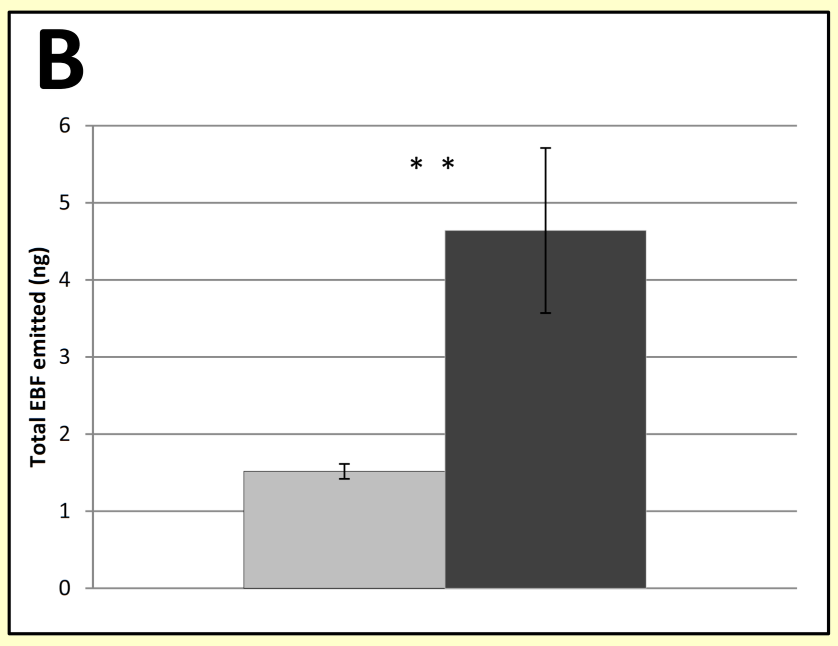
Graphs: **Average (± S.E.)**

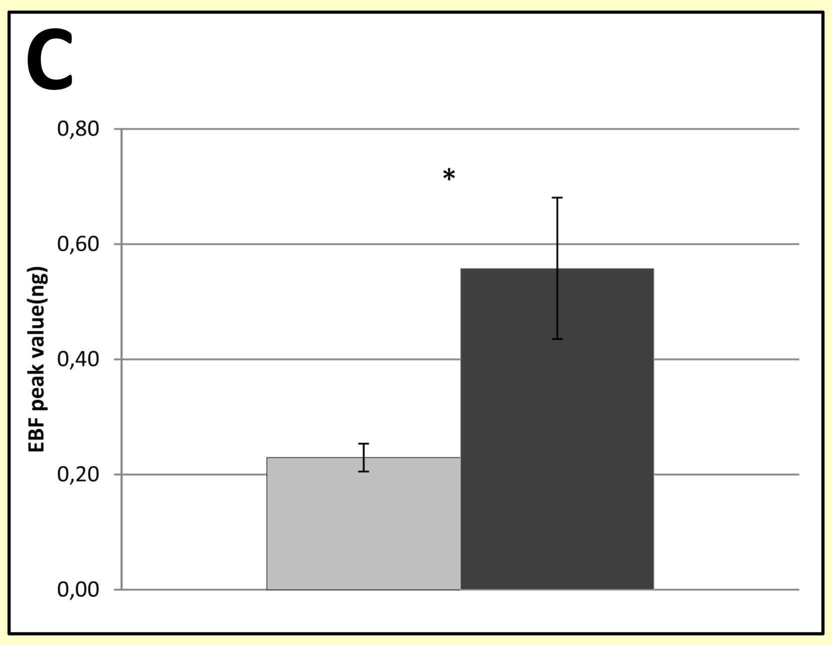
A- EBF emission overtime by an aphid after attack.

B- Total amount of EBF emitted by an aphid after attack.

C- Peak EBF emission by an aphid after attack.







Ambient CO_2 aphids (N = 4) Elevated CO_2 aphids (N = 7)

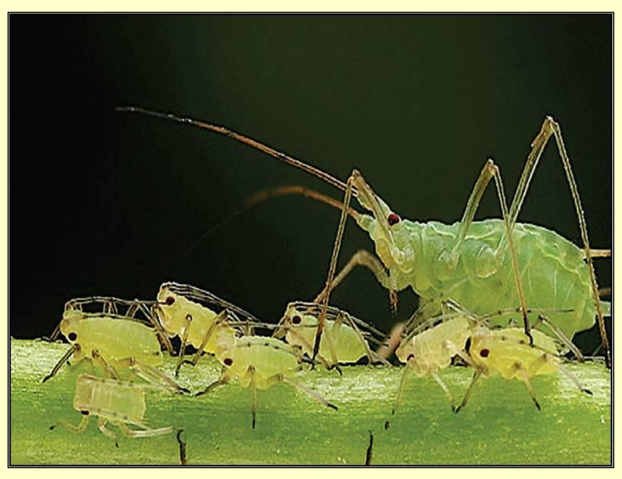
Statistical analyses: Wilcoxon rank sum test - **p.value**: 0,05 > * > 0,01 > ** > 0,001

Discussion:

✓Aphids reared under elevated atmospheric CO_2 conditions release a greater quantity of alarm pheromone.

✓ In a climate change context, the escape behavior of aphids could be enhanced, leading to a decrease in efficiency of natural enemies.

✓ Further behavioral researches are underway to confirm these results.



Acknowledgments :

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