

THE PREDATOR *NESIDIOCORIS TENUIS* TRIGGERS THE RESPONSE OF AN EGG PARASITOID TO TOMATO PLANTS INFESTED BY *TUTA ABSOLUTA*

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BACKGROUND

The generalist predator *Nesidiocoris tenuis*, an effective biological control agent of numerous pests of the tomato crop, can also trigger plant defence mechanisms (direct and indirect) due to its phytophagous behaviour. In southern Europe, *N. tenuis* is frequently released in tomato greenhouses to control the invasive pest *Tuta absoluta*, sometimes combined with another biocontrol agent, the egg parasitoid *Trichogramma achaeae*. Our research team aimed to study whether mirid phytophagy influences the volatile chemical profile of tomato plants altering the behaviour of *T. achaeae*. We tested this hypothesis in different scenarios both in the absence and in the presence of *T. absoluta* eggs or larvae.

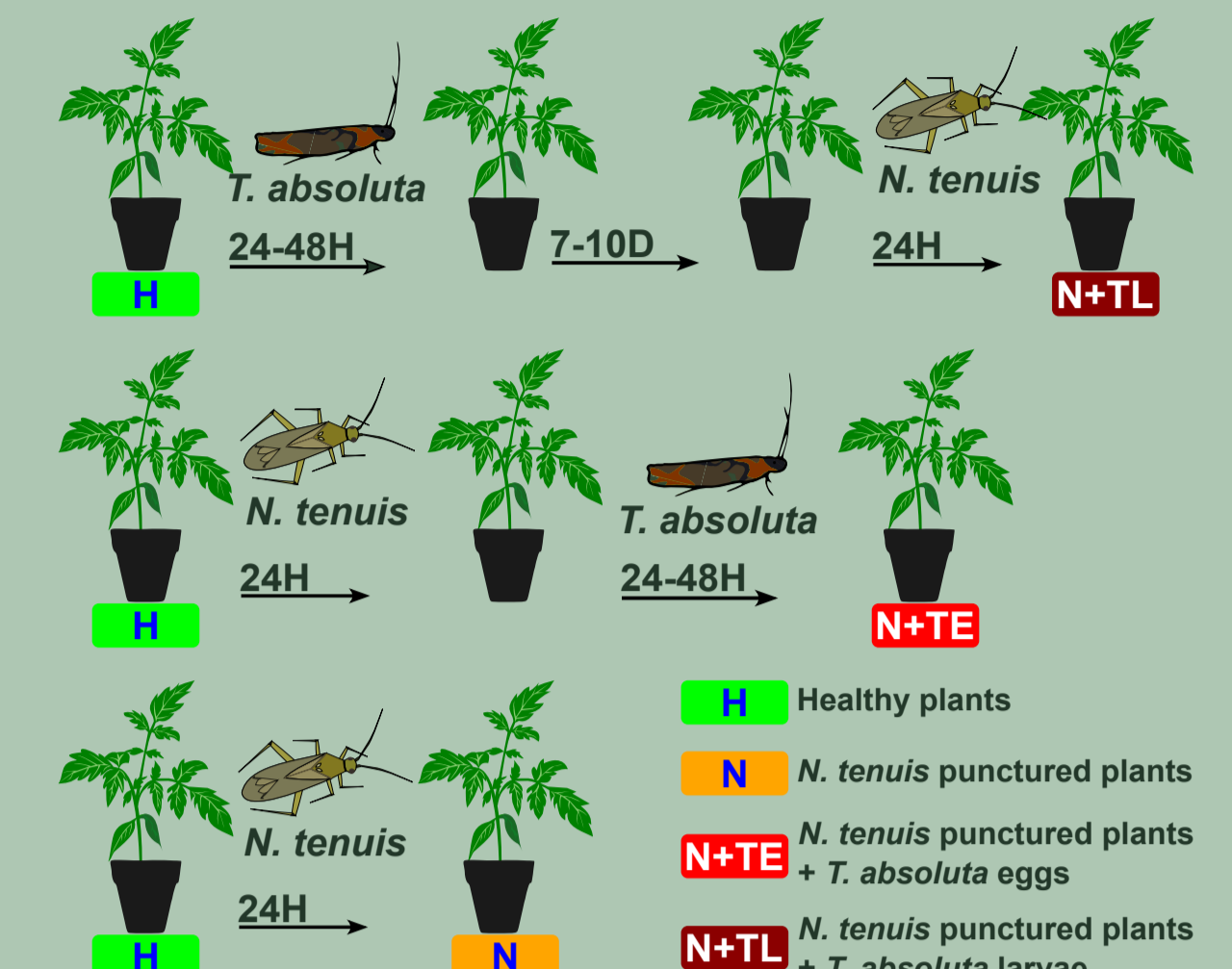
METHODOLOGY

Plant treatments

N+TL For the N + TL treatment, plants were first exposed to *T. absoluta* ovipositing females for 24–48 h, then kept within cages for 7–10 days to allow the eggs hatching into larvae

N+TE For the N+TE treatment, N plants were offered to *T. absoluta* for oviposition for 48–72 h prior to olfactometer tests

N *Nesidiocoris tenuis* punctured plants (N) were obtained by allowing 100 mirids to feed on four healthy plants (in average 25 mirids per plant) placed in a cage for 24 h



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Does *N. tenuis* phytophagy influence the foraging behaviour of *T. achaeae*? Do the VOCs emitted play a role?

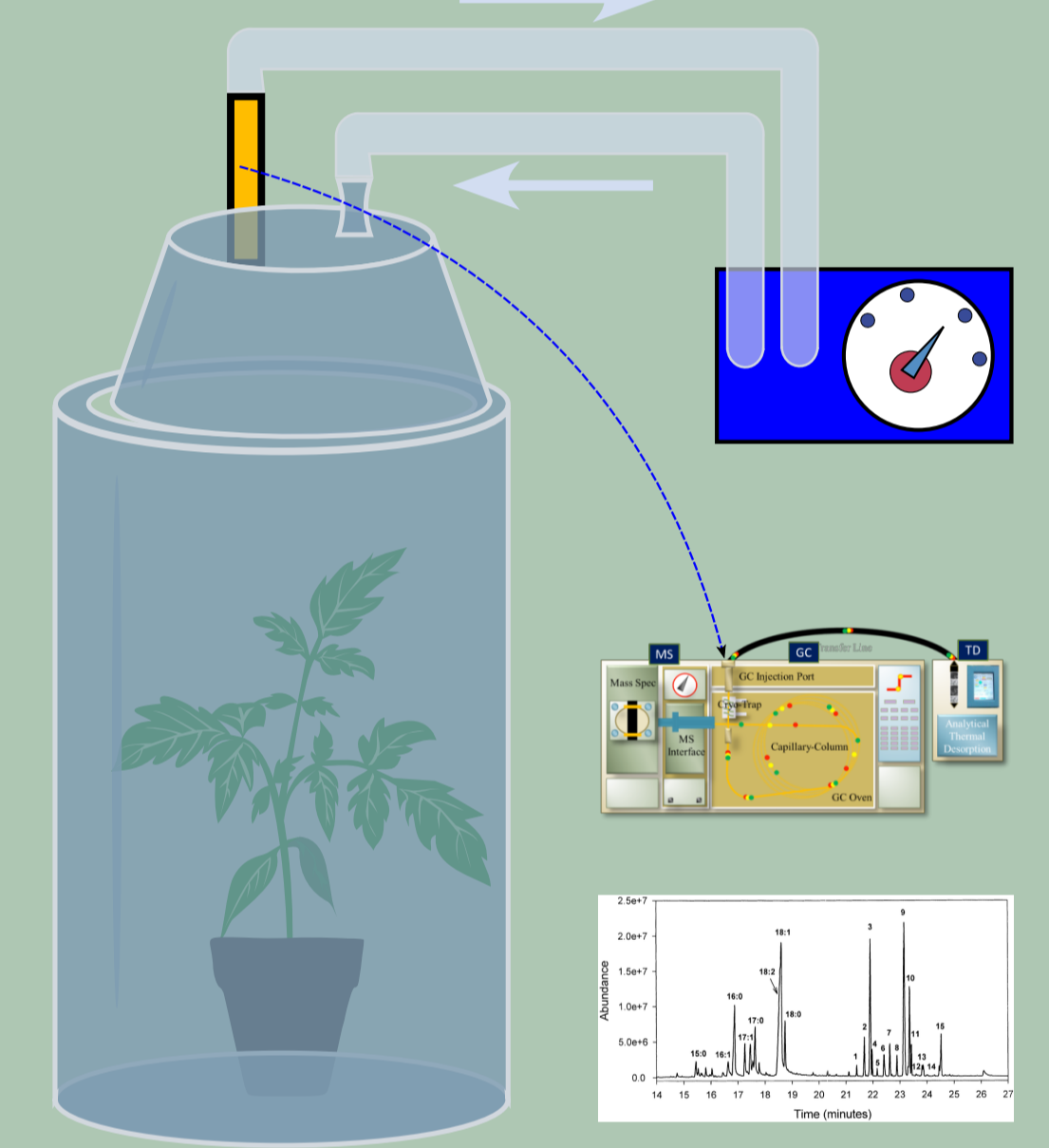
The VOC profile of all plant treatments were analyzed and tested towards *T. achaeae* in different combinations

We found that a few compounds (e.g. β -pinene and myrcene) could play a role in the foraging behaviour of *T. achaeae* in this scenario.

This data show an ecological role of *N. tenuis*, in making tomato crops more resilient against the attack of pests, including *T. absoluta*.

VOCs analysis

VOC were collected soon after the olfactometer bioassay. Glass jars containing the tomato plants (N=10) were connected to an airtight entrainment system consisting of a circulating pump (closed-loop). Before re-entering the pump, the air passed through an adsorbent cartridge made of a narrow glass tube filled with a biphasic phase of 30 mg of Tenax and 30 mg of Carboxen. Volatile cartridges were analysed by CIS4-TDU-GC/MS.



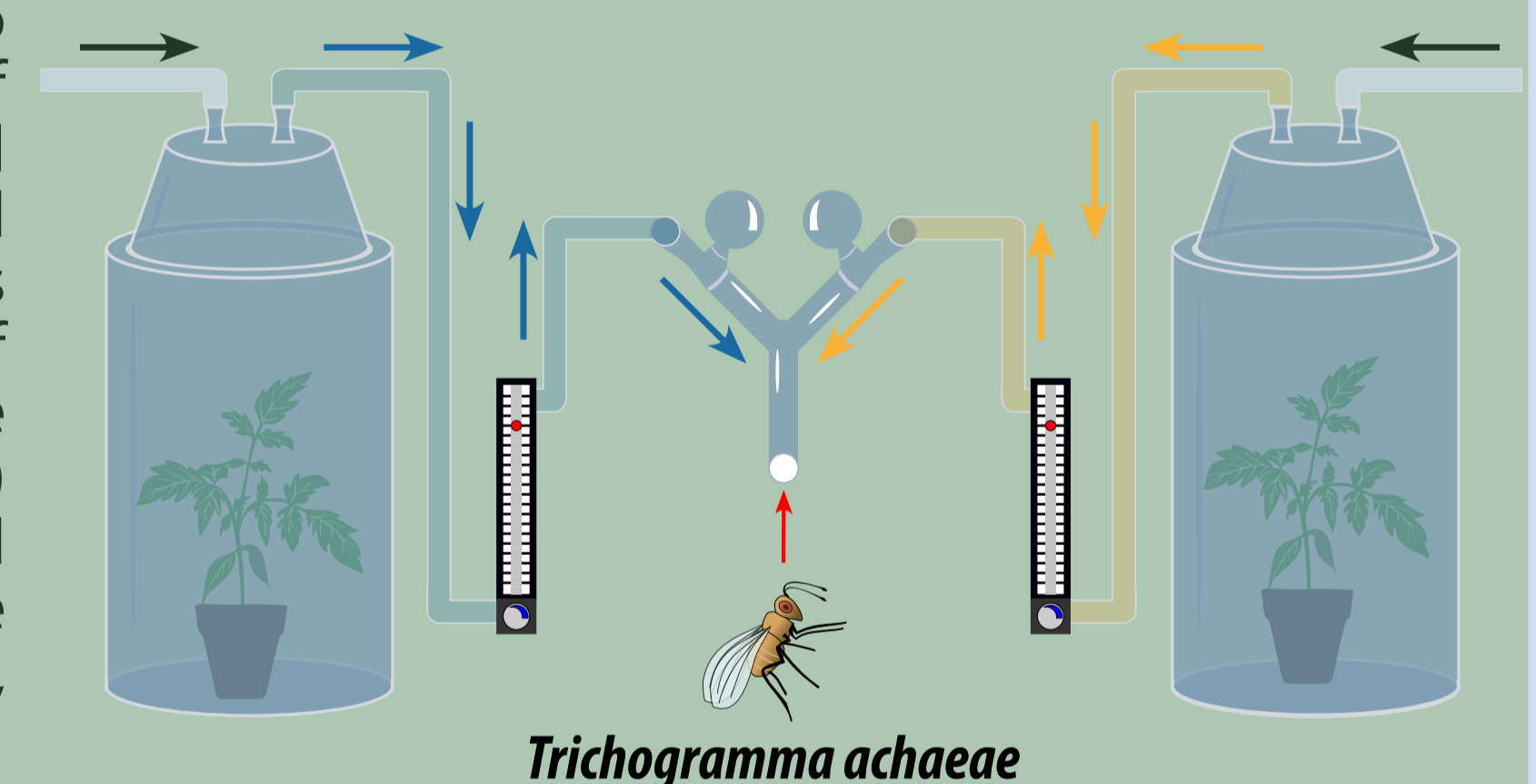
CONCLUSIONS

We confirmed the ecological role of *N. tenuis* in increasing the resilience of tomato plants to biotic stressors.

Our results further support the possibility of integrating the inundative release of *T. achaeae* in a sustainable IPM strategy aimed at the maximum possible reduction of synthetic insecticides.

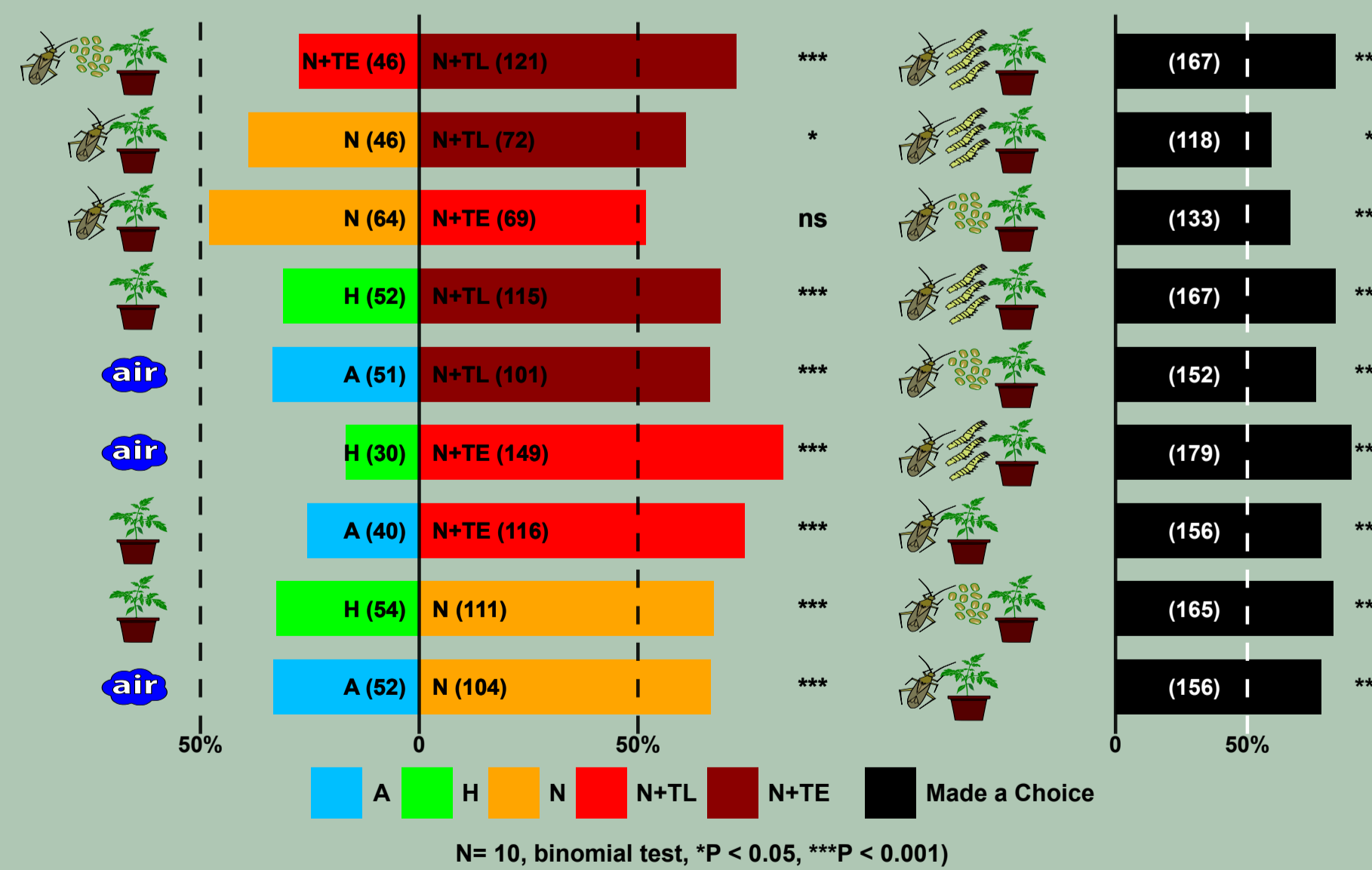
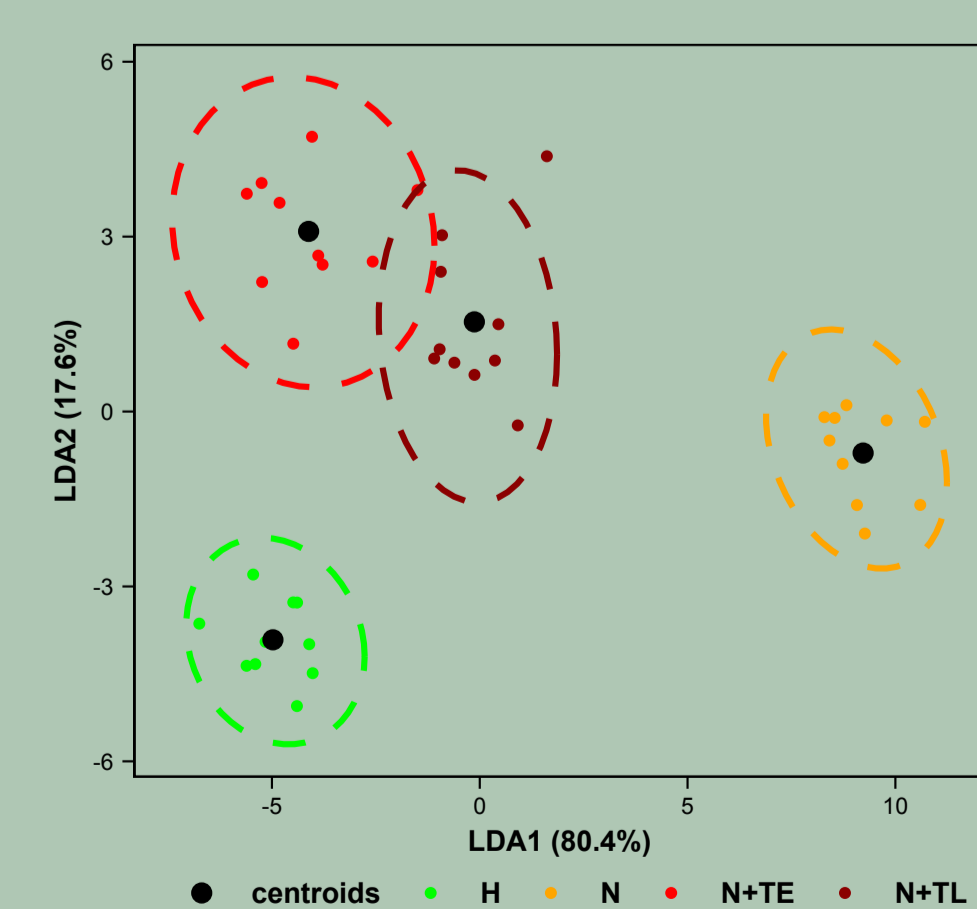
Olfactometer bioassay

Ten wasp females were released (red arrow) into the system simultaneously, and two groups of females, representing a single experimental replicate for each plant pair tested, were observed per tested plant pair. The position of the plants was swapped after having tested the first group of ten females to avoid any position bias. The choice between the two odour sources (tested plants) was recorded within 30 min from the parasitoid release, with a choice considered to be made when wasps were found inside the trapping bulbs, located near the ends of the Y-tube arms.



RESULTS

LDA on plants from the different treatments succeeded in splitting them into appropriate groups, with the first two functions explaining 98% of the total variance



Plants punctured by *N. tenuis* were more attractive towards *T. achaeae* females than clean air (A) or healthy (H) plants.

The combination of *N. tenuis* punctures and *T. absoluta* larval feeding was more attractive to *T. achaeae* than both N and N + TE treatments.

Parasitoid females did not make a choice between N and N + TE treatments.

Overall, the attractiveness was high and statistically significant in all olfactometer bioassays

All compounds except camphene, β -pinene and sabinene were released at a significant higher rate by plants exposed to the feeding activity of *N. tenuis* (N) in respect to healthy plants (H).

Similarly, both eggs oviposition (N + TE) and larval feeding by *T. absoluta* (N + TL) triggered a significant increase in the emission of almost all compounds in respect to healthy plants (H).

Exceptions are represented by α -terpinene, β -phellandrene and carvacrol, which were not influenced by N + TE treatment in respect to healthy plants (H).

