Weed-induced crop allelopathy : deciphering molecular underground interactions

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Agricultural challenges

Growing demand for **food production**

Reducing **arable land**

Utilizing **eco friendly** products

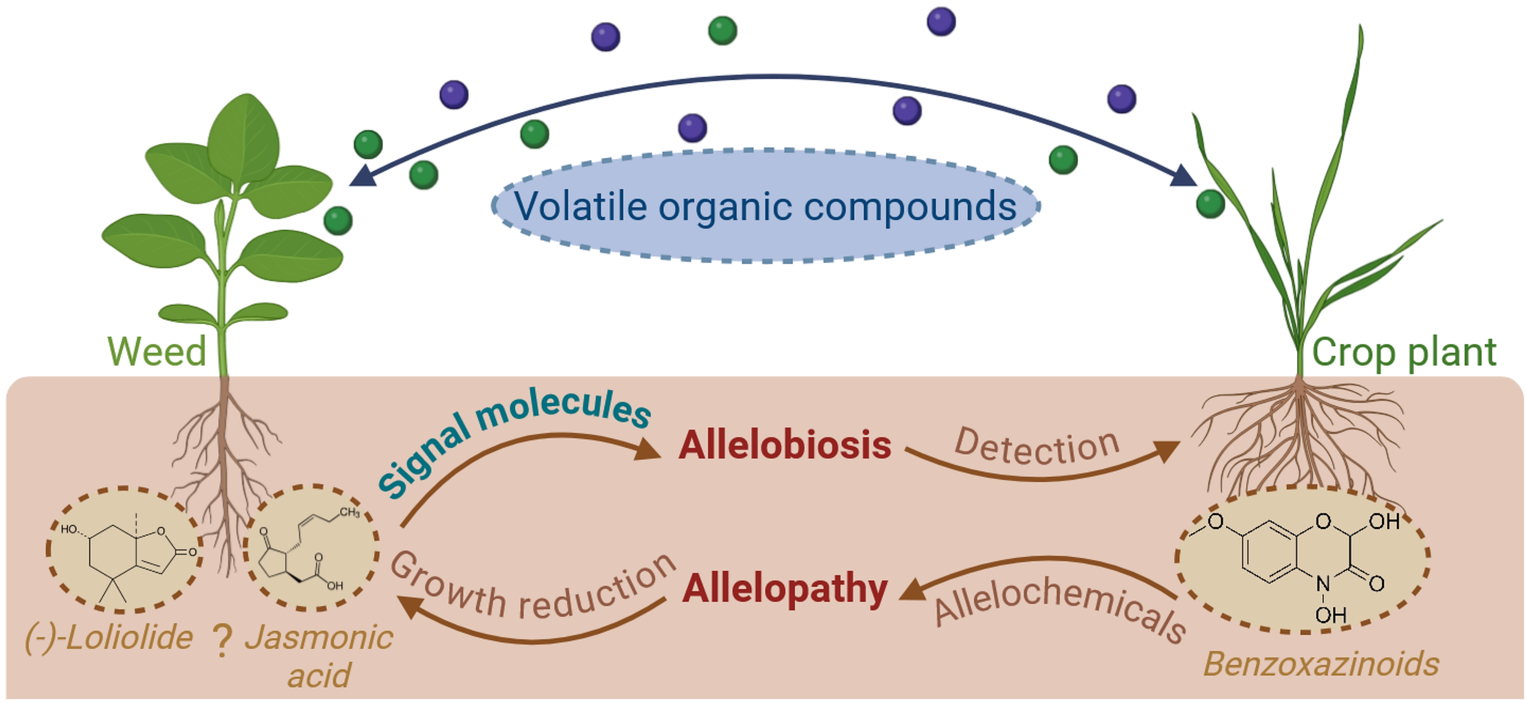
One significant problem…

Weeds cause on average **34% yield loss**

Competition for nutrients, space, light and water

Allelopathy, a promising approach for weed control

Allelopathy refers to the **inhibition of the growth** of one plant by another due to the production of **allelochemicals.** It can be **triggered** by the **detection of weeds by the crop plant**.



OBJECTIVE

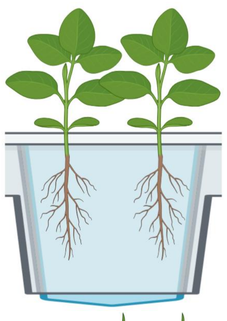
Identifying the **signal molecules** from weeds that triggers an allelopathic response in a crop plant

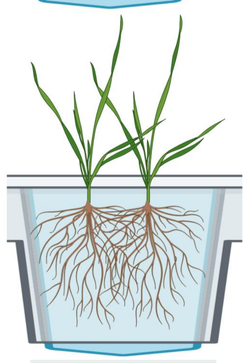
1 Establishment of culture systems

Hydroponic conditions

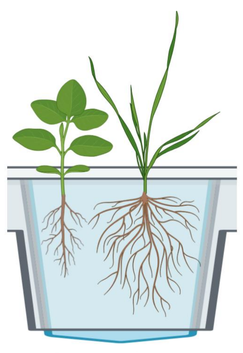
Pure cultures

Avena fatua
Lolium perenne
Alopecurus myosuroides
Galium aparine
Papaver rhoeas
Matricaria chamomilla





Secale cereale



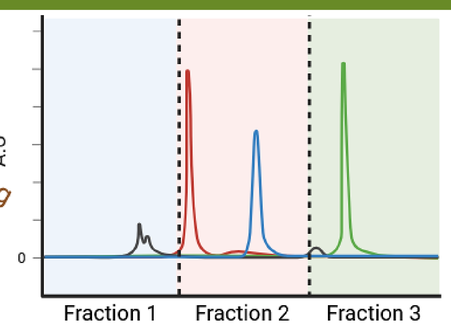
Co-culture

Fagnant *et al.* 2024

Rhizoboxes, more realistic edaphic conditions

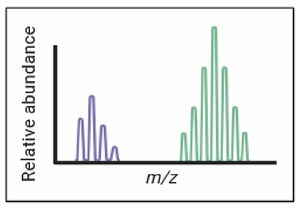
2 Identification of the bioactive compounds

Weed's root exudates sampling



Fractionning

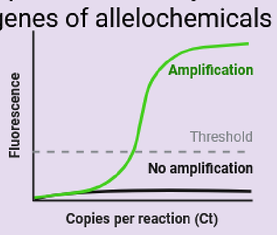
Assay fraction bioactivity



Identification of the bioactive compounds that induce a surge in the production of allelochemicals
LC-MS / GC-MS

Caracterization of the most effective fraction

Expression of biosynthetic genes of allelochemicals



Allelochemicals quantification

3 Transcriptomic analysis

Molecular pathways induced in crop plant's roots by the application of the identified molecules ?

CONCLUSION

Ultimately, a better understanding of plant-plant chemical communication will improve the effectiveness of sustainable weed control.

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