Chemical defences in wild and cultivated cotton plants

"picking cotton"
Jose Arpa (1858–1952)
Cotton (*Gossypium sp.*)

The World's "Dirtiest" Crop. It covers 2.5% of the world’s cultivated land, but accounts for 24% of the world’s insecticide market.

Alternative pest control strategies are needed.
The mechanism remains to be unraveled, but most likely plant volatiles boost the chemical defenses in the cotton plants.
Cultivated cotton is highly vulnerable to insect pests
Exploiting plant-plant communication to improve cotton production

Scientists of Cirad and IER in Mali have found that “topping” of young cotton greatly reduces caterpillar infestation later in the season, also in neighboring plants.
infestation by caterpillars

F$_{5,15}$ = 4.60 ; p = 0.009
F$_{15,100}$ interaction = 57.92 ; p = 0.000

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<th>nb de chenilles de la capsule (toutes espèces) pour 100 plants par observation échelle logarithmique</th>
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<tr>
<td>non écimé</td>
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<td>écimé</td>
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pesticide
topped
pruning effect can almost double cotton yield
The most commonly cultivated cotton species, *Gossypium hirsutum*, originates from Mexico.
Can natural plant-derived defense elicitors be used instead of pesticides?

Results from methyl-jasmonate application in the lab look very promising.
Cotton defenses

Leaf terpenoids quantification and volatile emission

![Mortar and pestle](image1.png)

![Scientific equipment](image2.png)

![Chemical structure](image3.png)

Gossypol
Gossypol – is more concentrated in wild than in cultivated cotton – is more concentrated in induced wild plants, but not in induced cultivated plants
Spodoptera frugiperda
*S. littoralis* larvae prefer to feed on control plants and avoid MeJA-treated plants.

MeJA-treated | Control
---|---
Cultivated cotton (N=12)\[P<0.001\] | Wild cotton (N=12)\[P<0.001\]

Feeding preference of *Spodoptera littoralis* (%)
collection of volatiles
Volatile emissions

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3.5 FOLD
- What signals are released by damaged cotton plant?
- Which ones of these signals are essential to increase resistance against caterpillars?
- What chemical defenses are involved in increased resistance?
- Are wild cotton plants better at signaling?
- Can resistance signaling be enhanced in cultivated cotton?

We will seek further funding for research to help answer these questions.

Prospective sponsors:

Thank you

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