IECE 2025 Conference
The 2nd International Electronic Conference on Entomology
19–21 May 2025 | Online
MDPI

Polyphenol-Based Biostimulants Shape Soybean-Pest Interactions

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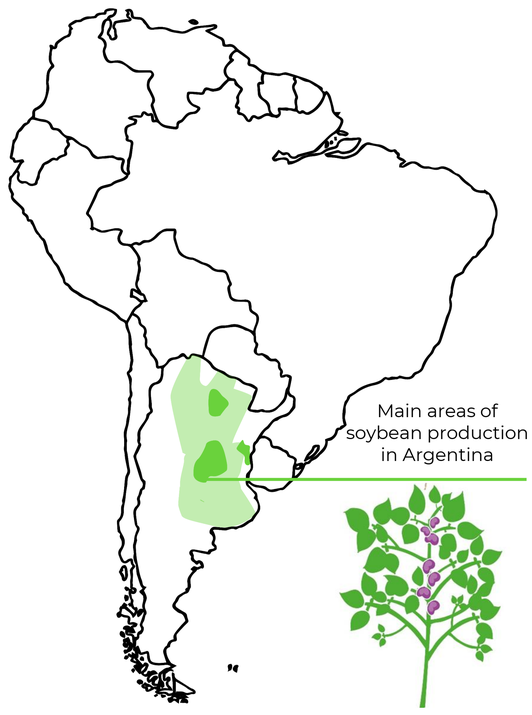


Glycine max (Fabales: Fabaceae) is a key global crop, with over **17 million hectares** dedicated to soybean production in **Argentina**.

To promote **sustainable agriculture**, farmers increasingly use **plant-based biostimulants;** however, their effects on pest interactions remain unclear.

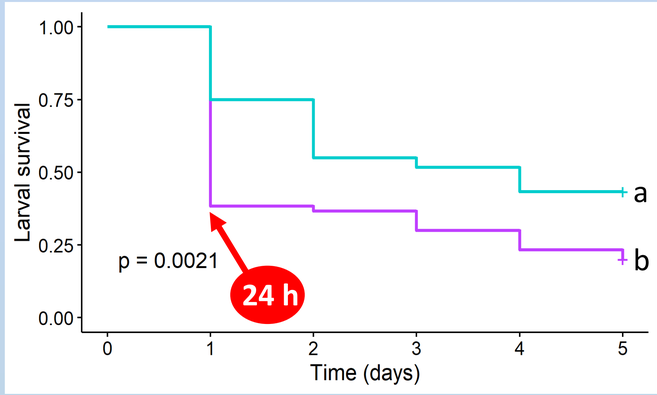
This study evaluates the **impact of a polyphenol-based biostimulant (Bern) applied to soybean seeds from the Williams 82 (Will) cultivar on two pests*: Spodoptera frugiperda*** **(Lepidoptera: Noctuidae) and *Nezara viridula*** **(Hemiptera: Pentatomidae).**

Treatments:

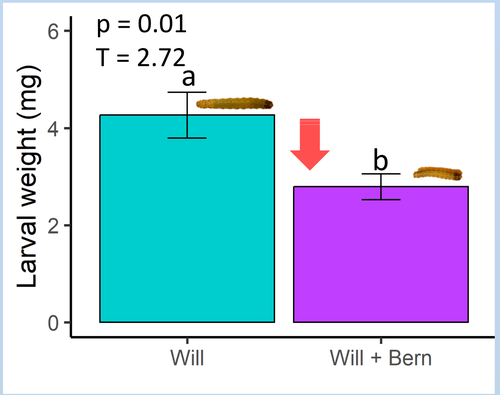
- **Will** — Williams 82 control plants → + *S. frugiperda* → * Feeds on **leaves** * Susceptible to trypsin protease inhibitors (TPIs) from soybean
- **Will + Bern** — Williams 82 plants treated with the biostimulant → + *N. viridula* → * Feeds on **pods and seeds** * Susceptible to cysteine protease inhibitors (CysPIs) from soybean

Interaction: Soybean + Biostimulant + *S. frugiperda*

Larval survival probability

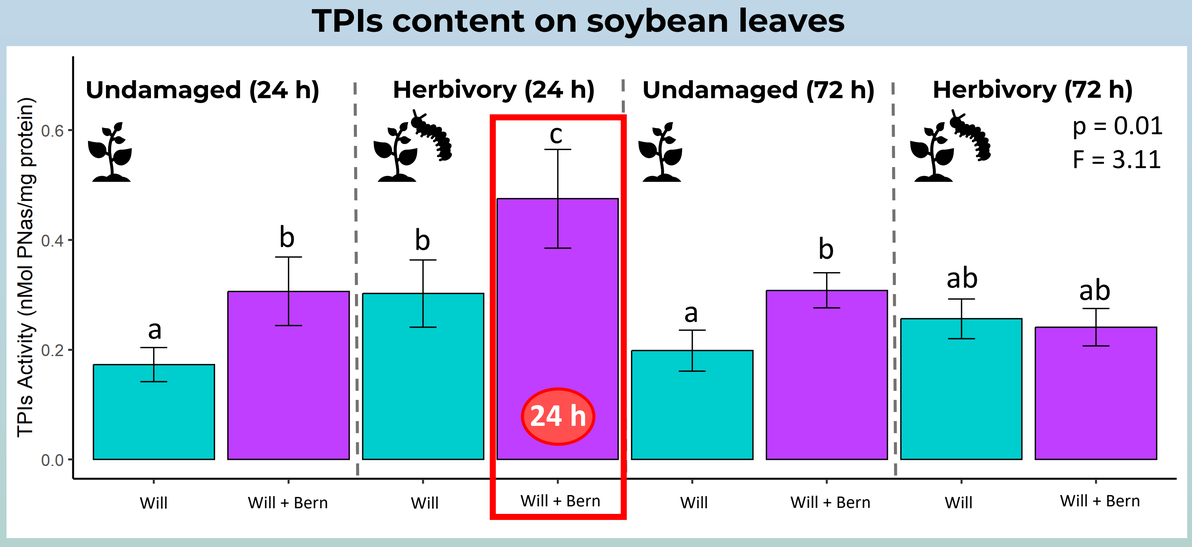


Larval weight (Mean ± SE)



Larvae feeding on plants treated with the biostimulant (Bern) show a lower survival probability (Log-Rank test, N = 60, p < 0.05) **and reduced weight** (t-test, N = 6, p < 0.05). Different letters indicate statistically significant differences

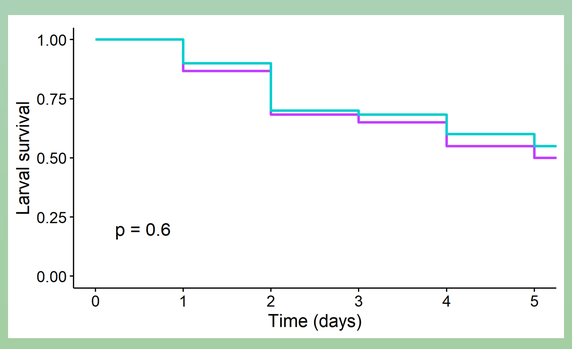
TPIs content on soybean leaves



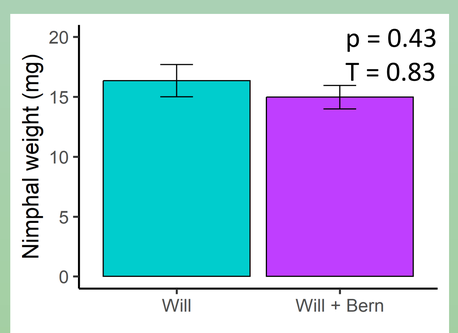
Treated plants (Will + Bern) show higher constitutive levels of TPIs compared to control plants (Will). After 24 h of herbivory, induced TPIs levels are also elevated in treated plants (ANOVA, N = 6, p < 0.05). Different letters indicate statistically significant differences

Interaction: Soybean + Biostimulant + *N. viridula*

Nymphal survival probability

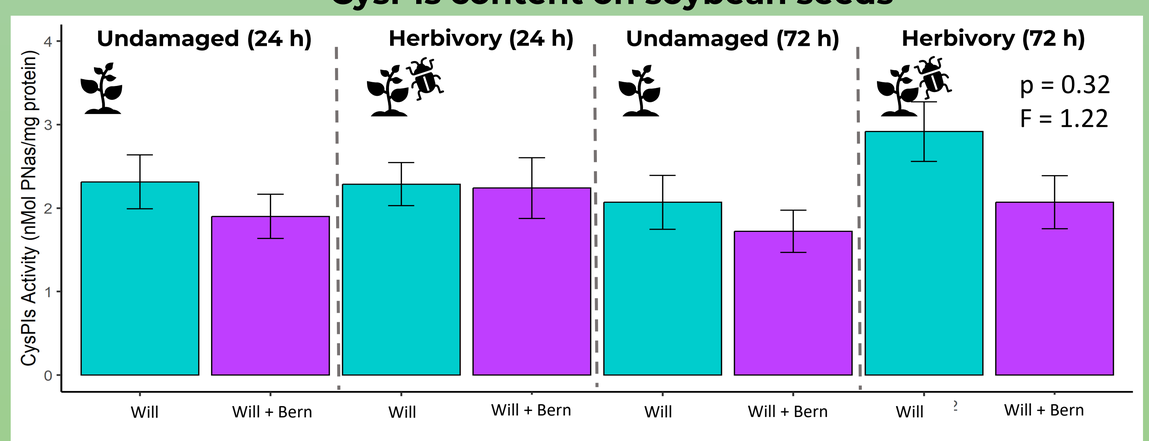


Nymphal weight (Mean ± SE)



Plant treatment has no effect on nymphal survival or weight gain (Log-Rank test, N = 60, p > 0.05; t-test, N = 6, p > 0.05). Different letters indicate statistically significant differences

CysPIs content on soybean seeds



Plant treatment does not affect seed CysPIs content (ANOVA, N = 6, p > 0.05). Different letters indicate statistically significant differences

Materials and methods were adapted from:
Romero et *al.*, 2020 (https://doi.org/10.1007/s11829-019-09730-y) and Sardoy et *al.*, 2021 (https://doi.org/10.1016/j.jinsphys.2021.104250)

Enhances plant resistance against *S. frugiperda*

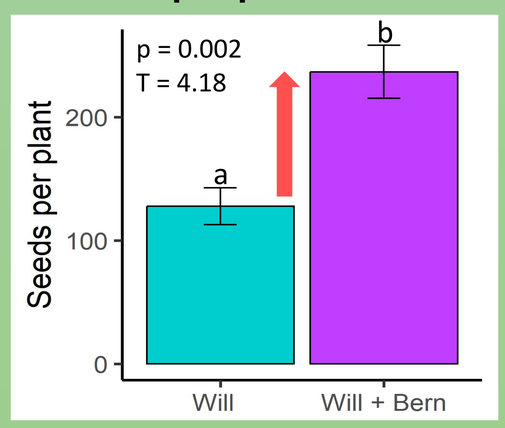
Does not affect the interaction with *N. viridula*

Effect of the biostimulant on soybean plants

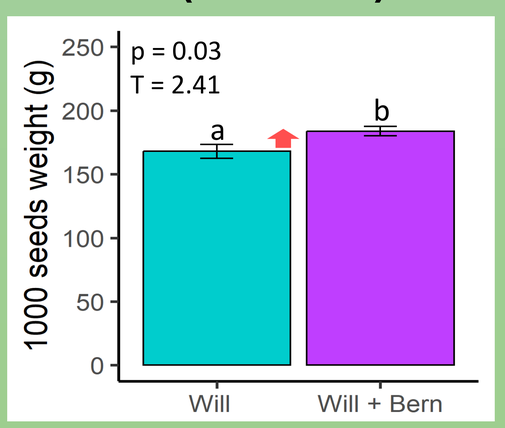
Increases soybean yield

These findings highlight the **potential** of polyphenol-based **biostimulants** to **improve pest management** and **crop productivity** in **sustainable** soybean **farming.**

Number of seeds (Mean ± SE) per plant



Weight of 1000 seeds (Mean ± SE)



Treatment with the biostimulant (Bern) significantly increases both the mean number of seeds per plant (t-test, N = 6, p < 0.05) **and the seed weight** (t-test, N = 6, p < 0.05). Different letters indicate statistically significant differences