

Guayule on Marginal Lands

Exploitation of guayule co-products: rubber, resins, essential oil and other high value products

12/11/2025

Manuel Carmona Delgado

Midas

MARGINAL LANDS, INDUSTRIAL CROPS
AND INNOVATIVE BIO-BASED VALUE CHAINS

 **UCLM**
Universidad
Castilla-La Mancha



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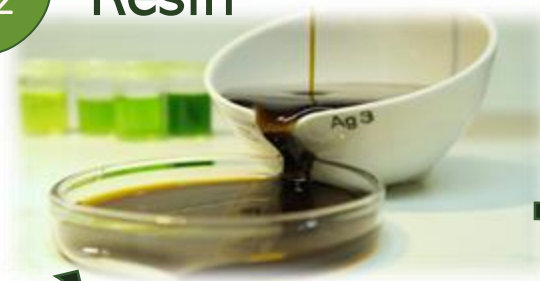


01

Rubber

02

Resin



 Midas



05

Isolated
compounds



Essential oil

03



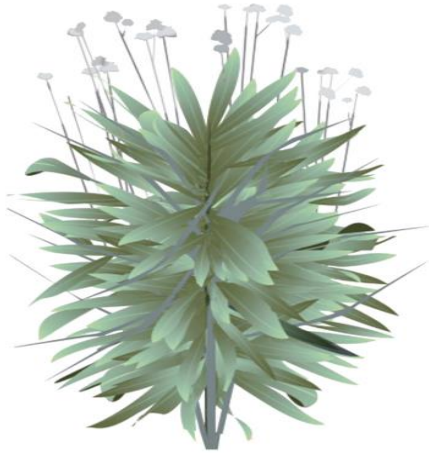
04

Bagasse



01

Guayule rubber



01

Guayule rubber

Taraxacum koksaghyz

*Hevea
brasiliensis*



Parthenium argentatum



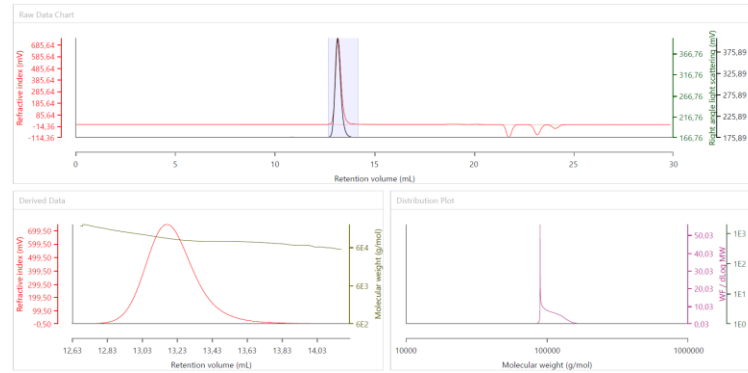
2,500 plants produce natural rubber
Only 2 industrializable alternatives



Guayule rubber

Current state:

- Good knowledge about guayule and hybrid accessions production and adaptation to different soil and weather,
- Different well known extraction procedures able to produce 800,000-1,500,000 Da molecular weight.



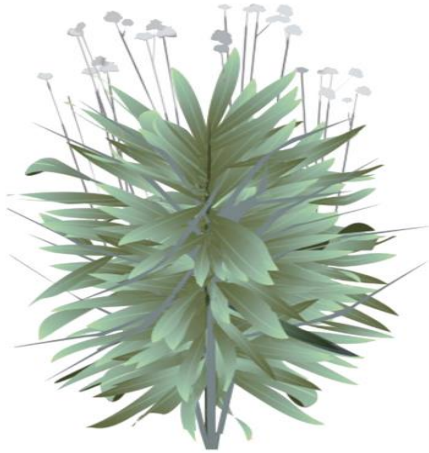
Guayule rubber

Challenge:

- Scale up the process to make it feasible,
- Using greener solvents / technologies for extraction,
- Accurate LCA analysis (field to product vs Hevea) is lacking,
- Co-exploitation of other co-products.



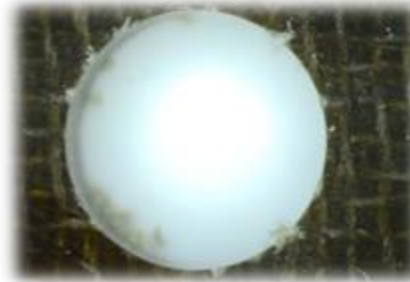
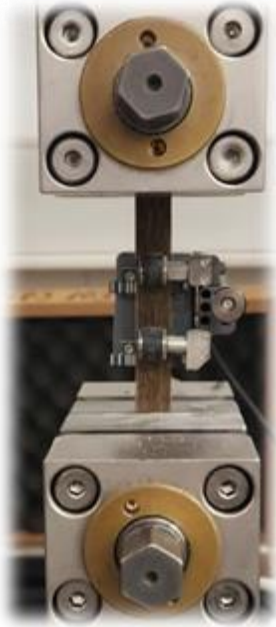
Guayule resin



Guayule resin

Current state:

- Nice mechanical properties, very nice performance with natural fibers in composites
- Lower Tg than synthetic resins but enough good for most of the applications



02

Guayule resin

Wind sector



Automotive or light
mobility



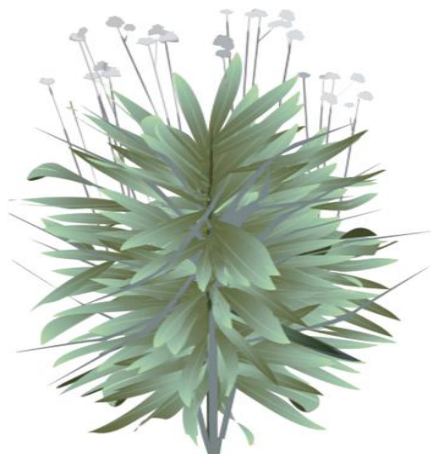
Challenge:

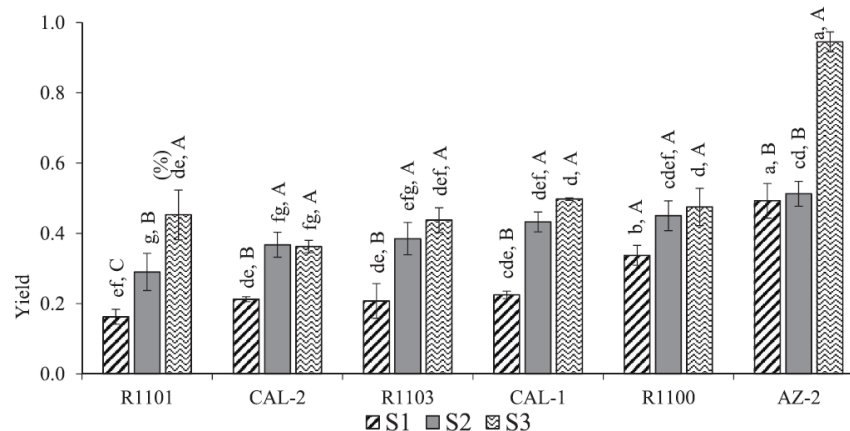
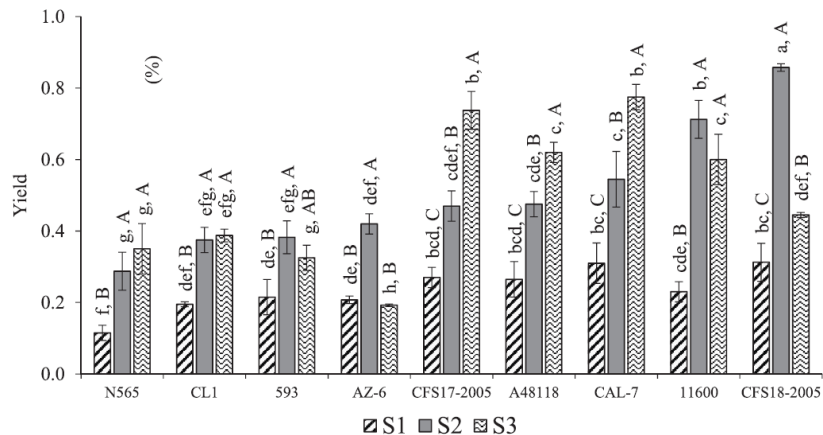
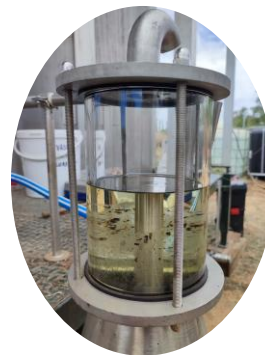
- Scale up the process to make it feasible,



03

Essential oil





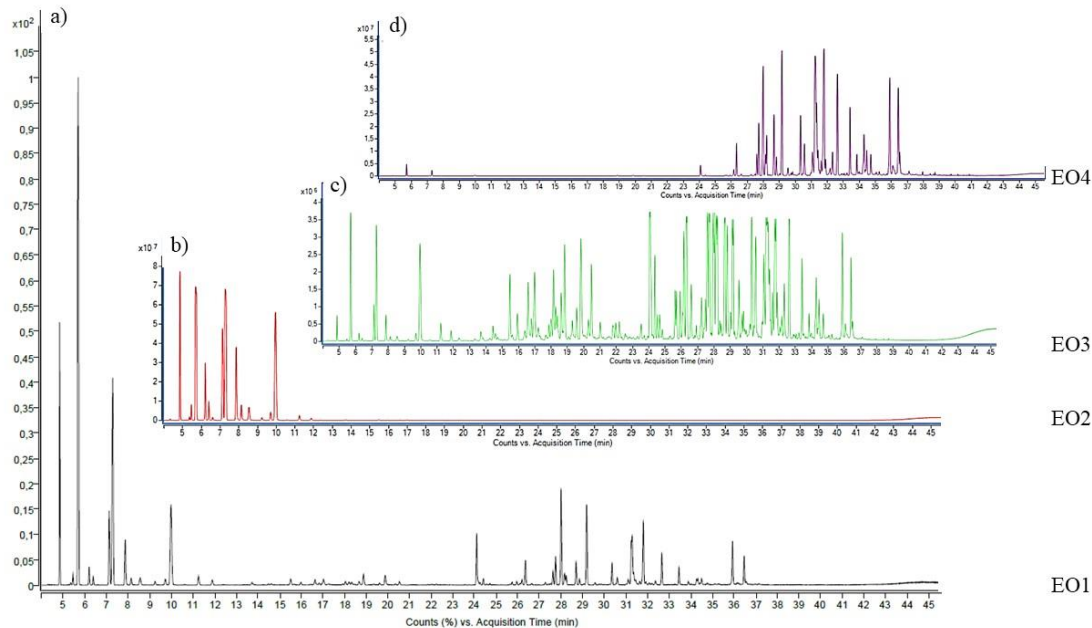
Abbreviations: S1, June 2023; S2, July 2023; S3, August 2023.

doi: [10.1016/j.indcrop.2024.118469](https://doi.org/10.1016/j.indcrop.2024.118469)



03

Essential oil

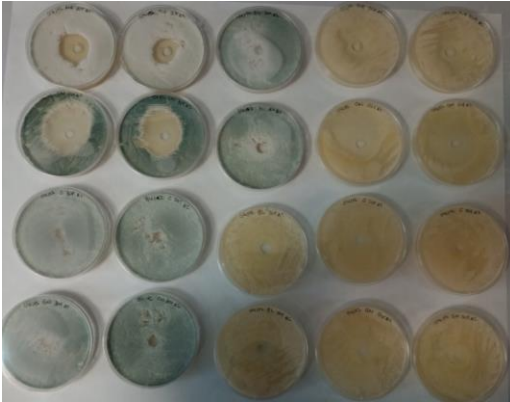


03

Essential oil

3.1. Biopesticides

a) Antifungal activity against food molds or agricultural fungi



b) Insect repellent

Tuta absoluta



03

Essential oil

- 3.1. Biopesticides
- 3.2. Parfums
- 3.3. Cosmetics (for skin and hair care and hydration)
- 3.4. Aromatherapy, stress relief and improved sleep, house cleaning

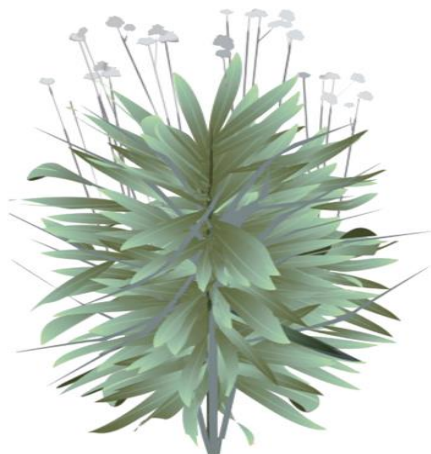
Challenge:

- Introducing a new product into a saturated essential oils market



04

Bagasse



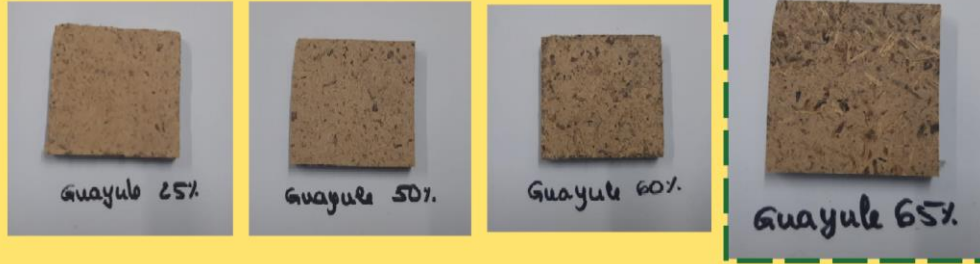
04

Bagasse

CHIMAR. valbopan

Manufacturing boards by substituting wood fibers
with guayule bagasse

Results:

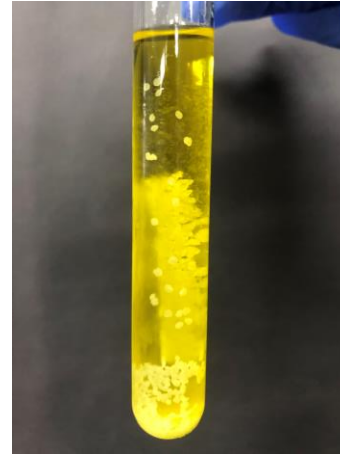
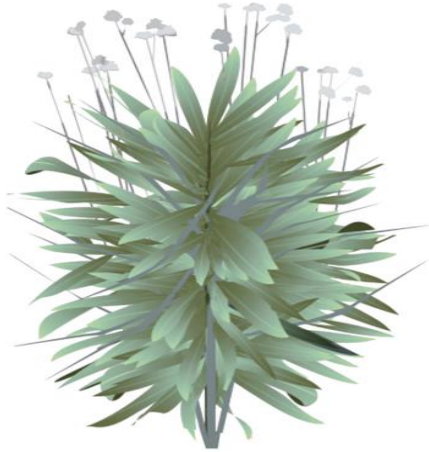


Fill material for artificial
football fields



05

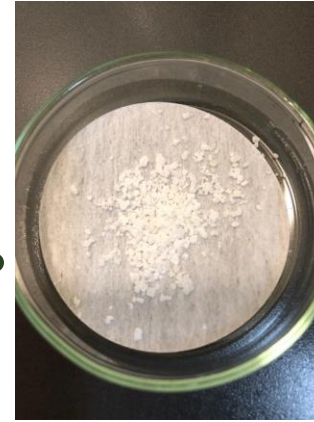
Isolated compounds



Isolated compounds

Resin

- Argentatins , up to 27 %
- Guayulins, up to 10 %



Essential oils: isolation of high price sesquiterpenes??

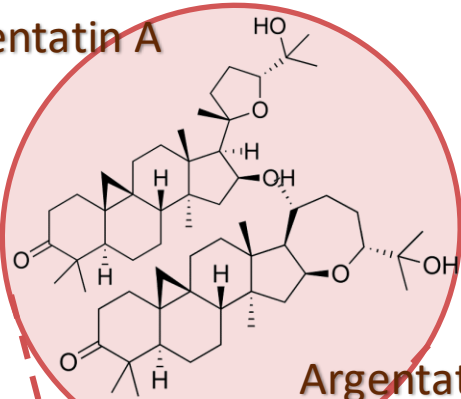


05

Isolated compounds

Argentatins references

Argentatin A



Argentatin B

01

Anti-inflammatory

(Romero JC, et al. 2014)

02

Analgesic

(Duran P, et al. 2023)

03

Antimicrobial

(Martínez Vázquez. et al 1994)

04

Antitumoral

(Parra Delgado, et al. 2005; Alcántara Flores, et al. 2015)



Challenge: relatively low activity, API

5.1. Anti-inflammatory

5.2. Antitumoral

RESEARCH ARTICLE

Immunomodulatory activity of argentatins A and B isolated from guayule

Aniela M. Silva-Nolasco¹ , Miguel A. de la Cruz-Morcillo¹ , M. Mercedes García-Martínez^{2,3} , Amaya Zalacain², Beatriz G. Gálvez^{4*}, Manuel Carmona^{1*}

Journal of Cellular and Molecular Medicine

WILEY

ORIGINAL ARTICLE 

Synergistic Potential of Argentatins A and B to Improve 5-Fluorouracil Cytotoxicity in Colorectal Cancer Cell Models

Paula Sánchez-Olivares¹ | Aniela M. Silva-Nolasco²  | Miguel A. de la Cruz-Morcillo² | María Mercedes García-Martínez^{3,4}  | Alejandro Pinedo-Serrano¹ | Manuel Carmona²  | Eva M. Galán-Moya^{1,5}



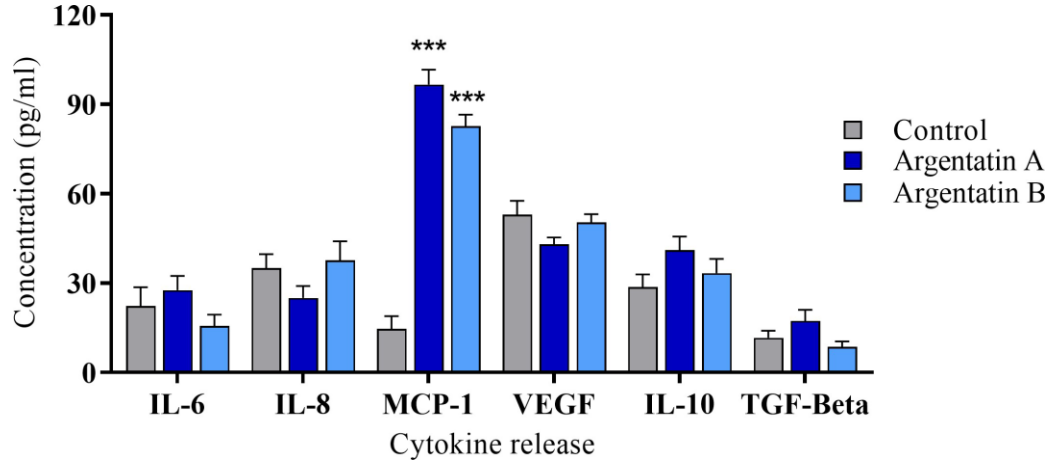
05

Isolated compounds

Argentatins
our research

5.1.

Anti-inflammatory



Argentatins are promising agents in autoimmune or allergic diseases



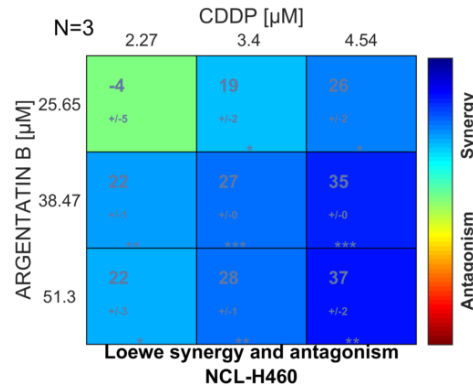
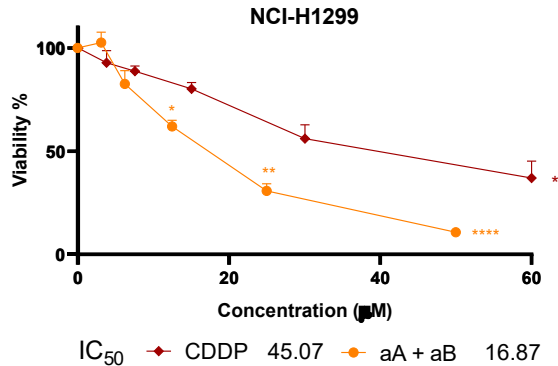
doi: [10.1371/journal.pone.0304713](https://doi.org/10.1371/journal.pone.0304713)

05

Isolated compounds

5.2.

Antitumoral: combination therapy
enhanced efficacy and avoiding drug resistance



Argentatins our research

Cisplatin (CDDP) is the treatment of choice for lung cancer

Argentatins sensitize non-small lung cancer cells (NCL-H1299) resistant to cisplatin treatment



doi: [10.1111/jcmm.70294](https://doi.org/10.1111/jcmm.70294)

05

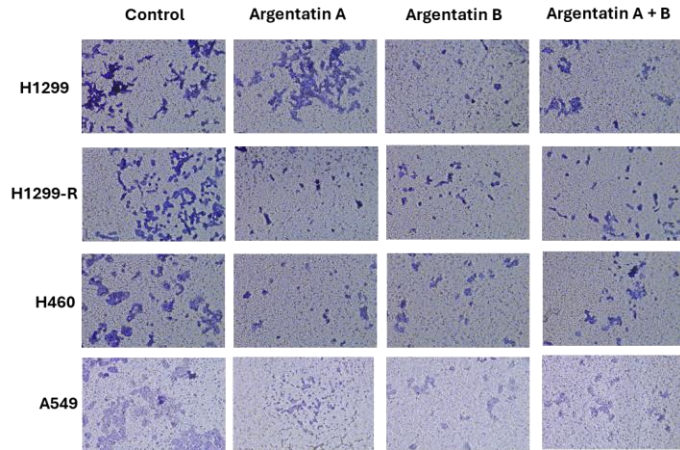
Isolated compounds



Argentatins
our research

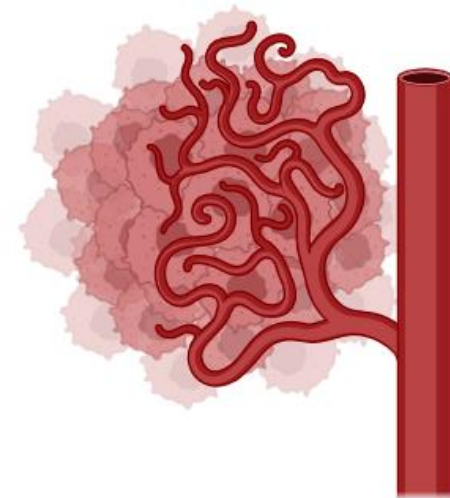
5.2.

Antitumoral: cell invasion and angiogenesis



Argentatin A and B exert significant inhibitory effects on key processes involved in tumor progression, having anti-invasive capacity.

This anti-invasive effect is a reproducible phenomenon in different tumor types.



doi: [10.1016/j.indcrop.2025.121474](https://doi.org/10.1016/j.indcrop.2025.121474)

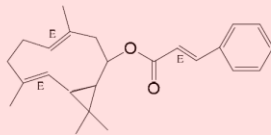


Isolated compounds

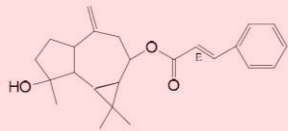
Guayulins

references

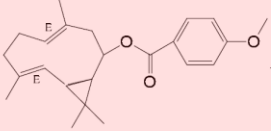
Guayulin A



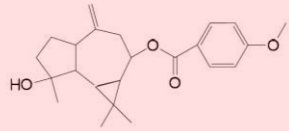
Guayulin C



Guayulin B



Guayulin D



01

Termiticide

(Maatooq, et al. 1996)

02

Antifungal

(Bultman et al., 1991)



05

Isolated compounds



Guayulins

our research

Field-Scale

5.3.

Biopesticides

T. urticae



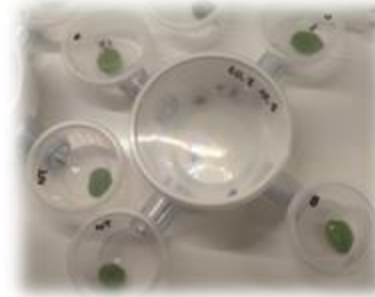
M. persicae



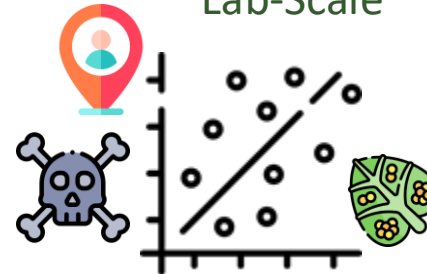
B. tabaci



L. lusitanica



Lab-Scale



doi: [10.3390/plants11091169](https://doi.org/10.3390/plants11091169)

[10.1016/j.cropro.2023.106434](https://doi.org/10.1016/j.cropro.2023.106434)

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Isolated compounds

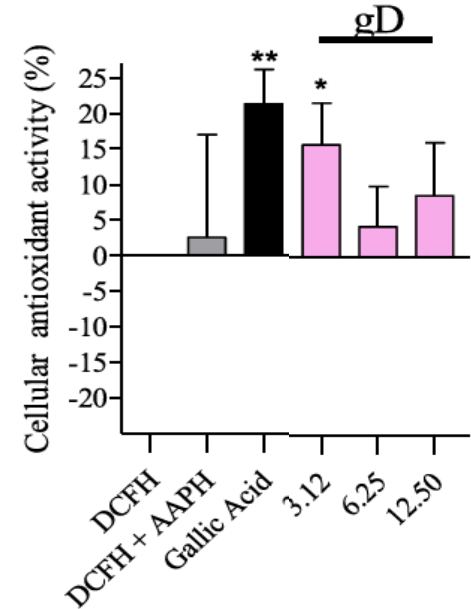
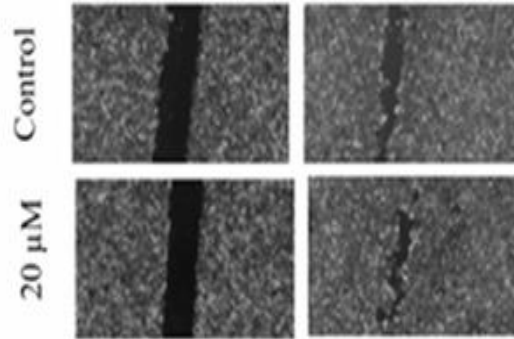
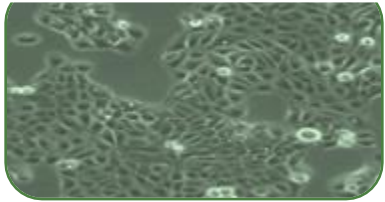
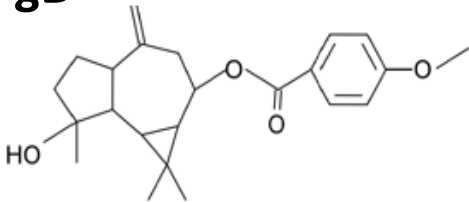


Guayulins our research

5.4. Cosmetic

- ✓ Antioxidant activity
- ✓ Epidermis regeneration

gD



doi: [10.1016/j.indcrop.2025.121883](https://doi.org/10.1016/j.indcrop.2025.121883)

Conclusion

Guayule is an amazing vegetal platform to produce compounds with industrial interest.

The challenge is to scale up an industrial process for any of the co-products to generate return and activate the circle cultivation-exploitation.



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-  info@midas-bioeconomy.eu

Thank you very much



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