



SUSTAINABLE BIOECONOMY
FOR ARID REGIONS

GUAYULE RESIN FOR INSECT REPELLENTS

EXECUTIVE SUMMARY

> Guayule (*Parthenium argentatum*) is a desert-adapted shrub that produces natural rubber in its stems. To improve the economics of the cultivation and processing of guayule as a source of rubber, value-added uses are needed for the two rubber co-products, the resin and the bagasse.

> The resin is a complex mixture of compounds, each with potential uses – as long as the mixture can be properly separated. One of those potential uses is as a bio-based insect repellent.

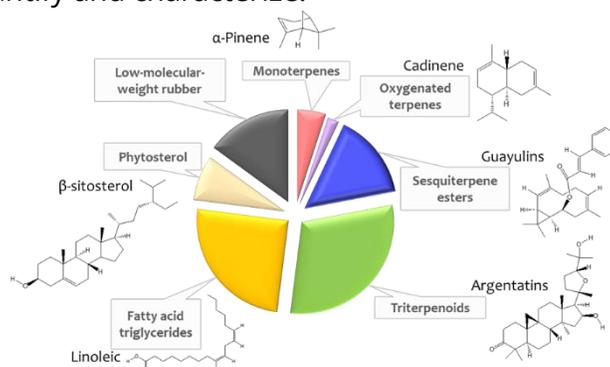
> Guayule resin contains compounds that are already known to repel insects, or a similar to such compounds. SBAR researchers are separating and testing guayule resin fractions with the goal of identifying repellents for urban pests that are safer and easier to use.

SBAR ACCOMPLISHMENTS

> Since 2017, SBAR researchers have used physical and chemical separations and analytical techniques to more completely understand the composition of guayule resin, including compounds that are difficult to quantify and characterize.

> Chemical engineers have worked with urban entomologists to design methods for testing guayule resin fractions as repellents for cockroaches. Test results have been

promising for whole resin and many resin fractions. Application for a preliminary patent is underway.



RESIN DETAILS

- > For each kg of guayule rubber produced, there are 1-3 kg of guayule resin
- > Resin contains 100s of compounds, including essential oils and fatty acids
- > Guayulin and argentatin compounds are unique to guayule and may have anticancer, anti-fungal, and antimicrobial properties



QUEST FOR BETTER SEPARATION METHODS

- > Vacuum distillation for large-scale, solvent-free separation
- > Accelerated solvent extraction for faster separation and purer fractions
- > Supercritical fluid extraction with carbon dioxide and other “green” solvents

POINT OF CONTACTS

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FUTURE WORK AND POSSIBILITIES

- > Future work will focus on testing guayule resin fractions against other urban pests, such as bed bugs and mosquitoes, as well as determining the level of toxicity to see if some guayule resin fractions can kill the insects. These fractions can then be tested in pesticide and repellent formulations to replace synthetic compounds or compounds that negatively impact humans, animals, plants, and other insects.



- > Once the target guayule resin compounds have been identified, the separation process will be optimized to get the highest combined product value for the least processing cost.

WHAT IS STILL NEEDED

- > Partnerships with chemical and bio-based product companies to test the efficacy and safety of guayule-driven compounds and fractions into pesticide formulations.
- > Pilot-scale studies of guayule resin extraction and separation methods to compare realistic yields and to evaluate impact on overall guayule processing costs.
- > Testing of guayule resin compounds for bio-activity related to human health (anticancer, anti-inflammatory, antioxidant, etc.).
- > Testing of guayule resin fractions for use in functional coatings (anti-termite).
- > Partnerships to explore the use of guayule resin compounds in fragrance applications.

For more information: <https://sbar.arizona.edu>



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