



Guayule: Introducing a Potential Crop for Sustainable Soil Management in the Desert

Debankur Sanyal, Charles Stackpole, Trevor Pettit, and Sanjoy Kumar

Environmental Science, The University of Arizona

Introduction

Desert environments are characterized by arid conditions, restricted water availability, and nutrient shortages, which present unique challenges for soil health management. In arid and semi-arid environments like the desert Southwest, soils are prone to wind erosion due to traditional agronomic practices that support irrigated agriculture such as frequent conventional tillage and fallowing, which necessitates creative solutions for sustainable soil management (Elshikha et al., 2023). Guayule (*Parthenium argentatum*) emerges as a promising crop that can thrive, grow, and provide economic benefits to commercial growers while paving the way for a more sustainable and resilient agricultural future in the desert ecosystems of the US Southwest.

Why is Guayule Important in The Desert?

Guayule is a perennial shrub native to the arid regions of the southwestern United States and northern Mexico. This hardy plant has long been prized for its latex, which is used to make natural rubber (Figure 1). In contrast to conventional rubber-producing plants like the rubber tree (*Hevea brasiliensis*), guayule grows well in water-limited semi-arid and arid conditions, which makes it a more sustainable choice for cultivation in desert environments facing water scarcity. Guayule can be grown successfully with only 30-35 inches of water each year (Elshikha, 2023; Elshikha et al., 2023), which is approximately one-third of the total water consumed by Alfalfa (74 inches annually) in Arizona (Ottman, accessed 2025). A low water requirement, therefore, makes this crop well-suited for commercial growers in Arizona amidst water cutbacks (Quirk, 2023). For more planting guidelines, please see Evancho and Dial (2020). As interest in environmentally safe, sustainable, locally derived alternatives increases, guayule latex may prove to be a competitive consideration. Furthermore, research has proven that latex produced from guayule has similarities to Hevea latex and can be used in tires, adhesives, and medical products (Ray et al., 2015).



Figure 1. Showcasing latex and tire produced from guayule during a field day at the Maricopa Agricultural Center, University of Arizona, with a guayule research trial in the background

Can Guayule Provide Soil Health Benefits and Ecosystem Services?

Guayule protects the topsoil year-round as a perennial plant, offering several advantages over contemporary annual crops (Wick et al., 2017). The deep root system of plants helps stabilize the soil, preventing erosion and promoting water infiltration through soil aggregation similar to other perennial crops (Duchene et al., 2020). Additionally, guayule grown in Arizona has been associated with a group of beneficial soil microbes (including bacteria and archaea) involved in nitrogen cycling (Chen et al., 2023). For these reasons guayule is being evaluated as a crop that improves desert soil (Figure 2). The perennial nature of guayule also aids in carbon sequestration (Eddy and Wang, 2022). The ability of the plant to capture and



Figure 2. Sampling a guayule trial in Eloy, AZ to conduct soil assessments



Figure 3. The University of Arizona Cooperative Extension team is sharing research outcomes with growers to boost crop production in Arizona

store carbon in above and below-ground biomass and eventually sequester carbon in the soil can help mitigate the adverse effects of climate change by reducing carbon emissions. Therefore, introducing guayule as a sustainable and climate-smart crop can significantly improve soil health (Brown 2023), reduce soil erosion, and sequester carbon in desert soils and crop biomass.

Things to Consider

Although guayule has a great deal of promise for sustainable soil management in arid climates, effective cultivation necessitates careful consideration of several criteria.

- **Water management** is of paramount importance, given the arid conditions of the desert. Efficient irrigation practices, such as drip irrigation, can optimize water use and ensure plant survival in these challenging conditions (Bucks et al., 1984).
- **Soil preparation** is another crucial aspect of guayule cultivation. Desert soils may lack essential nutrients, so incorporating organic amendments like manure, compost, and fertilizers may be necessary for optimal plant growth.
- A big concern is often the **management of weeds and plant-feeding pests** in the first 60-75 days after germination. Guayule is a slow-growing plant, and some weed species can outcompete plants for resources and space. Additionally, tender new leaves may be foraged on by insect pests. To date, growers have limited options to manage pests, and timely weed management is critical for successfully establishing this crop. Specialists are working on

finding more effective ways to manage weeds and insect pests in the early growing season to support vigorous establishment of guayule crops.

- In summary, guayule presents a promising solution to the soil health challenges faced by desert ecosystems by providing cover, protecting the soil from erosion and through modification of the soil microbiome. Considering that growers have limited water supplies guayule is an attractive crop well adapted to arid growing conditions. The perennial nature and soil-improving characteristics position guayule as a sustainable and resilient crop for desert agriculture. By carefully considering water management, soil preparation, and pest control, farmers can harness the potential of guayule to foster a more sustainable and productive agricultural landscape in the face of changing climatic conditions.

Additional resources to help you get started with growing guayule

- https://plants.usda.gov/DocumentLibrary/plantguide/pdf/pg_PAAR5.pdf
- <https://climatesmartguayule.arizona.edu/>
- <https://sbar.arizona.edu/extension/growers-producers/guayule>

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Cooperative Extension

AUTHORS

DEBANKUR SANYAL

Assistant Professor and Specialist, Soil Health

CHARLES STACKPOLE

Research Technician

TREVOR PETTIT

Research Professional

SANJOY KUMAR

Postdoctoral Research Associate

CONTACT

DEBANKUR SANYAL

dsanyal@arizona.edu

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