

Texas Alliance for Water Conservation

Funded by:



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TEXAS TECH UNIVERSITY Agricultural Sciences & Natural Resources Davis College[™]

Water is our Future

Ogallala Aquifer & TAWC Footprint



By 2030; TTU Geospatial Technology

TAWC's Operational Landscape

TAWC



Guayule Latex Production Using Produced Water



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Guayule is an alternative rubber and latex plant that is more sustainable and drought resistant than Hevea rubber.



Hevea brasiliensis Brazilian rubber tree: can grow only in tropical climates.



Parthenium argentatum Gray Guayule: Native to the Chihuahuan Desert and tolerant to challenging conditions

Benefits

- In times of water scarcity, crops that <u>tolerate poor quality water</u> or drought are important.
- Guayule can be grown using more sustainable practices and using alternative water sources because it is <u>not an edible crop</u>.
- Guayule latex and rubber has higher quality and better properties than synthetics
- Guayule also produces latex that <u>does not contain the protein</u> that causes latex allergies, making it ideal for medical applications
- <u>Terpenes</u> in Guayule keep pests away

Guayule

- Guayule was grown in the Southern High Plains for a brief period.
- Different lines have shown different yields, cold tolerance, and management responses.
- Not much information is known about <u>impacts of salinity or</u> <u>alternative water on guayule</u> <u>latex or rubber</u>.



Guayule latex and rubber

- Low irrigation rates generally result in lower yields of latex and rubber from guayule
- Yields are more dependent upon location and environment
- Irrigation can affect latex:rubber ratios
- Less water usually results in <u>irreversible</u>
 <u>conversion of latex to rubber</u>
- Both latex and rubber are valuable products, but <u>latex has more niche</u> <u>market uses and may bring higher profits</u>



 $https://cfaes.osu.edu/sites/cfaes_main/files/site-library/site-images/Latex\%20 oozing.jpeg$

Produced water

- Produced water is a byproduct of oil and gas production operations
- West Texas produced over 3.9 billion barrels in 2019
- Characterized by high salinity and other contaminants
 - Na, Cl, As, B, benzene, etc.



Produced water for agriculture

- Produced water has been explored in various capacities for agricultural production
- However, there is still some stigma associated with its use in food crop production
- So <u>high-value, non-edible crops</u> would be ideal

Water Quality	TDS (mg/L)
Fresh	<1,000
Slightly saline	1,000-3,000
Brackish	3,000-10,000
Saline	10,000-35,000
Highly saline	>35,000

Produced water > 120,000-130,000 mg/L TDS

Produced water for guayule

- Treated or blended produced water could be used to irrigate guayule
- Guayule can tolerate <u>salinity up</u> to 4.5 dS/m (2800 ppm) but little is known about the impacts on rubber and latex
- <u>Hypothesis</u> Because salinity increases osmotic stress, it could also affect latex and rubber yields & quality



Goals and objectives (Sept 2024 – Aug 2025)

• **Goal**: Determine the impacts of produced water on guayule latex and rubber.

- **Objective 1**: Quantify guayule physiological responses to produced water
- **Objective 2**: Evaluate effects on guayule rubber and latex
- **Objective 3**: Understand how produced water impacts nutritional composition of guayule plants.

Methodology

- <u>Genotype</u> : Two proprietary lines of guayule
- <u>Water treatments</u>: RO water, treated produced water, blended produced water (3 dS/m; 1920 ppm).
- <u>Measurements</u>:
 - Latex/rubber yields
 - Latex/rubber quality
 - Plant physiology
 - Water use efficiency
 - Nutrient and heavy metal content
 - Biomass
 - Plant health



Methodology

- Plants will be grown for ~6 weeks prior to transplanting into larger pots
- Irrigation with water treatments will begin
 2 weeks after transplant
- Tissue samples will be taken every 3 months
- Plant measurements will be taken every 3-4 weeks
- Latex and rubber extraction will be conducted every 3 months
- Full plant harvest planned after 2 years



Anticipated Outcomes

- We expect that fully treated produced water will have <u>few or</u>
 <u>no impacts on guayule latex</u> production or quality.
- Blended produced water may affect yields or quality of guayule latex/rubber.
- Set the stage of extending the use of treated produce water on field grown guayule.



https://ur-biowooeb.cirad.fr/var/ur_biowooeb/storage/images/biowooeb/actualites/latex-de-guayule-une-nouvelle-etape-vers-la-bioraffinerie/37611-1-fre-FR/latex-de-guayule-une-nouvelle-etape-vers-la-bioraffinerie.jpg

Initial Goal

- Is the treated produced water good enough for Phase I
 - Native grasses or non-edible crops (Guayule/Cotton)
 - Biofuels (Corn/Sorghum)

Phase II

- Edible crops
- Forages to support beef and dairy industry
- Impact on crop physiology, yield and quality
- Soil microbial dynamics

Other efforts:

- NSF grant awarded to study alternative rubber crops.
- https://fabe.osu.edu/node/11065







Outreach and Technology Demonstrations



TAWC