



SUSTAINABLE BIOECONOMY
FOR ARID REGIONS

Extension & Outreach Newsletter

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SBAR Updates

The SBAR Center continues to update our sbar.arizona.edu website with materials ranging from new lesson plans and briefing papers to links to latest published research. Our newest lesson focusing on indigenous growing practices is highlighted on page 3. Additional lessons and activities will be added this spring.

We are still recruiting for our two summer internship programs. The SBAR Explorer Internship is a 2-week program on the University of Arizona campus in Tucson. The SBAR Research Internship is a 6-week commitment that will take place in Pima or Pinal county. All details can be found on the SBAR website (<https://sbar.arizona.edu/>).



New Mexico Agricultural Science Advisory Committee

We are setting up a New Mexico Agricultural Science Advisory Committee to help grow Agricultural Science contests, and agricultural science and technology literacy in general. This committee will help raise scholarship funds and promote contests throughout New Mexico. The committee will build a network that provides a ladder for rural students to connect to faculty and industry professionals to support independent scientific investigation with agricultural and natural resource applications. The first meeting was held on Monday, March 7th. If you are interested in learning more about serving on this committee, please contact Frannie Miller (franniem@nmsu.edu).

Join us: Yavapai County SBAR 4-H STEM Experience

There is still time to sign up for the Saturday, March 26 SBAR STEM Experience Workshop taking place at the Yavapai County Cooperative Extension Office. Read more about the recent workshop on page 4.

To sign up, and learn more, go to our [website](#).

Guar Research Update: Effects of Nitrogen and Phosphorus Fertilizers on Guar at Four Locations in New Mexico

Guar is a legume that can be used for multiple purposes. Guar utility includes forage for animals since it is high in protein; immature plants can serve as vegetables for human consumption; it can be grown as a summer cover crop to add nitrogen to the soil; and it can be raised as a seed crop for the extraction of guar gum that is used by various industries. However, the greatest economic benefit from guar is realized when it is raised as a seed crop and guar gum is extracted from the seeds for industrial applications. Guar gum, for example, is in high demand by the inland oil and gas industry because it is utilized in hydraulic fracturing, a process used to recover gas and petroleum from natural reservoirs within the bedrock where such mineral resources abound.

The majority of guar gum used in the oil and gas industry is imported, but the semiarid and arid southwest provide ideal conditions for growing guar. As a result, it is important to optimize agronomic inputs in the southwest, notably New Mexico, to boost high guar seed yields.

Through the funding from SBAR, trials were conducted over two growing seasons at four locations in New Mexico (Las Cruces, Los Lunas, Tatum, and Clovis, NM), to assess the effects of nitrogen and phosphorus fertilizer application on the growth and bean yield of guar. Two rates of nitrogen and phosphorus were applied to the soil just before planting guar. The rates applied were 22 lb/ac and 44 lb/ac for nitrogen, 22 lb P_2O_5 /ac, and 44 lb P_2O_5 /ac for phosphorus. These rates were compared to the control which had no nitrogen or phosphorus added to the soil. The response of guar to applied nitrogen and phosphate fertilizers was minor and insignificant at most locations, especially in Los Lunas and Tatum, according to the results. Phosphorus enhanced the yield in Las Cruces in only one year, while nitrogen raised the yield in Clovis in just one year. The yield response to nitrogen and phosphorus fertilizers differed depending on the trial year and location. Between the two trial years, there was a 39 percent variation in average yield, with the yields in 2020 higher than 2019. The average guar bean yield was 1307 lb/ac for Los Lunas, 1024 lb/ac for Clovis, 1002 lb/ac for Tatum, and 786 lb/ac for Las Cruces over the two trial years.



Guar Field, K Grover

According to this study, guar may not require additional fertilizer inputs to grow in New Mexico, rather, the seasonal weather variation and growing locations have a greater impact on guar productivity. However, growers are advised to test their soils to make sure that nutrients are sufficient before growing guar.

Article written by John Idowu

Guayule Research Update: Response of Guayule across Nitrogen Fertility Gradient

Guayule has long been described as a low input desert shrub and to meet those requirements, the plant would need to be heat tolerant, drought tolerant and have a low fertility requirement. While these generalities hold true for guayule, questions frequently arise surrounding guayule's drought tolerance and low fertility requirements when grown in a cropping system. SBAR researchers are investigating these questions with plans to scientifically determine just how tolerant this Chihuahuan Desert native is to drought and low fertility soils. There is exciting SBAR research ongoing to describe the irrigation water requirement of guayule and we will have all of those results in the months to come, but we have a completed set of experiments on the nitrogen fertility requirement of guayule to share. *(continued on page 3)*

Research Updates

(continued from page 2)

These experiments tested nitrogen fertility along a large gradient of concentrations. It is not reasonable to expect a plant to grow or even survive with no nitrogen fertilizer, as it is the essential nutrient required in the largest amounts. However, all the guayule plants tested in our trials, with no nitrogen fertilization, survived and even grew slightly. While this was an interesting find, the most interesting result of this trial was the overall response of guayule across the nitrogen fertility gradient.

In our trials, guayule grew very little at the no-nitrogen fertility treatment, grew well and at a similar rate in the middle 4 nitrogen fertility treatments, and still grew but, not as well at the highest nitrogen fertility treatment (see image). This indicates that guayule can handle a wide range of fertility levels, but the minimum amount of nitrogen required to grow well, lies somewhere between 0 ppm and 50 ppm nitrogen and there may be toxic effects above 150 ppm nitrogen.

After the 0 ppm to 50 ppm nitrogen fertility range was identified as the low threshold for nitrogen, we tested nitrogen levels across that range in 10 ppm increments. The results clearly fell into 3 groups of growth, 0 ppm – 10 ppm, 20 ppm – 30 ppm and 40 ppm – 50 ppm.

These results were important for two reasons. 1) We now know what the minimum nitrogen fertility range for growth is in this system. 2) We combined leaf nutrient tests from all of the experiments to determine that leaf nitrogen levels should be between 2.5% to 4.2% for adequate growth. This is the most important result from this trial as there are currently no field measurements to describe nitrogen deficiency. Further research will include testing other plant nutrients, particularly phosphorus and potassium, to see how these nutrients affect plant growth and to develop field measures for these nutrients if applicable.

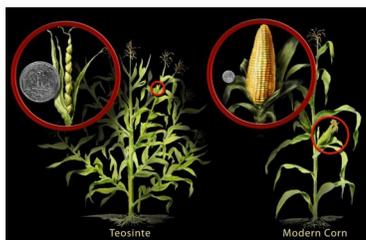
Article written by Blase Evancho



Guayule plants show a nitrogen response along the gradient of nitrogen fertilizer. The lowest treatment is on the left, increasing in nitrogen concentration to the highest treatment on the right.

Education Updates

Indigenous Agriculture and Plant Cultivation in the Southwest



A new lesson focused on Indigenous Agriculture has been added to the SBAR website. This lesson introduces students to the long and rich history of agriculture and food gathering in the Sonoran desert practiced by Indigenous peoples in the Southwestern US. The activities and content include traditional food cultivation practices, plant science, relationships between various plants, and human-nature relationships. This lesson, along with 8 others, are available to educators on our [website](#).

SBAR Materials for Educators

SBAR is continuing to work with educators in both formal and informal settings. New curriculum is being added to the SBAR website regularly for use in classrooms, by youth groups and others. As part of the SBAR 4-H STEM training in Navajo County this month, lesson supplies including presses, scales, beakers, and more were delivered to adults working with youth in rural areas of Arizona.

We are also seeking middle school educators to try out and adapt classroom lessons and activities including the SBAR Lotería. Support can be provided to educators by SBAR graduate fellows as guest presenters/facilitators. Please reach out to Torran Anderson (torrananderson@arizona.edu).



NMSU ACES Public Speaking Workshop

The 2021 NMSU ACES Public Speaking workshop was a trio of fun, learning, and discovery for the students and volunteers from different fields that are stakeholders in the agricultural sector. All participants spent the afternoon developing a speech to use for agricultural and natural resource-focused public speaking contests. The event was held on December 14th and had 22 high school students attend, 17 middle school students and 15 elementary (3rd – 5th grade) students attend. A follow up zoom session was held for 6 elementary students from San Fidel who couldn't attend because of exposure to COVID-19.



The core of the hands-on program had NMSU faculty, students and alumni volunteers as facilitators and assistants to help students develop interest areas into a speech outline. The students who already had an idea for their speech were able to visit with faculty, alumni, and graduate students to identify areas for further research, ask questions, and get suggestions about how to shape a general idea into a specific topic.

A big note of thanks to NMSU students that gave up a Saturday before finals week to volunteer. These included SBAR fellows Luis Ramos-Coronado and Oluwatobi Omotayo, who provided lunch time SBAR demonstrations. Luis did a demonstration on viscosity, and Oluwatobi hosted the ever-popular guar bubble session. The motivation behind the two sessions was to encourage students to think more broadly about what an agricultural topic might be. Dr. Catie Brewer spoke to the middle school students to encourage the same type of expansionary thinking about agricultural topics.



Thanks to the following NMSU students: Lexi Montgomery, Anne Hodnett, Eva Cortes-Monroy, Kathryn Petty, Marisol Olivas, Shaylee Own, Eden Taylor, Kelsey Nelson, Neal Bitse, Sophia Flores, and Maggie Long. Additional thanks to SBAR, First Savings Bank, Ag New Mexico Farm Credit, NMSU Collegiate Farm & Livestock Bureau, and Beaverhead Ranch Group for sponsoring the meal and the t-shirts!

Report by Frannie Miller

SBAR 4-H STEM Experience in Navajo County, AZ

On Saturday, February 26, youth development professionals from around Arizona convened in Navajo County for the second SBAR / 4-H STEM Exploration Workshop. The workshop was led by Associate in Extension for 4-H Curriculum



Development Matt Swanson, Program Coordinator David Shafer, and Arizona Cooperative Extension Equine Specialist Dr. Betsy Greene. Matt and David modeled the use of SBAR activity kits and distributed supplies and plans so that teachers and volunteers could easily replicate the activities with youth in their communities.



The next workshop will take place at the Yavapai County Cooperative Extension Office in Prescott, AZ, on March 26. Sign up on our [website](#).

Report by David Shafer

Connect with SBAR

Recruiting: Growers for Trial Plots

Contact: John Idowu for guar in New Mexico

Contact: Blase Evancho for guayule in Arizona

Recruiting: Educators

SBAR is seeking middle school educators.

Contact: Torran Anderson

Join Us: 4-H STEM Workshop

March 26, 9am to 3pm at Yavapai County Coop Ext, Prescott, AZ

Contact: David Shafer

SBAR Plant Guide on Guar

Available 2022

Contact: John Idowu

SBAR Agronomics on Guayule

Available 2022

Contact: Blase Evancho

SBAR Whole Farm Analysis Tool for Evaluating the Adoption of Guayule and Guar into Your Current Operation

Available 2022

Contact: Clark Seavert or Blase Evancho

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We would love to hear from you! Contact our team directly at the email addresses provided.

Check out the SBAR website for more information about the program, research, and resources: <https://sbar.arizona.edu>

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