

GUAYULE GERMPLASM CHARACTERIZATION FOR VARIATION IN PLOIDY AND BIOMASS PRODUCTION

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Many companies have initiated sustainability initiatives. As the world's largest tire company, Bridgestone embarked to commercialize guayule (*Parthenium argentatum* A. Gray) as an alternative source of tire-grade rubber to achieve its long-term vision of manufacturing products from raw materials that are fully renewable and sustainable by 2050. Guayule crop improvement efforts rely on a diverse set of germplasm to enable genetic gain in the breeding program. Characterization of available germplasm collections is important for gathering information about the amount of diversity that breeders can work with. Guayule has a complex mode of reproduction which presents a challenge to breeders. Diploids ($2n=2x=36$) are known to be sexually reproducing while polyploids ($2n=3x$ to $6x$) are facultative apomictic in nature. Identifying these types of materials in the collection is critical for making decisions in the breeding program as well as characterization of trait potential. This study, as part of the Sustainable Bioeconomy for Arid Regions program, aims to evaluate the accession level variability in ploidy of guayule germplasm and biomass yield which contributes to the shrub's total rubber yield. Fifty four (54) accessions from the U.S. National Plant Germplasm System were direct seeded in two fields at Eloy, AZ and established using sprinkler irrigation on April and May 2018. Leaf tissues were obtained from individual seedlings for flow cytometry analysis. Shrubs were harvested at 10 and 11 months after planting and analyzed for biomass and rubber content. The predominant ploidy observed on the germplasm set was $4x$ (64%) followed by $3x$ (34%). Fourteen hexaploid ($6x$) plants were identified out of the 1,493 analyzed. Among the germplasm, 11619 and N565II had variable ploidy with plants that are $3x$ to $6x$. Twenty six accessions are uniform and have plants that have similar ploidy, while twenty eight accessions are variable with more than two ploidy types among plants. The highest diversity in ploidy in terms of the Shannon-index was on 11619 (1.08), CFS24 (0.81), and CAL2 (0.80). CAL2, CAL1 and AZ2 were observed to have the highest dry biomass (>600g per plant), while 11635 and R1092 had the least amount (<110g per plant). The mean dry biomass of all accessions was 287g. The highest mean rubber content was observed on AZ6 (4.07%), followed by 11693 (3.78%) and lowest on R1037 (2.05%) and CAL1 (1.99%). These data and trait ranking of shrubs that were less than one year old will be compared with observations from 24-month-old shrubs at the next harvest.

Association for the Advancement of Industrial Crops, 31st Annual Meeting
~ *Advancing the Adoption of Industrial Crops through Innovation and Technology* ~
Tucson, Arizona – 8-11 September 2019.
<https://aaic.org/>

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