**2022 Sugarcane Crop Germplasm Committee Meeting**

**June 21, 2022**

**Hyatt Regency Coconut Point, Bonita Springs, Fl**

**Chaired By Dr. Anna Hale, USDA-ARS, Houma, LA**

**AGENDA**

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| 9:00-9:10(10 minutes) | Introductions and welcome | **Zoom:** [https://www.zoomgov.com/j/16084686264](https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.zoomgov.com%2Fj%2F16084686264&data=05%7C01%7C%7C59e3ff05d4be4ccdb79408da4ed9af8e%7Ced5b36e701ee4ebc867ee03cfa0d4697%7C0%7C0%7C637908994099550713%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=d45HX9XXq5nDLvPNpqgUGg6sXnLWpktaeD%2BuMJoLgYw%3D&reserved=0) **Meeting ID:** 160 8468 6264 |
| 9:10-9:15(5 minutes) | Approval of previous meeting’s minutes (previously sent to committee) | Collins Kimbeng – LSU Ag Center, Baton Rouge, LA |
| 9:15-9:25(10 minutes) | National Germplasm Resources Laboratory’s 2022 Report to PGOC, RTACs and CGCs  | Gary Kinard, USDA-ARS-NGRL, Beltsville, MD  |
| 9:25-9:45(20 minutes) | Report on the Status of the World Collection at SHRS, Miami and Genotyping and Establishing a Core Collection of Sugarcanes | Gul Shad Ali, USDA-ARS, Miami, FL |
| 9:45-10:15(30 minutes) | NPL Report | Peter Bretting, Beltsville, MD |
| 10:15-10:25(10 minutes) | Sugarcane Importation and Quarantine-Related Activities | Bishwo Adhikari, USDA-APHIS, Beltsville, MD |
| 10:25-10:40(15 minutes)  | BREAK |  |
| 10:40-10:55 (15 minutes) | Update on 2018 Funded Project, “Assessing the Resistance Response of Basic Germplasm and Accessions to Sorghum Mosaic Virus and Identification of Genetic Markers for Resistance through Genotyping by Sequencing and Genome Wide Association Studies” | Niranjan Baisakh, LSU AgCenter, Baton Rouge, LA |
| 10:55-11:25(30 minutes) | Discussion on Establishment of SugarcaneBase database | Keo Corak, USDA-ARS, Raleigh, NC. |
| 11:25-10:35 (10 minutes) | Nomination of Committee Members and Officers  |  |
| 11:35-12:00 | New Topics and Open Discussion | Open Discussion |
| 12:00 | Adjourn |  |

Introductions: In attendance:

|  |  |
| --- | --- |
| Online:Gary Kinard (USDA, NGRL, Beltsville)Bishwo Adhikari (USDA, APHIS, Beltsville)Gul Shad Ali (USDA, Miami)James Shine (SCGC, Belle Glade)Peter Bretting (USDA, CPP, Beltsville)In person:Anna Hale (USDA, Houma) Collins Kimbeng (LSU AgCenter)Michael Ponti (LSU AgCenter)Niranjan Baisakh (LSU AgCenter, Baton Rouge)Elio Jimenez (Florida Crustals)Hardev Sandhu (UF )James Todd (USDA, Houma)Aliya Momotaz (USDA, Canal Point)Herman Waguespack (ASCL, Thibodeaux)Keo Corak (USDA-ARS, Raleigh, NCPhillip Rott (CIRAD, France)Claudia Kaye (US Sugar)Mike Irey (US Sugar)Jeff Hoy (LSU AgCenter, St Gabriel)Christopher LaBorde (US Sugar, Clewiston)Kenneth Gravois (LSU AgCenter, St. Gabriel) |  |

Meeting was called to order by Chair Dr. Anna Hale at 9:00 AM.

**\*\*Approval of previous meeting’s minutes, Collins Kimbeng – LSU Ag Center, Baton Rouge, LA.**

* Chair Anna Hale tabled the minutes for approval.
* Herman moved for the minutes to be approved as presented.
* Jeff seconded.
* Motion carried.

**National Germplasm Resources Laboratory’s 2022 Report to PGOC, RTACs and CGCs; presented by Gary Kinard, USDA-ARS-NGRL, Beltsville, MD**

* Shared screen remotely
* Personnel: Dr. Anne Frances joined NGRL as a Botanist in August 2021. Anne comes to ARS and NGRL after serving as the Lead Botanist for NatureServe, a conservation science-based NGO, for ten years. Anne is a scientist in the Plant Exchange Office project. Experienced in conservation biology.
* Approved plant exploration: Postponed due to covid. Plant explorations are becoming possible again. Backlog from last 2 years. Hope to ramp up this year and 2023. New proposals may not be approved until the backlog is cleared. FY 2021 two explorations. 1 Illinois (domestic, state of) for *Aronia* species and 2. Georgia Republic (country) for *Salix* by in-country scientists
* RFP sent out already deadline to submit is late July.
* GRIN: progress made in last couple of years in GRIN global. The search page (excluding the World Economic Plants search) was rewritten in 2021 to allow a broader range of searches and provide the option to export most search results. One new progress is with the distribution of citrus, which is only available at certain times of the year. GRIN New open access site, supported by NIFA challenge grant. Peter provided a link to access it and opined that it is very good for teaching.
* Anna: Q for Gary? None.
* Changed program around as Peter had to leave early.
* **The National Plant Germplasm System: 2022 Status, Prospects, and Challenges. Presented by Peter Bretting**
* Remotely shared screen
* Showed map with locations of gene banks. Gene banks cover most of the crop growing area in the US.
* Collocated at land grant university.
* Miami not collocated. Mayaguez, he believes is adjacent to Univ but may not be collocated with the university, Hilo is not collocated. No one organization can effectively run the program. Partnership needed. USDA and Univ. Sugarcane is one group with active industry participation, which bodes well for the commodity.
* Showed slide of 10-year growth of NPGS accession: In 2021 past 600,000
	+ Focus on filing gaps with acquisitions, targeted to traits from researchers needs.
* Showed slide of demand for NPGS germplasm 1012-2021: down 20% in 2020 from 236,000 to 188,900 and went back up in 2021 to 219,000.
* Largest category of request: fac, student, followed by ARS depending on the crop.
* No quota just long term average 2/3 to ¾ are domestic.
* In 2021 proportion of international request higher 38%
* Harder to fulfil the mission. Rather than covid, one constraint has been the labor market. Especially student labor. Gene banks are finding it difficult to hire. GRIN-Global has functioned normally throughout Covid.
* Budget up a little. Up $49.7 M in 2021 from 47.2M in 2020. But in today’s (deflated) dollars still buys less equivalent to 2000 $. Budget up but accessions and distribution also went up.
* Key challenges: Expand operational capacity and infrastructure to accommodate increased demand and backlog because of loss of purchasing power. Personnel transition. generational turnover. Hiring new people and training has been challenging. Developing and applying cryopreservation and or in vitro for clonal crops and some seed crops has been very challenging.
* Key challenges: BMP and procedures for genetically engineered accession, formerly proprietary traits coming off patterns, adventitious presence, more crops with unregulated traits, tools also changing, old diagnostic tools/test to see if cultivar has been engineered no longer apply with a diversity of promoters, then there is gene editing, determining this without accompanying information will be impossible.
* Priorities of this multifaced complicated process: maintenance > Acquisition to avoid loss due to extinction, if a breeding program changes priority and wants to get rid of material > regeneration, documentation and mgt, distribution. Then we can think of 2nd level priorities such as characterization, evaluation, enhancement (increase value of germpasm), and research support of the proceeding priorities.
* Personnel transition: Provided a long list of people retiring and a much longer list of new hires. Currently recruiting at Corvallis, OR; Davis, CA; Pullman, WA; and Geneva, NY.
* None above for sugarcane
* Takes a long time to hire. Playing catch up.
* PGR Management Training Initiative: No formal program for training new PGR managers. Volk and Byrne (through an ARS and NIFA grant) can now provide a 3 credit hour online course. Next one in Aug.-Sept. 2022. Info can be accessed @ <http://pgrcourse.colostate.edu/> $200 cost for credit more expensive. Other materials freely available @ GRIN-Global at <https://grin-u.org/>. Infographic posters for PGR, gene banks and conservation, and PGR and food security in 6 languages; download at <http://genebanktraining.colostate.edu/trainingmaterials.html>
* FY 20-21 ARS NPGS Budgetary Increases: Small grains PGR ($190,000): Aberdeen, ID; *Vaccinium* PGR ($150,000): Corvallis, OR; Hemp PGR ($1.35 million): Geneva, NY; Pecan PGR ($400,000): College Station… specific commodity groups led this effort. Increase not uniform.
* Non research request is clogging the system: new video to discourage because this is highly valuable material meant for food security. [**https://youtu.be/uHOclGNELuw**](https://youtu.be/uHOclGNELuw). Encouraged us to post the link.
* Anna: Questions?
* Q Collins: Don’t you receive some information with any GMO?
* A Peter: materials received where the protection has expired. No mandatory declaration to state whether it is transgenic. Sometimes they do not. The curator has to go searching for that information.
* Q Elio: Is sugarcane included among priorities to develop in vitro and cryopreservation methods?
* A Peter: yes, it is, currently backing up sugarcane in tissue culture at Fort Collins, very labor-intensive operation. Highly inefficient. The issue is endophytic microbes in the tissue. The microbes reduce the life span and complicate the process. Shad Ali can speak to that. A better way must be a priority. For now, 2 plantings at 2 sites is more cost effective. Invitro/cryo technologically challenging for now. Hope through research to develop an effective method. Shad may have more to say.
* Q Mike: thought there was previous success from Gale’s work?
* A Peter: Still experimental now. Complicated by microbes.
* Q Mike: what about storage through true seed?
* A Peter: If worse came to worse it can be done that way, but you will not get back the phenotype.
* A Shad: inaudible…. Mentioned endophyte as an issue.
* Comment: Mike: seed storage is not to gain true to type material but to make the important genes available for breeders to recover if need be
* Comment: Peter: worth investigating especially wild relatives
* Comment: Bishwo: endophyte problem with sugarcane … says they have tissue culture method that have tried to eliminate the problem, it has worked but then again this is not for preservation… has seen a lot of problems with other grasses, problem common among grasses not an isolated issue
* Comment: Peter: hopefully we can come up with a common solution

**Report of the Status of the World Collection at SHRS, Miami and Genotyping and Establishing a Core Collection of Sugarcanes Presented by Gul** Shad Ali, USDA-ARS, Miami, FL

* Remotely shared screen (not too audible)
* Apologized for not attending in person. The trip was cancelled, high covid in Miami area.
* Hired more people. Partial technician for sugarcane. He also has responsibilities for other crops.
* In GRIN Global
	+ 974 sugarcane accessions, more than half not available.
	+ Only 442 available, majority *Saccharum species*. No passport data
	+ 300 unknowns.
* *Sacharrum spontaneum:* identity issues with germplasm. Ongoing for a while, getting some handle on the problem. Mislabeling a big problem. Tried to collaborate with Angelique (CIRAD) using DNA markers to ID. Collaborating with Dr. Dapeng Zhang sequencing to ID duplicates.
* Introduced new genotyping tools. SNPs
* We must recover lost germplasm…. Duplicate in Brazil. Brazil willing to send germplasm back.
* Follow up on introduced new genotyping tools. SNPs
* SNP flowchart: Complex genome.. 4x-6X potentially. outsourcing work to private company.
* 3 planned phases
* 1. Tested 2000 SNPs, selected 192 accessions based on a select subset of useful SNPs. Get passport information. Has been able to ID some clones.
* 2. Sequenced material from Hawaii, maybe different from our material, new diversity, targeted genotype by sequencing, 400 SNPs, 1496 individual plants.
* 3. 300 accessions, large number of SNPs for GWAS studies. Will not do GWAs, too many resources needed, No infrastructure available, Maybe UF or Houma
* Rotation into new field: Established new field, 3 reps from clean source.
* In addition to targeted SNPs found new SNPs 1 BP change
* Also work on other grasses, using same type of SNPs, Found duplicate. One of them represents a functional change, in future ID SNPs in accessions with targeted trait of interest.
* Distribution: increased 6-10-fold, material backed up in liquid N in future, like to update passport information

Anna: Q??

* Q Niranjan: are you mapping SNPs to sponts? Did you map reads against sponts?
* A Shad: Had difficulty doing this, sponts is A,B,D genome. No plan for in depth marker work, map them individually, plan to just ID, find duplicates.
* Comments: Niranjan: sponts is only 10% of hybrids, you might miss out on info.
* A Shad: True but goal with SNPs is to find out variation. Not in-depth analysis. Out of 400 about 300-400 are nice SNPs.
* In addition, in Hawaii 2 professors have more in-depth information, have been invited to make a joint publication so more information will be coming out and will be useful for the community.
* Q Aliya: How many SNPs? How can the information and the platform you are using be used by others? We have 2000 plants and are using SSR markers. How can your work help us.
* A Shad:SNPs we are using is good and flexible and allows us to add additional markers to platform, may not be applicable to every accession but 100 markers is a good number
* Dr. Zhang uses about 40 on other crops, 200-300 good for sugarcane because of extreme heterozygosity.
* Once we are done the SNPs will be put on the public domain and made available for stake holders

**Sugarcane Importation and Quarantine-Related Activities presented by**

Bishwo Adhikari

* Shared screen remotely
* Poaceae Quarantine Program is the longest plant quarantine program in US.
* Rice, sorghum, sugarcane, other Poaceae crops
* Small group of people about 25. Last year lost 4 people, mol biol and tissue culture person retired, hired new person. Still waiting to hire more people.
* Sugarcane has the longest lasting quarantine program.
* Program last 2 years when stuff comes in.
* Materials comes in we grow for 2 cycles and test including for RNA viruses. Test – if infected- goes through tissue culture. Battery of test, including electron microscopy, done once, all other test done twice, and on top of this we use high throughput sequencing, been using this method for the last 5 years,
* A couple of activities: new ways of doing things, we are optimizing the tissue culture technique, working with plant protection and Agric department to release material, , the question is can we release +ve test for things that are not pathogens? avoid the growth period of the plant from where we collected. Establish high number of plants so we don’t have to move the plants to a different pot. Could reduce quarantine time 6-8 months.
* Tissue culture therapy, working hard to bring in healthy plant material, helping the source to import clean material, if they ID infected, we ask for high number of plants from the source
* HTS this technique has been a blessing, when we ID a virus sequence and clear visual symptoms, we can clean the plant. What about symptoms and we don’t know the cause? We clean through tissue culture. If not a reported pathogen we can release. Another category if no symptoms and no cause? Very common in other crops eg rice, Bamboo a lot of cryptic viruses?? We don’t know what they are. We work with stake holders and dept of Agric to see if we can release. The way we are using the technology in sugarcane this situation may arise.
* Number imported 14 new accessions in, low because of Covid, released 40 clones, 28 clones in the system now.
* Q Anna Questions
* Q Jeff: Any feedback from recipient of any changes of phenotype of the clone after tissue culture?
* A: Bishwo: No, no feedback as to that yet. Be interesting.
* Q Phillip: do you only do HTS diagnosis
* A No we still use PCR- we use all techniques. If novel virus we still use a combination of tools to ID.
* Q Gary: Chat box:::: Is the therapy tissue culture only or does it include heat treatment
* A Tissue culture, no heat treatment used. 0.5 mm of meristem tissue in TC has given good results, 90% efficient.
* Comment Shad: Cryo techniques also eliminate viruses .. something for future use

 Break Break Break 15 Minutes break….

 **Update on 2018 Funded Project, “Assessing the Resistance Response of Basic Germplasm and Accessions to Sorghum Mosaic Virus and Identification of Genetic Markers for Resistance through Genotyping by Sequencing and Genome Wide Association Studies” presented by Niranjan Baisakh**

* Sugarcane mosaic caused mostly by Sorghum mosaic, S office mostly susceptible, introgression breeding led to resistance, mosaic found in experimental varieties.
* Screening mostly natural infection escapes prone to happen.
* Objectives develop association panel, ID markers.
* 716 sugarcane cultivars, 6 plants inoculated, 2 years, mechanical inoculation, rating 0-100%, 5-6 weeks after inoculation, selected 213 clones out of 716 that were consistently Res or Susc over 2 years.
* Extracted DNA and checked quality and quantity, sent to Univ of Minnesota for GBS… genotype by sequencing, mapped sequence reads from GBS to monoploid genome of R570, unmapped reads since the monoploid genome is not complete, unmapped were mapped to sorghum genome, GBS derived SNPs filtered through tassl 50% or less were discarded. More than 5% were kept. Kept 1 SNP, used Jump genomics platform.
* Structure, GWAS, ID candidate markers,
* SNPOs with P = 0.0001 and > 10% kept.
* Some clones had mixed reaction, res in one year suscept in others
* Among consistent clones:
* Introgression hybrids 57% resistant 8 suceptible
* Commercial 98, 81
* Ambiguity we used RT PCR to confirm.
* Highly heritable trait of .87
* Showed population structure spontaneum clustered separately from cult, from Officinarum. Heat map showed the same thing.
* Filtered down to 6000 biallelic single dose markers.
* GWAS ID 42 markers highly sign. Increased stringency and found 34 with high conf levels, target those 34 SNP, 12 SNP after increasing stringency some more
* The annotation showed Glutamine transferase gene, and other genes anti oxidation pathway.
* He showed an example of allelic state of one marker to see contribution in homozygous (14%) and heterozygous state 86(%), and when absent no resistance.
* Using markers to look at cultivars.
* Mosaic res highly heritable, MAS possible
* Anna: Questions?
* Q Kenneth: validated in commercial?
* A Phenotype biparental cross already.
* Q Not sure by whom? Do you know where the resistance markers come from.
* A some from S. spontaneum. Some markers like 3 came from somewhere else not S. spontaneum. maybe other species. Rubustum., Barberi?
* Q Aliya: data is it coming from plant cane? How do you make sure of the pressure of the
* A Greenhouse plant cane for heritability. That is why we took the susceptible and resistant clones after the testing for consistent reaction. 24 plants flipped reaction from year to year.
* Q: Phillip: Sorghum mosaic virus. Some strains have been changed due to more research. Why do we only have sorghum mosaic in LA? Is it plant or vector?
* A: Jeff No. More introgression breeding doesn’t know why sorghum mosaic is dominating.
* Q Collins? Is heritability high in biparental population (Narrow sense heritability)
* A High yes 0.74 narrow sense in seedlings

**Collaborating to establish official transdisciplinary sugarcane breeding with breeding insight on Ramp Presented by Keo Corak in collaboration with Amanda Hulse Kemp**

* Tim talked about USDA program called Breeding Insight, but sugarcane was not included.
* Group support brought about breeding insight OnRamp
* Talked to the developers, sugarcane not a traditional row crop so more difficult, they are used to working with citrus, cotton.
* More accurate phenotyping is necessary. Using breeder’s equation, can build predictive models using GWAS but also models based on data.
* Trying to integrate software e.g. Field Book, GPS field book
* Trying to establish a sugarcane database, have a breeding database integrated with breeding management software in the clouds.
* Allow access in a routine, novel way.
* Showed example of CP 12-1417. The data structure is such that shows the entity relationship and can communicate with field book.
* Anna: questions
* Comment Jim Shine: Applauded accomplishment, thanked all involved, opined that such a tool can help minimize lack of continuity that happens when people retire
* Q Kenneth: did you figure out how to handle multiple crops in the same location?
* A Keo: each crop treated as a separate trial, but it is possible to link them up. Originally not developed for vegetatively vegetative crops.
* Q Mike Irey: what about private/ public data?
* A Keo: Data privacy important

**Nomination of New Members (Dialogue to capture what was said and how decisions were reached)**

Jack on phone: Jack not representing Texas.

Q: Herman: who is representing Texas?

Anna: Jim has been nominated.

Q: Collins: Did Texas say so?

A: Jack - Matt

Herman: Nominated Jim

Kenneth Seconded.

Chris: But Jim represents the coop?

Jim: I will not represent the coop.

Chris: nominated Mike to represent the coop.

Anna: Call in favor …. No opposition.

Anna: Mike Irey to represent the coop replacing Jim Shine

Herman: What about Mike Grisham

Anna: I suggest it is left open till a replacement is found.

Collins: what about Dimitre?

Gary: ARS launching a search.

Phillip: Is it a sugarcane focused position?

James: Asked about S. spontaneum collection in Panama

Mike: talk to Jeff Flynn. Second backup in Panama

Anna: asked for a motion to adjourn.

Herman motioned.

Niranjan seconded.

Meeting ended.

Chair Dr. Anna Hale adjourned the meeting at 1:09 PM.

Respectfully Submitted by,

Collins Kimbeng