Sorghum and Millet Crop Germplasm Committee
Frontenac Hilton Hotel, St. Louis, MO
January 29, 2018

The meeting was called to order by Jeff Dahlberg, Chair at 4:30 PM. Introductions were made with several visitors to the meeting. We need to encourage greater participation of our members to these meetings, as only 8 of the 20 members were present. At one time, it had been discussed by the committee to count attendance to these meetings as a requirement of staying on the committee and perhaps this needs to be brought up again in our next meeting.

Dr. Dahlberg had sent out various reports that had been sent to him from Peter Bretting and others for review prior to the meeting. Also, corrections to the members listed were solicited. Dr. Gary Kinard talked about the efforts of the ARS to update these membership lists through the use of google docs and encouraged the committee to ensure that the list was accurate. I have updated the membership list and forwarded to the ARS (see attached updated list). Several past members were removed from the active list for various reason. Dr. Fred Miller was removed for health reasons and Merryln Spinks was removed as she has retired from ARS.

Drs. Jose Costa and Maureen Whalen provided an update to ARS as a supplement to Dr. Peter Bretting's report on the Germplasm system. Dr. Dahlberg provide an abbreviated report from Dr. Peter Bretting, who could not attend the meeting. The number of NPGS accessions in the system continues to grow and distributions continue to hover around 250,000 accessions per year. The budget for the NPGS peaked at roughly $47 million in 2010-12 to its current level of $44 million. Challenges to the system are many, including managing and expanding NPGS operational capacity and infrastructure and this is really evident with the upcoming retirements within the system. Characterization and evaluation of accessions continues to be a challenge and acquiring and conserving wild relatives continue to be a priority. Currently, there is a shortfall of approximately 10% in staff and with continuing resolution budgets and hiring freezes, hiring replacements or new people will be a challenge.

Dr. Melanie Harrison, new RL and Sorghum Curator at Griffin introduced herself to the group and provided her report on the unit. Overall, the collection is in good health (see attached file). Dr. Gary Kinard provided the 2018 report on the NGRL. There are opportunities with the Plant Exploration and Exchange program to strengthen our wild collection if there is interest. There is a project underway to information on historical plant introductions. If anyone on the committee has information that they might be willing to share, please contact Dr. Kinard. Several other updates were provided in his document (see attachment).

Dr. Doreen Ware was invited by the Committee to talk about the work on sorghum genetic & genomic community resources. Her group is working on something similar to Maize GB and she has formed a small group of advisors, Drs. Steve Kresovich, Mitch Tuinstra, and Cleve Franks to help navigate this project. The first year will concentrate on genomic sources and Sugarcane aphid to build a platform that will then be used for other traits of interest. She stressed the need for agreement on standards and is looking for help to make this successful and will be reaching out for participation in working groups to support this effort. The committee will continue to follow up and provide support as Dr. Ware moves forward with this project.

Dr. Tim Dalton provide a quick update on the USAID Sorghum program. The 5-year sorghum and millet project will be coming to an end in July 2018 and right now he continues to work towards keep this project funded and moving forward. USAID is in the process of determining whether or not to keep the program or retool. They currently have a project in Ethiopia that is bringing phenotyping and genotyping data together on Ethiopian germplasm and this data will become available for general use. There is a similar project underway in West Africa. The 2018 Global Sorghum Meeting in Cape Town is coming together. Currently they have received 450 abstracts/papers and 350 have signed up to come.

The Sorghum Conversion Project has released several partially converted and converted lines. Bob Klein and Leo Hoffmann sent a distribution announcement as an update to the program.

Discussion followed on the status of the Crop Vulnerability Statement. The Sorghum statement has been updated and submitted to ARS and we are working to complete the Millet statement.

No new business and meeting was adjourned.

Distribution Announcement

Germplasm Utilization and Enhancement of Sorghum Program: Distribution of Forty-four Introgression Populations

Leo Hoffmann, Jr.[1], Nikhil Patel[1], William L. Rooney[1], Robert R. Klein[2] and Patricia A. Klein[1]

[1]Texas A&M AgriLife Research and [2]United States Department of Agriculture

January 2018

Forty-four populations of sorghum [*Sorghum bicolor* (L.) Moench] originating from backcrossing genetically diverse unadapted germplasm into elite public inbreds (BC_1F_1-derived F_2 families) are available to sorghum research programs for further development. This germplasm is provided by the *Germplasm Utilization & Enhancement of Sorghum Strategy* (*GUESS*) Program which is sponsored by the United Sorghum Checkoff Program.

With help from the sorghum breeding community, the Texas A&M AgriLife Sorghum Research program identified a diverse panel of unadapted germplasm for introgression breeding. Selection of material was based on relative value for specific traits and general agronomic productivity in the native environment or specifically for genetic diversity. Original sources were characterized by genotyping-by-sequencing (GBS) and for fertility reaction in A1 cytoplasm. Lines that maintained sterility used BTx623 *ms3/ms3* as the recurrent parent and lines that restored fertility used RTx436*ms3/ms3* as the recurrent parent. Through this breeding scheme, new genetic diversity has been introduced into both heterotic pools (A/B, R) without compromising the fertility reaction of the derived germplasm pools.

Early flowering, short stature BC_1F_1 were selected in College Station, TX, from each of the 44 introgression populations, and one seed bulk per each population was created for distribution. Each population results from bulking pooled seed from ~50-300 BC_1F_1-derived F_2 selections. Each bulk represents a pre-breeding resource that will require further selection and evaluation to determine the agronomic value of this introgression material. The two elite public inbreds both used genetic male sterility (*ms3*) to facilitate F_1 and BC_1F_1 crosses so each population will segregate for recessively-inherited genetic male sterility for several generations. Beyond selecting for early flowering, short stature, fertile BC_1F_1 progeny, no further selection for improved phenotypes was conducted by the *GUESS* program participants prior to distribution of this material.

Passport data and agronomic information of the original NGPS accessions are contained in Table 1. Additional data on each of the original accessions may be obtained from the USDA-NPGS GRIN-Global database https://npgsweb.ars-grin.gov/gringlobal/search.aspx. If seed is acquired, requests for data from GBS of the original unadapted parent should be directed to Patricia Klein (pklein@tamu.edu).

This distribution is a one-time offering from the previously listed agencies. Amount of seed for each of the 44 introgression populations varies based on the quantity of seed available within the BC_1F_1-derived F_2 bulk. There is a $1,000 one-time fee required to obtain these 44 populations. Upon payment, seed is distributed without any other constraints on the materials from this distribution, but redistribution of the original materials by the requesting agency to third parties is prohibited. Acknowledgement of the source of the material in publications is requested. **Requests for seed should be directed to the Texas A&M Sorghum Breeding Program, by e-mail to** leohjr@tamu.edu.

Table 1. Designation of Forty-four backcross introgression populations, with information and phenotypic observations of the original unadapted parent.

Introgression population designation (BC1F1 deriv. F2)	Unadapted parent	Recurrent parent	Classification			Reasoning	Parental Phenotype					
			Country of origin	Race	Working group		Fert. rx.	Plant height (cm)*	Plant color	Pericarp color	Anthesis	
											LD	SD*
GUESS 2	SC1428	RTx436 ms3/ms3	Sudan	-	-	Imp. var.	R	173	Tan	White	PS	48
GUESS 4	PI 521999	RTx436 ms3/ms3	Malawi	Guinea	-	Grain M. res., biomass	R	236	Purple	White	PS	57
GUESS 5	PI 522039	BTx623 ms3/ms3	Malawi	Guinea	-	Food qual., Dis. res.	B	262	Purple	White	PS	61
GUESS 8	PI 536008	RTx436 ms3/ms3	Cameroon	-	-	Div. agro.	R	-	Purple	-	N/A	57
GUESS 9	PI 330272	BTx623 ms3/ms3	Ethiopia	-	-	Div. agro.	N/A	221	Purple	Red	PS	59
GUESS 10	PI 330272	RTx436 ms3/ms3	Ethiopia	-	-	Div. agro.	N/A	221	Purple	White	PS	59
GUESS 11	PI 510763	BTx623 ms3/ms3	Cameroon	Guinia	-	Dis. res.	N/A	216	Purple	White	PS	58
GUESS 12	PI 510763	RTx436 ms3/ms3	Cameroon	Guinea	-	Dis. res.	N/A	216	Purple	White	PS	58
GUESS 13	SC1400	BTx623 ms3/ms3	Honduras	-	-	Div. agro.	N/A	183	Purple	White	PS	64
GUESS 14	SC1400	RTx436 ms3/ms3	Honduras	-	-	Div. agro.	N/A	183	Purple	White	PS	64
GUESS 15	PI 291213	BTx623 ms3/ms3	Jamaica	Durra-caudatum	48 Durra-feterita/Kaura	Dis. res.	PB	315	Tan	Yellow	PI	63
GUESS 16	PI 533999	BTx623 ms3/ms3	Ethiopia	-	Subglad	Dis. res., agro	PB	257	Purple	Red	PI	57
GUESS 17	PI 536571	BTx623 ms3/ms3	Honduras	-	-	Dis. res.	PB	231	Purple	-	PS	57
GUESS 18	PI 563179	BTx623 ms3/ms3	Kenya	Caudatum	39 Caudatum-nigricans	Forage qual. biomass	PB	241	Purple	Red	PS	65
GUESS 19	SC1174	BTx623 ms3/ms3	Ethiopia	-	-	Dis. res.	B	251	Purple	-	PS	82
GUESS 20	SC1385	BTx623 ms3/ms3	Honduras	-	-	Div. agro.	B	208	Purple	White	PS	57
GUESS 21	GRIF717	RTx436 ms3/ms3	-	-	-	Dis. res.	R	178	Purple	White	PS	66
GUESS 22	PI 152828	RTx436 ms3/ms3	Zaire	-	-	Dis. res.	R	226	Purple	White	PS	55
GUESS 23	PI 248334	RTx436 ms3/ms3	India	Durra-caudatum	34 Durra-kaura	Food qual., Dis. res.	PR	239	Purple	Red	PS	61
GUESS 24	PI 276839	RTx436 ms3/ms3	Ethiopia	Durra	33 Caudatum	Dis. res.	R	239	Purple	Red	PS	64
GUESS 25	PI 454051	RTx436 ms3/ms3	Ethiopia	Kafir	46(1) Nandyal	Dis. res., agro.	R	257	Purple	White	PS	69
GUESS 26	PI 454390	RTx436 ms3/ms3	Ethiopia	Caudatum	33 Caudatum	Dis. res., agro.	R	259	Tan	White	PI	73
GUESS 27	PI 454426	RTx436 ms3/ms3	Ethiopia	Kafir-durra	46 Durra-kafir	Dis. res., agro.	R	287	Purple	White	PS	68
GUESS 28	PI 454584	RTx436 ms3/ms3	Ethiopia	Kafir-durra	46 Durra-kafir	Dis. res., agro.	R	234	Tan	White	PS	70
GUESS 29	PI 454780	RTx436 ms3/ms3	Ethiopia	Durra	46(1) Nandyal	Dis. res., agro.	R	267	Tan	White	PS	72
GUESS 30	PI 454791	RTx436 ms3/ms3	Ethiopia	Durra	46(1) Nandyal	Dis. res., agro.	R	229	Tan	White	PS	72
GUESS 31	PI 482903	RTx436 ms3/ms3	Zimbabwe	-	-	Forage qual., biomass	R	251	Purple	Red	PS	61
GUESS 32	PI 494884	RTx436 ms3/ms3	Zambia	-	-	Dis. res.	R	262	Purple	White	PS	56
GUESS 33	PI 494891	RTx436 ms3/ms3	Zambia	Guinea		Food qual., Dis. res.	R	229	Purple	White	PS	59
GUESS 34	PI 521191	RTx436 ms3/ms3	Kenya	Durra-caudatum	-	Forage qual., biomass	R	277	Purple	Red	PS	65
GUESS 35	PI 524466	BTx623 ms3/ms3	Sudan	Guinea-bicolor	-	Bio., Dis. res.	R	221	Purple	Red	PS	59
GUESS 36	PI 524485	RTx436 ms3/ms3	Sudan	Caudatum	-	Bio., Dis. res.	R	234	Purple	White	PS	59
GUESS 37	PI 524916	RTx436 ms3/ms3	Zambia	Caudatum-Bicolor	-	Dis. res., agro.	R	244	Purple	Red	PS	49
GUESS 38	PI 536565	RTx436 ms3/ms3	Honduras		38 Caudatum-kafir	Anth. res.	R	168	Purple	White	PS	61
GUESS 39	PI 536602	RTx436 ms3/ms3	Honduras	-	38 Cudatum-kafir	Dis. res.	R	226	Purple	-	PS	72
GUESS 40	SC1173	RTx436 ms3/ms3	Ethiopia	-	-	Dis. res.	PR	274	Purple	-	PS	74
GUESS 41	SC1180-1	RTx436 ms3/ms3	Nigueria	-	-	Dis. res.	R	251	Purple	White	PS	59
GUESS 42	SC1279	RTx436 ms3/ms3	India	-	41 Durra	Sugary end.	R	264	Purple	White	PS	61
GUESS 43	SC1365	RTx436 ms3/ms3	Honduras			Div. agro.	R	173	Purple	White	PS	62
GUESS 44	SC1387	RTx436 ms3/ms3	India	-	-	Midge res.	R	277	Tan	White	PI	59
GUESS 45	SC1404	RTx436 ms3/ms3	Honduras			Div. agro	R	175	Purple	White	PS	69
GUESS 46	SC1405	RTx436 ms3/ms3	Honduras	-	-	Div.agro	R	180	Purple	White	PS	66
GUESS 47	SC1428	RTx436 ms3/ms3	Sudan	-	-	Imp. var.	R	173	Tan	White	PS	48
GUESS 48	SC1531	RTx436 ms3/ms3	Sudan	-	39(1) Zerazera	DM res, agro, long pan.	R	152	Purple	Red	PI	71

*Data collected in Puerto Rico 2016.

REPORT TO THE SORGHUM and MILLET CROP GERMPLASM COMMITTEE
January 29, 2018
Melanie L. Harrison, Sorghum & S9 Millet Curator
Plant Genetic Resources Conservation Unit, Griffin, GA

STATUS OF THE COLLECTION

A new maintenance group was defined this year, S9 Millets, to include pearl millet, finger millet, and minor millets curated in Griffin, GA (Table 1). Currently 87% of the sorghum accessions and 98% of the S9 millet accessions are available for distribution (Table 2). Ninety-six percent of the sorghum germplasm and 99.9% of the S9 millet germplasm is backed up at the National Laboratory for Genetic Resources Preservation (NLGRP) in Fort Collins, CO. Germplasm backed up at the Global Seed Vault in Svalbard, Norway include 8628 accessions of sorghum and 932 accessions of S9 millets. Viability tests have been completed for 88% of the sorghum germplasm and 99% of the S9 millet germplasm.

Table 1. List of species included in the new maintenance group S9 Millets curated at Griffin, GA.

Taxon	# Accessions
Cenchrus americanus	1295
Cenchrus sieberianus	1
Digitaria exilis	1
Eleusine coracana	736
Eleusine coracana subsp. africana	2
Eleusine floccifolia	1
Eleusine indica	5
Eleusine intermedia	1
Eleusine multiflora	2
Eleusine tristachya	5
Panicum schinzii	7
Paspalum scrobiculatum	336
Paspalum scrobiculatum var. bispicatum	2
Pennisetum schweinfurthii	1
Urochloa deflexa	1
Urochloa ramosa	4
Urochloa texana	1
TOTALS	**2401**

Table 2. Status of the USDA Sorghum and S9 Millet Germplasm Collection as of December 30, 2017

	Sorghum	S9 Millets
Total Number of Taxa	22	17
Total Number of Accessions	44820	2401
Number of Available Accessions	38983	452
Number of Unavailable Accessions	5837	54
Number of Accessions Backed Up	42855	2400
Svalbard Back Up	8628	932
Number of Accessions at -18C	38604	2398
Number of Viability Tests	39548	2385
Items shipped in 2017	14644	1327
Orders shipped in 2017	200	20

DISTRIBUTIONS

For the 2017 calendar year, 14644 accessions of sorghum germplasm, including genetic stocks, were distributed (Table 2) with the majority (90%) of the sorghum germplasm going to domestic cooperators (Table 3). This was also true for S9 Millets and Sorghum Genetic Stocks with 98% and 80% shipped to domestic cooperators, respectively.

Table 3. Distributions of sorghum and S9 millet germplasm during the 2017 calendar year.

Cooperator Affiliation	Number of Accessions Sorghum	Number of Accessions S9 Millets	Number of Accessions Sorghum Genetic Stocks
Foreign commercial category	65	2	4
Foreign genebank	60	3	0
Foreign individual no affiliation	46	1	171
Foreign non-commercial organization	1169	15	195
U.S. state agencies and all universities	4719	19	1437
Agricultural Research Service	2200	11	12
U.S. commercial company	4093	3	73
U.S. individual no affiliation	82	1271	0
U.S. non-profit organizations	314	2	4
Total Distributions	**12748**	**1327**	**1896**

REGENERATION AND MAINTENANCE

Sorghum regenerations from 2016 and 2017 (~2400 accessions) are being processed into the collection. The 2018 sorghum regeneration is being held due to the effects of Hurricane Maria on both Puerto Rico and Saint Croix. Efforts by Stephanie Greene, National Laboratory for Genetic Resources Preservation (NLGRP), Fort Collins, CO to reduce the number of accessions maintained only at NLGRP is still underway. The majority of the 5000+ accessions selected for transfer from NLGRP to the active collection in Griffin, GA have been received with only three shipments (150 accessions) remaining. This entire set is waiting to be processed into the active collection once processing of the 2016 and 2017 regenerations is completed.

A set of several hundred accessions of pearl millet crop wild relatives donated by Wayne Hanna (University of Georgia, formerly USDA,ARS) are being cleaned and will be processed into the active collection. Once complete, we will determine how many of these accessions require regeneration before distribution. Accessions with sufficient seed quantities will be made available for distribution immediately upon processing.

CHARACTERIZATION AND EVALUATION

A nutritional analysis of the finger millet core collection has been completed and is anticipated to be published this year. The analysis includes mineral content, protein content, and oil content of the 83 finger millet core collections.

FIVE YEAR PROJECT PLAN

The USDA, ARS 2018-2022 Project Plan “Conservation, Characterization, Evaluation, and Distribution of Grain, Oilseed, Vegetable, Subtropical and Tropical Legume, and Warm Season Grass Genetic Resources and Associated Information” which covers PGRCU curation and research has undergone review by the USDA, ARS, Office of Scientific Quality Review. Several objectives relating to sorghum and S9 millet curation are including in the five year plan as noted below.

- Acquire finger millet and pearl millet accessions from Fort Collins, CO and add to the working collection.
- Add pearl millet CWR germplasm to working collection
- Document on GRIN-Global, descriptor data obtained during previous sorghum regenerations
- Determine protein and mineral content in 100 pearl millet accessions
- Screen sorghum mutant lines for phosphorus use efficiency