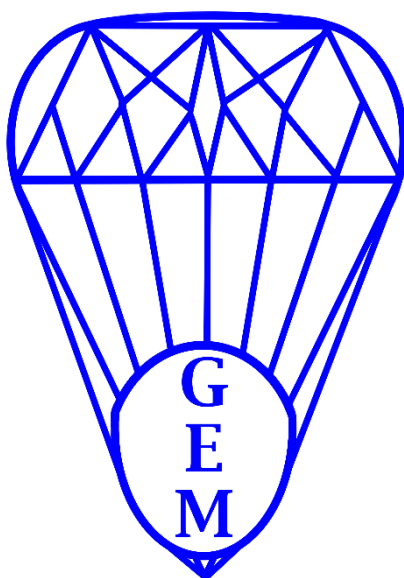


United States Department of Agriculture

Agricultural Research Service



Germplasm Enhancement of Maize

2022 GEM Cooperator Handout

December 7, 2022

The information in this report is shared cooperatively.
The data are not published, but are presented with the understanding that
they will not be used in publications without specific consent of the public cooperator.

GEM Mission:

The mission of the GEM (Germplasm Enhancement of Maize) Project is to effectively increase the diversity of U.S. maize germplasm utilized by producers, global end-users and consumers. The mission will be achieved through a collaborative effort between USDA-ARS, and both public and private research scientists by utilizing exotic, public, and proprietary maize germplasm. The resulting germplasm and associated knowledge, derived via the identification and incorporation of favorable alleles for prioritized traits from exotic sources, is utilized in private and public breeding programs and ultimately contributes to increased genetic diversity of maize grown by producers and improved product performance. In addition, the GEM Project provides opportunities for training plant scientists in the enhancement and utilization of unadapted germplasm. This contributes to the global sustainability of agricultural production, economic stability, and the nutrition and well-being of society.

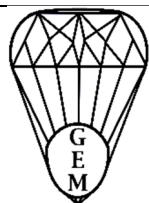
2022 GEM TSG Meeting Booklet

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GEM WEBSITE

<https://www.ars.usda.gov/midwest-area/ames/plant-introduction-research/home/germplasm-enhancement-of-maize/>



**Germplasm
Enhancement of
Maize**

Cooperator Meeting:

DATE: Wednesday, December 7, 2022

HOURL: 8:30 am to 12:00 pm CST

**Hyatt Regency Hotel
Regency Ballroom D (West Tower)
Chicago, IL**

Meeting called by: W. Trevisan, Chair

Note taker: Stephen Swarm

Agenda Topics

Call to Order and Welcome	W. Trevisan / J. Parks	8:30 – 8:35
Minutes of December 16, 2021	W. Trevisan / J. Parks	8:35 – 8:40
TSG Election Updates	Lead by W. Trevisan / J. Parks	8:40 – 8:45
Annual Reports, Program Stats, 2023 Releases	M. Krakowsky, A. Vanous	8:45 – 9:10
Top Line Project Update	M. Krakowsky, A. Vanous	9:10 – 9:25
Project Participation/Interaction	GEM Team	9:25 – 9:40
Genomic Prediction Update	M. Krakowsky, A. Vanous	9:40 – 9:55
Genomes to Fields Update	D. Lima	9:55 – 10:25
Break		10:25 – 10:40
Incoming TSG Chair Introduction	W. Trevisan	10:40 – 10:45
Incoming TSG Chair	J. Parks	10:45 – 11:00
TSG Chairman Recap	W. Trevisan	11:00 – 11:40
Discussion		11:40 – 12:00
Adjourn		~12:00

GEM Cooperator Virtual Meeting - December 16, 2021

Zoom Host – Adam Vanous (GEM Coordinator, Ames)

Walter Trevisan (TSG Chairman)

1. Walter Trevisan called the meeting to order at 9:00 AM CST. Minutes for the December 16, 2020, meeting were presented for approval. Walter Trevisan moved to accept the minutes. Wenwei Xu seconded the motion. Cooperators voted to accept the minutes as presented.
2. New Releases & Project Updates:
 - Raleigh – Matt Krakowsky
 - o Raleigh thanked Cooperators for helping to secure additional funding for Raleigh Project. Matt briefly covered where the money will be invested in the project and how this will strengthen the GEM mission. To date, a tractor, two small batch seed treaters, two vehicles, and expanded winter nursery have been possible. A Zurn 160 plot combine was ordered and expect in April 2022. Despite additional funding, pandemic restrictions necessitated reduced nursery effort and impact to yield trial program. Winter nursery has expanded to include Hawaii. Summary of materials in yield testing program was presented and can be viewed in the annual report. Breeding cross observation were conducted on 225 new populations.
 - Ames
 - o Ames released four lines:
 - GEMS-0322: KO679Y/GEMS-0030//794-015-001-001-B
 - GEMS-0323: GEMS-0219//GEMS-0147/GEMS-0227-SIB-B-122-001-B
 - GEMS-0324: GEMS-0227/Ki14//41-002-001-001-B
 - GEMN-0325: PHN46//GEMN-0130/Mp494///41-002-001-001-B
 - o Ames nursery rows increased by 36% but is still reduced due to Covid-19 restrictions. Gro-Alliance was used as a source to contract isolation fields and 2,200 rows were sent to be topcrossed. Farmers Business Network, Maximum Production Genetics, and Peterson Genetics grew the other isolation plots through in-kind support. ~330 lines from the set donated by Bayer were increased. Yield trials were successful and only 1.6% of the replications were lost due to weather damage. Winter nursery rows were increased by adding Hawaii as a second location. Ames thanked the cooperators for securing additional funding. Ames was able to purchase a new air planter, upgrade current combine, contract isolations, obtain a new tractor, and increase winter nursery rows.
3. Male Sterility Allele Screening Update:
 - Raleigh – Matt Krakowsky
 - o Sixty-five GEM releases were tested for the presence of the Gal-m allele. GEM lines were used as the male and crossed to the Gal-s W22 stock tester, created by Jerry Kermickle, via Jim Holland. Seven lines tested positive for Gal-s. Eighteen tropical inbreds were also tested; Five of these lines were found to carry the Gal-s allele.
 - Ames – Adam Vanous
 - o Fifty-four GEM releases were tested in Ames for the presence of Gal-s. Eight of these lines tested positive and will be retested in 2022.

4. Germplasm Distribution Update – Adam Vanous:
 - Cooperators were reminded that seed available through the GRIN website should be requested from there. New releases are expected to be ready for shipment in early 2022.
5. GEM Website Update – Adam Vanous
 - Issues with the GEM website were highlighted. Continuing work within USDA to update website to new platform is ongoing. Suggestions and volunteers were welcomed to contribute.
6. Germplasm Sampling Expansion – Dave Peters
 - Bayer Donation
Brief presentation given on germplasm donation from Bayer Crop Science. Summary of land races involved, and country of origin was presented. Plans for germplasm evaluation and utilization briefly reviewed. Priority Group 1 increase was outlined. Plans for additional Priority Groups were given.
 - Novasem Germplasm Donation
Brief presentation on breeding crosses made by Mexican Cooperator Novasem. Crosses of GEM lines to company elite lines derived from Tuxpeno and ETO germplasm were made in Puerto Vallarta. Material was sent to winter nursery for crossing and will be in observations for 2022.
7. GEM Top 10 Project Results – Jode Edwards and Adam Vanous
 - Review of Top 10 project was done before data summary was presented. Jode Edwards presented the most recent updates on the data and how the GEM lines combined with current elite germplasm. Adam Vanous outlined the plan for 2022 and 2023.
8. Meeting Adjourned – 10:40 AM CST

Annual Reports

2022 Annual Report of the GEM Project, Ames, IA and Raleigh, NC

PERSONNEL:

Ames: *USDA-ARS-PIRU*

Dr. Adam Vanous, Midwest Coordinator
Dr. James McNellie, Support Scientist
Dr. Mack Shen, IT Specialist
Dr. Tracie Hennen-Bierwagen, Technician
Skye Bradley, Technician
Kiara Kappelmann, Graduate Student
Brooke Dietsch, Graduate Student

Dr. David Peters, Research Leader

Raleigh: *USDA-ARS-PSRU*

Dr. Matt Krakowsky, Southeast Coordinator
Mark McLaughlin, Technician
Technician (Vacant)

Research Leader (Vacant)

GEM - Ames Highlights

Germplasm releases and development:

- Three hundred and twenty-three (323) GEM line releases are now available to GEM Cooperators. A total of 342 lines have been released, including 19 from our university collaborators.
- The Ames program will be releasing four new GEM lines for the 2023 planting year (Table 1). Yield data for the 2023 releases can be found in the handout.
- Summary Tables of test cross data are presented in the section of this book labeled ‘Released Lines.’

Table 1. 2023 GEM-Ames Germplasm Releases

GEM Code	Pedigree	Race	Country	Type	Het. Group
GEMS-0326	GEMS-0220/CML373//R3212Z-069-002-001-B	Tuxpeño / Olotillo / Tropical Inbred	Mexico	34 % Exotic	SS
GEMS-0327	GEMS-0227/CML373//R3212Z-087-002-001-B	Tropical Inbred	Thailand / Mexico	31% Exotic	SS
GEMS-0328	GEMS-0227/Ki14//GEMS-0218-040-001-001-B	Creole / Tropical Inbred	Thailand / Cuba	53% Exotic	SS
GEMS-0329	GEMS-0227/Ki14//PHW51-005-001-001-B	Tropical Inbred	Thailand	31% Exotic	SS

Breeding Nursery and Isolated Crossing:

- Ten new breeding cross populations were sent to six Cooperators for in-kind support.
- Twenty-six families of S1 and S2 ears were advanced in Ames. These S2s and S3s will be topcrossed in isolated blocks in 2023.
- Twenty-eight S1 bulked families were advanced to S2 in Ames. These S2s will be advanced to S3 in 2023.
- Four families of S1 ears were advanced to S2 by Cooperators. The S2 ears will be topcrossed in 2023 within each Cooperator’s program and moved to first year testing in 2024.

- Pandemic related work, travel, and labor availability restrictions necessitated the cancelation of shade structure crossing and reduction of nursery size.
- Winter nursery (returned Spring 2022) returns from Puerto Vallarta, Jalisco, Mexico, and Hawaii were adequate. Breeding cross development to make new 25% tropical populations was successful with ample seed quantities returned. Hand pollination nurseries supporting line advancement, breeding cross development, and line increase have been sent to Puerto Vallarta and Hawaii for return Spring 2023.

Nursery and isolation row summary:

- 5,651 nursery rows were pollinated
 - 3,470 selection rows
 - 1,778 various types of increase rows
 - 403 crossing block rows
- 2,364 observation rows
- 3,124 isolation rows were contract grown with GroAlliance
- 200 isolation rows were contributed by Farmers Business Network
- 100 isolation rows were contributed by Maximum Production Genetics
- 2,000 isolation rows were contributed by Peterson Genetics
- Not included in the count are the numerous nursery rows grown by Cooperators for in-kind support to generate breeding crosses, S1 families, etc.

Genomic Prediction Project:

- A collaborative project with Bayer Crop Science was initiated to explore use of genomic prediction in GEM breeding program. Bayer has committed to run 100 high-density parental samples and 2,500 low-density genotyping samples, annually.
- Ames program sent 32 parental lines for high-density genotyping and 1,715 S3 samples for low-density genotyping.

Breeding Cross Observation:

- Breeding crosses were observed and evaluated for breeding potential in Ames, Iowa, Washington, Indiana (Cooperator), and Ft. Branch, Indiana (Cooperator). Results are presented in Table 14 - 16 of the 'Breeding Cross Observation' section of this book.

Host Plant Resistance:

- Pathology and entomology research collaborators from the U.S. private and public sectors screened GEM releases for Northern Leaf Blight (NLB), Southern Leaf Blight (SLB), Gray Leaf Spot (GLS), Goss's Bacterial Wilt (GW), Fusarium ear rot (FUSERS), Aspergillus (aflatoxin and other mycotoxins), and Tar Spot. Disease evaluation trials are summarized in Table 2.
- International collaborators evaluated GEM releases for Late Wilt, Maize Stunt, Tar Spot, agronomic traits, and ear rots.
- 2022 disease data can be requested by emailing nuo.shen@usda.gov.

Appreciation is extended for all in-kind support and extensive efforts by private and public GEM Cooperators:

- Corteva provided Fusarium ear rot data and head smut data (Jonathan Flora) from their Woodland, California site. Trials for Northern leaf blight disease data (Nicholas Noël) were lost due to poor environmental conditions.
- Bayer Crop Science conducted trials for Goss's Bacterial Wilt (Nebraska) and Tar Spot (Illinois); however, hail damaged the Goss's Wilt trial, and the infection levels were too low to provide meaningful data in the Tar Spot trial.
- USDA-ARS-PSRU in Raleigh provided SLB data (Peter Balint-Kurti).
- USDA-ARS-CHPRRU, Mississippi State University, MS (Spencer Smith and Dan Jeffers) provided evaluation data for aflatoxin content in grain.
- Wyffels Hybrids (Chris Eichhorn) screened GEM lines for Goss's Bacterial Wilt screening; however, due to poor disease progression, meaningful data was not obtained.

Table 2. 2022 Disease Observation Summary - Domestic

Cooperator	Location	Disease	Plots
Bayer	Nebraska	Goss's Bacterial Wilt	500
	Illinois	Tar Spot	300
Corteva	Iowa	Northern Leaf Blight	250
	California	Fusarium Ear Rot	500
	California	Head Smut	500
USDA-ARS	North Carolina	Southern Leaf Blight	150
	Mississippi	Aflatoxin/Fumonisin	40
Wyffels	Illinois	Goss's Bacterial Wilt	150

Ames 2022 Yield Trials:

- Cooperator in-kind trial support contributions are detailed in Tables 3 and 4.
- Approximately 14,354 plots (2,157 entries) were managed or coordinated through Ames in 2022.
- Of the core development program, 1,632 plots were devoted to 2nd year trials and 6,912 were in 1st year trials.
- Yield trials were planted in early to mid-May. The Carroll site was damaged from wind events; however, data was still useful.
- Stand count data was collected in collaboration with Iowa Crop Improvement Association using their drone data collection system. The drone system provided accurate stand counts at a much lower cost than traditional student labor methods.
- The five standard checks in this year's trials included:

MBS3628/MBS9530
MBS3520/MBS8731

Pioneer P0987
Pioneer P1151
Pioneer P1498.

Table 3. Ames and Cooperator Yield Trial Resource Summary

Trial Type	# Entries	# Plots GEM-Ames	# Plots Private Coops	Total Plots
1st Year Trials	1,152	6,912	0	6,912
2nd Year Trials	300	1,632	1,284	2,916
Released Line Trials	60	672	864	1,536
Collaborator Trials	645	2,990	0	2,990
Totals	2,157	12,206	2,148	14,354

New GEM Cooperators in 2022:

CLSC, Agriscience, LLC., an international private Cooperator, is pending approval. LongPing High-Tech Biotecnologia Ltda., a current Cooperator, is the parent company of CLSC

Table 4. Private In-Kind Support - Summer 2021

Collaborator	Breeding & Nursery Support	Breeding Cross Obs	Made Top Crosses	Yield Trials	Disease & Insect Screening	GEM Top Lines Project
Ag Reliant Genetics, LLC	X	X		X		X
Bayer Crop Science	X		X	X	X	X
Becks Superior Hybrids				X		X
Corteva Agriscience	X		X	X	X	X
Farmers Business Network			X	X		
DKD Genetics	X			X		
GEM-Raleigh		X		X		
KMR				X		
CLSC Agriscience	X			X		
Maximum Production Genetics	X		X			
Peterson Genetics			X			
Renk Seed Company	X					
Syngenta			X	X		X
Terrell Seed Research	X	X				
USDA-ARS (Balint-Kurti)					X	
USDA-ARS (Smith/Jeffers)					X	
Wyffels Hybrids			X	X	X	X

Germplasm Donation:

- Bayer Crop Science initiated a germplasm project in 2016 to adapt several land races to the central Corn-Belt. Representative accessions (1 to 5 per land race) were selected and crossed to a current elite 105-day SS and 105-day NSS inbred line. Crosses were made within each land race and lines selected for flowering in central Iowa. Lines were recombined and selected through the 2019 growing season for adaptation to central Iowa.

- Single ears representing 50%, 63%, and 75% land race origin were selected on ear type phenotype and genotypically evaluated to ensure identity and land race content. A total of 1,990 ears representing 31 landraces were donated to GEM with unrestricted release for line development and genetic research. Twenty-one of these land races had not been used in the GEM project breeding program. The remaining 10 land races involved accessions not previously used in GEM.
- Table 4 lists the landraces and the percentages of the tropical donor for the lines increased in summer 2022.

Table 5. Germplasm Donation Increase Summary

Race	% Tropical	Country(s)
Cristalino Chileno	63, 75	Chile
Canilla	50, 63, 75	Dominican Republic
Ototillo	50, 63, 75	Mexico
Tabloncillo	50, 63, 75	Mexico
Arequipeno	50, 63, 75	Peru
Mochero	50, 63, 75	Peru
Shajatu	50, 63, 75	Peru

GEM Top Lines Project:

- The purpose of the project is to annually test 30 lines released by the Ames and Raleigh programs on an array of current elite seed industry testers to calculate GCA and SCA estimates. The information would be useful for assessing potential value of the lines for recycling in different breeding programs and other purposes and inform on best heterotic combinations. Selected lines will be tested for two years by the following GEM Cooperators: AgReliant Genetics, Bayer Crop Science, Becks Hybrids, Corteva, Syngenta, and Wyffels.
- Thirty lines were selected for the trial based on yield trial performance across testers. Six lines (3 SS, 3 NSS) were selected based on best performance in the Top 48 trial that concluded in 2017. Remaining lines were selected on phenotypic evaluation and yield trial performance and were released since 2015.
- Lines were distributed to six private sector TSG members for inclusion in 2020 summer crossing nurseries and isolated crossing. The lines were crossed to current two elite testers from each program and will be included in the 2021 or 2022 yield trial experiments within each company.
- Yield trials will be planted in 2021 and 2022 at 8 to 10 locations with 1 replication per location including sites inside and outside of the Corn-Belt. Data generated will be returned to the Ames GEM Coordinator for full analysis. The combined data will be available to all GEM Cooperators through the GEM website.
- Yield trials using these 30 GEM lines and testers will be conducted for 2 years (2021, 2022, or 2023). After completion of the cycle, a new set of 30 GEM lines will be identified and be part of the next Top Lines testing round.

Ga1 Screening

- Forty-one GEM releases and checks from Ames were tested for the presence of Ga1-s (Table 6).

Ames GEM Program 2023 Goals:

The Ames GEM Program has identified several areas for changes planned for 2023 and beyond.

Nursery:

- Efforts to generate new breeding cross populations of 50% and 25% exotic content will be included as an annual focus of the program. The breeding cross observation system will be focused to evaluate all populations in Ames and additional data will be provided by the Cooperators.
- Continue to increase and phenotypically evaluate germplasm donated by Bayer. Develop strategy for use of this resource in consultation with experience germplasm introgression breeders. To date, a research agreement is in place with Jianming Yu and Diana Escamilla (Iowa State University) to use prediction to estimate trait values of the lines. This will aid in the selection of lines to prioritize to the top of the list.
- 2023 will be the first year that GEM Ames fully incorporates genomic prediction. GEBV's will be provided by Bayer for selections. Nursery work will need to continue updating to take full advantage of this resource.

Isolated Crossing:

- With the inclusion of Bayer's genomic prediction, isolated crossing numbers will be reduced within the Ames program.

Disease Evaluations:

- International disease evaluation capacity will be expanded for diseases not yet in the US (and for endemic diseases with unique pathogen races) within our Cooperator network, and Cooperators will be sought that can contribute to this capacity. Specific diseases of interest include Gray Leaf Spot in South Africa, Maize Stunt Virus in Brazil, and Tar Spot in Mexico.

GEM Website:

- Continue to look for solutions to update the GEM website for appearance and user interface.

Table 6. GEM-Ames Lines screened for Ga1-s

Line	Seed Set Ears	Pollinations
LH291	0	0
MBWZ	0	11
PH03D	0	12
PH42B	0	10
PHP02	0	0
PHW52	0	11
WQCD10	0	8
01DIB2	0	2
GEMS-0066	0	5
GEMS-0201	3	3
GEMN-0225	9	9
GEMS-0226	0	4
GEMN-0229	10	10
GEMS-0234	0	10
GEMS-0235	0	14
GEMN-0236	0	9
GEMS-0237	0	10
GEMN-0238	0	11
GEMN-0239	0	11
GEMS-0240	0	12
GEMS-0241	0	11
GEMN-0246	0	4
GEMN-0247	0	13
GEMS-0248	0	6
GEMN-0249	0	7
GEMS-0250	0	9
GEMN-0252	0	10
GEMN-0260	0	10
GEMN-0261	3	9
GEMS-0262	0	11
GEMS-0264	4	6
GEMS-0265	0	10
GEMN-0266	0	3
GEMS-0268	0	7
GEMN-0286	2	2
GEMS-0307	6	11
GEMS-0308	8	10
GEMS-0322	0	8
GEMS-0323	0	11
GEMS-0324	0	13
GEMN-0325	0	7

GEM - Raleigh Highlights

Germplasm releases:

- There will be no new releases from the Raleigh project for 2023. We are still transitioning to new testers in Raleigh, and this, combined with the restricted nurseries for the past few years, has led to a decline in the number of entries in the 2nd year yield trials. None of the entries in the 2022 trials met the criteria for release, primarily due to the lack of evaluation on a second tester.

GEM-Raleigh Budget Increase:

- I would like to again thank the GEM Cooperators, the GEM TSG, and particularly the GEM members who have made great efforts each spring to travel to the Capitol to talk to congressional staff members about the valuable work performed by the GEM project. Your efforts culminated in a significant budget increase for the project in FY20 and forward, which was especially needed for the Raleigh location. Our budget increased by over 200% from FY19 to FY20 and we have been using the new funds to replace antiquated equipment, upgrade to new systems, and eventually we hope to add support personnel. Our recent purchases include:
 - Another small batch seed treaters, which in addition to the two purchased in FY21 have been particularly useful for preparing seed for shipment to winter nursery, given the short turn-around.
 - A trailer to haul the new combine and tractor/planter combination.
 - Off-season nurseries in Mexico and Hawaii along with isolated crossing blocks with Gro Alliance in Illinois during the summers.

We have also funded agreements with NCSU to support our research and new graduate students on the project. We are currently in the market for a new truck to haul the new planter/tractor combination and the combine and we also need to construct a machine shed to store our equipment at the research farm in Clayton, NC.

Germplasm development:

- Our summer nurseries have been rebounding from the low of 2020 but the lack of temporary summer labor has restricted our ability to expand to the degree that we would prefer. Approximately 1800 GEM nursery plots were grown in Clayton, NC (up from 1200 in 2021), while 1400 isolation plots were planted under contract with Gro Alliance and 700 under contract with Hawaii Seed Pro.
- A small number of breeding crosses were produced in the summer nursery this year (Table 7), with more set for production in winter.
- Conditions were not favorable for good returns from the nursery in 2022, with hot, dry conditions persisting throughout the pollinating period. The numbers of selected ears were significantly lower than expectations due to poor ear formation and poor seed set.
- No winter nursery was planted in Homestead, FL again this year and unfortunately, we may be done planting off-season nurseries in Florida. We sent 600 plots to winter nursery with Moreno-Retis and 100 to Cruz-Robledo, both near Puerto Vallarta, Mexico. Most of the germplasm sent to Mexico was for breeding cross development or for making testcrosses for yield trials. We are looking into other possibilities for winter nursery as well, but the timing of our growing season in North Carolina and the maturities of the germplasm we are working with restricts our options. Argentina is not a good option for us due to restrictions on importing seed produced in the Carolinas and Florida (concerns over Striga).

Table 7. 2022 Breeding crosses produced in Raleigh

Stiff Stalk breeding crosses	non-Stiff Stalk breeding crosses
CML341/S42//GEMS-0298	BARB GP2/LH82//LH287
CML373/S42//GEMS-0298	SCRO GP3/LH82//LH287
La Posta Sequia C7 F71-1-1-1-2-B*4/S40a//GEMS-0298	Comun-VAL 343/N40x//LH287
La Posta Sequia C7 F71-1-1-1-2-B*4/S40b//GEMS-0298	Cubano Amarillo-UCA 12/N40x//LH287
GEMS-0245/GEMS-0298	
GEMS-0311/GEMS-0298	
GEMS-0320/GEMS-0298	
GEMS-0321/GEMS-0298	
CML341/S42//PH37C	
CML373/S42//PH37C	
POPN 21 (IST) C2/PHP38//PH37C	
CML343/GEMS-0032//S40x//PH37C	

Testcrossing and Isolated Crossing Blocks

- The project at Raleigh had long relied on using F₁ testers for ICBs at Clayton, NC due to the poor performance of Corn-Belt adapted inbreds in North Carolina. As of late 2020 we started contracting ICBs using MBS testers, but the process had gotten off to a rocky start. Our attempts in fall/winter 2020 (south Texas) and summer 2021 (central Illinois) were both largely unsuccessful to weather issues, particularly too much rain early in the growing season. Winter 2021/2022 proved to be more successful but still many entries came back with insufficient seed, and the seed arrived back in Raleigh too late for planting last spring. Returns from the late winter/spring ICB in Hawaii are still being evaluated, though the costs associated with this location may rule out future attempts. We should find out about the returns from the summer 2022 ICBs before the end of the year, and hopefully the returns will be better.

Germplasm Evaluations:

- Overall, about 8000 yield plots (Table 8) were coordinated from Raleigh, with slightly more than half of those planted in North Carolina and the rest planted by five cooperators (Corteva, Bayer, University of Tennessee, AgReliant and GEM-Ames) at thirteen locations throughout the Southeast and Midwest. This is the first year we had trials planted in NC under contract with the NC Official Variety Testing group. They planted around 300 plots at each of three different locations, two in the east and one in the Piedmont.
- Evaluations of GEM releases from Raleigh and Ames were included in experiments 21NCG01 and 21NCG02 to identify lines with the best potential for use in GEM x GEM crosses and to compare some of the available testers from Peterson Corn Genetics. Data from these trials is presented in the Yield Trial section of this book.

Personnel:

- Dr. Major Goodman retired from North Carolina State University in January of 2022 after more than 50 years of service to the colleges of Statistics and Crop (and Soil) Sciences. Major was the driving force behind the GEM project in the Southeast from the beginning of the project until 2007 and continued to provide assistance and mentorship until his retirement. With his departure we also lost the aid of his two technicians, Bill Hill and Wayne Dillard, both of whom had worked with Major for many years (Bill since 1984 and Wayne since 1999). Major, Wayne and Bill will be sorely missed by the GEM project.
- Dr. David Marshall, Research Leader for the Plant Science Research Unit for about 20 years, also retired in January. His leadership and devotion to the research unit will be sorely missed, especially as we are still awaiting his permanent replacement.
- We are hoping to fill a new technician position during 2023, with a goal of finding a highly qualified candidate with some experience in plant pathology to help run the disease evaluations of GEM materials in North Carolina as well as helping with all of the other project work.

Table 8. GEM-Raleigh Yield Trials (2022)

Trial	Experimental Pedigree(s)	# of Locations	Tester	# of Experimental Entries
22NCG01	Mostly released GEMN lines	20	PCG SSS testers	35
22NCG02	2 nd year pre-release and released GEMS lines	20	PCG non-SSS testers	32
22NCG03	Non-SSS ex-PVPs	15	PCG SSS testers	44
22NCG04	SSS ex-PVPs	15	PCG non-SSS testers	52
22NCG05	First-year trials: AC454/LH213, G17(C34)HS208+Pool 33-128/LH213, and CML449/GEMN-0097//40x	9	MBS3640GT	50
22NCG06	First-year trials: GEMN-0272/GEMN-0104, GEMN-0272/GEMN-0287	9	MBS3640GT	38
22NCG07	First-year trials: Ki21/DK_HBA1, F45/DK_HBA1, and F45/NC290	9	MBS3640GT	56
22NCG08	CIMMYT inbreds and NEI9004	9	Ex-PVP x Ex-PVP	45
22NCG09	Unreleased CIMMYT Germplasm	9	Ex-PVP x Ex-PVP	11
22NCG10	Entries from Major Goodman	4	Ex-PVP x Ex-PVP	39

Host Plant Resistance:

- GEM releases were evaluated for aflatoxin accumulation by USDA-ARS researchers at Starkville, MS and by cooperators at Texas A+M-College Station in 2022. The results from Starkville are presented later in this booklet. Fumonison accumulation was also evaluated by the researchers in Starkville.
- Gray Leaf Spot and Northern Leaf Blight evaluations were not conducted for GEM lines in North Carolina in 2022. We are hoping to continue this work in the future, see the personnel section for more information.

Breeding Cross Observations:

- Breeding crosses and exotic/semi-exotic populations were planted in two different blocks at Clayton, NC during 2022. The blocks were planted based on seed availability; the first block (F1) was planted with seed on hand during the early spring, the second block (C10) was planted with seed that arrived from winter nursery (Mexico) at the end of April.
- Due to the high temperatures and lack of significant rainfall during the growing season, useful data could not be collected from either planting, and many of the entries will be planted again in 2023. Notes on the entries are presented in the “Breeding Cross Observations” section of this book.

Corn Gametophyte Factors:

- As we discussed at previous meetings, the “dent-sterile” allele (Ga1-s) is important to popcorn and other specialty corn producers to maintain genetic purity of their product in farmer’s fields when planted in close proximity to field corn. We continued screening GEM releases for the presence of the Ga1-s allele in the summer of 2022, and results are presented in Table 9.

Table 9. GEM-Raleigh Lines screened for Ga1-s

Pedigree	Pollinations made/Ears with seed		Pedigree	Pollinations made/Ears with seed
GEMS-0003	1/5		GEMS-0248	0/12
GEMN-0137	3/11?		GEMS-0264	2/5*
GEMN-0209	0/12		GEMS-0268	3/16*
GEMN-0230	6/7		GEMS-0281	0/13
GEMN-0232	15/15		GEMS-0286	9/13
GEMN-0259	0/13		GEMS-0307	6/13
GEMN-0271	9/12		GEMS-0308	3/13
GEMN-0205	0/11		CML97	0/12
GEMN-0225	12/12			

These are mostly retests based on the data from 2021, and only for GEMS-0248 was there a difference in the observations from 2021 and 2022. Conditions were not favorable for seed set in 2022 and so in this case the failure to set seed may have been due to inviable pollen as opposed to incompatibility. GEMN-0205, -0209, -0259 and GEMS-0281 had no seed set in both 2021 and 2022 though they had been previously reported as segregating for Ga1-m, while GEMN-0271 had seed set in both years but had previously been reported as having only ga1.

Thanks again to our yield trial Cooperators, Corteva, Bayer, AgReliant, the University of Tennessee (Dennis West) and GEM Ames, and to Corteva and Bayer for nursery support as well. Also, USDA-ARS Raleigh, Starkville and Tifton as well as Texas A+M University (Seth Murray) have provided us with valuable host plant resistance data for several years.

Table 10. 2022 GEM-Raleigh Cooperator In-Kind Support

Cooperator	In-kind support
Corteva	Yield Trials (7 locations, 2500 plots overall)
Bayer	Yield Trials (2 locations, 1000 plots overall) and Nursery (Advance two populations from S0)
AgReliant	Yield Trials (1 location, 220 plots)
University of Tennessee-Knoxville	Yield Trials (1 location, 220 plots)
GEM-Ames	Yield Trials (2 locations, 440 plots)
USDA-ARS Starkville	Aflatoxin and Fumonison evaluations (15 entries)
USDA-ARS Tifton	FAW and CEW evaluations (30 entries)
Texas A+M-College Station	Aflatoxin evaluations (15 entries)

GEM Releases

GEMS-0326: GEMS-0220/CML373//R3212Z-069-002-001-B

Exotic Background:

- GEMS-0220 was derived from the single cross GEMS-0091 (Tuxpeño/Olotillo) and GEMS-0113 (Tuxpeño).
- CML373 is a tropical inbred released by CIMMYT.

Line Performance:

- Plant Height: 195 cm
- Ear Height: 90 cm
- Head Smut: 63% of plants disease free when inoculated
- Fusarium Ear Rot: 6 (1-9; 9 is the best)
- Southern Leaf Blight: 7.5 (1-9; 9 is the best)

Hybrid Performance:

Year	# Reps	Exp	Tester	Yield (bu/a)	Y/M	%MST	% Stalk Lodging	% Root Lodging	Test Weight
2022	10	2264201	MBS8488	214.7	11.3	19.1	3.0	11.0	58.3
% Check Mean				94.9	94.7	94.2	136.4	96.5	102.8
2022	9	2264202	MBS8731	227.7	11.2	20.2	2.0	13.0	56.6
% Check Mean				97.9	90.1	102.8	111.1	104.8	99.1



GEMS-0327: GEMS-0227/CML373//R3212Z-087-002-001-B

Exotic Background:

- GEMS-0227 has a tropical inbred parent from NEI9004 (Suwan).
- CML373 is a tropical inbred released by CIMMYT.

Line Performance:

- Plant Height: 210 cm
- Ear Height: 85 cm
- Head Smut: 95% of plants disease free when inoculated
- Fusarium Ear Rot: 5 (1-9; 9 is the best)
- Southern Leaf Blight: 2 (1-9; 9 is the best)

Hybrid Performance:

Year	# Reps	Exp	Tester	Yield (bu/a)	Y/M	% MST	% Stalk Lodging	% Root Lodging	Test Weight
2022	10	2264201	MBS8488	216.08	11.8	18.3	1.0	10.0	58.5
% Check Mean				95.6	99.4	90.3	45.5	87.7	103.2
2022	9	2264202	MBS8731	217.4	11.6	18.7	1.0	13.0	56.5
% Check Mean				93.4	93.3	94.8	55.5	104.8	98.9



GEMS-0328: GEMS-0227/Ki14//GEMS-0218-040-001-001-B

Exotic Background:

- GEMS-0227 has a tropical inbred parent from NEI9004 (Suwan).
- Ki14 is a tropical inbred from Thailand.
- GEMS-0218 was derived from a single cross of a parent containing CUBA164 (Creole) background and GEMS-0002 (FS8A).

Line Performance:

- Plant Height: 205 cm
- Ear Height: 75 cm
- Head Smut: 91% of plants disease free when inoculated
- Southern Leaf Blight: 5.75 (1-9; 9 is the best)

Hybrid Performance:

Year	# Reps	Exp	Tester	Yield (bu/a)	Y/M	% MST	% Stalk Lodging	% Root Lodging	Test Weight
2022	10	2264201	MBS8488	216.0	12.4	17.4	1.0	12.0	59.11
% Check Mean				95.5	104.4	86.0	45.5	105.3	104.2
2022	9	2264202	MBS8731	210.6	10.9	19.3	1.0	12.0	56.7
% Check Mean				90.5	87.6	97.8	55.5	96.8	99.2



GEMS-0329: GEMS-0227/Ki14//PHW51-005-001-001-B

Exotic Background:

- GEMS-0227 has a tropical inbred parent from NEI9004 (Suwan).
- Ki14 is a tropical inbred from Thailand.

Line Performance:

- Plant Height : 205 cm
- Ear Height: 95 cm
- Southern Leaf Blight: 7.5 (1-9; 9 is the best)

Hybrid Performance:

Year	# Reps	Exp	Tester	Yield (bu/a)	Y/M	% MST	% Stalk Lodging	% Root Lodging	Test Weight
2022	10	2264201	MBS8488	221.2	11.5	19.2	4.0	12.0	58.9
% Check Mean				97.8	96.9	94.8	181.8	105.3	103.9
2022	9	2264202	MBS8731	209.6	10.2	20.6	2.0	13.0	56.3
% Check Mean				90.1	81.5	104.6	111.1	104.8	98.5



Table 11. Racial Background of GEM Releases

Race	Ames Releases	NC Releases	Other Releases	Total Releases
Alazan	1	0	0	1
Argentino	6	0	0	6
Argentino/Tropical Inbred	5	0	0	5
Argentino/Tuxpeño	1	0	0	1
Camelia	7	0	1	8
Cateto	0	11	0	11
Cateto Sulino	4	0	0	4
Cateto/Mixed Tropical	0	1	0	1
Corn Belt Dent	1	0	0	1
Creole	17	1	1	19
Creole/Tropical Inbred	3	0	0	2
Criollo	1	1	0	2
Criollo/Argentino	0	0	1	1
Criollo/Tusón	1	0	0	1
Cristalino Colorado	16	0	2	18
Cuban Yellow	6	3	0	9
Dentado Blanco	5	0	0	5
Dentado Blanco Rugoso	3	0	3	6
Dente Amarelo	10	3	1	14
Dente Amarelo/Mixed Tropical	2	0	0	2
Dente Branco	5	0	0	5
Early Caribbean	1	0	0	1
Mixed Tropical	13	2	4	19
Mixed Tropical//Dente Amarelo/Tropical Hybrid	1	0	0	1
Multiple Borer Composite	1	0	0	1
Semidentado Riograndense	2	0	0	2
St. Croix	1	1	1	3
Suwan	11	2	0	13
Suwan/Cristalino Colorado	2	0	0	2
Suwan/Tusón	1	0	0	1
Tropical Hybrid	25	77	4	106
Tropical Hybrid/Mixed Tropical	1	2	0	3
Tropical Hybrid/Multiple Borer Composite	1	0	0	1
Tropical Hybrid/Tuxpeño	0	1	0	1
Tropical Inbred	22	9	0	29
Tropical Inbred/Mixed Tropical	1	0	0	1
Tropical Inbred/Tropical Hybrid	1	0	0	1
Tropical Inbred/Tusón	2	0	0	2
Tusón	10	2	1	13
Tuxpeño	4	8	0	12
Tuxpeño/Olotillo	3	0	0	3
Tuxpeño/Olotillo/Tropical Inbred	1	0	0	0
Unclassified Tropical	1	0	0	1
Totals	199	124	19	342

Table 12. GEM Germplasm Releases

Entry	Pedigree	Code	Race	Country	Site	Year
1	Piura 144/B94/B94)	GEMS-0001	Alazan	Peru	Ames	2001
2	FS8A(S):S09-043-002	GEMS-0002	Mixed Tropical	Mixed	Ohio St.	2003
3	BR52051(SE32):S17-B-023-001-B-B	GEMS-0003	Dente Amarelo	Brazil	NC	2003
4	DK212T:S11-B-013-002-B-B	GEMS-0004	Tropical Hybrid	Thailand	NC	2003
5	DK212T:S11-B-015-001-B-B	GEMS-0005	Tropical Hybrid	Thailand	NC	2003
6	DK212T:S11-B-017-001-B-B	GEMS-0006	Tropical Hybrid	Thailand	NC	2003
7	DK212T:S11-B-018-001-B-B	GEMS-0007	Tropical Hybrid	Thailand	NC	2003
8	DK212T:S11-B-038-001-B-B	GEMS-0008	Tropical Hybrid	Thailand	NC	2003
9	DK212T:S11-B-040-001-B-B	GEMS-0009	Tropical Hybrid	Thailand	NC	2003
10	DK212T:S11-B-041-002-B-B	GEMS-0010	Tropical Hybrid	Thailand	NC	2003
11	DK212T:S11-B-045-002-B-B	GEMS-0011	Tropical Hybrid	Thailand	NC	2003
12	DK888:S11-B-003-001-B-B	GEMS-0012	Tropical Hybrid	Thailand	NC	2003
13	DK888:S11-B-004-004-B-B	GEMS-0013	Tropical Hybrid	Thailand	NC	2003
14	DK888:S11-B-010-001-B-B	GEMS-0014	Tropical Hybrid	Thailand	NC	2003
15	DK888:S11-B-014-001-B-B	GEMS-0015	Tropical Hybrid	Thailand	NC	2003
16	DK888:S11-B-015-003-B-B	GEMS-0016	Tropical Hybrid	Thailand	NC	2003
17	DK888:S11-B-025-001-B-B	GEMS-0017	Tropical Hybrid	Thailand	NC	2003
18	DK888:S11-B-026-002-B-B	GEMS-0018	Tropical Hybrid	Thailand	NC	2003
19	DK888:S11-B-029-001-B-B	GEMS-0019	Tropical Hybrid	Thailand	NC	2003
20	DK888:S11-B-033-001-B-B	GEMS-0020	Tropical Hybrid	Thailand	NC	2003
21	DK888:S11-B-035-002-B-B	GEMS-0021	Tropical Hybrid	Thailand	NC	2003
22	DK888:S11-B-035-003-B-B	GEMS-0022	Tropical Hybrid	Thailand	NC	2003
23	DK888:S11-B-039-002-B-B	GEMS-0023	Tropical Hybrid	Thailand	NC	2003
24	DKB830:S11-B-045-001-B-B	GEMS-0024	Tropical Hybrid	Mexico	NC	2003
25	DKXL370:S11-B-001-002-B-B	GEMS-0025	Tropical Hybrid	Brazil	NC	2003
26	DKXL370:S11-B-025-001-B-B	GEMS-0027	Tropical Hybrid	Brazil	NC	2003
27	DKXL370:S11-B-025-002-B-B	GEMS-0028	Tropical Hybrid	Brazil	NC	2003
28	DKXL370:S11-B-028-001-B-B	GEMS-0029	Tropical Hybrid	Brazil	NC	2003
29	DKXL380:S11-B-004-003-B-B	GEMS-0030	Tropical Hybrid	Brazil	NC	2003
30	DKXL380:S11-B-028-001-B-B	GEMS-0031	Tropical Hybrid	Brazil	NC	2003
31	DKXL380:S11-B-029-001-B-B	GEMS-0032	Tropical Hybrid	Brazil	NC	2003
32	BR51403(PE001):N16-B-044-B	GEMN-0033	Cateto	Brazil	NC	2003
33	BR51403(PE001):N16-B-172-B	GEMN-0035	Cateto	Brazil	NC	2003
34	BR51403(PE001):N16-B-176-B	GEMN-0036	Cateto	Brazil	NC	2003
35	BR51403(PE001):N16-B-181-B	GEMN-0037	Cateto	Brazil	NC	2003
36	BR51403(PE001):N16-B-239-B	GEMN-0039	Cateto	Brazil	NC	2003
37	BR51403(PE001):N16-B-431-B	GEMN-0040	Cateto	Brazil	NC	2003
38	BR51403(PE001):N16-B-521-B	GEMN-0041	Cateto	Brazil	NC	2003
39	BR51403(PE001):N16-B-705-B	GEMN-0042	Cateto	Brazil	NC	2003
40	BR51403(PE001):N16-B-857-B	GEMN-0043	Cateto	Brazil	NC	2003
41	CH05015:N12-20-1-B-B	GEMN-0044	Camelia	Chile	Ames	2003
42	CH05015:N12-140-1-B-B	GEMN-0045	Camelia	Chile	Ames	2003
43	CH05015:N15-8-1-B-B	GEMN-0046	Camelia	Chile	Ames	2003
44	UR13085:N0215-014-001	GEMN-0047	Cateto Sulino	Uruguay	Ames	2003
45	DKXL370:N11a20-31-1-B-B	GEMN-0048	Tropical Hybrid	Brazil	Ames	2003

Table 12. GEM Germplasm Releases

Entry	Pedigree	Code	Race	Country	Site	Year
46	DKB844:S1601-512-1-B	GEMS-0049	Tropical Hybrid	Mexico	Ames	2003
47	DKB844:S1601-517-1-B	GEMS-0050	Tropical Hybrid	Mexico	Ames	2003
48	CUBA164:S2008a-83-1-B	GEMS-0051	Creole	Cuba	Ames	2003
49	CUBA164:S2008a-326-1-B	GEMS-0052	Creole	Cuba	Ames	2003
50	CUBA164:S15-192-2-B	GEMS-0053	Creole	Cuba	Ames	2003
51	AR16035:S02-450-1-B	GEMS-0054	Cristalino Colorado	Argentina	Ames	2003
52	AR16035:S02-443-1-B-B	GEMS-0055	Cristalino Colorado	Argentina	Ames	2003
53	FS8B(T):N1809-946-1-B	GEMN-0056	Mixed Tropical	Mixed	Ames	2003
54	AR01150:N04-545-1-B	GEMN-0057	Dentado Blanco Rugoso	Argentina	Ames	2003
55	AR01150:N04-696-1-B	GEMN-0058	Dentado Blanco Rugoso	Argentina	Ames	2003
56	SCRO1:N1310-398-1-B	GEMN-0059	St. Croix	St. Croix	Ames	2003
57	CHIS775:N1912-519-1-B-B	GEMN-0060	Tuxpeño	Mexico	Ames	2003
58	AR16026:S17-10-1-B-B	GEMS-0061	Cristalino Colorado	Argentina	Ames	2003
59	AR16026:S17-16-1-B-B	GEMS-0062	Cristalino Colorado	Argentina	Ames	2003
60	CUBA164:S1511b-325-001	GEMS-0063	Creole	Cuba	Ames	2003
61	CUBA164:S1511b-249-1-B-B	GEMS-0064	Creole	Cuba	Ames	2003
62	CUBA117:S1520-41-1-B-B	GEMS-0065	Argentino	Cuba	Ames	2003
63	CUBA117:S1520-52-1-B-B	GEMS-0066	Argentino	Cuba	Ames	2003
64	GUAT209:S13/(H99ae/OH43ae)-4-4-2-1	GEMS-0067	Tusón	Guatemala	Truman St	2007
65	AR16026:S1704-153-001	GEMS-0068	Cristalino Colorado	Argentina	Ames	2003
66	AR16035:S19-161-001	GEMS-0069	Cristalino Colorado	Argentina	Ames	2003
67	CH05015:N12-183-001	GEMN-0070	Camelia	Chile	Ames	2003
68	CH05015:N15-003-001	GEMN-0071	Camelia	Chile	Ames	2003
69	CHIS775:S1911b-439-001	GEMS-0072	Tuxpeño	Mexico	Ames	2003
70	CUBA117:S15-372-001	GEMS-0073	Argentino	Cuba	Ames	2003
71	CUBA164:S1517-163-001	GEMS-0074	Creole	Cuba	Ames	2003
72	CUBA164:S1517-241-002	GEMS-0075	Creole	Cuba	Ames	2003
73	DKB844:N11b-118-001	GEMN-0076	Tropical Hybrid	Mexico	Ames	2003
74	DKXL370:N11a20-604-001	GEMN-0077	Tropical Hybrid	Brazil	Ames	2003
75	FS8A(S):S09-362-001	GEMS-0078	Mixed Tropical	Mixed	Ames	2003
76	FS8B(S):S0316-802-001	GEMS-0079	Mixed Tropical	Mixed	Ames	2003
77	FS8B(S):S0316-814-001	GEMS-0080	Mixed Tropical	Mixed	Ames	2003
78	FS8B(T):N1802-382-001	GEMN-0081	Mixed Tropical	Mixed	Ames	2003
79	FS8B(T):N1802-525-001	GEMN-0082	Mixed Tropical	Mixed	Ames	2003
80	GUAT209:N1925-081-001	GEMN-0083	Tusón	Guatemala	Ames	2003
81	PASCO14:S0105-198-001	GEMS-0084	Cuban Yellow	Peru	Ames	2003
82	UR01089:S0525-519-001	GEMS-0085	Cateto Sulino	Uruguay	Ames	2003
83	UR10001:S1813-257-001	GEMS-0086	Dente Branco	Uruguay	Ames	2003
84	AR03056:N09-024-001	GEMN-0087	Dentado Blanco	Argentina	Ames	2004
85	AR03056:N09-182-001	GEMN-0088	Dentado Blanco	Argentina	Ames	2004
86	AR03056:N09-191-001	GEMN-0089	Dentado Blanco	Argentina	Ames	2004
87	AR03056:N09-250-001	GEMN-0090	Dentado Blanco	Argentina	Ames	2004
88	CHIS740:S1411a-783-002	GEMS-0091	Tuxpeño/Olotillo	Mexico	Ames	2004
89	CUBA164:S2012-444-001	GEMS-0092	Creole	Cuba	Ames	2004
90	CUBA164:S2012-966-001	GEMS-0093	Creole	Cuba	Ames	2004

Table 12. GEM Germplasm Releases

Entry	Pedigree	Code	Race	Country	Site	Year
91	DKXL370:N11a20-199-002	GEMN-0094	Tropical Hybrid	Brazil	Ames	2004
92	DKXL370:N11a20-234-002	GEMN-0095	Tropical Hybrid	Brazil	Ames	2004
93	DKXL370:-N11a20-322-001	GEMN-0096	Tropical Hybrid	Brazil	Ames	2004
94	FS8B(T):N11a-087-001	GEMN-0097	Mixed Tropical	Mixed	Ames	2004
95	FS8B(T):N11a-110-001	GEMN-0098	Mixed Tropical	Mixed	Ames	2004
96	FS8B(T):N11a-322-001	GEMN-0099	Mixed Tropical	Mixed	Ames	2004
97	UR11003:S0302-937-001	GEMS-0100	Dente Branco	Uruguay	Ames	2004
98	DK212T:S11b-007-B-B	GEMS-0101	Tropical Hybrid	Thailand	NC	2004
99	DK888:S11b-001-B	GEMS-0102	Tropical Hybrid	Thailand	NC	2004
100	DK888:N11(95)-B-027-010-B-B	GEMN-0103	Tropical Hybrid	Thailand	NC	2004
101	DK888:N11(95)-B-027-012-B-B	GEMN-0104	Tropical Hybrid	Thailand	NC	2004
102	DK888:N11(95)-B-027-015-B-B	GEMN-0105	Tropical Hybrid	Thailand	NC	2004
103	DK888:N11(95)-B-022-007-B-B	GEMN-0106	Tropical Hybrid	Thailand	NC	2004
104	DK888:N11(95)-B-022-012-B-B	GEMN-0107	Tropical Hybrid	Thailand	NC	2004
105	DK888:N11(95)-B-027-001-B-B	GEMN-0108	Tropical Hybrid	Thailand	NC	2004
106	DKXL380:N11-B-015-003-B-B	GEMN-0109	Tropical Hybrid	Brazil	NC	2004
107	BARBGP2:N08a18-332-001	GEMN-0110	Tusón	Barbados	Ames	2005
108	CH05015:N1204-057-001	GEMN-0111	Camelia	Chile	Ames	2005
109	CH05015:N1502-086-001	GEMN-0112	Camelia	Chile	Ames	2005
110	CHIS775:S1911b-120-001	GEMS-0113	Tuxpeño	Mexico	Ames	2005
111	DK212T:N11a12-191-001	GEMN-0114	Tropical Hybrid	Thailand	Ames	2005
112	DKB844:S1601-073-001	GEMS-0115	Tropical Hybrid	Mexico	Ames	2005
113	DKB844:S1601-003-002	GEMS-0116	Tropical Hybrid	Mexico	Ames	2005
114	DREP150:N2011d-624-001	GEMN-0117	Mixed Tropical	Dominican Republic	Ames	2005
115	UR11003:S0302-1011-001	GEMS-0118	Dente Branco	Uruguay	Ames	2005
116	CHS775:N19-042-001-B	GEMN-0119	Tuxpeño	Mexico	NC	2005
117	CHS775:N19-042-003-B	GEMN-0120	Tuxpeño	Mexico	NC	2005
118	CHS775:N19-027-010-B	GEMN-0121	Tuxpeño	Mexico	NC	2005
119	CHS775:N19-093-002-B	GEMN-0122	Tuxpeño	Mexico	NC	2005
120	CHS775:N19-030-011-B	GEMN-0123	Tuxpeño	Mexico	NC	2005
121	DK212T:N11-B-003-001-B	GEMN-0124	Tropical Hybrid	Thailand	NC	2005
122	DK888:S11-B-029-001-B	GEMS-0125	Tropical Hybrid	Thailand	NC	2005
123	DK888:S11-B-029-006-B	GEMS-0126	Tropical Hybrid	Thailand	NC	2005
124	DK888:N11(95)-B-017-001-B	GEMN-0127	Tropical Hybrid	Thailand	NC	2005
125	DKXL370:N11-B-005-002-B	GEMN-0128	Tropical Hybrid	Brazil	NC	2005
126	DKXL370:N11-B-005-006-B	GEMN-0129	Tropical Hybrid	Brazil	NC	2005
127	DKXL370:N11-B-005-010-B	GEMN-0130	Tropical Hybrid	Brazil	NC	2005
128	DKXL370:N11-B-005-011-B	GEMN-0131	Tropical Hybrid	Brazil	NC	2005
129	DKXL370:N11-B-005-021-B	GEMN-0132	Tropical Hybrid	Brazil	NC	2005
130	DKXL370:N11-B-029-002-B	GEMN-0133	Tropical Hybrid	Brazil	NC	2005
131	DKXL380:N11-B-010-017-B	GEMN-0134	Tropical Hybrid	Brazil	NC	2005
132	DKXL380:N11-B-007-025-B	GEMN-0135	Tropical Hybrid	Brazil	NC	2005
133	DKXL380:N11-B-007-028-B	GEMN-0136	Tropical Hybrid	Brazil	NC	2005
134	SCR Gp3:N14-028-003-003-B	GEMN-0137	Tusón	St. Croix	NC	2005
135	AR17056:N2035-421-001	GEMN-0138	Cristalino Colorado	Argentina	Ames	2006

Table 12. GEM Germplasm Releases

Entry	Pedigree	Code	Race	Country	Site	Year
136	AR17056:N2035-473-001	GEMN-0139	Cristalino Colorado	Argentina	Ames	2006
137	BR51675:N0620-033-001	GEMN-0140	Dente Amarelo	Brazil	Ames	2006
138	BR51675:N0620-053-001	GEMN-0141	Dente Amarelo	Brazil	Ames	2006
139	BR52060:S0210-143-001	GEMS-0142	Dente Amarelo	Brazil	Ames	2006
140	BR52060:S0210-147-001	GEMS-0143	Dente Amarelo	Brazil	Ames	2006
141	MDI022:N2120-284-001	GEMN-0144	Cuban Yellow	Peru	Ames	2006
142	MDI022:N2120-333-001	GEMN-0145	Cuban Yellow	Peru	Ames	2006
143	NEI9004:S2818-003-001	GEMS-0146	Tropical Inbred	Thailand	Ames	2006
144	NEI9004:S2818-025-001	GEMS-0147	Tropical Inbred	Thailand	Ames	2006
145	NEI9004:S2818-376-001	GEMS-0148	Tropical Inbred	Thailand	Ames	2006
146	UR05017:S0415-180-002	GEMS-0149	Semidentado Riograndense	Uruguay	Ames	2006
147	UR05017:S0415-187-001	GEMS-0150	Semidentado Riograndense	Uruguay	Ames	2006
148	CHIS775:N19-042-001-003-B-B-B	GEMN-0151	Tuxpeño	Mexico	NC	2006
149	DK212T:N11-B-016-005-B-B-B	GEMN-0152	Tropical Hybrid	Thailand	NC	2006
150	DKXL380:N11-B-007-027-B-B-B	GEMN-0153	Tropical Hybrid	Brazil	NC	2006
151	AR13026:N08b15-016	GEMN-0154	Cristalino Colorado	Argentina	Ames	2007
152	AR13026:N08b15-086	GEMN-0155	Cristalino Colorado	Argentina	Ames	2007
153	BR51721:N2012-098-002	GEMN-0156	Dente Amarelo	Brazil	Ames	2007
154	BR51721:N2012-164-002	GEMN-0157	Dente Amarelo	Brazil	Ames	2007
155	BR51721:N2012-397-001	GEMN-0158	Dente Amarelo	Brazil	Ames	2007
156	CASH:N1410-018-001	GEMN-0159	Corn Belt Dent	USA	Ames	2007
157	CUBA117:S1542-037-002	GEMS-0160	Argentino	Cuba	Ames	2007
158	CUBA117:S1542-057-001	GEMS-0161	Argentino	Cuba	Ames	2007
159	CUBA117:S1542-057-002	GEMS-0162	Argentino	Cuba	Ames	2007
160	CUBA164:S2012-456-001	GEMS-0163	Creole	Cuba	Ames	2007
161	DK212T:N11-B-003-022-B-B-B	GEMN-0164	Tropical Hybrid	Thailand	NC	2007
162	DK888:N11(95)-B-022-012-026-B-B	GEMN-0165	Tropical Hybrid	Thailand	NC	2007
163	DK888:N11(95)-B-027-001-008-B-B	GEMN-0166	Tropical Hybrid	Thailand	NC	2007
164	DK888:N11(95)-B-027-001-018-B-B	GEMN-0167	Tropical Hybrid	Thailand	NC	2007
165	DK888:N11(95)-B-027-001-019-B	GEMN-0168	Tropical Hybrid	Thailand	NC	2007
166	DK888:N11(95)-B-027-001-027-B	GEMN-0169	Tropical Hybrid	Thailand	NC	2007
167	DK888:N11(95)-B-027-001-030-B	GEMN-0170	Tropical Hybrid	Thailand	NC	2007
168	DK888:N11(95)-B-027-001-037-B	GEMN-0171	Tropical Hybrid	Thailand	NC	2007
169	DK888:N11(95)-B-027-001-040-B	GEMN-0172	Tropical Hybrid	Thailand	NC	2007
170	DK888:N11(95)-B-027-012-009-B	GEMN-0173	Tropical Hybrid	Thailand	NC	2007
171	AR17056:N2025-574-001	GEMN-0174	Cristalino Colorado	Argentina	Ames	2008
172	BVIR155:S2012-029-001	GEMS-0175	Tusón	British Virgin Islands	Ames	2008
173	CUBA164:S2008c-289-001	GEMS-0176	Creole	Cuba	Ames	2008
174	DK888:N11a08a-395-001	GEMN-0177	Tropical Hybrid	Thailand	Ames	2008
175	DK888:N11a08a-440-001	GEMN-0178	Tropical Hybrid	Thailand	Ames	2008
176	FS8B(T):N11a08c-030-002	GEMN-0179	Mixed Tropical	Mixed	Ames	2008
177	GUAT209:S1308a-047-001	GEMS-0180	Tusón	Guatemala	Ames	2008
178	GUAT209:S1308a-068-001	GEMS-0181	Tusón	Guatemala	Ames	2008
179	GUAT209:S1308a-084-001	GEMS-0182	Tusón	Guatemala	Ames	2008
180	GUAT209:S1308a-104-001	GEMS-0183	Tusón	Guatemala	Ames	2008

Table 12. GEM Germplasm Releases

Entry	Pedigree	Code	Race	Country	Site	Year
181	GUAT209:S1308a-120-001	GEMS-0184	Tusón	Guatemala	Ames	2008
182	CUBA164:S2012-966-001-B wx	GEMS-0185	Creole	Cuba	Ames	2008
183	DKXL370:N11a20-036-002-B wx	GEMN-0186	Tropical Hybrid	Brazil	Ames	2008
184	ANTIG03:N1218-056-001	GEMN-0187	Criollo	Antigua	Ames	2009
185	DKXL212:S0912-012-001	GEMS-0188	Tropical Hybrid	Brazil	Ames	2009
186	DKXL212:S0912-117-001	GEMS-0189	Tropical Hybrid	Brazil	Ames	2009
187	PASCO14:N0424-078-001	GEMN-0190	Cuban Yellow	Peru	Ames	2009
188	SCROGP3:N2017-003-001	GEMN-0191	Tusón	St. Croix	Ames	2009
189	SCROGP3:N2017-172-001	GEMN-0192	Tusón	St. Croix	Ames	2009
190	UR11002:N0308b-086-001	GEMN-0193	Dente Branco	Uruguay	Ames	2009
191	DK888:N11(95)-B-027-001-011-B	GEMN-0194	Tropical Hybrid	Thailand	NC	2009
192	DK888:N11(95)-B-027-001-015-B	GEMN-0195	Tropical Hybrid	Thailand	NC	2009
193	DK888:N11(95)-B-003-001-001-B	GEMN-0196	Tropical Hybrid	Thailand	NC	2009
194	DK888:N11(95)-002-021-008-B-B	GEMN-0197	Tropical Hybrid	Thailand	NC	2009
195	DK212T:N11-040-001-007	GEMN-0198	Tropical Hybrid	Thailand	NC	2009
196	AR16021:S0908a-039-001	GEMS-0199	Cristalino Colorado	Argentina	Ames	2010
197	BR105:S1612-008-001	GEMS-0200	Suwan	Brazil	Ames	2010
198	BR105:S1612-057-001	GEMS-0201	Suwan	Brazil	Ames	2010
199	BR105:S1640-128-001	GEMS-0202	Suwan	Brazil	Ames	2010
200	CUBA164:S2008dF44-012-001	GEMS-0203	Creole	Cuba	Ames	2010
201	FS8A(T):N1804-006-001	GEMN-0204	Mixed Tropical	Mixed	Ames	2010
202	GUAD05:N3215-197-001	GEMN-0205	Early Caribbean	Guadalupe	Ames	2010
203	AR16035:S02-615-001-B wx	GEMS-0206	Cristalino Colorado	Argentina	Ames	2010
204	BR51403(PE001):N16-B-044-004-001-001C-001	GEMN-0207	Cateto	Brazil	NC	2010
205	BR51403(PE001):N16-B-044-004-001-002G-003	GEMN-0208	Cateto	Brazil	NC	2010
206	BR51721(RN07):N20-B-017-002	GEMN-0209	Dente Amarelo	Brazil	NC	2010
207	CL-G1607(CML420):N11-008-001-007	GEMN-0210	Tropical Inbred	Mexico	NC	2010
208	DK888:N11-B-027-012-B-007	GEMN-0212	Tropical Hybrid	Thailand	NC	2010
209	DKXL380:N11-B-007-010-B-002	GEMN-0213	Tropical Hybrid	Brazil	NC	2010
210	MDI022:N21-B-002-003	GEMN-0214	Cuban yellow	Peru	NC	2010
211	NS1:S08-006-001-002	GEMS-0215	Tropical Inbred	Thailand	NC	2010
212	PASCO14:N11b-B-001-002	GEMN-0216	Cuban Yellow	Peru	NC	2010
213	DK888:N11-B-027-001-B-001	GEMN-0217	Tropical Hybrid	Thailand	NC	2010
214	(CUBA164:S2012-459-001-B/GEMS-0002)-B-B-011	GEMS-0218	Creole	Cuba	Ames	2011
215	(CUBA164:S2012-459-001-B/GEMS-0002)-B-B-031	GEMS-0219	Creole	Cuba	Ames	2011
216	(GEMS-0113/GEMS-0091)-B-058-001	GEMS-0220	Tuxpeño/Olotillo	Mexico	Ames	2011
217	BR105:N1641-159-001	GEMN-0221	Suwan	Brazil	Ames	2011
218	MBRC10:S1741-B-057	GEMS-0222	Multiple Borer Composite	Mexico	Ames	2011
219	CUBA164:S2012-444-001-B wx	GEMS-0223	Creole	Cuba	Ames	2011
220	BG070404:D27S42-B-014	GEMS-0224	Unclassified Tropical	Venezuela	Ames	2012
221	BR105:N16a16b-B-074	GEMN-0225	Suwan	Brazil	Ames	2012
222	BR106:S(LH132)(PHG39)-B-053	GEMS-0226	Tuxpeño	Brazil	Ames	2012
223	NEI9004:S2809-B-022	GEMS-0227	Tropical Inbred	Thailand	Ames	2012
224	NEI9004:S2809-B-025	GEMS-0228	Tropical Inbred	Thailand	Ames	2012
225	SANM126:N12(LH123)-B-033	GEMN-0229	Cuban Yellow	Peru	Ames	2012

Table 12. GEM Germplasm Releases

Entry	Pedigree	Code	Race	Country	Site	Year
226	CML413:N18-001-036-002	GEMN-0230	Tropical Inbred	Mexico	NC	2012
227	CUBA164:D27-B-017-001	GEMN-0231	Creole	Cuba	NC	2012
228	SCR_Gp3:N14-028-003-B-002	GEMN-0232	Tusón	St. Croix	NC	2012
229	CML329:N18-001-020-001	GEMN-0233	Tropical Inbred	Mexico	NC	2012
230	AR17026:S1648-B-030	GEMS-0234	Cristalino Colorado	Argentina	Ames	2013
231	CUBA173:S0446-B-030	GEMS-0235	Criollo/Tusón	Cuba	Ames	2013
232	DK212T:N11a10-B-110	GEMN-0236	Tropical Hybrid	Thailand	Ames	2013
233	DKXL370:S08c17c-B-008	GEMS-0237	Tropical Hybrid	Brazil	Ames	2013
234	NEI9004:N0803-B-027	GEMN-0238	Tropical Inbred	Thailand	Ames	2013
235	NEI9004:N0803-B-053	GEMN-0239	Tropical Inbred	Thailand	Ames	2013
236	UR13085:S(N28)(CUBA117:S1520-156-1-B-B)-B-023	GEMS-0240	Cateto Sulino	Uruguay	Ames	2013
237	UR13085:S(N28)(CUBA117:S1520-156-1-B-B)-B-058	GEMS-0241	Cateto Sulino	Uruguay	Ames	2013
238	SE32(BR52051):N11c-015-004-B	GEMN-0242	Dente Amarelo	Brazil	NC	2013
239	CML287:S15-024-003-B	GEMS-0243	Tropical Inbred	Mexico	NC	2013
240	CML287:S15-027-001-B	GEMS-0244	Tropical Inbred	Mexico	NC	2013
241	DK888:S11b-037-018-008-B	GEMS-0245	Tropical Hybrid	Thailand	NC	2013
242	AR01150:N0402-B-026	GEMN-0246	Dentado Blanco Rugoso	Argentina	Ames	2014
243	AR03056:N0902-064-001-B-B	GEMN-0247	Dentado Blanco	Argentina	Ames	2014
244	AR16042:S2028-B-012-B-B	GEMS-0248	Cristalino Colorado	Argentina	Ames	2014
245	BR105:N1643-B-020-B-B	GEMN-0249	Suwan	Brazil	Ames	2014
246	CL-G1703:S17c43-B-023-B-B	GEMS-0250	Tropical Inbred	Mexico	Ames	2014
247	CL-G1703:S17c43-B-026-B-B	GEMS-0251	Tropical Inbred	Mexico	Ames	2014
248	DKB844:N11b18-241-001-B-B	GEMN-0252	Tropical Hybrid	Mexico	Ames	2014
249	DK212T:S0640-034-002	GEMS-0253	Tropical Hybrid	Thailand	NC	2015
250	FS8B(T):N11a-225-002	GEMN-0254	Mixed Tropical	Mixed	NC	2015
251	FS8B(S):S03-133-002	GEMS-0255	Mixed Tropical	Mixed	NC	2015
252	NS1:S0834-006-002	GEMS-0256	Suwan	Thailand	NC	2015
253	CHIS462:N08d-013-001	GEMN-0257	Tuxpeño	Mexico	NC	2015
254	DKB830:S19-009-004	GEMS-0258	Tropical Hybrid	Mexico	NC	2015
255	SCR01:N11c-015-002	GEMN-0259	St. Croix	St. Croix	NC	2015
256	(GEMN-0140/GEMN-0097)-B-B-026-B-B	GEMN-0260	Dente Amarelo/Mixed Tropical	Brazil/Mixed	Ames	2015
257	(GEMN-0140/GEMN-0097)-B-B-027-B-B	GEMN-0261	Dente Amarelo/Mixed Tropical	Brazil/Mixed	Ames	2015
258	(GEMS-0147/GEMS-0180)-B-104-001-B-B	GEMS-0262	Tropical Inbred/Tusón	Thailand/Quatemala	Ames	2015
259	BR105:S1626(GEMS-0175)-B-049-B-B	GEMS-0263	Suwan/Tusón	Brazil/British Virgin Islands	Ames	2015
260	BR105:S1643-078-001-B-B	GEMS-0264	Suwan	Brazil	Ames	2015
261	DKXL212:S0950-B-083-B-B	GEMS-0265	Tropical Hybrid	Brazil	Ames	2015
262	NEI9008:N0826(GEMN-0155)-B-074-B-B	GEMN-0266	Suwan/Cristalino Colorado	Thailand/Argentina	Ames	2015
263	NEI9008:N0826(GEMN-0155)-B-095-B-B	GEMN-0267	Suwan/Cristalino Colorado	Thailand/Argentina	Ames	2015
264	NS1:S0852-B-021-B-B	GEMS-0268	Suwan	Thailand	Ames	2015
265	NS1:S0852-B-054-B-B	GEMS-0269	Suwan	Thailand	Ames	2015
266	ANTIG01:N16-050-002	GEMN-0270	Criollo	Antigua	NC	2016
267	BR105:N16-043-001	GEMN-0271	Suwan	Brazil	NC	2016
268	(GEMN-0043/GEMN-0097)-B-001	GEMN-0272	Cateto/Mixed Tropical	Brazil/Mixed	NC	2016
269	(GEMS-0032/GEMS-0050)-B-007	GEMS-0273	Tropical Hybrid/Tropical Hybrid	Brazil/Mexico	NC	2016
270	(GEMS-0032/GEMS-0113)-B-004	GEMS-0274	Tropical Hybrid/Tuxpeño	Brazil/Mexico	NC	2016

Table 12. GEM Germplasm Releases

Entry	Pedigree	Code	Race	Country	Site	Year
271	((KO679Y/GEMS-0115)/GEMS-0162)-008-001	GEMS-0275	Tropical Inbred	South Africa	Ames	2016
272	(53SS4/GEMS-0026)-SIB-B-003	GEMS-0276	Tropical Hybrid	Brazil	Ames	2016
273	(53SS4/GEMS-0031)-SIB-B-039	GEMS-0277	Tropical Hybrid	Brazil	Ames	2016
274	(GEMS-0115/S49w)-B-B-036	GEMS-0278	Tropical Hybrid	Mexico	Ames	2016
275	(GEMS-0176/S49w)-B-B-028	GEMS-0279	Creole	Cuba	Ames	2016
276	BR52051:S172641-B-018	GEMS-0280	Dente Amarelo	Brazil	Ames	2016
277	BR52051:S172641-B-054	GEMS-0281	Dente Amarelo	Brazil	Ames	2016
278	CHIS740:S(PHW17)(87916W)-126-001	GEMS-0282	Tuxpeño/Olotillo	Mexico	Ames	2016
279	UR11002:S1409-068-001	GEMS-0283	Dente Branco	Uruguay	Ames	2016
280	AR17056:S1217-B-025	GEMS-0284	Cristalino Colorado	Argentina	Ames	2016
281	(GEMN-0117/DKXL212:N11a-139-001-001-B-B-B-B-B)-B-B-019	GEMN-0285	Tropical Hybrid	Thailand	Ames	2016
282	MDI022:N(PHG35)(GEMN-0097)-072-001	GEMN-0286	Cuban yellow	Peru	Ames	2016
283	(GEMN-0108/GEMN-0178)-B-004	GEMN-0287	Tropical Hybrid	Thailand	NC	2016
284	(GEMS-0147/GEMS-0115)-B-002-001-001-B	GEMS-0288	Tropical Inbred/Tropical Hybrid	Thailand/Mexico	Ames	2017
285	(GEMS-0147/GEMS-0180)-B-033-001-001-B	GEMS-0289	Tropical Inbred/Tusón	Thailand/Guatemala	Ames	2017
286	BR52051:S172641-B-050-001-B	GEMS-0290	Dente Amarelo	Brazil	Ames	2017
287	Ki21:S(DJ7)(GEMS-0115)-B-051-002-B	GEMS-0291	Tropical Inbred	Thailand	Ames	2017
288	(GEMN-0097/GEMN-0136)-B-008	GEMN-0292	Mixed Tropical/Tropical Hybrid	Mixed/Brazil	NC	2017
289	CML341:S42-B-124	GEMS-0293	Tropical Inbred (Tuxpeño)	Mexico	NC	2017
290	DKB844:S16-005-022-012	GEMS-0294	Tropical Hybrid	Mexico	NC	2017
291	DKB830:S51-031-003	GEMS-0295	Tropical Hybrid	Mexico	NC	2017
292	(GEMS-0113/GEMS-0162)-B-B-054-001	GEMS-0296	Tuxpeño/Argentino	Mexico/Cuba	Ames	2018
293	(GEMS-0115/GEMS-0222)-B-B-033-001	GEMS-0297	Tropical Hybrid/Multiple Borer Composite	Mexico	Ames	2018
294	(GEMS-0219/GEMS-0227)-B-015-001	GEMS-0298	Creole/Tropical Inbred	Cuba/Thailand	Ames	2018
295	(H8431/((GEMS-0115/Mp717)/TZAR101))-SIB-B-005-001	GEMS-0299	Tropical Inbred	Nigeria	Ames	2018
296	NS1:S(GEMS-0149)41-051-001-001	GEMS-0300	Suwan	Thailand	Ames	2018
297	NS1:S(GEMS-0149)41-066-001-001	GEMS-0301	Suwan	Thailand	Ames	2018
298	ATL100:N(LH82)(GEMN-0097)-041-001	GEMN-0302	Tropical Hybrid/Mixed Tropical	Brazil/Mixed	Ames	2018
299	(GEMS-0162/GEMS-0227)-040-002-001	GEMS-0303	Argentino/Tropical Inbred	Cuba/Thailand	Ames	2019
300	(GEMS-0162/GEMS-0227)-046-001-001	GEMS-0304	Argentino/Tropical Inbred	Cuba/Thailand	Ames	2019
301	(GEMS-0227/PHP38)-018-001-001	GEMS-0305	Tropical Inbred	Thailand	Ames	2019
302	((LH195/KO679Y)/GEMS-0227)-010-001-002	GEMS-0306	Tropical Inbred/Tropical Inbred	South Africa/Thailand	Ames	2019
303	((PHB47/CML373)/GEMS-0162)-SIB-053-002	GEMS-0307	Tropical Inbred/Argentino	Mexico/Cuba	Ames	2019
304	((PHB47/CML373)/GEMS-0162)-SIB-086-001	GEMS-0308	Tropical Inbred/Argentino	Mexico/Cuba	Ames	2019
305	ATL100:N(LH82)(GEMN-0097)-090-001	GEMN-0309	Tropical Hybrid	Brazil	Ames	2019
306	(GEMN-0104/GEMN-0097)-070-003	GEMN-0310	Tropical Hybrid/Mixed Tropical	Thailand/Mixed	NC	2019
307	BR106:S42-063-002	GEMS-0311	Tuxpeño	Brazil	NC	2019
308	PASCO14:S11a-128-003	GEMS-0312	Cuban Yellow	Peru	NC	2019
309	((GEMS-0162/PHP38)/GEMS-0227)-206-001-001	GEMS-0313	Argentino/Tropical Inbred	Cuba/Thailand	Ames	2020
310	((GEMS-0227/K114)/12)-080-001-002	GEMS-0314	Tropical Inbred	Thailand	Ames	2020
311	(GEMS-0227/(Mp494/GEMS-0002)-001-002-001-001)-SIB-138-001-002	GEMS-0315	Tropical Inbred/Mixed Tropical	Thailand/Mixed	Ames	2020
312	((KO679Y/GEMS-0030)/12)-090-001-001	GEMS-0316	Tropical Inbred	South Africa	Ames	2020
313	(GEMN-0097/(GEMN-0140/GEMN-0130))-002-001-002	GEMN-0317	Mixed Tropical//Dente Amerelo/Tropical Hybrid	Mixed/Brazil	Ames	2020
314	(GEMN-0097/TF-2-0-T3-P74-G121)-147-001-002	GEMN-0318	Mixed Tropical	Mixed	Ames	2020
315	Ki14:N4212-185-001-002	GEMN-0319	Tropical Inbred	Thailand	Ames	2020

Table 12. GEM Germplasm Releases

Entry	Pedigree	Code	Race	Country	Site	Year
316	La Posta Sequia C7 F71-1-1-1-2-B*4:S40b-B-031	GEMS-0320	Tropical Inbred	Mexico	NC	2021
317	La Posta Sequia C7 F71-1-1-1-2-B*4:S40b-B-018	GEMS-0321	Tropical Inbred	Mexico	NC	2021
318	KO679Y/GEMS-0030//794-015-001-001-B	GEMS-0322	Tropical Inbred	South Africa	Ames	2022
319	GEMS-0219//GEMS-0147/GEMS-0227-SIB-B-122-001-B	GEMS-0323	Creole/Tropical Inbred	Cuba/Thailand	Ames	2022
320	GEMS-0227/Ki14//41-002-001-001-B	GEMS-0324	Tropical Inbred	Thailand	Ames	2022
321	PHN46//GEMN-0130/Mp494//41-002-001-001-B	GEMN-0325	Tropical Inbred/Tropical Inbred	Brazil/Mixed	Ames	2022
322	GEMS-0220/CML373//R3212Z-069-002-001-B	GEMS-0326	Tuxpeño/Olotillo/Tropical Inbred	Mexico	Ames	2023
323	GEMS-0227/CML373//R3212Z-087-002-001-B	GEMS-0327	Tropical Inbred	Thailand/Mexico	Ames	2023
324	GEMS-0227/Ki14//GEMS-0218-040-001-001-B	GEMS-0328	Creole/Tropical Inbred	Thailand/Cuba	Ames	2023
325	GEMS-0227/Ki14//PHW51-005-001-001-B	GEMS-0329	Tropical Inbred	Thailand	Ames	2023
1	DKXL212:N11a-139-001-001	DE EXP	Tropical Hybrid	Brazil	Univ of Delaware	2003
2	DE3 (DKXL212:N11a-191)	DE3	Tropical Hybrid	Brazil	Univ of Delaware	2002
3	DE4 (DKXL212:N11a-365)	DE4	Tropical Hybrid	Brazil	Univ of Delaware	2002
4	DE6 (DKXL212:N11a-234)	DE6	Tropical Hybrid	Brazil	Univ of Delaware	2005
5	NY212 (FS8B(T):N1802-212)	NY212	Mixed Tropical	Mixed	Cornell Univ	2009
6	NY215 (FS8B(T):N1802-215)	NY215	Mixed Tropical	Mixed	Cornell Univ	2009
7	NY266 (AR01150:N0406-266)	NY266	Dentado Blanco Rugoso	Argentina	Cornell Univ	2009
8	Tx204 (AR01150:N0406)	Tx204	Dentado Blanco Rugoso	Argentina	Texas A&M	2004
9	Tx205 (AR01150:N0406)	Tx205	Dentado Blanco Rugoso	Argentina	Texas A&M	2004
10	W605S (AR17026:N1019)	W605S	Cristalino Colorado	Argentina	Univ of Wisconsin	2004
11	W606S (SCRO1:N1310)	W606S	St. Croix	St. Croix	Univ of Wisconsin	2009
12	W607S (BR52051:N04)	W607S	Dente Amarelo	Brazil	Univ of Wisconsin	2009
13	W608S (CH05015:N15)	W608S	Camelia	Chile	Univ of Wisconsin	2009
14	W609S (FS8B(T):N11a)	W609S	Mixed Tropical	Mixed	Univ of Wisconsin	2009
15	W610S (CUBA164:S2012)	W610S	Creole	Cuba	Univ of Wisconsin	2009
16	W615S (GEM Quality Syn. GQS C0)	W615S	Criollo/Argentino	Cuba	Univ of Wisconsin	2013
17	W616S (AR16026:S1719)	W616S	Cristalino Colorado	Argentina	Univ of Wisconsin	2013

Bolded codes are Crop Science Registered

Breeding Cross Observation

Table 13. 2022 Breeding Cross Observations - Ft. Branch, IN

Entry	HG	Pedigree	Pollen GDU	Silk GDU	Ear Height Rating	Health Intactness Rating	Kernel Cap Rating	Breeder Score	Notes
1	Ck	MBS3628/MBS9530	1,404	1,404	4	4	5	4	
2	Ck	MBS3520/MBS8731	1,433	1,433	4	6	1-2	2	very dented green
3	Ck	Pioneer P0987	1,512	1,433	5	8	6-8	8	
4	Ck	Pioneer P1151	1,433	1,433	5	8	4-6	8	
5	Ck	Pioneer P1498	1,433	1,459	6	6	7	8	
6	SS	PHW52/55T2//PH42B	1,537	1,512	5	6	6-8	6	very long shank
7	SS	HC33/55T4//PHW52	1,563	1,563	5	5	6-7	5	
8	SS	HC33/55T4//WQCD10	1,512	1,484	5	6	7-8	6	
9	SS	LH204/55T4//PH80B	1,563	1,590	3	7	8-9	3	
10	SS	LH227/55T4//PHW52	1,537	1,537	4	3	6-8	2	
11	SS	PHHB4/55T4//LH204	1,537	1,563	3	6	6-7	4	
12	SS	PHHB4/55T4//LH242	1,563	1,590	3	6	6-9	4	
13	SS	PHHB4/55T4//PH80B	1,590	1,563	4	6	8-9	5	
14	SS	F298W/BO165W//87916W	1,537	1,590	4	5	6-9	4	variable EH pearly white hard kernels
15	SS	PHHB4/BO165W//LH242	1,563	1,590	4	6	4-7	5	
16	SS	PHHB4/BO165W//PH42B	1,512	1,537	5	6	5-6	4	poor tip fill, very shanky
17	SS	PHHB4/BO165W//PH80B	1,563	1,590	4	6	6-8	6	
18	SS	PHN18/BO165W//87916W	1,512	1,563	3	4	5-9	5	white endosperm primarily
19	SS	PHN18/BO165W//F298W	1,537	1,563	4	7	6-9	6	many kernels pearly white hardness
20	SS	PHW52/BO165W//LH242	1,537	1,563	4	4	4-7	4	
21	SS	PHW52/BO165W//LH244	1,484	1,512	4	4	3-7	3	poor tip fill
22	SS	PHW52/BO165W//WQCD10	1,484	1,459	4	5	5-6	5	
23	SS	LH227/Cargill North Temp Zone Mexican Dent//PH42B	1,404	1,404	5	3	5-7	4	
24	SS	PHHB4/Cargill North Temp Zone Mexican Dent//WQCD10	1,433	1,433	5	5	6-8	6	
25	SS	PHW52/Cargill North Temp Zone Mexican Dent//WQCD10	1,404	1,433	5	4	6	3	
26	SS	LH227/Cargill North Temperate Zone Carribean//WQCD10	1,433	1,459	6	3	5-6	3	
27	SS	PHHB4/Cargill North Temperate Zone Carribean//PH42B	1,459	1,459	4	6	5-8	5	
28	SS	PHHB4/Cargill North Temperate Zone Carribean//PH80B	1,512	1,537	4	6	7-9	6	
29	SS	2FACC/Celaya-GTO84//WQCD10	1,537	1,590	3	6	6-8	4	variable ear height
30	SS	PHW51/Celaya-GTO84//PH42B	1,537	1,563	3	5	4-7	2	

Table 13. 2022 Breeding Cross Observations - Ft. Branch, IN

Entry	HG	Pedigree	Pollen GDU	Silk GDU	Ear Height Rating	Health Intactness Rating	Kernel Cap Rating	Breeder Score	Notes
31	SS	PHW51/Celaya-GTO84//PH80B	1,537	1,563	2	7	6-7	2	variable ear height
32	SS	PHW52/Celaya-GTO84//LH242	1,537	1,590	4	6	5-6	5	
33	SS	PHW52/GTO 36//WQCD10	1,459	1,433	4	4	6-8	4	
34	SS	LH227/Ki20//PH80B	1,512	1,537	4	7	7-9	6	
35	SS	LH227/Ki20//PHW52	1,484	1,484	4	4	6-8	4	
36	SS	PHHB4/Ki20//PH42B	1,563	1,537	4	5	6-9	5	
37	SS	PHHB4/Ki20//PH80B	1,563	1,619	2	6	8-9	3	
38	SS	PHHB4/Ki20//WQCD10	1,484	1,459	4	5	7-9	6	
39	SS	PHW52/Ki20//PH42B	1,484	1,512	4	6	6-9	5	
40	SS	PHW52/Ki20//WQCD10	1,484	1,459	4	5	6-9	5	
41	SS	LH227/Ki59//PHW52	1,459	1,433	5	3	5-8	5	
42	SS	PHHB4/Ki59//WQCD10	1,484	1,459	5	5	6-8	7	
43	SS	PHHB4/KO537Y//LH242	1,537	1,590	5	6	6	8	
44	SS	PHHB4/KO537Y//PH42B	1,563	1,512	5	6	6-9	6	
45	SS	PHHB4/KO537Y//WQCD10	1,433	1,484	5	6	7-8	8	
46	SS	PHW52/KO537Y//PH42B	1,459	1,459	4	5	6-9	5	
47	SS	PHW52/KS23(S)C5//LH242	1,537	1,563	3	4	5-6	2	
48	SS	PHW52/KS23(S)C5//PH42B	1,484	1,484	3	4	6-7	2	
49	SS	PHW52/KS23-5//WQCD10	1,433	1,433	5	3	6-9	5	
50	SS	PHW52/KS23-6//PH42B	1,484	1,512	4	5	6-7	5	
51	SS	PHW52/KS23-6//WQCD10	1,433	1,433	5	3	6-9	5	
52	NSS	01IBH10/Cargill North Temperate Zone Carribean//PH24E	1,374	1,404	5	3	5-6	3	
53	NSS	LH176/Cargill North Temperate Zone Carribean//01IBH10	1,311	1,374	6	2	5-6	3	
54	NSS	LH283/Cargill North Temperate Zone Carribean//PH24E	1,374	1,404	5	3	4-6	2	
55	NSS	LH283/Cargill North Temperate Zone Cateto//01IBH10	1,343	1,374	5	3	5-7	4	
56	NSS	LH283/Cargill North Temperate Zone Cateto//PH38B	1,433	1,484	3	3	5-8	2	
57	NSS	LH283/Cargill North Temperate Zone Cateto//PHAW6	1,194	1,459	5	3	4-6	2	
58	NSS	01IBH10/Cargill North Temperate Zone Coroico//PH24E	1,311	1,374	7	2	5-7	3	
59	NSS	LH176/Cargill North Temperate Zone Coroico//PH38B	1,374	1,484	5	3	4-8	2	
60	NSS	LH176/Cargill North Temperate Zone Cuzco//PH24E	1,343	1,343	4	3	2-3	2	

Table 13. 2022 Breeding Cross Observations - Ft. Branch, IN

Entry	HG	Pedigree	Pollen GDU	Silk GDU	Ear Height Rating	Health Intactness Rating	Kernel Cap Rating	Breeder Score	Notes
61	NSS	LH283/Cargill North Temperate Zone Cuzco//PH24E	1,433	1,433	4	4	3-6	2	
62	NSS	LH283/Cargill North Temperate Zone Cuzco//PH38B	1,433	1,459	4	4	6-8	4	
63	NSS	LH283/CG-Cateto Flint//01IBH10	1,404	1,343	4	4	5-6	2	
64	NSS	PHBE2/CG-Cateto Flint//PH24E	1,343	1,343	4	2	6-8	4	
65	NSS	PHBE2/CG-Cateto Flint//PHAW6	1,433	1,433	4	3	5-8	2	
66	NSS	3IIH6/CML311//LH283	1,537	1,563	4	7	4-7	5	
67	NSS	3IIH6/CML311//PH24E	1,484	1,512	3	6	6	4	
68	NSS	3IIH6/CML311//PH38B	1,512	1,537	3	5	6-9	4	
69	NSS	HBA1/CML311//01IBH10	1,537	1,619	4	6	6-8	5	
70	NSS	HBA1/CML311//PH24E	1,512	1,563	3	7	5-6	3	
71	NSS	LH168/CML311//PH38B	1,512	1,563	4	3	6-8	2	
72	NSS	MBWZ/CML311//LH299	1,459	1,484	5	8	1-3	3	
73	NSS	MBWZ/CML311//PH38B	1,537	1,590	3	5	7-9	4	
74	NSS	MBWZ/CML311//PHAW6	1,563	1,590	4	7	6-8	5	
75	NSS	3IIH6/CML323//PHAW6	1,459	1,484	5	4	6-8	5	
76	NSS	HBA1/CML323//01IBH10	1,433	1,512	4	4	5-7	4	
77	NSS	HBA1/CML323//PHAW6	1,537	1,563	5	4	5-7	5	
78	NSS	MBWZ/CML323//LH168	1,433	1,433	4	5	5-6	5	
79	NSS	MBWZ/CML323//PH38B	1,484	1,537	4	5	7-9	6	
80	NSS	HBA1/CML349//01IBH10	1,484	1,537	3	5	5-6	2	
81	NSS	HBA1/CML349//PH24E	1,484	1,512	3	5	5-8	2	
82	NSS	LH168/CML349//PH24E	1,433	1,433	4	6	3-6	6	
83	NSS	MBWZ/CML349//LH168	1,433	1,459	4	5	4-6	5	
84	NSS	HBA1/CML384//01IBH10	1,537	1,590	4	6	6	4	
85	NSS	HBA1/CML384//PH24E	1,563	1,563	4	6	6-8	5	
86	NSS	HBA1/CML384//PH38B	1,619	1,619	4	5	6-8	6	
87	NSS	LH168/CML384//PH24E	1,512	1,537	4	6	5-7	7	relatively short statured
88	NSS	LH168/CML384//PH38B	1,563	1,590	4	5	6-8	5	
89	NSS	PHR55/CML384//PH38B	1,590	1,619	4	4	7-8	5	
90	NSS	MBWZ/Ki45//LH168	1,484	1,512	4	6	2-6	6	

Table 13. 2022 Breeding Cross Observations - Ft. Branch, IN

Entry	HG	Pedigree	Pollen GDU	Silk GDU	Ear Height Rating	Health Intactness Rating	Kernel Cap Rating	Breeder Score	Notes
91	NSS	MBWZ/Ki45//PH38B	1,537	1,537	4	6	6-7	5	
92	NSS	MBWZ/Ki45//PHAW6	1,537	1,537	4	5	5-7	4	
93	NSS	PHJ33/Ki45//LH283	1,563	1,590	4	7	6-7	5	
94	NSS	PHJ33/Ki45//PHAW6	1,512	1,512	4	4	5-7	6	
95	NSS	PHR55/KO301Y//PH38B	1,563	1,590	4	5	7-9	5	
96	NSS	PHR55/KO301Y//PHAW6	1,590	1,590	5	5	5-8	6	
97	NSS	PHR55/KO326Y//01IBH10	1,484	1,484	5	4	2-6	4	
98	NSS	PHR55/KO326Y//PH38B	1,512	1,563	5	4	6-8	7	

Trial Information

Planting Date: May 11, 2022

Location: Fort Branch, IN

Ear Height Rating: 1 (tall) - 9 (short)

Health Intactness Rating: 1 (least intact) - 9 (most intact)

Table 14. 2022 Breeding Cross Observations - Ames, IA

Entry	HG	Pedigree	Pollen GDU	Silk GDU	Plant Height (cm)	Ear Height (cm)	Breeder Score
1	Ck	MBS3520/MBS8731	1,358	1,384	276	114	7
2	Ck	MBS3628/MBS9530	1,333	1,346	270	110	6
3	Ck	Pioneer P0987	1,416	1,409	256	124	6
4	Ck	Pioneer P1151	1,320	1,326	264	101	7
5	Ck	Pioneer P1498	1,340	1,352	259	114	7
6	SS	01DIB2///42T2/GEMS-0226//42B	1,326	1,340	253	115	5
7	SS	01DIB2///42T2/GEMS-0227//42A	1,326	1,326	248	105	4
8	SS	01DIB2//FBLL/KS23-6	1,378	1,392	235	110	6
9	SS	01DIB2//HC33/55T6	1,462	1,487	265	123	6
10	SS	01DIB2//LH227/55T4	1,390	1,456	280	143	5
11	SS	01DIB2//PHG39/55T2	1,390	1,439	253	123	6
12	SS	01DIB2//PHHB4/Cargill North Temperate Zone Carribean	1,326	1,326	258	115	5
13	SS	01DIB2//PHHB9/Canilla-BVIR 106	1,378	1,429	268	128	5
14	SS	01DIB2//WQCD10/Cargill North Temperate Zone Cateto	1,313	1,313	240	110	4
15	SS	84BRQ4///42T2/GEMS-0226//42B	1,453	1,462	273	125	6
16	SS	84BRQ4///42T2/GEMS-0227//42A	1,430	1,456	265	113	5
17	SS	84BRQ4//LH195/55T3	1,494	1,536	265	118	7
18	SS	84BRQ4//LH195/55T6	1,594	1,594	273	135	7
19	SS	84BRQ4//LH195/Celaya-GTO84	1,538	1,596	298	135	6
20	SS	84BRQ4//LH204/Tuxpeño-VER 147	1,528	1,566	288	133	6
21	SS	84BRQ4//LH235/BO394Y	1,536	1,584	288	135	6
22	SS	84BRQ4//PHG39/55T2	1,528	1,564	285	140	6
23	SS	84BRQ4//PHHB4/Cargill North Temperate Zone Carribean	1,456	1,517	290	123	7
24	SS	84QAB1///42T2/GEMS-0226//42B	1,402	1,475	275	123	6
25	SS	84QAB1//BO165W/PH42B	1,475	1,497	273	125	6
26	SS	84QAB1//HC33/Coastal Tropical Flint-BVIR 104	1,475	1,517	293	153	6
27	SS	84QAB1//LH195/Celaya-GTO84	1,534	1,578	290	148	6
28	SS	84QAB1//LH204/55T1	1,453	1,494	283	128	7
29	SS	84QAB1//LH227/Tuxpeño-BVIR 153	1,485	1,566	318	150	6
30	SS	84QAB1//PHMK0/Chandelle-BVIR 116	1,506	1,564	303	150	7
31	SS	84QAB1//PHMK0/Kei1421	1,506	1,506	290	145	7
32	SS	84QAB1//PHW52/55T2	1,475	1,485	290	133	7
33	SS	84QAB1//PHW86/55T1	1,402	1,430	263	125	7
34	SS	91BMA2//HC33/55T5	1,404	1,443	283	133	6
35	SS	91BMA2//HC33/55T6	1,365	1,365	268	125	6
36	SS	91BMA2//LH195/55T3	1,377	1,443	268	113	6
37	SS	91BMA2//LH204/55T1	1,365	1,429	263	118	5
38	SS	91BMA2//PHHB4/Cargill North Temperate Zone Carribean	1,340	1,352	260	125	6
39	SS	91BMA2//PHHB9/Canilla-BVIR 106	1,364	1,416	280	133	6
40	SS	91BMA2//PHK29/55T3	1,417	1,429	278	133	7
41	SS	91BMA2//PHTP9/Cargill North Temp Zone Mexican Dent	1,263	1,275	250	113	4
42	SS	91BMA2//PHTP9/Cargill North Temperate Zone Coroico	1,263	1,288	258	105	5
43	SS	91BMA2//WQCD10/Cargill North Temperate Zone Cateto	1,275	1,275	255	108	5
44	SS	F298W///LH195//Tuson/Criollo-BVIR 155	1,566	1,619	298	155	6
45	SS	F298W//FBLL/KS23-6	1,485	1,517	295	138	7

Table 14. 2022 Breeding Cross Observations - Ames, IA

Entry	HG	Pedigree	Pollen GDU	Silk GDU	Plant Height (cm)	Ear Height (cm)	Breeder Score
46	SS	F298W//LH204/Tuxpeño-VER 147	1,506	1,554	288	148	7
47	SS	F298W//LH227/55T4	1,516	1,524	273	128	7
48	SS	F298W//PHHB4/Cargill North Temperate Zone Carribean	1,402	1,462	275	135	6
49	SS	F298W//PHK29/55T3	1,506	1,528	270	133	6
50	SS	F298W//PHMK0/Chandelle-BVIR 116	1,564	1,594	290	143	7
51	SS	F298W//WQCD10/Cargill North Temperate Zone Cateto	1,326	1,365	268	123	7
52	NSS	GEMN-0048/NX20T0025//PH02T	1,517	1,536	295	145	7
53	NSS	GEMN-0048/NX20T0025//PH32C	1,506	1,536	295	143	6
54	NSS	GEMN-0048/NX20T0025//PHDG1	1,429	1,429	285	143	6
55	NSS	GEMN-0048/NX20T0025//ZS0541	1,429	1,485	298	145	5
56	NSS	GEMN-0097/NX20T0067//LH280	1,506	1,528	285	135	6
57	NSS	GEMN-0097/NX20T0067//LH283	1,430	1,462	290	133	7
58	NSS	GEMN-0097/NX20T0067//PH02T	1,466	1,485	285	128	7
59	NSS	GEMN-0097/NX20T0067//ZS0541	1,390	1,416	288	133	6
60	NSS	GEMN-0098/NX20T0022//LH262	1,487	1,475	283	148	5
61	NSS	GEMN-0098/NX20T0022//LH283	1,466	1,456	290	150	6
62	NSS	GEMN-0098/NX20T0022//PH04G	1,487	1,507	300	155	5
63	NSS	GEMN-0098/NX20T0022//PH32C	1,474	1,462	288	133	6
64	NSS	GEMN-0157/NX20T0039//LH280	1,536	1,545	275	143	6
65	NSS	GEMN-0157/NX20T0039//PH03D	1,594	1,594	293	150	6
66	NSS	GEMN-0157/NX20T0039//PH0AA	1,417	1,417	280	138	5
67	NSS	GEMN-0157/NX20T0039//ZS1284	1,402	1,475	263	128	4
68	NSS	GEMN-0177/NX20T0056//PH03D	1,487	1,506	295	143	6
69	NSS	GEMN-0177/NX20T0056//PH04G	1,456	1,506	303	163	7
70	NSS	GEMN-0177/NX20T0056//PH32C	1,497	1,538	305	155	7
71	NSS	GEMN-0177/NX20T0056//PHDG1	1,453	1,507	310	153	7
72	NSS	GEMN-0178/NX20T0073//LH262	1,453	1,466	275	148	7
73	NSS	GEMN-0178/NX20T0073//PH02T	1,487	1,506	285	130	6
74	NSS	GEMN-0178/NX20T0073//PHDG1	1,326	1,377	278	120	7
75	NSS	GEMN-0178/NX20T0073//ZS1284	1,340	1,377	275	128	5
76	NSS	GEMN-0238/NX20T0042//LH262	1,506	1,516	295	165	7
77	NSS	GEMN-0238/NX20T0042//LH280	1,556	1,556	285	148	7
78	NSS	GEMN-0238/NX20T0042//PHDG1	1,390	1,443	265	135	6
79	NSS	GEMN-0238/NX20T0042//ZS1284	1,416	1,429	268	120	5
80	NSS	GEMN-0247/NX20T0045//PH04G	1,619	1,619	295	170	6
81	NSS	GEMN-0247/NX20T0045//PH0AA	1,462	1,475	270	138	7
82	NSS	GEMN-0247/NX20T0045//PH44G	1,564	1,619	275	138	5
83	NSS	GEMN-0247/NX20T0045//ZS0541	1,456	1,485	285	145	6
84	NSS	GEMN-0252/NX20T0029//LH283	1,476	1,494	285	153	7
85	NSS	GEMN-0252/NX20T0029//PH32C	1,494	1,494	288	130	7
86	NSS	GEMN-0252/NX20T0029//PH44G	1,528	1,528	293	138	6
87	NSS	GEMN-0252/NX20T0029//ZS0541	1,430	1,443	278	128	6
88	NSS	GEMN-0266/NX20T0059//PH02T	1,506	1,528	285	140	6
89	NSS	GEMN-0266/NX20T0059//PH03D	1,506	1,506	260	140	6
90	NSS	GEMN-0266/NX20T0059//PH0AA	1,390	1,416	288	125	6

Table 14. 2022 Breeding Cross Observations - Ames, IA

Entry	HG	Pedigree	Pollen GDU	Silk GDU	Plant Height (cm)	Ear Height (cm)	Breeder Score
91	NSS	GEMN-0266/NX20T0059//PH0HR	1,429	1,439	275	135	5
92	NSS	GEMN-0285/NX20T0048//LH262	1,516	1,516	288	148	6
93	NSS	GEMN-0285/NX20T0048//PH03D	1,453	1,475	280	153	6
94	NSS	GEMN-0285/NX20T0048//PH0AA	1,402	1,430	273	133	6
95	NSS	GEMN-0285/NX20T0048//PH0HR	1,416	1,430	270	140	6
96	NSS	GEMN-0286/NX20T0049//LH280	1,574	1,574	280	145	6
97	NSS	GEMN-0286/NX20T0049//PH04G	1,497	1,534	305	155	6
98	NSS	GEMN-0286/NX20T0049//PH0HR	1,594	1,594	288	138	6
99	NSS	GEMN-0286/NX20T0049//PH44G	1,506	1,528	275	140	6
100	NSS	GEMN-0302/NX20T0088//LH283	1,365	1,365	250	120	6
101	NSS	GEMN-0302/NX20T0088//PH0HR	1,364	1,378	268	128	7
102	NSS	GEMN-0302/NX20T0088//PH44G	1,475	1,494	278	128	6
103	NSS	GEMN-0302/NX20T0088//ZS1284	1,340	1,340	245	113	4
104	SS	GEMS-0049/NX20T0026//84BRQ4	1,599	1,599	293	148	8
105	SS	GEMS-0049/NX20T0026//F298W	1,517	1,528	298	173	6
106	SS	GEMS-0049/NX20T0026//PHAG6	1,506	1,517	275	140	7
107	SS	GEMS-0049/NX20T0026//PHEG9	1,681	1,718	290	160	5
108	SS	GEMS-0050/NX20T0061//01DIB2	1,462	1,485	265	130	7
109	SS	GEMS-0050/NX20T0061//91BMA2	1,497	1,515	285	148	5
110	SS	GEMS-0050/NX20T0061//PH25A	1,506	1,528	260	133	6
111	SS	GEMS-0115/NX20T0063//84QAB1	1,528	1,554	285	143	6
112	SS	GEMS-0115/NX20T0063//F298W	1,516	1,536	280	148	7
113	SS	GEMS-0115/NX20T0063//PH40B	1,566	1,586	285	150	6
114	SS	GEMS-0115/NX20T0063//PHEG9	1,556	1,586	298	158	5
115	SS	GEMS-0235/NX20T0019//PH20A	1,536	1,554	290	140	6
116	SS	GEMS-0235/NX20T0019//PHAG6	1,517	1,554	278	143	6
117	SS	GEMS-0235/NX20T0019//PHEG9	1,596	1,596	298	148	6
118	SS	GEMS-0235/NX20T0019//RQAA8	1,536	1,554	295	143	7
119	SS	GEMS-0263/NX20T0057//01DIB2	1,443	1,443	268	133	6
120	SS	GEMS-0263/NX20T0057//84BRQ4	1,574	1,594	280	130	6
121	SS	GEMS-0263/NX20T0057//91BMA2	1,429	1,443	278	153	6
122	SS	GEMS-0263/NX20T0057//PHAG6	1,485	1,506	275	138	7
123	SS	GEMS-0281/NX20T0032//01DIB2	1,456	1,466	268	133	6
124	SS	GEMS-0281/NX20T0032//PH20A	1,556	1,566	300	145	6
125	SS	GEMS-0281/NX20T0032//PH25A	1,528	1,528	285	135	6
126	SS	GEMS-0281/NX20T0032//RQAA8	1,528	1,528	285	140	7
127	SS	GEMS-0282/NX20T0033//84QAB1	1,517	1,556	295	133	6
128	SS	GEMS-0282/NX20T0033//PHAG6	1,485	1,528	288	140	6
129	SS	GEMS-0282/NX20T0033//PHEG9	1,594	1,606	290	135	6
130	SS	GEMS-0282/NX20T0033//RQAA8	1,494	1,506	295	143	6
131	SS	GEMS-0284/NX20T0034//84BRQ4	1,584	1,606	290	133	6
132	SS	GEMS-0284/NX20T0034//F298W	1,497	1,517	305	133	7
133	SS	GEMS-0284/NX20T0034//PH42B	1,497	1,497	298	135	6
134	SS	GEMS-0284/NX20T0034//RQAA8	1,475	1,485	285	130	6
135	SS	GEMS-0288/NX20T0020//01DIB2	1,427	1,448	278	130	5

Table 14. 2022 Breeding Cross Observations - Ames, IA

Entry	HG	Pedigree	Pollen GDU	Silk GDU	Plant Height (cm)	Ear Height (cm)	Breeder Score
136	SS	GEMS-0288/NX20T0020//91BMA2	1,405	1,453	268	135	5
137	SS	GEMS-0288/NX20T0020//PH40B	1,564	1,574	293	138	7
138	SS	GEMS-0288/NX20T0020//PH42B	1,470	1,505	290	130	7
139	SS	GEMS-0289/NX20T0021//84QAB1	1,528	1,556	293	155	6
140	SS	GEMS-0289/NX20T0021//91BMA2	1,404	1,429	283	138	6
141	SS	GEMS-0289/NX20T0021//PH20A	1,564	1,573	298	150	7
142	SS	GEMS-0289/NX20T0021//PH42B	1,507	1,516	293	133	6
143	SS	GEMS-0301/NX20T0058//84BRQ4	1,584	1,594	283	138	6
144	SS	GEMS-0301/NX20T0058//PH20A	1,545	1,556	290	143	7
145	SS	GEMS-0301/NX20T0058//PH25A	1,524	1,534	270	135	7
146	SS	GEMS-0301/NX20T0058//PH40B	1,574	1,584	283	145	6
147	SS	GEMS-0307/NX20T0035//84QAB1	1,634	1,657	273	128	6
148	SS	GEMS-0307/NX20T0035//PH25A	1,487	1,517	280	140	6
149	SS	GEMS-0307/NX20T0035//PH40B	1,536	1,545	288	135	6
150	SS	GEMS-0307/NX20T0035//PH42B	1,546	1,584	293	143	6
151	NSS	LH262//3IIH6/55T1	1,456	1,456	300	163	6
152	NSS	LH262//3IIH6/KS23-5	1,456	1,466	283	153	6
153	NSS	LH262//LH213/55T5	1,556	1,566	285	155	5
154	NSS	LH262//LH213/Early Carribean-BVIR 139	1,506	1,528	290	153	6
155	NSS	LH262//LH213/Kei1421	1,556	1,556	300	153	6
156	NSS	LH262//PHBE2/Cargill North Temperate Zone Cateto	1,417	1,439	250	133	6
157	NSS	LH262//PHBE2/Cargill North Temperate Zone Cuzco	1,340	1,365	278	133	6
158	NSS	LH262//PHJ33/KO301Y	1,487	1,487	295	153	7
159	NSS	LH262//PHR55/Cargill North Temperate Zone Carribean	1,416	1,443	275	133	5
160	NSS	LH280//PHJ33//Tuson/Criollo-BVIR 155	1,507	1,547	310	150	6
161	NSS	LH280//01IBH10/Cargill North Temperate Zone Carribean	1,353	1,456	273	125	6
162	NSS	LH280//LH213/Ki59	1,494	1,536	278	125	6
163	NSS	LH280//LH216/Chandelle-BVIR 116	1,516	1,528	308	160	6
164	NSS	LH280//LH216/Cubano Amarillo-BVIR 102	1,485	1,517	278	135	6
165	NSS	LH280//LH216/Ki45	1,476	1,485	273	133	6
166	NSS	LH280//LH82/55T1	1,417	1,429	250	128	6
167	NSS	LH280//PHK56/Kei1421	1,494	1,494	278	148	8
168	NSS	LH280//PHR55/Cargill North Temperate Zone Carribean	1,392	1,417	265	118	6
169	NSS	LH283//3IIH6/KS23-5	1,402	1,443	265	128	7
170	NSS	LH283//LH213/55T5	1,485	1,485	290	135	7
171	NSS	LH283//LH82/55T1	1,443	1,443	263	123	7
172	NSS	LH283//PHBE2/Cargill North Temperate Zone Cuzco	1,340	1,364	273	130	7
173	NSS	LH283//PHJ33/Ki45	1,475	1,475	265	135	7
174	NSS	LH283//PHR55/Cargill North Temperate Zone Carribean	1,417	1,456	265	125	7
175	NSS	LH283//PHR55/CML384	1,538	1,546	283	145	7
176	NSS	PH02T//PHJ33//Tuson/Criollo-BVIR 155	1,556	1,594	303	153	4
177	NSS	PH02T//3IIH6/55T1	1,475	1,494	290	135	6
178	NSS	PH02T//LH185/55T4	1,515	1,535	298	145	7
179	NSS	PH02T//LH216/Chandelle-BVIR 116	1,524	1,574	300	145	6
180	NSS	PH02T//LH216/Ki45	1,556	1,574	288	150	6

Table 14. 2022 Breeding Cross Observations - Ames, IA

Entry	HG	Pedigree	Pollen GDU	Silk GDU	Plant Height (cm)	Ear Height (cm)	Breeder Score
181	NSS	PH02T//PHBE2/Cargill North Temperate Zone Cuzco	1,448	1,462	270	135	5
182	NSS	PH02T//PHJ33/Ki45	1,507	1,507	280	148	7
183	NSS	PH02T//PHK56/Ki59	1,476	1,506	285	143	7
184	NSS	PH03D//LH185/55T4	1,439	1,453	280	133	5
185	NSS	PH03D//LH216/Cubano Amarillo-BVIR 102	1,416	1,456	270	138	6
186	NSS	PH03D//LH216/Ki45	1,443	1,497	278	138	5
187	NSS	PH03D//PHBE2/Cargill North Temperate Zone Cateto	1,326	1,390	245	120	6
188	NSS	PH03D//PHJ33/KO301Y	1,430	1,443	260	125	6
189	NSS	PH03D//PHR55/CML384	1,497	1,538	270	145	6
190	NSS	PH03D//PHR55/Coastal Tropical Flint-BVIR 104	1,416	1,456	265	140	6
191	NSS	PH04G//LH213/Early Carribean-BVIR 139	1,456	1,497	300	143	6
192	NSS	PH04G//LH216/Cubano Amarillo-BVIR 102	1,456	1,528	273	148	7
193	NSS	PH04G//LH216/Ki45	1,429	1,485	275	133	7
194	NSS	PH04G//PHK56/KO326Y	1,402	1,466	273	118	6
195	NSS	PH04G//PHR55/Canilla-BVIR 106	1,430	1,475	275	138	7
196	NSS	PH04G//PHR55/Cargill North Temperate Zone Coroico	1,340	1,364	260	108	5
197	NSS	PH0AA//3IIH6/55T1	1,365	1,377	263	133	5
198	NSS	PH0AA//LH213/Early Carribean-BVIR 139	1,416	1,456	265	125	6
199	NSS	PH0AA//LH283/Cargill North Temperate Zone Cateto	1,301	1,365	265	115	4
200	NSS	PH0AA//LH82/55T1	1,326	1,352	253	128	6
201	NSS	PH0AA//PHBE2/Cargill North Temperate Zone Cuzco	1,275	1,288	253	105	6
202	NSS	PH0AA//PHK56/Kei1421	1,390	1,430	273	130	6
203	NSS	PH0AA//PHK56/KO326Y	1,352	1,340	270	103	6
204	NSS	PH0AA//PHR55/Cargill North Temperate Zone Coroico	1,327	1,326	280	110	4
205	NSS	PH0AA//PHR55/CML384	1,439	1,453	270	128	6
206	NSS	PH0AA//PHR55/Coastal Tropical Flint-BVIR 104	1,417	1,456	275	133	6
207	NSS	PH0HR//3IIH6/55T1	1,352	1,402	275	128	5
208	NSS	PH0HR//3IIH6/KS23-5	1,326	1,390	245	113	6
209	NSS	PH0HR//LH185/55T4	1,402	1,429	268	140	6
210	NSS	PH0HR//LH213/55T5	1,430	1,456	263	133	7
211	NSS	PH0HR//LH213/Ki59	1,390	1,429	260	133	6
212	NSS	PH0HR//PHBE2/CG-Cateto Flint	1,300	1,326	243	113	5
213	NSS	PH0HR//PHJ33/Chandelle-BVIR 116	1,390	1,443	278	138	6
214	NSS	PH0HR//PHK56/Kei1421	1,377	1,402	248	118	5
215	NSS	PH0HR//PHR55/Canilla-BVIR 106	1,378	1,402	250	130	6
216	NSS	PH0HR//PHR55/Coastal Tropical Flint-BVIR 104	1,353	1,443	248	125	5
217	SS	PH20A//BO165W/PH42B	1,485	1,494	280	128	8
218	SS	PH20A//HC33/Coastal Tropical Flint-BVIR 104	1,506	1,564	295	138	6
219	SS	PH20A//LH195/55T6	1,596	1,606	273	138	7
220	SS	PH20A//LH227/55T4	1,506	1,517	273	138	5
221	SS	PH20A//LH235/BO394Y	1,456	1,506	268	133	7
222	SS	PH20A//PHMK0/55T4	1,573	1,584	298	158	6
223	SS	PH20A//PHMK0/Chandelle-BVIR 116	1,556	1,594	313	153	5
224	SS	PH20A//WQCD10/Cargill North Temperate Zone Cateto	1,365	1,416	268	120	7
225	SS	PH25A//LH195//Tuson/Criollo-BVIR 155	1,516	1,564	285	143	7

Table 14. 2022 Breeding Cross Observations - Ames, IA

Entry	HG	Pedigree	Pollen GDU	Silk GDU	Plant Height (cm)	Ear Height (cm)	Breeder Score
226	SS	PH25A//HC33/55T5	1,453	1,474	280	143	6
227	SS	PH25A//HC33/55T6	1,462	1,462	270	125	6
228	SS	PH25A//HC33/Coastal Tropical Flint-BVIR 104	1,416	1,462	278	130	7
229	SS	PH25A//LH204/55T1	1,453	1,485	268	120	6
230	SS	PH25A//LH227/Tuxpeño-BVIR 153	1,429	1,476	293	133	5
231	SS	PH25A//PHG39/55T2	1,416	1,453	278	133	7
232	SS	PH25A//PHMK0/55T4	1,476	1,494	298	160	7
233	SS	PH25A//PHMK0/Kei1421	1,485	1,494	295	138	7
234	SS	PH25A//PHTP9/Cargill North Temperate Zone Cuzco	1,313	1,326	255	115	5
235	SS	PH25A//PHW52/55T2	1,416	1,443	275	130	6
236	SS	PH25A//PHW86/55T1	1,377	1,390	248	115	5
237	NSS	PH32C//PHJ33//Tuson/Criollo-BVIR 155	1,487	1,528	305	148	6
238	NSS	PH32C//LH213/Early Carribean-BVIR 139	1,466	1,528	303	143	5
239	NSS	PH32C//LH213/Kei1421	1,485	1,528	283	133	7
240	NSS	PH32C//LH283/CG-Cateto Flint	1,288	1,326	250	115	5
241	NSS	PH32C//PHJ33/Chandelle-BVIR 116	1,429	1,475	283	145	6
242	NSS	PH32C//PHJ33/KO301Y	1,402	1,453	275	128	7
243	NSS	PH32C//PHK56/Ki59	1,466	1,497	283	135	6
244	NSS	PH32C//PHK56/KO326Y	1,429	1,475	275	103	6
245	NSS	PH32C//PHR55/Cargill North Temperate Zone Coroico	1,327	1,377	265	103	4
246	NSS	PH32C//PHR55/Coastal Tropical Flint-BVIR 104	1,475	1,517	260	135	6
247	SS	PH40B///42T2/GEMS-0226//42B	1,466	1,466	283	138	6
248	SS	PH40B///42T2/GEMS-0227//42A	1,448	1,485	275	143	6
249	SS	PH40B//LH195/55T3	1,506	1,538	280	143	6
250	SS	PH40B//LH204/Tuxpeño-VER 147	1,475	1,538	290	140	6
251	SS	PH40B//LH227/Tuxpeño-BVIR 153	1,524	1,545	293	140	5
252	SS	PH40B//PHMK0/55T4	1,517	1,546	298	155	7
253	SS	PH40B//PHW52/55T2	1,507	1,538	288	125	7
254	SS	PH42B//FBLL/KS23-6	1,416	1,429	280	173	6
255	SS	PH42B//HC33/55T6	1,466	1,485	258	123	7
256	SS	PH42B//LH195/55T3	1,416	1,485	270	123	6
257	SS	PH42B//LH204/55T1	1,430	1,466	255	110	6
258	SS	PH42B//LH235/BO394Y	1,525	1,525	268	118	7
259	SS	PH42B//PHHB9/Canilla-BVIR 106	1,429	1,535	280	128	6
260	SS	PH42B//PHMK0/55T4	1,556	1,566	285	150	8
261	SS	PH42B//PHW86/55T1	1,365	1,390	268	118	6
262	NSS	PH44G//LH213/Kei1421	1,494	1,517	290	143	8
263	NSS	PH44G//LH216/Chandelle-BVIR 116	1,506	1,566	278	158	6
264	NSS	PH44G//LH82/55T1	1,475	1,516	258	128	6
265	NSS	PH44G//PHJ33/Ki45	1,476	1,536	278	133	7
266	NSS	PH44G//PHK56/KO326Y	1,402	1,475	265	128	6
267	NSS	PH44G//PHR55/Canilla-BVIR 106	1,466	1,516	263	130	6
268	SS	PHAG6///42T2/GEMS-0227//42A	1,424	1,470	245	110	5
269	SS	PHAG6//LH195//Tuson/Criollo-BVIR 155	1,506	1,573	288	140	6
270	SS	PHAG6//BO165W/PH42B	1,439	1,476	268	125	7

Table 14. 2022 Breeding Cross Observations - Ames, IA

Entry	HG	Pedigree	Pollen GDU	Silk GDU	Plant Height (cm)	Ear Height (cm)	Breeder Score
271	SS	PHAG6//FBLL/KS23-6	1,443	1,466	268	120	7
272	SS	PHAG6//HC33/Coastal Tropical Flint-BVIR 104	1,443	1,506	280	130	6
273	SS	PHAG6//LH204/55T1	1,416	1,494	250	123	6
274	SS	PHAG6//LH227/55T4	1,485	1,494	273	135	6
275	SS	PHAG6//PHK29/55T3	1,466	1,506	263	130	7
276	SS	PHAG6//PHMK0/Kei1421	1,556	1,556	285	138	6
277	SS	PHAG6//PHW86/55T1	1,353	1,390	255	120	5
278	NSS	PHDG1//PHJ33//Tuson/Criollo-BVIR 155	1,429	1,506	295	155	5
279	NSS	PHDG1//01IBH10/Cargill North Temperate Zone Carribean	1,275	1,364	230	103	5
280	NSS	PHDG1//LH213/55T5	1,402	1,453	283	140	7
281	NSS	PHDG1//LH213/Ki59	1,377	1,429	265	120	8
282	NSS	PHDG1//PHBE2/CG-Cateto Flint	1,288	1,326	250	110	5
283	NSS	PHDG1//PHJ33/Chandelle-BVIR 116	1,392	1,439	280	145	5
284	NSS	PHDG1//PHJ33/KO301Y	1,377	1,453	260	128	5
285	NSS	PHDG1//PHK56/Ki59	1,353	1,390	260	130	7
286	NSS	PHDG1//PHR55/Cargill North Temperate Zone Coroico	1,275	1,313	253	113	5
287	NSS	PHDG1//PHR55/Coastal Tropical Flint-BVIR 104	1,353	1,416	273	120	7
288	SS	PHEG9//42T2/GEMS-0226//42B	1,439	1,485	260	120	6
289	SS	PHEG9//42T2/GEMS-0227//42A	1,430	1,430	250	113	5
290	SS	PHEG9//LH195//Tuson/Criollo-BVIR 155	1,534	1,594	288	135	6
291	SS	PHEG9//BO165W/PH42B	1,475	1,485	295	125	6
292	SS	PHEG9//HC33/55T5	1,506	1,534	268	135	7
293	SS	PHEG9//LH195/55T6	1,524	1,524	278	128	7
294	SS	PHEG9//LH195/Celaya-GTO84	1,517	1,564	280	138	6
295	SS	PHEG9//PHK29/55T3	1,494	1,538	255	113	6
296	SS	PHEG9//PHMK0/Chandelle-BVIR 116	1,536	1,584	285	140	6
297	SS	PHEG9//PHMK0/Kei1421	1,517	1,517	288	135	7
298	SS	RQAA8//HC33/55T5	1,466	1,485	283	128	7
299	SS	RQAA8//LH195/55T6	1,517	1,536	278	133	7
300	SS	RQAA8//LH195/Celaya-GTO84	1,528	1,574	308	155	7
301	SS	RQAA8//LH227/Tuxpeño-BVIR 153	1,485	1,506	318	150	6
302	SS	RQAA8//LH235/BO394Y	1,443	1,494	300	128	6
303	SS	RQAA8//PHG39/55T2	1,538	1,574	263	120	5
304	SS	RQAA8//PHHB9/Canilla-BVIR 106	1,466	1,506	278	128	5
305	SS	RQAA8//PHMK0/Kei1421	1,546	1,564	288	138	7
306	SS	RQAA8//PHW52/55T2	1,494	1,506	268	123	6
307	SS	RQAA8//PHW86/55T1	1,404	1,456	250	110	5
308	NSS	ZS0541//01IBH10/Cargill North Temperate Zone Carribean	1,313	1,364	245	103	5
309	NSS	ZS0541//01IBH10/Cargill North Temperate Zone Carribean	1,340	1,416	238	110	5
310	NSS	ZS0541//LH176/Cargill North Temp Zone Mexican Dent	1,237	1,275	260	105	4
311	NSS	ZS0541//LH213/Ki59	1,404	1,443	283	123	6
312	NSS	ZS0541//LH283/Cargill North Temperate Zone Cateto	1,301	1,301	255	108	5
313	NSS	ZS0541//PHJ33/Chandelle-BVIR 116	1,456	1,475	288	153	5
314	NSS	ZS0541//PHJ33/Ki45	1,390	1,416	270	133	7
315	NSS	ZS0541//PHK56/Ki59	1,377	1,429	285	133	6

Table 14. 2022 Breeding Cross Observations - Ames, IA

Entry	HG	Pedigree	Pollen GDU	Silk GDU	Plant Height (cm)	Ear Height (cm)	Breeder Score
316	NSS	ZS0541//PHR55/Canilla-BVIR 106	1,402	1,456	278	130	7
317	NSS	ZS0541//PHR55/Cargill North Temperate Zone Carribean	1,288	1,364	275	110	5
318	NSS	ZS1284//01IBH10/Cargill North Temperate Zone Coroico	1,250	1,352	243	108	5
319	NSS	ZS1284//3IIH6/KS23-5	1,326	1,365	250	110	3
320	NSS	ZS1284//LH185/55T4	1,378	1,456	263	125	6
321	NSS	ZS1284//LH213/Kei1421	1,416	1,456	268	115	6
322	NSS	ZS1284//LH216/Chandelle-BVIR 116	1,402	1,456	265	128	6
323	NSS	ZS1284//LH216/Cubano Amarillo-BVIR 102	1,429	1,494	268	130	6
324	NSS	ZS1284//PHBE2/Cargill North Temperate Zone Cateto	1,249	1,313	225	100	4
325	NSS	ZS1284//PHK56/Kei1421	1,402	1,439	250	115	5
326	NSS	ZS1284//PHR55/CML384	1,390	1,443	260	120	6

Trial Information

Planting Date: May 22, 2022

Location: Ames, Iowa

Table 15. 2022 Breeding Cross Observations - Raleigh, NC - F1

Entry	Pedigree	Notes
1	BR106/PHG39)-012-002-#/LH236	Looks good, plant in 2023 nursery
2	BR106/S42//GEMS-0050	Needs re-evaluation in 2023
3	BR106/S42//GEMS-0281	Needs re-evaluation in 2023
4	LH233/CML78	Green snap issues? Needs re-evaluation in 2023
5	DK_FBLL/CML287	Needs second cross to temperate line
6	LH233/CML287	Needs second cross to temperate line
7	CML341/S42//GEMS-0281	Needs re-evaluation in 2023, maybe plant in nursery as well
8	CML343/FBLL	Needs re-evaluation in 2023, or just move on to newer ex-PVP
9	CML343/LH228	Sent to winter nursery for selfing
10	CML343/LH233	Needs re-evaluation in 2023
11	CML343/ZS1202	Probably a no due to EH
12	CML343/GEMS-0032//S40x//GEMS-0281	Needs re-evaluation in 2023
13	CML343/PHHB9//GEMS-0281	Needs re-evaluation in 2023
14	GEMS-0050//CML343/S42	Needs re-evaluation in 2023
15	CML343/S42//GEMS-0281	Needs re-evaluation in 2023, maybe plant in nursery as well
16	DK_FBLL/CML380	Sent to winter nursery for selfing
17	LH228/CML380	Sent to winter nursery for selfing
18	LH233/CML380	Sent to winter nursery for selfing
19	ZS1202/CML380	Needs re-evaluation in 2023
20	CML494/GEMS-0032//S40x//GEMS-0281	Needs re-evaluation in 2023
21	DKB830/S51//GEMS-0050	Needs re-evaluation in 2023
22	DKB830/S51//GEMS-0281	Needs re-evaluation in 2023
23	DKB844/S51//GEMS-0050	Needs re-evaluation in 2023
24	DKB844/S51//GEMS-0281	Needs re-evaluation in 2023
25	GEMS-0050/GEMS-0226	Needs re-evaluation in 2023
26	GEMS-0050/GEMS-0243	Needs re-evaluation in 2023
27	GEMS-0050/GEMS-0245	Needs re-evaluation in 2023
28	GEMS-0050/GEMS-0321	Needs re-evaluation in 2023
29	GEMS-0245/GEMS-0320	Needs re-evaluation in 2023
30	GEMS-0281/GEMS-0050	Needs re-evaluation in 2023
31	GEMS-0281/GEMS-0245	Needs re-evaluation in 2023
32	GEMS-0281/GEMS-0298	Needs re-evaluation in 2023
33	GEMS-0281/GEMS-0320	Needs re-evaluation in 2023
34	GEMS-0293/LH233	Plant in 2023 nursery
35	GEMS-0301/NX20T0058	Compact with low EH but late and ear rot issues
36	GEMS-0320/GEMS-0050	Needs re-evaluation in 2023, maybe plant in nursery as well
37	GEMS-0321/GEMS-0281	Needs re-evaluation in 2023
38	PHW52/Celaya-GTO 36//LH242	Needs re-evaluation in 2023
39	2FACC/Celaya-GTO84//LH242	Poor, probably don't need to replant
40	PHW52/Celaya-GTO84//LH242	Needs re-evaluation in 2023
41	PHW52/Celaya-GTO84//LH244	Needs re-evaluation in 2023, maybe plant in nursery as well
42	LH227/Ki20//LH242	Needs re-evaluation in 2023, maybe plant in nursery as well
43	PHHB4/Ki20//LH242	Needs re-evaluation in 2023
44	PHW52/Ki20//LH242	Needs re-evaluation in 2023, maybe plant in nursery as well
45	KS23-4/PHHB9//LH233	Do not replant
46	KS23-4/PHHB9//PHHB9	Do not replant
47	PHW52/KS23-5//LH242	Needs re-evaluation in 2023, maybe plant in nursery as well
48	PHW52/KS23(S)C5//LH242	Needs re-evaluation in 2023, maybe plant in nursery as well
49	La Posta Sequia C7 F71-1-1-1-2-B*4/S40a//GEMS-0281	Needs re-evaluation in 2023, maybe plant in nursery as well
50	La Posta Sequia C7 F71-1-1-1-2-B*4/S40b//GEMS-0281	Needs re-evaluation in 2023, maybe plant in nursery as well

Table 15. 2022 Breeding Cross Observations - Raleigh, NC - F1

Entry	Pedigree	Notes
51	NC320/NC368//GEMS-0050	Needs re-evaluation in 2023
52	NC320/NC368//GEMS-0281	Needs re-evaluation in 2023
53	POP21 (IST) C2/PHP38//GEMS-0281	Needs re-evaluation in 2023
54	PHW52/55T1//LH242	Needs re-evaluation in 2023, maybe plant in nursery as well
55	PHW52/55T2//LH242	Needs re-evaluation in 2023, maybe plant in nursery as well
56	HC33/55T4//LH242	Needs re-evaluation in 2023, maybe plant in nursery as well
57	LH227/55T4//LH242	Needs re-evaluation in 2023, maybe plant in nursery as well
58	PHHB4/55T4//LH242	Needs re-evaluation in 2023, maybe plant in nursery as well
59	PHW52/55T4//LH242	Needs re-evaluation in 2023, maybe plant in nursery as well
60	HC33/55T5//LH242	Needs re-evaluation in 2023, maybe plant in nursery as well
61	Barbados GP2/LH82//GEMN-0048	Needs re-evaluation in 2023
62	Barbados GP2/LH82//LH214	Needs re-evaluation in 2023
63	PHK56/Cubano Amarillo-BVIR 102//LH263	EH too high, do not replant
64	PHK56/Coastal Tropical Flint-BVIR 104//LH263	EH too high, do not replant
65	LH213/Tuson-BVIR 155//LH283	Green snap issues, do not replant
66	LH283/Cargill North Temperate Zone Caribbean//PH38B	Very short and early, do not replant
67	CML36/LH283//DK_WKBC5	Several green snapped, need a different line for second cross
68	GEMN-0272/CML323	Needs re-evaluation in 2023
69	GEMN-0287/CML323	Needs re-evaluation in 2023, maybe plant in nursery as well
70	LH168/CML384//PH38B	EH too high, kernel spacing issues, do not replant
71	GEMN-0048//CML449/GEMN-0272	EH issues, do not replant
72	GEMN-0257/PHVB2	Premature plant death, do not replant
73	GEMN-0272/GEMN-0048	Do not replant
74	GEMN-0287/PHVB2	Premature plant death, do not replant
75	GEMN-0310/GEMN-0048	Already in 2022 nursery, replant in 2023 nursery due to poor returns
76	PHK56/Ki59//PH38B	EH too high, do not replant
77	Lima 13/LH82//GEMN-0048	Needs re-evaluation in 2023
78	Lima 13/LH82//LH214	Needs re-evaluation in 2023
79	PM-801/LH82//GEMN-0048	Needs re-evaluation in 2023
80	PM-801/LH82//LH214	Needs re-evaluation in 2023
81	Population 32 (IST) C2/LH185//GEMN-0048	Needs re-evaluation in 2023
82	Saint Croix GP3/LH82//GEMN-0048	Green snap issues? Needs re-evaluation in 2023
83	Saint Croix GP3/LH82//LH214	well
84	Ucayali 12/N40x//GEMN-0048	EH issues, do not replant
85	Valle 343/N40x//GEMN-0048	Needs re-evaluation in 2023
86	Venezuela 981/N40x//GEMN-0048	EH issues, do not replant
87	LH216/Tropical Hybrid 19x03//GEMN-0048	Needs re-evaluation in 2023
88	GEMN-0048//Tropical Hybrid 19x03/N40	EH issues, do not replant
89	PHK56/Tropical Hybrid 19x03//GEMN-0048	Needs re-evaluation in 2023
90	PHK56/Tropical Hybrid 19x03//LH214	Plant in 2023 nursery

Table 16. 2022 Breeding Cross Observations - Raleigh, NC - C10

Entry	Pedigree	Notes
1	LH283/LH287//89291	EH too high?
2	PHHB9/LH244//89291	Replant in 2023 BC Obs
3	89343//LH283/LH287	Poor kernel spacing, ear height issues?
4	89343//PHHB9/LH244	
5	89343/DK_WKBC5	EH too high, do not replant
6	89343/LH214	Plant again in 2023 Obs
7	89343/PHVB2	Premature plant death, do not replant
8	AC454/PHVB2	Premature plant death, do not replant
9	BO385Y//LH283/LH287	Decent but some ear rot, EH/PH issues?
10	BO385Y//PHHB9/LH244	Some ear rot, EH an issue?
11	CA00370//LH283/LH287	High EH and small ears
12	CA00370//PHHB9/LH244	EH slightly better than LH283.LH287 cross, small ears
13	CIMMYT A-21//PHHB9/LH236	High EH and small ears
14	CL-04353//LH283/LH287	EH issues?
15	CL-04368//LH283/LH287	EH and kernel spacing issues?
16	CL-04935//LH283/LH287	Decent? Try CL-04935 in SSS breeding crosses
17	CL-SPLW04//PHHB9/LH236	Decent? Try CL-04935 in nSSS breeding crosses
18	CML36//PHHB9/LH236	EH too high? Cross to low eared nSSS?
19	CML78//LH283/LH287	Decent but lodging a problem
20	CML78//PHHB9/LH244	Decent but lodging and kernel spacing problems
21	CML97/DK_WKBC5	Ear height too high
22	CML97/LH214	Ear height too high
23	CML97//LH283/LH287	Ear height marginal, ears ok
24	CML215//LH283/LH287	Decent ears but EH too high
25	CML215//PHHB9/LH244	Decent ears but EH too high
26	CML254//LH283/LH287	Late and high EH
27	CML254//PHHB9/LH244	Late and high EH
28	CML309//LH283/LH287	High EH and some ear rot
29	DK_WKBC5/CML323	Ear height too high
30	CML323/PHND1	Sent to winter nursery for selfing
31	CML323/PHVB2	Do not replant, premature plant death
32	CML343//DK_FBLL/LH233	Poor stand, replant in 2023 BC Obs
33	CML343//DK_FBLL/PHHB9	Poor stand, replant in 2023 BC Obs
34	CML343//PHAG6/DK_FBLL	Poor stand, replant in 2023 BC Obs
35	CML343//PHAG6/LH233	Poor stand, replant in 2023 BC Obs
36	PHHB9/LH244//CML343	Replant in 2023 BC Obs
37	LH283/LH287//CML343	Decent
38	CML373//DK_FBLL/LH233	Replant in 2023 BC Obs
39	CML373//DK_FBLL/PHHB9	Replant in 2023 BC Obs
40	CML373//PHAG6/DK_FBLL	Replant in 2023 BC Obs
41	CML373//PHAG6/LH233	Replant in 2023 BC Obs
42	CML373//PHHB9/LH244	Replant in 2023 BC Obs
43	CML373//LH283/LH287	Replant in 2023 BC Obs
44	CML375/DK_WKBC5	EH too high? Ear rot issues?
45	CML375/LH214	EH ok? Ear rot issues? Sent to winter nursery for selfing

Table 16. 2022 Breeding Cross Observations - Raleigh, NC - C10

Entry	Pedigree	Notes
46	CML375/PHVB2	Do not replant, premature plant death
47	CML384//PHHB9/LH236	EH up too high.
48	CML392//LH283/LH287	EH up too high, kernel spacing issues
49	CML405//LH283/LH287	Decent, cross to SSS
50	CML448//LH283/LH287	Decent but late?
51	CML448//PHHB9/LH244	Decent, cross to other SSS?
52	LH283/LH287//CML449	Replant in 2023 BC Obs
53	CML449/DK_WKBC5	EH issues?
54	CML449/PHND1	EH too high
55	CML449/PHVB2	Do not replant, premature plant death
56	CML449//PHHB9/LH236	Decent but less stay green than CML448 crosses
57	PHHB9/LH244//CML449	
58	CML451//PHHB9/LH236	Decent but late
59	CML451/DK_WKBC5	Tall, late
60	CML451/PHVB2	Sent to winter nursery for selfing, may need second cross
61	LH283/LH287//CML494	EH probably too high, kernel spacing issues
62	PHHB9/LH244//CML494	
63	DK_WKBC5/GEMN-0287	Replant in 2023 BC Obs
64	DO940Y//PHHB9/LH244	Decent but some ear rot
65	GEMN-0104/Tx772	EH and EH/PH issues?
66	GEMN-0257/PHVB2	Decent? Replant in 2023 BC Obs
67	GEMS-0232/Tx772	Decent? Replant in 2023 BC Obs
68	GEMN-0272/Tx772	Decent? Replant in 2023 BC Obs
69	GEMN-0287/Tx772	Decent? Replant in 2023 BC Obs
70	HI 62//LH283/LH287	Decent? Flinty ears
71	HI 62//PHHB9/LH244	Decent? Replant in 2023 BC Obs
72	HI 63//LH283/LH287	Premature plant death, do not replant
73	HI 63//PHHB9/LH244	EH issues? Better than LH283.LH287 cross
74	ICA H-154//LH283/LH287	Variable EH, poor kernel spacing
75	ICA V-106-#//LH283/LH287	EH probably too high
76	Ki46//LH283/LH287	Kernel spacing issues? Replant in 2023 BC Obs
77	Ki46//PHHB9/LH244	EH too high, ear rot issues?
78	Ki60//LH283/LH287	Decent? Replant in 2023 BC Obs
79	Ki60//PHHB9/LH244	EH too high, ear rot issues?
80	Ki64//LH283/LH287	Replant in 2023 BC Obs
81	Ki64//PHHB9/LH244	Replant in 2023 BC Obs
82	LH283/LH287//KO679Y	Replant in 2023 BC Obs
83	PHHB9/LH244//KO679Y	Much taller than expected
84	KO800Y//LH283/LH287	Replant in 2023 BC Obs
85	KO800Y//PHHB9/LH244	EH too high?
86	L36//PHHB9/LH236	EH too high? Cross to low -eared nSSS?
87	LH283/LH287//La Posta Sequia C7 F64-1-1-1-1-B*3	Replant in 2023 BC Obs
88	PHHB9/LH244//La Posta Sequia C7 F64-1-1-1-1-B*3	EH too high?
89	La Posta Sequia C7 F64-1-1-1-2-B*3/LH228	Sent to winter nursery for selfing
90	La Posta Sequia C7 F64-1-1-1-2-B*3/LH233	Replant in 2023 BC Obs

Table 16. 2022 Breeding Cross Observations - Raleigh, NC - C10

Entry	Pedigree	Notes
91	LH283/LH287//La Posta Sequia C7 F64-1-1-1-2-B*3	Replant in 2023 BC Obs
92	PHHB9/LH244//La Posta Sequia C7 F64-1-1-1-2-B*3	Replant in 2023 BC Obs
93	La Posta Sequia C7 F71-1-1-1-2-B*4/DK_FBLL	Replant in 2023 BC Obs
94	La Posta Sequia C7 F71-1-1-1-2-B*4/LH228	Sent to winter nursery for selfing
95	La Posta Sequia C7 F71-1-1-1-2-B*4/LH233	Replant in 2023 BC Obs
96	La Posta Sequia C7 F71-1-1-1-2-B*4/ZS1202	EH too high?
97	La Posta Sequia C7 F71-1-1-1-2-B*4/DK_FBLL/LH233	EH too high?
98	La Posta Sequia C7 F71-1-1-1-2-B*4/DK_FBLL/PHHB9	EH too high?
99	La Posta Sequia C7 F71-1-1-1-2-B*4/PHAG6/DK_FBLL	EH too high?
100	La Posta Sequia C7 F71-1-1-1-2-B*4/PHAG6/LH233	EH too high?
101	PHHB9/LH244//La Posta Sequia C7 F71-1-1-1-2-B*4	EH too high?
102	LH283/LH287//La Posta Sequia C7 F71-1-1-1-2-B*4	Replant in 2023 BC Obs
103	LH283/LH287//N3-2-3-3	Replant in 2023 BC Obs
104	PHHB9/LH244//N3-2-3-3	Ear height and ear quality issues
105	NEI402020//DK_FBLL/LH233	EH too high?
106	NEI402020//DK_FBLL/PHHB9	EH too high?
107	NEI402020//PHAG6/DK_FBLL	EH too high?
108	NEI402020//PHAG6/LH233	Replant in 2023 BC Obs
109	Pool 33-128-01-01)%B/LH214	Ear rot issues? Replant in 2023 BC Obs
110	Pool 33-128-01-01)%B//LH283/LH287	Premature plant death, replant in 2023 BC Obs
111	Pool25GT#1)%B/LH214	Replant in 2023 BC Obs
112	Pool25GT#2)%B/LH214	Replant in 2023 BC Obs
113	Pool25GT#3)%B/LH214	Replant in 2023 BC Obs
114	Pool33GT#1)%B//LH283/LH287	Replant in 2023 BC Obs
115	Pool33GT#1)%B/LH214	Replant in 2023 BC Obs
116	Pool33GT#2)%B//LH283/LH287	Replant in 2023 BC Obs
117	Pool33GT#2)%B/LH214	Replant in 2023 BC Obs
118	Pool33GT#3)%B//LH283/LH287	Replant in 2023 BC Obs
119	Pool33GT#3)%B/LH214	Replant in 2023 BC Obs
120	POPULATION 44 (IST) C2//PHHB9/LH244	Replant in 2023 BC Obs
121	SA-5/LH214	Do not replant, premature plant death
122	TropHyb19x03:N40//LH283/LH287	Do not replant
123	Tx740//LH283/LH287	Replant in 2023 BC Obs
124	Tx740//PHHB9/LH236	Replant in 2023 BC Obs
125	TZI26//LH283/LH287	Do not replant
126	TZI26//PHHB9/LH244	Do not replant
127	TZI8//LH283/LH287	Replant in 2023 BC Obs
128	TZI8//PHHB9/LH244	Replant in 2023 BC Obs
129	TZI9//LH283/LH287	Replant in 2023 BC Obs
130	TZI9//PHHB9/LH244	Replant in 2023 BC Obs

Disease Screening

Table 17. 2022 GEM Disease Trial Summary

Entry	Pedigree	Corteva		USDA			Trimble	
		Head Smut	Fusarium Ear Rot	Aflatoxins ng/g	Fumonisin (ng/g)	SLB	Tar Spot	Rust
1	01DIB2	97.5						
2	B73	100				5.00		
3	LH195	89	5			5.75		
4	LH213	82				6.25		
5	LH283	90	1.5			6.50		
6	Mol7	100	2			7.50		
7	Mp717			68.69	580			
8	Mp718			300	2630			
9	Mp719			24.73	3950			
10	PH0HR	38.5						
11	PH79A	94	2					
12	PHMK0			623.33	28330			
13	PHW52	78.5	3			6.00		
14	T173			3640	9330			
15	GEMN-0096	100	3					
16	GEMN-0097	100	4.5				2	2
17	GEMN-0178	100	5.5				2	2
18	GEMN-0260	87.5	4.5					
19	GEMN-0266	86	4.5					
20	GEMN-0267	90.5	3.5				2	2
21	GEMN-0287	92.5	4				2	2
22	GEMN-0292	95	5.5				2	2
23	GEMN-0302	97.5	3.5				2	2
24	GEMN-0309	86.5	4.5	1640	23330			
25	GEMN-0310	70	4.5					
26	GEMN-0317	95	3.5	1100	5970	6.00		
27	GEMN-0318	95	5	1773.33	17970	5.75		
28	GEMN-0319	81.5	5	736.67	51670	4.50		
29	GEMN-0325	95	4	3281.93	44350	8.00		
30	GEMS-0002	90	5					
31	GEMS-0027			79.33	5330			
32	GEMS-0032	85	5.5	141.24	5630			
33	GEMS-0050	95.5	5.5	383.33	8970		2	2
34	GEMS-0115	100	5.5				2	2
35	GEMS-0227	87.5					2	2

Table 17. 2022 GEM Disease Trial Summary

Entry	Pedigree	Corteva		USDA			Trimble	
		Head Smut	Fusarium Ear Rot	Aflatoxins ng/g	Fumonisin (ng/g)	SLB	Tar Spot	Rust
36	GEMS-0245			233.33	5430			
37	GEMS-0248	100	6				2	
38	GEMS-0251	100	5				2	
39	GEMS-0258	97.5	5.5				2	2
40	GEMS-0262	100	5					
41	GEMS-0263	77.5	4.5					
42	GEMS-0264	97.5	5				2	2
43	GEMS-0268	97.5	5				2	2
44	GEMS-0269	95	4.5				2	
45	GEMS-0273			306.93	12750			
46	GEMS-0274			471.67	42330			
47	GEMS-0275	97.5	5					
48	GEMS-0276	97.5	4					
49	GEMS-0278	100	5					
50	GEMS-0280	68	5				2	2
51	GEMS-0281	97.5	5					
52	GEMS-0282	94	4.5					
53	GEMS-0283		5					
54	GEMS-0284	97	3					
55	GEMS-0288	80	4				2	2
56	GEMS-0289	97	5.5				2	2
57	GEMS-0290	100	3				2	2
58	GEMS-0291	100	4				2	2
59	GEMS-0293	100	5	194.33	5630		2	2
60	GEMS-0294	62	5	673.33	1630		2	2
61	GEMS-0295	100	8				2	2
62	GEMS-0296	100					2	
63	GEMS-0297	84	4.5				2	2
64	GEMS-0298	100	3.5				2	2
65	GEMS-0299	100	5.5				2	2
66	GEMS-0300	56.5	5.5				2	2
67	GEMS-0301	100	5				2	2
68	GEMS-0303	95			12740			
69	GEMS-0304	71		2800	29000			
70	GEMS-0305	97.5		4466.67	30210		2	2

Table 17. 2022 GEM Disease Trial Summary

Entry	Pedigree	Corteva		USDA			Trimble	
		Head Smut	Fusarium Ear Rot	Aflatoxins ng/g	Fumonisin (ng/g)	SLB	Tar Spot	Rust
71	GEMS-0306	100	5	366.67	4230			
72	GEMS-0307	90.5	3.5	940	5130			
73	GEMS-0308	93	3.5	2093.33	27000			
74	GEMS-0311	67	5.5	770	10800			
75	GEMS-0312	57	3.5	223.33	7700			
76	GEMS-0313	96	5	1466.67	4570	8.25		
77	GEMS-0314	100		496.67	15870	8.25		
78	GEMS-0315	97	5	293.33	78670	7.50		
79	GEMS-0316	97	3	853.33	43330			
80	GEMS-0320	100	5	2586.67	7570	6.75		
81	GEMS-0321	92.5	5.5	523.33	4330	7.50		
82	GEMS-0322	100	5.5	656.67	40000	7.75		
83	GEMS-0323	97.5	4	1373.33	29440	5.00		
84	GEMS-0324	100		5600	28330	5.25		
85	(CML449/PHG47)/LH82-006-002	100	3.5			5.50		
86	(CML449/PHG47)/LH82-018-001					4.50		
87	(CML449/PHG47)/LH82-058-001					4.00		
88	(CML449/PHG47)/LH82-122-001	100	3.5			5.75		
89	(CML449/PHG47)/LH82-125-001					4.00		
90	(CML449/PHN37)/LH82-003-001					6.25		
91	(CML449/PHN37)/LH82-041-001					5.00		
92	(CML449/PHN37)/LH82-041-002					6.25		
93	(CML449/PHN37)/LH82-074-001	72.5				4.50		
94	(CML449/PHN37)/LH82-077-001	100	2.5			7.00		
95	(CML449/PHN37)/LH82-085-001					3.00		
96	(CML449/PHN37)/LH82-104-001					4.00		
97	(CML449/PHN37)/LH82-111-001	97.5				5.25		
98	(CML449/PHN37)/LH82-112-001	95.5	5					
99	(CML449/PHN37)/LH82-118-001					5.75		
100	(CML449/PHN37)/LH82-124-001	92.5				5.00		
101	(CML449/PHN37)/LH82-131-001					6.75		
102	(CML449/PHN37)/LH82-138-001					4.75		
103	(CML449/PHN37)/LH82-141-001					6.75		
104	(CML449/PHN37)/LH82-149-001					5.00		
105	(CML494 x GEMN-0097)/LH185-072-001	91	4.5			6.50		

Table 17. 2022 GEM Disease Trial Summary

Entry	Pedigree	Corteva		USDA			Trimble	
		Head Smut	Fusarium Ear Rot	Aflatoxins ng/g	Fumonisin (ng/g)	SLB	Tar Spot	Rust
106	(GEMS-0113 x CML103)/GEMS-0227-006-001					5.50		
107	(GEMS-0113 x CML103)/GEMS-0227-018-002	97.5				6.50		
108	(GEMS-0113 x CML103)/GEMS-0227-025-001					7.25		
109	(GEMS-0113 x CML103)/GEMS-0227-038-001	97.5	5			5.00		
110	(GEMS-0113 x CML103)/GEMS-0227-069-001	86	5			4.75		
111	(GEMS-0113 x CML103)/GEMS-0227-081-001					4.75		
112	(GEMS-0113 x CML103)/GEMS-0227-085-002	95				4.00		
113	(GEMS-0113 x CML103)/GEMS-0227-089-001					5.75		
114	(GEMS-0113 x CML103)/PHG39-034-001					7.75		
115	(GEMS-0220/CML373)/R3212Z-006-001					4.75		
116	(GEMS-0220/CML373)/R3212Z-006-002	95	3.5			4.50		
117	(GEMS-0220/CML373)/R3212Z-017-002					4.50		
118	(GEMS-0220/CML373)/R3212Z-037-001	100	3.5			5.75		
119	(GEMS-0220/CML373)/R3212Z-043-001					5.00		
120	(GEMS-0220/CML373)/R3212Z-056-001					5.50		
121	(GEMS-0220/CML373)/R3212Z-058-001	86.5	6			5.75		
122	(GEMS-0220/CML373)/R3212Z-063-001					7.50		
123	(GEMS-0220/CML373)/R3212Z-066-001	100				5.25		
124	(GEMS-0220/CML373)/R3212Z-069-002	63	6			7.50		
125	(GEMS-0220/CML373)/R3212Z-081-003	100	5			5.75		
126	(GEMS-0220/CML373)/R3212Z-121-003					5.25		
127	(GEMS-0220/CML373)/R3212Z-129-002	93	4.5			4.50		
128	(GEMS-0220/CML373)/R3212Z-133-001	100				3.00		
129	(GEMS-0227/CML373)/R3212Z-004-001	92.5	4.5			5.25		
130	(GEMS-0227/CML373)/R3212Z-006-001	97.5	5			5.75		
131	(GEMS-0227/CML373)/R3212Z-016-001	92.5	5.5			4.00		
132	(GEMS-0227/CML373)/R3212Z-024-002	100	5			7.50		
133	(GEMS-0227/CML373)/R3212Z-025-001	87	5			5.25		
134	(GEMS-0227/CML373)/R3212Z-028-001	100				6.25		
135	(GEMS-0227/CML373)/R3212Z-035-001	81	3			5.00		
136	(GEMS-0227/CML373)/R3212Z-036-001	52	4			6.75		
137	(GEMS-0227/CML373)/R3212Z-064-001	95				6.00		
138	(GEMS-0227/CML373)/R3212Z-070-002	100						
139	(GEMS-0227/CML373)/R3212Z-087-001	93				4.00		
140	(GEMS-0227/CML373)/R3212Z-087-002	95	5			2.00		

Table 17. 2022 GEM Disease Trial Summary

Entry	Pedigree	Corteva		USDA			Trimble	
		Head Smut	Fusarium Ear Rot	Aflatoxins ng/g	Fumonisin (ng/g)	SLB	Tar Spot	Rust
141	(GEMS-0227/CML373)/R3212Z-096-001	97.5						
142	(GEMS-0227/CML373)/R3212Z-099-001	82	3.5			5.00		
143	(GEMS-0227/CML373)/R3212Z-109-001	97.5				6.00		
144	(GEMS-0227/CML373)/R3212Z-112-001	86				4.00		
145	(GEMS-0227/CML373)/R3212Z-118-001	80.5	2.5			7.00		
146	(GEMS-0227/CML373)/R3212Z-119-001					7.25		
147	(GEMS-0227/CML373)/R3212Z-124-002					8.00		
148	(GEMS-0227/CML373)/R3212Z-125-001	90	3			6.75		
149	(GEMS-0227/CML373)/R3212Z-127-001	95	3.5			7.25		
150	(GEMS-0227/CML373)/R3212Z-129-001	73	6.5					
151	(GEMS-0227/CML373)/R3212Z-139-001	95.5	5			7.25		
152	(GEMS-0227/GEMS-0091)/2FACC-020-001	100				7.00		
153	(GEMS-0227/GEMS-0091)/2FACC-043-001					6.00		
154	(GEMS-0227/GEMS-0091)/2FACC-055-001	100				6.00		
155	(GEMS-0227/GEMS-0091)/2FACC-065-001	92.5						
156	(GEMS-0227/GEMS-0091)/2FACC-073-002	87.5	3.5			6.25		
157	(GEMS-0227/GEMS-0091)/2FACC-110-001	100				6.00		
158	(GEMS-0227/Ki14)/GEMS-0218-006-001					7.00		
159	(GEMS-0227/Ki14)/GEMS-0218-025-001	100				7.00		
160	(GEMS-0227/Ki14)/GEMS-0218-040-001	90.5				5.75		
161	(GEMS-0227/Ki14)/GEMS-0218-041-001					7.25		
162	(GEMS-0227/Ki14)/GEMS-0218-061-001	100						
163	(GEMS-0227/Ki14)/GEMS-0218-061-002	100						
164	(GEMS-0227/Ki14)/PHW51-005-001					7.50		
165	(GEMS-0227/Ki14)/PHW51-013-001					6.75		
166	(GEMS-0227/Ki14)/PHW51-017-002					7.75		
167	(GEMS-0227/Ki14)/PHW51-030-002					7.00		
168	(GEMS-0227/Ki14)/PHW51-030-003	97.5				7.75		
169	(GEMS-0227/Ki14)/PHW51-040-001	87.5	5			7.50		
170	(GEMS-0227/Ki14)/PHW51-046-001					7.75		
171	(La Posta Seq C7 F64-1-1-1-1-B-B-B/LH193)/F9214Z-011-001					5.00		
172	(La Posta Seq C7 F64-1-1-1-1-B-B-B/LH193)/F9214Z-039-001					6.75		
173	(La Posta Seq C7 F64-1-1-1-1-B-B-B/LH193)/F9214Z-039-002	97.5				6.75		
174	(La Posta Seq C7 F64-1-1-1-1-B-B-B/LH193)/F9214Z-056-001	100	5.5			7.75		
175	(La Posta Seq C7 F64-1-1-1-1-B-B-B/LH193)/F9214Z-069-001	95				7.50		

Table 17. 2022 GEM Disease Trial Summary

Entry	Pedigree	Corteva		USDA			Trimble	
		Head Smut	Fusarium Ear Rot	Aflatoxins ng/g	Fumonisin (ng/g)	SLB	Tar Spot	Rust
176	(La Posta Seq C7 F64-1-1-1-B-B-B/LH193)/F9214Z-086-001					5.25		
177	(PHN37/CML313)/LH82-031-001	93	1.5					
178	(PHN37/CML313)/LH82-037-001					6.00		
179	(PHP38/CML343)/LH195-004-001					5.00		
180	(PHP38/CML343)/LH195-006-001	97.5	4			5.50		
181	(PHP38/CML343)/LH195-032-001	51	4			7.75		
182	(PHP38/CML343)/LH195-054-001					6.75		
183	(PHP38/CML343)/LH195-064-001					5.50		
184	(PHP38/CML343)/LH195-069-002					8.25		
185	(PHP38/CML423)/F9214Z-036-001					6.50		
186	(PHP38/CML423)/F9214Z-096-001	91.5				7.50		
187	(PHP38/CML423)/F9214Z-107-001	97.5				8.00		
188	(PHP38/CML423)/F9214Z-114-002	97.5				7.75		
189	(PHP38/CML423)/F9214Z-118-001					7.25		
190	(PHP38/CML423)/F9214Z-120-001					7.75		
191	(PHP38/CML423)/F9214Z-135-001					5.50		
192	(PHP38/Ki43)/2FACC-019-001					7.75		
193	(PHP38/Ki43)/2FACC-019-002					7.25		
194	(PHP38/Ki43)/2FACC-032-001	100	5			7.50		
195	(PHP38/Ki43)/2FACC-116-001	100	6			7.25		
196	(PHP38/Ki43)/LH195-046-002	100	5			8.00		
197	(PHP38/Ki43)/LH195-078-002					8.00		
198	(PHP38/Ki43)/LH195-085-001	97.5				8.00		
199	(PHP38/Ki43)/LH195-090-001					8.00		
200	(PHP38/Ki43)/LH195-094-001					8.00		
201	(PHP38/Ki43)/LH195-094-002					8.00		
202	01DIB2/GEM Pop Dev1-014-001-001	100	6					
203	01DIB2/GEM Pop Dev1-018-001-001	100	7					
204	01DIB2/GEM Pop Dev1-047-001-001	95	7.5					
205	3AZA1/GEM Pop Dev1-034-001-001	87.5	4.5					
206	3AZA1/GEM Pop Dev1-041-001-001	100	5					
207	3AZA1/GEM Pop Dev1-092-001-001	98	5					
208	84BRQ4/GEM Pop Dev1-039-001-001	93.5	3					
209	84BRQ4/GEM Pop Dev1-055-001-001	100	6.5					
210	84QAB1/GEM Pop Dev1-087-001-001	95.5	3.5					

Table 17. 2022 GEM Disease Trial Summary

Entry	Pedigree	Corteva		USDA			Trimble	
		Head Smut	Fusarium Ear Rot	Aflatoxins ng/g	Fumonisin (ng/g)	SLB	Tar Spot	Rust
211	84QAB1/GEM Pop Dev1-113-001-001	87	4					
212	91BMA2/GEM Pop Dev1-066-001-001	97.5	6.5					
213	91BMA2/GEM Pop Dev1-110-001-001	95	4					
214	91BMA2/GEM Pop Dev1-120-001-001	97.5	5					
215	F298W/GEM Pop Dev1-022-001-001	100	5.5					
216	FBPL/GEM Pop Dev1-018-001-001	97.5	6.5					
217	FBPL/GEM Pop Dev1-067-001-001	95.5	7					
218	FBPL/GEM Pop Dev1-086-001-001	100	5.5					
219	FBPN/GEM Pop Dev1-001-001-001	67	5					
220	FBPN/GEM Pop Dev1-045-001-001	100	5.5					
221	FBPN/GEM Pop Dev1-081-001-001	100	4.5					
222	HC33/GEM Pop Dev1-070-001-001	95.5	4.5					
223	HC33/GEM Pop Dev1-081-001-001	95	4.5					
224	HC33/GEM Pop Dev1-094-001-001	95	4.5					
225	LH225/GEM Pop Dev1-045-001-001	87	5					
226	LH225/GEM Pop Dev1-058-001-001	88	5					
227	LH225/GEM Pop Dev1-107-001-001	97.5	2.5					
228	LH226Ht/GEM Pop Dev1-110-001-001	92	5					
229	LH226Ht/GEM Pop Dev1-120-001-001	88	4.5					
230	LH226Ht/GEM Pop Dev1-121-001-001	91.5	5.5					
231	LH227/GEM Pop Dev1-014-001-001	94.5	3					
232	LH227/GEM Pop Dev1-066-001-001	91	6					
233	LH227/GEM Pop Dev1-105-001-001	97.5	5					
234	LH228/GEM Pop Dev1-038-001-001	95	4.5					
235	LH228/GEM Pop Dev1-055-001-001	97.5	6.5					
236	LH228/GEM Pop Dev1-094-001-001	97.5	3.5					
237	LH233/GEM Pop Dev1-032-001-001	85.25	5					
238	LH233/GEM Pop Dev1-093-001-001	97.5	5.5					
239	LH235/GEM Pop Dev1-105-001-001	92.5	5					
240	LH236/GEM Pop Dev1-038-001-001	96	4.5					
241	LH244/GEM Pop Dev1-041-001-001	100	5.5					
242	LH244/GEM Pop Dev1-045-001-001	97	5.5					
243	LH244/GEM Pop Dev1-081-001-001	97.5	4					
244	PH20A/GEM Pop Dev1-055-001-001	97.5	5.5					
245	PH20A/GEM Pop Dev1-070-001-001	88.5	5.5					

Table 17. 2022 GEM Disease Trial Summary

Entry	Pedigree	Corteva		USDA			Trimble	
		Head Smut	Fusarium Ear Rot	Aflatoxins ng/g	Fumonisin (ng/g)	SLB	Tar Spot	Rust
246	PH25A/GEM Pop Dev1-014-001-001	100	3					
247	PH25A/GEM Pop Dev1-058-001-001	97.5	5					
248	PH25A/GEM Pop Dev1-087-001-001	100	3.5					
249	PH40B/GEM Pop Dev1-105-001-001	97.5	5					
250	PH40B/GEM Pop Dev1-113-001-001	93	4					
251	PH40B/GEM Pop Dev1-120-001-001	95	3					
252	PH42B/GEM Pop Dev1-067-001-001	100	4.5					
253	PH42B/GEM Pop Dev1-089-001-001	95	3					
254	PH42B/GEM Pop Dev1-106-001-001	86.5	6					
255	PH80B/GEM Pop Dev1-038-001-001	98	4					
256	PH80B/GEM Pop Dev1-039-001-001	68	3.5					
257	PHAG6/GEM Pop Dev1-067-001-001	97.5	5.5					
258	PHAG6/GEM Pop Dev1-070-001-001	97.5	5					
259	PHBB3/GEM Pop Dev1-001-001-001	73	5					
260	PHBB3/GEM Pop Dev1-086-001-001	92.5	3.5					
261	PHEG9/GEM Pop Dev1-093-001-001	94.25	4					
262	PHEG9/GEM Pop Dev1-094-001-001	90.5	4					
263	PHEM7/GEM Pop Dev1-047-001-001	77.5	4.5					
264	PHEW7/GEM Pop Dev1-022-001-001	100	3.5					
265	PHEW7/GEM Pop Dev1-087-001-001	92.5	5					
266	PHHB4/GEM Pop Dev1-058-001-001	84	5.5					
267	PHHB4/GEM Pop Dev1-089-001-001	95	4					
268	RQAA8/GEM Pop Dev1-018-001-001	95	5					
269	RQAA8/GEM Pop Dev1-022-001-001	93	3.5					
270	SX2788:S(794)(GEMS-0188)(PHG39)-013-002	85.5				8.00		
271	SX2788:S(794)(GEMS-0188)(PHG39)-029-001	93.5				8.00		
272	SX2788:S(794)(GEMS-0188)(PHG39)-037-001	95				8.00		
273	SX2788:S(794)(GEMS-0188)(PHG39)-040-001					7.75		
274	SX2788:S(794)(GEMS-0188)(PHW51)-021-001	97.5	5.5			8.00		
275	SX2788:S(794)(GEMS-0188)(PHW51)-026-001	88.5	3.5			7.25		
276	SX2788:S(794)(GEMS-0188)(PHW51)-040-001	100				8.00		
277	SX2788:S(794)(GEMS-0188)(PHW51)-114-001					7.75		
278	WQCD10/GEM Pop Dev1-079-001-001	98	4.5					
279	WQCD10/GEM Pop Dev1-092-001-001	97	5					
280	WQCD10/GEM Pop Dev1-121-001-001	90	6.5					

Table 17. 2022 GEM Disease Trial Summary

Entry	Pedigree	Corteva		USDA			Trimble	
		Head Smut	Fusarium Ear Rot	Aflatoxins ng/g	Fumonisin (ng/g)	SLB	Tar Spot	Rust
281	ZS365/GEM Pop Dev1-039-001-001	71.5	3.5					
282	ZS365/GEM Pop Dev1-106-001-001	95.5	6.5					
283	ZS365/GEM Pop Dev1-121-001-001	88	4					

Corteva Legend:

Fusarium Ear Rot: 1-9, 9=best

Head Smut: % plants without smut

USDA

Aflatoxin: ng/g of toxin

Fumonisin: ng/g of toxin

SLB: 1-9, 9=best

Trimble

Tar Spot: 1-3, 3=Resistant

Rust: 1-3, 3=Resistant

Yield Trials

Table 18. 2021 GEM-Ames Coded Line Trials (2264301)

Entry	GEM Line	Tester	% CK YLD	Yield (bu/ac)	MST	Y/M	TWT
1	GEMS-0293	MBS5562	94.1	203.6	18.5	11.0	57.4
2	GEMS-0296	MBS9530	105.7	228.7	20.9	10.9	55.0
3	GEMS-0296	MBS5562	84.0	181.6	16.3	11.1	58.8
4	GEMS-0296	MBS8488	88.3	191.0	17.2	11.1	60.3
5	GEMS-0296	MBS9451	96.1	207.9	17.3	12.0	58.4
6	GEMS-0297	MBS9451	96.6	209.0	18.1	11.5	55.8
7	GEMS-0297	MBS5562	96.0	207.6	17.7	11.7	57.3
8	GEMS-0297	MBS9530	96.1	207.9	18.7	11.1	56.8
9	GEMS-0297	MBS8488	92.7	200.5	16.8	11.9	58.7
10	GEMS-0298	MBS8488	104.6	226.3	17.9	12.6	58.6
11	GEMS-0298	MBS5562	95.6	206.9	17.3	12.0	57.3
12	GEMS-0298	MBS9451	96.9	209.7	19.9	10.5	55.7
13	GEMS-0298	MBS9530	93.3	201.8	19.2	10.5	56.7
14	GEMS-0299	MBS9530	99.1	214.4	18.6	11.5	56.0
15	GEMS-0299	MBS8488	99.4	215.1	16.1	13.4	57.2
16	GEMS-0299	MBS5562	93.8	203.0	17.2	11.8	55.5
17	GEMS-0299	MBS9451	93.6	202.5	18.7	10.8	54.7
18	GEMS-0300	MBS9530	101.1	218.8	22.3	9.8	54.9
19	GEMS-0300	MBS5562	101.7	219.9	20.5	10.7	57.1
20	GEMS-0300	MBS8488	99.2	214.7	20.4	10.5	57.4
21	GEMS-0300	MBS9451	92.1	199.2	21.6	9.2	55.9
22	GEMS-0301	MBS9451	104.2	225.4	19.5	11.6	56.4
23	GEMS-0301	MBS5562	102.0	220.6	17.8	12.4	57.2
24	GEMS-0301	MBS9530	102.2	221.0	20.3	10.9	56.6
25	GEMS-0303	MBS9530	87.3	188.9	18.5	10.2	57.7
26	GEMS-0303	MBS5562	80.3	173.7	17.4	10.0	58.2
27	GEMS-0303	MBS8488	87.5	189.2	17.1	11.1	58.5
28	GEMS-0303	MBS9451	83.5	180.6	19.5	9.2	57.1
29	GEMS-0304	MBS9530	89.2	192.9	18.5	10.4	58.1
30	GEMS-0304	MBS9451	88.8	192.0	19.1	10.1	57.7
31	GEMS-0304	MBS5562	87.6	189.6	17.1	11.1	58.8
32	GEMS-0304	MBS8488	86.9	188.1	17.2	10.9	59.1
33	GEMS-0305	MBS9530	99.4	214.9	17.6	12.2	57.4
34	GEMS-0305	MBS5562	91.4	197.8	17.1	11.6	57.8
35	GEMS-0305	MBS9451	95.0	205.5	18.6	11.0	56.2
36	GEMS-0305	MBS9530	93.0	201.2	18.2	11.0	57.7
37	GEMS-0305	MBS5562	89.8	194.1	17.5	11.1	57.4
38	GEMS-0305	MBS8488	99.6	215.5	17.5	12.3	58.9
39	GEMS-0306	MBS8488	88.9	192.2	18.2	10.6	58.8
40	GEMS-0306	MBS9530	91.8	198.5	20.3	9.8	57.4
41	GEMS-0306	MBS5562	91.6	198.2	18.3	10.9	57.3
42	GEMS-0306	MBS9451	84.6	183.0	20.6	8.9	56.0
43	GEMS-0307	MBS9530	98.8	213.8	19.9	10.8	57.0
44	GEMS-0307	MBS9451	84.7	183.2	20.9	8.8	56.0
45	GEMS-0307	MBS8488	93.9	203.0	19.3	10.5	58.3

Table 18. 2021 GEM-Ames Coded Line Trials (2264301)

Entry	GEM Line	Tester	% CK YLD	Yield (bu/ac)	MST	Y/M	TWT
46	GEMS-0307	MBS5562	89.6	193.8	17.5	11.1	57.2
47	GEMS-0308	MBS9530	86.5	187.0	19.3	9.7	58.5
48	GEMS-0308	MBS5562	88.7	191.9	18.2	10.5	59.2
49	GEMS-0308	MBS8488	94.3	204.0	18.6	11.0	59.9
50	GEMS-0308	MBS9451	89.1	192.6	20.9	9.2	57.3
51	GEMS-0313	MBS5562	92.3	199.6	17.1	11.7	58.3
52	GEMS-0313	MBS8488	99.8	215.8	16.6	13.0	59.6
53	GEMS-0313	MBS9451	98.6	213.2	18.5	11.5	56.8
54	GEMS-0313	MBS9530	96.6	209.0	18.3	11.4	58.7
55	GEMS-0314	MBS9530	92.8	200.6	19.7	10.2	60.0
56	GEMS-0314	MBS8488	95.9	207.4	18.5	11.2	58.0
57	GEMS-0314	MBS5562	102.5	221.6	18.2	12.2	56.7
58	GEMS-0314	MBS9451	93.8	202.9	20.8	9.8	55.3
59	GEMS-0315	MBS9530	90.1	195.0	18.5	10.6	56.6
60	GEMS-0315	MBS9451	96.5	208.8	19.1	10.9	55.6
61	GEMS-0315	MBS5562	89.4	193.4	16.6	11.7	57.4
62	GEMS-0315	MBS8488	93.6	202.4	17.3	11.7	58.3
63	GEMS-0316	MBS9451	85.8	185.6	19.8	9.4	55.9
64	GEMS-0316	MBS8488	85.1	184.1	17.3	10.6	58.2
65	GEMS-0316	MBS9530	91.2	197.3	19.5	10.1	56.8
66	GEMS-0316	MBS5562	89.0	192.6	17.8	10.8	56.5

Number of Locations			14	14		14
Non Check Mean			202.0	18.6		57.4
Check Mean			216.3	18.4		57.0
H ²			0.78	0.92		0.88

Table 19. 2022 GEM-Ames Coded Line Trials (2264302)

Entry	GEM Line	Tester	% CK YLD	Yield (bu/ac)	MST	Y/M	TWT
1	GEMN-0097	MBS2776	108.2	228.8	19.0	12.1	56.0
2	GEMN-0097	MBS2887	102.7	217.2	17.2	12.7	56.9
3	GEMN-0097	MBS3628	101.0	213.5	17.7	12.1	56.5
4	GEMN-0178	MBS2691	98.8	208.9	23.3	9.0	53.9
5	GEMN-0178	MBS2776	109.0	230.6	21.9	10.5	54.0
6	GEMN-0178	MBS2887	108.8	230.1	21.1	10.9	54.3
7	GEMN-0267	MBS3628	104.0	219.9	17.4	12.6	56.5
8	GEMN-0267	MBS2691	96.4	203.9	19.5	10.5	56.9
9	GEMN-0267	MBS2776	110.4	233.5	18.7	12.5	56.3
10	GEMN-0267	MBS3495	93.4	197.6	17.3	11.4	57.4
11	GEMN-0267	MBS2887	111.3	235.3	18.1	13.0	56.7
12	GEMN-0287	MBS3495	93.4	197.5	19.6	10.1	56.1
13	GEMN-0287	MBS3628	108.4	229.3	19.8	11.6	54.3
14	GEMN-0292	MBS2691	88.9	188.1	20.9	9.0	55.3
15	GEMN-0292	MBS2776	98.0	207.3	20.9	9.9	54.1
16	GEMN-0292	MBS3628	98.5	208.4	20.6	10.1	54.4
17	GEMN-0292	MBS3495	95.1	201.0	19.4	10.4	56.5
18	GEMN-0292	MBS2887	105.9	224.0	20.1	11.1	54.5
19	GEMN-0302	MBS2691	92.5	195.7	19.1	10.2	56.7
20	GEMN-0302	MBS3495	92.3	195.2	18.1	10.8	58.1
21	GEMN-0302	MBS2887	98.1	207.5	18.1	11.5	57.6
22	GEMN-0302	MBS3628	99.4	210.2	17.3	12.1	56.6
23	GEMN-0309	MBS2691	92.3	195.3	22.1	8.9	55.9
24	GEMN-0309	MBS2776	106.8	225.8	19.4	11.7	59.0
25	GEMN-0309	MBS2887	102.3	216.4	20.8	10.4	56.5
26	GEMN-0309	MBS3495	82.9	175.2	18.6	9.4	58.5
27	GEMN-0309	MBS3628	91.8	194.2	19.5	9.9	56.5
28	GEMN-0317	MBS2776	106.2	224.6	19.6	11.5	55.6
29	GEMN-0317	MBS3495	98.3	208.0	18.5	11.2	58.7
30	GEMN-0317	MBS2691	102.1	215.9	19.6	11.0	56.4
31	GEMN-0317	MBS2887	104.9	221.8	18.8	11.8	56.9
32	GEMN-0317	MBS3628	95.7	202.4	19.2	10.5	56.6
33	GEMN-0318	MBS2691	104.3	220.5	20.8	10.6	55.5
34	GEMN-0318	MBS3495	98.0	207.3	18.3	11.4	58.3
35	GEMN-0318	MBS2776	101.4	214.4	19.5	11.0	56.8
36	GEMN-0318	MBS2887	108.5	229.4	19.7	11.7	56.2
37	GEMN-0319	MBS2691	96.2	203.6	21.7	9.4	55.2
38	GEMN-0319	MBS2776	108.8	230.1	19.5	11.8	55.3
39	GEMN-0319	MBS3495	98.1	207.5	19.0	10.9	57.7
40	GEMN-0319	MBS2887	105.0	222.1	19.3	11.5	55.6
41	GEMN-0319	MBS3628	102.3	216.3	20.1	10.7	54.9

Number of Locations			11	11		11
Non Check Mean			212.5	19.5		56.2
Check Mean			211.5	18.4		56.9
H ²			0.76	0.91		0.90

Table 20. 2022 GEM-Ames Yield Trial Summary

Experiment	Material	Tester	Entries	Locations	Plots	Usable Reps	H ² Yield
2210101	KS23-6/LH195//PHHB4; La Posta Seq C7/40a//R3212Z	MBS8488	84	6	504	6	0.59
2210102	La Posta Seq C7/40a//R3212Z; LH204//KS23-6/PHW52	MBS8488	96	6	576	6	0.68
2213101	2FACC//KO679Y/La Posta Seq C7; 2FACC//KS23-6/LH204	MBS8488	72	6	432	6	0.55
2213102	2FACC//KS23-6/LH204; KS23-6/LH195//PHHB4	MBS8488	72	6	432	6	0.72
2213103	LH204//La Posta Seq C7/PHP38; PHHB4/KS23-6//2FACC	MBS8488	84	6	504	6	0.66
2213104	PHHB4/KS23-6//2FACC; PHHB9//KS23-6/PHW52	MBS8488	96	6	576	6	0.71
2213105	PHHB9//KS23-6/PHW52	MBS8488	48	6	288	6	0.67
2213106	PHHB9//KS23-6/PHW52	MBS8488	48	6	288	6	0.65
2213107	PHP38/CML287//LH195; PHW52//KS23-6/PHP38	MBS8488	36	6	216	6	0.76
2213108	PHW52//KS23-6/PHP38; PHW52//La Posta Seq C7/LH204	MBS8488	72	6	432	6	0.77
2213109	PHW52//La Posta Seq C7/LH204; PHP38/89291//R3212Z	MBS8488; MBS8814	96	6	576	6	0.80
2213110	PHMK0/KS23-6//HC33	MBX19671	36	6	216	6	0.72
2213111	CML449/LH82//MM402A; LH213/AC454//3IIH6	MBX20601	60	6	360	6	0.74
2213112	CML449/LH82//LH168; F45/DK_HBA1//PHG35; FL_4BT7/LH185//LH168; LH185/89343//PHN18; LH185/CML449//PHN18	MBS3640GT	84	6	504	6	0.64
2213113	LH185/CML449//PHN18; LH82/89343//PHR03; LH213/AC454//PHN18	MBS3640GT	48	6	288	6	0.86
2213114	PHN37/CA00370//LH82; PHN37/CA00370//PHG35; PHN37/CML449//MM501D	MBS3640GT	60	6	360	6	0.79
2213115	PHN37/CML449//MM501D; PHN37/CML449//PHW86	MBS3640GT	60	6	360	6	0.86
2264201	GEMS-0220/CML373//R3212Z; GEMS-0227/CML373//R3212Z; GEMS-0227/Ki14//GEMS-0218; GEMS-0227/Ki14//PHW51; La Posta Seq C7/LH193//F9214Z; SX2788/794//GEMS-0188//PHG39; SX2788/794//GEMS-0188//PHW51	MBS8488	72	10	720	10	0.77
2264202	GEMS-0220/CML373//R3212Z; GEMS-0227/CML373//R3212Z; GEMS-0227/Ki14//GEMS-0218; GEMS-0227/Ki14//PHW51; La Posta Seq C7/LH193//F9214Z; SX2788/794//GEMS-0188//PHG39; SX2788/794//GEMS-0188//PHW51	MBS8731; MBX19671; MBS8814	72	9	648	9	0.81
2264203	GEMS-0113/CML103//GEMS-0227; GEMS-0113/CML103//PHG39; GEMS-0227/GEMS-0091//2FACC; PHP38/CML343//LH195; PHP38/CML423//F9214Z; PHP38/Ki43//2FACC; PHP38/Ki43//LH195	MBS8488	48	11	528	11	0.86
2264204	GEMS-0113/CML103//GEMS-0227; GEMS-0113/CML103//PHG39; GEMS-0227/GEMS-0091//2FACC; PHP38/CML343//LH195; PHP38/CML423//F9214Z; PHP38/Ki43//2FACC; PHP38/Ki43//LH195	MBS8731	48	10	480	10	0.75
2264205	CML449/PHG47//LH82; CML494/GEMN-0097//LH185; PHN37/CML313//LH82	MBS3520	30	10	300	10	0.89
2264206	CML449/PHG47//LH82; CML494/GEMN-0097//LH185; PHN37/CML313//LH82	MBS3640GT	30	8	240	8	0.89
2264301	GEM Stiff Stalk Coded Line Trial	Misc.	72	14	1008	14	0.78
2264302	GEM Non-stiff Stalk Coded Line Trial	Misc.	48	11	528	11	0.76

Table 21. 2022 NCG01 GEM-Raleigh

Entry	Pedigree	Yield (bu/ac)	% Yield /CHK ^z	Moist (%)	Yield /Moist	Test Weight (lb/bu)	Stalk Lodging (%)	Root Lodging (%)	Erect Plants (%)	Plant Height (cm)	Ear Height (cm)
1	(GEMN-0097/GEMN-0048)-07-01//MBS2887	156	80	16.7	9.4	56.8	0.7	9.5	89.9	242	126
2	(GEMN-0097/GEMN-0048)-39-01//MBS2887	166	86	16.8	9.9	55.0	3.2	10.7	86.5	251	130
3	(GEMN-0097/GEMN-0048)-39-01//MBS3640GT	165	85	17.0	9.8	55.2	1.3	8.0	91.1	248	121
4	CA00370:N(GEMN-0097)40x-029-02/MBS3640GT	161	83	20.0	8.3	53.7				259	124
5	GEMN-0048/MBS2887	166	85	18.3	9.1	55.2	2.7	10.4	87.2	252	135
6	GEMN-0097/MBS2887	171	88	16.7	10.2	55.3	0.7	7.9	91.5	248	126
7	GEMN-0104/MBS2887	173	89	20.7	8.3	54.0	1.6	9.3	89.6	258	129
8	GEMN-0104/MBS3520	183	94	20.4	9.1	54.0	1.6	10.7	88.0	265	125
9	GEMN-0104/MBS3640GT	187	96	20.6	9.1	53.1	0.5	10.0	89.6	254	130
10	GEMN-0104/MBS3708	175	90	21.5	8.2	54.3	3.7	3.6	93.2	262	142
11	GEMN-0104//PHHB9/LH244	171	88	20.7	8.3	55.1	2.1	7.1	91.1	264	132
12	GEMN-0124/MBS2887	165	85	20.5	8.0	54.3	11.1	11.3	79.2	248	134
13	GEMN-0124/MBS3520	176	90	21.3	8.3	53.4	1.2	7.1	91.8	247	117
14	GEMN-0124/MBS3640GT	185	95	20.7	9.0	53.0	0.5	10.0	89.6	247	130
15	GEMN-0124/MBS3708	168	86	21.4	7.8	54.1	6.6	12.9	81.5	259	126
16	GEMN-0124//PHHB9/LH244	160	82	21.2	7.5	54.8	3.5	9.5	87.5	249	120
17	GEMS-0232/MBS2887	180	93	19.4	9.3	54.9	10.5	9.2	81.7	259	140
18	GEMS-0232/MBS3520	187	96	19.0	9.8	55.3	2.6	8.9	89.0	262	137
19	GEMS-0232/MBS3640GT	182	94	19.6	9.4	54.4	1.0	10.7	88.5	253	135
20	GEMS-0232/MBS3708	182	94	20.4	9.0	56.2				265	139
21	GEMS-0232//PHHB9/LH244	181	93	19.5	9.3	56.3	2.6	8.8	89.0	257	138
22	GEMN-0254/MBS2887	179	92	18.8	9.5	57.0	2.5	9.3	88.6	254	133
23	GEMN-0259/MBS2887	156	80	18.6	8.4	56.5	6.6	12.2	82.1	257	149
24	GEMN-0257/MBS2887	189	97	21.1	9.0	54.1	2.2	6.2	91.9	264	139
25	GEMN-0257/MBS3520	167	86	21.3	7.8	54.8	1.2	7.4	91.6	262	138
26	GEMN-0257/MBS3640GT	181	93	22.4	8.2	54.4	0.4	9.3	90.4	261	135
27	GEMN-0257/MBS3708	170	87	21.9	7.8	54.7	7.6	11.0	82.5	268	144
28	GEMN-0257//PHHB9/LH244	166	85	21.3	7.8	55.3	2.2	9.7	88.5	259	128
29	GEMN-0270/MBS2887	168	86	19.4	8.5	54.6	16.6	7.2	78.9	260	136
30	GEMN-0271/MBS2887	180	93	18.7	9.6	56.9	3.9	5.0	91.6	270	147
31	GEMN-0272/MBS2887	170	87	18.4	9.3	52.1	1.4	9.6	89.2	251	134
32	GEMN-0272/MBS3640GT	169	87	17.9	9.5	53.7	1.3	8.0	91.1	261	128
33	GEMN-0287/MBS2887	170	87	18.8	9.0	54.4	2.4	10.7	87.2	262	132
34	GEMN-0292/MBS2887	163	84	17.6	9.3	55.2				253	128
35	GEMN-0310/MBS2887	160	82	17.8	9.0	54.6	15.6	9.7	76.9	251	132

Table 21. 2022 NCG01 GEM-Raleigh

Entry	Pedigree	Yield (bu/ac)	% Yield /CHK ^z	Moist (%)	Yield /Moist	Test Weight (lb/bu)	Stalk Lodging (%)	Root Lodging (%)	Erect Plants (%)	Plant Height (cm)	Ear Height (cm)
36	DeKalb 63-57	182	94	18.4	10.0	57.0	0.7	8.6	90.8	229	118
37	<i>DeKalb 67-44</i>	203	104	19.3	10.5	57.4	1.9	12.1	86.3	241	120
38	<i>DeKalb 68-69</i>	200	103	22.1	9.2	56.3	2.2	10.7	87.4	239	114
39	<i>DeKalb 69-16</i>	198	102	20.9	9.6	56.9	0.0	9.3	90.7	235	112
40	Pioneer 1197R	162	83	17.1	9.6	56.8	0.9	10.0	89.2	229	105
41	<i>Pioneer 1637R</i>	192	99	20.4	9.4	55.9	0.7	11.6	87.8	253	115
42	<i>Pioneer 1794VYHR</i>	189	97	19.9	9.6	56.7	4.2	10.0	86.4	254	127
43	<i>Pioneer 1847VYHR</i>	196	101	21.4	9.2	56.5	0.9	10.0	89.2	245	117
44	<i>Pioneer 1870YHR</i>	187	96	20.5	9.2	57.5	0.0	10.0	90.0	243	111
45	Pioneer 2088R	185	95	20.9	8.9	55.8	0.0	9.3	90.7	254	117
46	Pioneer 2160YHR	194	100	21.0	9.3	57.4	0.0	10.7	89.3	247	125
47	Pioneer 1464 VYHR	215	111	19.8	10.9	57.1	1.2	12.1	86.8	251	124
48	A2956C	155	80	16.6	9.3	57.5	4.1	7.9	88.6	229	105
49	Pioneer 1870	186	96	20.0	9.6	57.2	0.3	10.7	89.1	253	117
50	Pioneer 1870AM	189	97	20.7	9.3	57.0	0.5	10.7	88.9	242	109
Replications		17		17	17	15	6	7	7	10	6
Check Means		194		20.6	9.5	56.7	1.4	10.5	88.2	244	117
Overall Means		178		19.8	9.1	55.4	2.9	9.3	88.2	252	129
CV		12.5		6.9	14.0	2.6	301	58	11.0	5.2	9.0
LSD (p=0.05)		13.8		0.9	0.8	0.9	5.3	3.4	6.0	8.2	7.2

Trial Information

- Commerical hybrids in *italics* were included in calculating check mean

Table 22. 2022 NCG02 GEM-Raleigh

Entry	Pedigree	Yield (bu/ac)	% Yield /CHK [#]	Moist (%)	Yield /Moist	Test Weight (lb/bu)	Stalk Lodging (%)	Root Lodging (%)	Erect Plants (%)	Plant Height (cm)	Ear Height (cm)
1	(CL-G1501:S17b-B-020/GEMS-0050)-001-01//MBS8731	180	89	18.4	10.0	53.0	1.6	9.0	90	255	146
2	(CL-G1501:S17b-B-020/GEMS-0050)-004-03//MBS8731	189	94	18.9	10.1	53.2	2.4	8.4	90	265	137
3	(CL-G1501:S17b-B-020/GEMS-0050)-011-01//MBS8731	189	94	18.3	10.3	53.4	0.9	10.1	89	261	138
4	(CL-G1501:S17b-B-020/GEMS-0050)-011-02//MBS8731	185	92	18.5	10.0	54.3	3.4	9.0	88	266	134
5	GEMS-0027/GEMS-0220)-03-05//MBS8731	187	93	19.5	9.6	53.9	0.7	10.3	89	256	129
6	GEMS-0050/MBS8814	173	86	19.0	9.1	55.3	0.0	8.1	92	254	125
7	GEMS-0115/MBS8731	182	90	18.5	9.8	55.5	0.0	8.0	92	261	140
8	GEMS-0115/MBS8814	170	85	19.8	8.7	55.7	1.8	8.1	90	250	127
9	GEMS-0147/MBS8731	187	93	19.6	9.5	53.8	3.5	9.4	88	260	123
10	GEMS-0147/MBS8814	163	81	20.1	8.1	55.3	2.0	10.0	88	256	128
11	GEMS-0220/MBS8731	178	89	17.9	9.9	55.5	1.0	8.1	91	252	108
12	GEMS-0226/MBS8731	176	88	19.8	9.0	56.1	0.2	10.6	89	257	135
13	GEMS-0227/MBS8731	171	85	18.2	9.5	55.4	0.0	8.1	92	248	114
14	(GEMS-0050/CL-G1501:S17b-B-020)-002-06//MBS8731	186	92	17.9	10.4	53.1	2.4	9.1	89	262	136
15	GEMS-0258/MBS9508	188	94	18.7	10.1	56.7	1.8	9.4	89	272	141
16	GEMS-0280/MBS8731	170	85	18.7	9.2	55.0	1.2	9.4	90	249	125
17	GEMS-0280/MBS8814	178	89	20.0	8.9	56.3	4.8	10.6	85	245	126
18	GEMS-0281/MBS8731	177	88	18.7	9.5	55.4	0.6	8.1	91	253	124
19	GEMS-0281/MBS8814	179	89	20.0	9.0	57.1	1.1	10.6	88	245	118
20	GEMS-0293/MBS6717	169	84	19.8	8.5	55.0	6.6	10.0	84	247	121
21	GEMS-0293/MBS8731	192	95	21.3	9.2	53.2	3.2	8.8	88	262	134
22	GEMS-0027/GEMS-0220)-06-01//MBS8731	180	90	18.6	9.7	54.8	0.7	9.4	90	261	132
23	GEMS-0293/MBS9508	174	87	19.3	9.2	57.3	4.9	6.4	89	253	127
24	(GEMS-0219/GEMS-0227)-B-015-001-002//MBS8731	180	90	19.0	9.4	55.2	0.0	10.6	89	253	119
25	(GEMS-0219/GEMS-0227)-B-015-001-002//MBS8814	178	89	20.1	8.9	55.0	0.9	9.1	90	248	113
26	GEMS-0311/MBS9508	178	89	19.3	9.3	57.9	1.0	9.4	90	263	133
27	GEMS-0311/MBS6717	175	87	20.4	8.6	55.1	0.4	11.3	88	262	130
28	GEMS-0311/MBS8731	188	93	20.1	9.5	54.9	1.8	9.6	89	272	142
29	GEMS-0027/GEMS-0220)-06-02//MBS8731	187	93	19.1	9.8	54.6	1.2	8.8	90	257	129
31	GEMS-0321/MBS9508	191	95	18.6	10.3	59.1	0.4	10.2	89	272	132

Table 22. 2022 NCG02 GEM-Raleigh

Entry	Pedigree	Yield (bu/ac)	% Yield /CHK [#]	Moist (%)	Yield /Moist	Test Weight (lb/bu)	Stalk Lodging (%)	Root Lodging (%)	Erect Plants (%)	Plant Height (cm)	Ear Height (cm)
32	(GEMS-0050/CL-G1501:S17b-B-020)-008-05//MBS8731	179	89	18.4	9.7	54.7	0.6	6.9	93	258	132
33	DeKalb 63-57	185	92	18.2	10.2	58.2	1.6	9.4	89	241	123
34	<i>DeKalb 67-44</i>	212	106	19.3	11.1	57.8	1.5	10.0	89	251	120
35	<i>DeKalb 69-16</i>	208	103	21.1	10.1	57.2	0.0	8.8	91	245	113
36	Pioneer 1197R	167	83	17.4	9.6	57.2	0.0	6.9	93	235	100
37	<i>Pioneer 1637R</i>	196	98	20.7	9.5	56.7	0.4	10.0	90	265	125
38	<i>Pioneer 1794VYHR</i>	186	92	19.7	9.5	57.2	8.3	8.8	84	259	131
39	<i>Pioneer 1847VYHR</i>	207	103	21.0	9.9	58.1	2.1	9.4	89	250	113
40	Pioneer 2088R	197	98	21.1	9.4	55.9	0.2	10.0	90	266	122

Replications	17		17	17	16	7	8	8	10	6
Check Means	201		20.3	9.9	57.3	2.5	9.4	88.5	254	121
Overall Means	183		19.3	9.5	55.6	1.6	8.6	90.0	256	126
CV	11.0		6.7	13.0	2.8	237	39	5.4	4.4	7.7
LSD (p=0.05)	12.5		0.8	0.8	1.0	2.3	2.1	3.0	7.0	6.1

Trial Information

- Commerical hybrids in *italics* were included in calculating check mean

