

Rice Experiment Station Overview 2023



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Rice Experiment Station Team

Dustin Harrell
Director

Emily Schaff
Executive Asst.

Teresa De Leon
Medium Grain

Nirmal Sharma
Long Grain

Frank Maulana
Short Grain

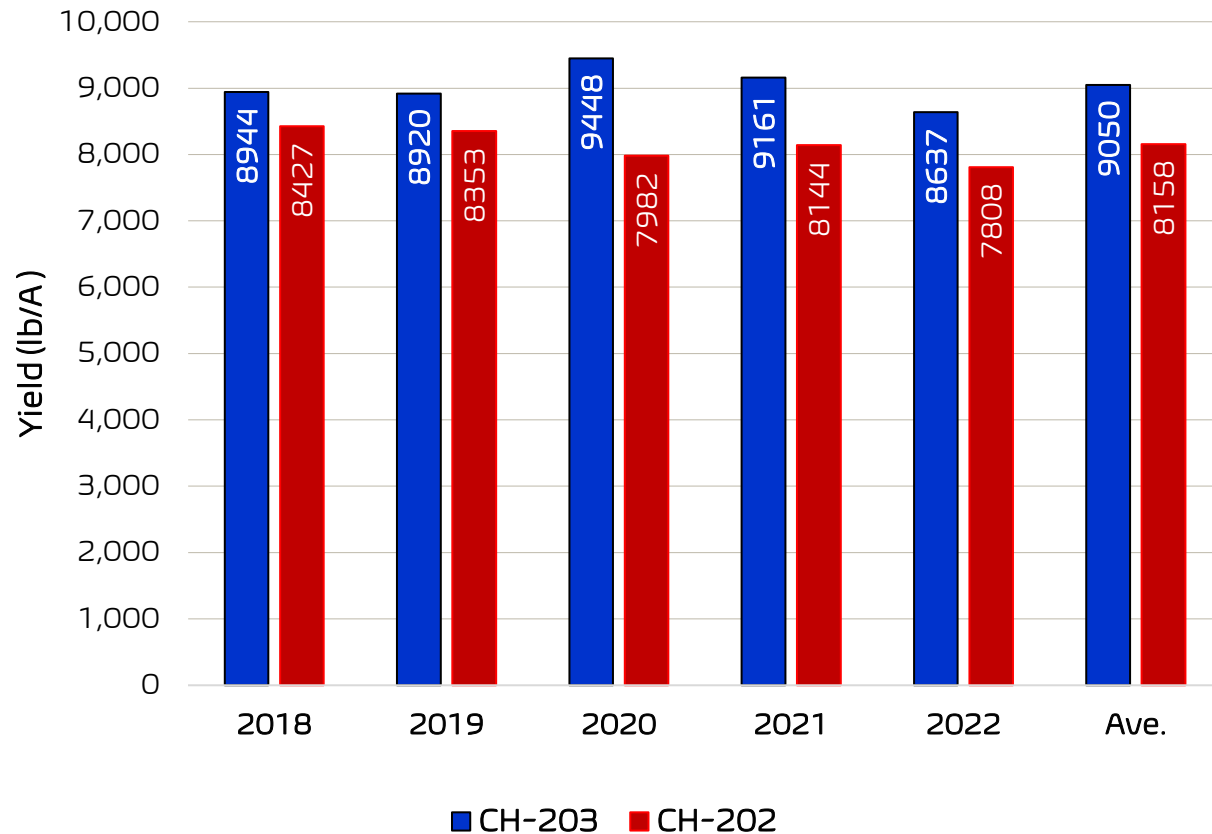
Gretchen
Zaunbrecher
Dir. Genetics Lab



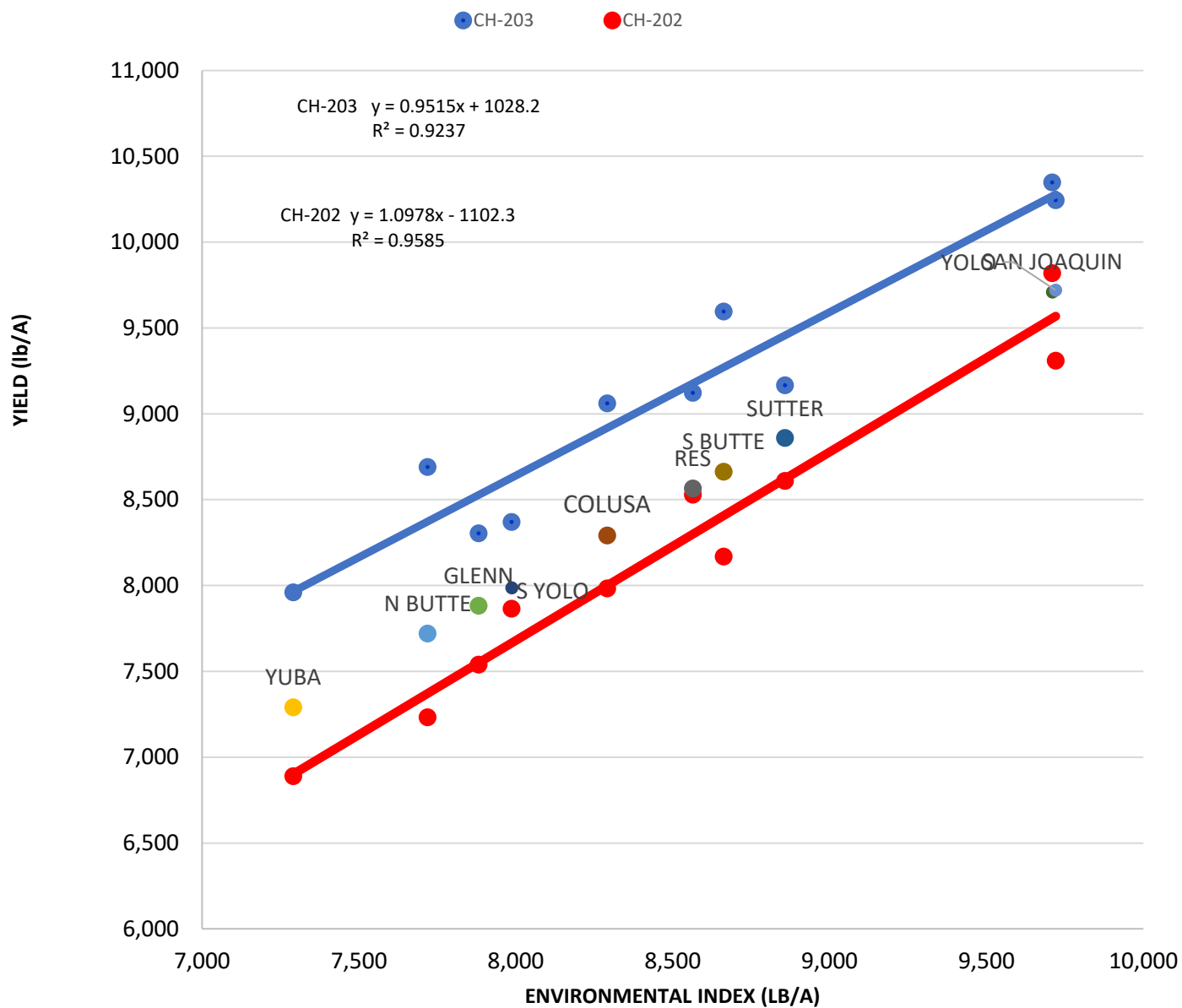
Calhikari-203 (CH-203)

Premium Quality Short Grain

Pedigree: 10Y2049/CH-202/4/Kosh*2/S-101//Kosh/S-101/3/Hitome



- 3rd Calhikari release (CH-201 & CH-202)
- Improved seedling vigor over CH-202
- Greatly Improved yield Potential w/o sacrificing quality
- 2-days earlier than CH-201 / 2-days later than CH-202
- 2023 - 1st year of registered seed production



	CH-202	CH-203	SOURCE
<i>Agronomics</i>			
% Head Rice/Total @ 18-20%MC	65/ 71	66/ 72	Milling Tests
Seedling Vigor (1-5)	4.8	4.8	SW Tests
Days to 50% Heading	87	89	SW Tests
Height (cm)	90	91	SW Tests
Lodging (%)	66	33	SW Tests
Panicle Blanking, SJ (%)	2	2	San Joaquin

Previous Calhikari varieties often referred to as Cal"itchy"

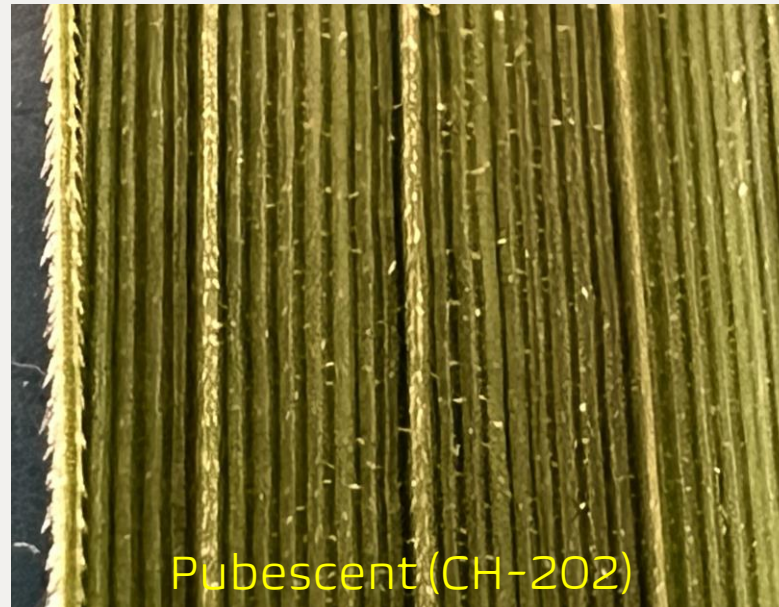
Pubescence

- Hairs on hulls, leaves
- Hairs called trichomes
- Glabrous – without hairs, smooth

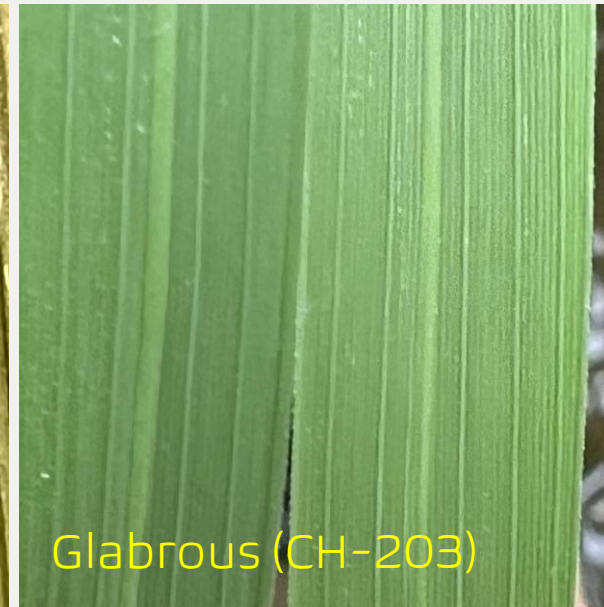


Pubescent (CH-202)

Glabrous (CH-203)



Pubescent (CH-202)



Glabrous (CH-203)



Mutation breeding with M-206 began. M_1 seed grown in greenhouse over the winter.

2012



29 potential mutants of M-206 seedlings were identified in a greenhouse herbicide screening

July 2014



First field testing began.
Genetic testing began.
Began crossing into other germplasm. Testing for F1 tolerance

2015

(12) United States Patent
McKenzie et al.
(10) Patent No.: US 11,180,771 B2
(45) Date of Patent: Nov. 23, 2021

(54) OXYFLUORFEN RESISTANT RICE LINES

(71) Applicant: CALIFORNIA COOPERATIVE
RICE RESEARCH FOUNDATION,
INC., Biggs, CA (US)

(72) Inventors: Kent Scheidel McKenzie, Oroville, CA
(US); Cynthia Razo Andaya, Chino,
CA (US); Virginia Cedro Andaya,
Chino, CA (US); Teresa Bernabe De
Leon, Chino, CA (US)

(73) Assignee: California Cooperative Rice Research
Foundation, Inc., Biggs, CA (US)

OTHER PUBLICATIONS

Fernandez, Pablo, et al. "Forward selection for multiple resistance
across the non-selective glyphosate, glufosinate and oxyfluorfen
herbicides in *Lolium* weed species." *Plant management science* 73.3
(2017): 936-944. (Year: 2017)*
Shimajima, Mei. "Biosynthesis and functions of the plant cuticle." *Protein
in lipid research* 98.3 (2011): 234-239. (Year: 2011)*
WO/PCT/US2017/04654, California Cooperative Rice Research
Foundation, Inc. Int. Search Report dated Dec. 11, 2017.
WO/PCT/US2017/04654, California Cooperative Rice Research
Foundation, Inc. Written Opinion dated Dec. 11, 2017.
WO/PCT/US2017/04654, California Cooperative Rice Research
Foundation, Inc. Int. Preliminary Report on Patentability dated
Mar. 19, 2019.
Abraham, et al., 2019, Efficacy of oxyfluorfen for weed control in
continuous rice, *Journal of Weed Research* 19.

US Patent granted for
Oxyfluorfen resistant rice
lines

November 2021



Variety release of
M-521

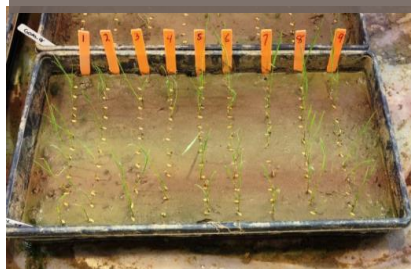
2023

2013

M_2 generation grown in
the field and harvested in
bulk (M_3).

November 2014

Seedlings were treated in
spray chamber and 9 lines
confirmed tolerant to
oxyfluorfen



2018

Albaugh & CCRRF
partnership began
ROXY® Trademark
granted

2022

Canadian Plant Novel
Trait Approval

2024

EPA and CDPR
Registration***





INITIAL ROXY RPS® VARIETY RELEASE

M-521

M = Medium Grain, 5 = ROXY, 2 = maturity, 1 = release #

Steps for California rice variety approval:

1. CCRRF approval & Albaugh co-approval
2. CCIA Certification Committee approval
3. California Rice Certification Act Advisory Board (managed by CRC)
 - Commercial Impact Review
 - ***2023 production must be Identity Preserved at drying and storage facilities***

M-521

M-210/14G9

(ROX 1.1 trait and M-210 blast resistance)

19Y4000

ROXY RPS



2023 Mill Quality Evaluation Program

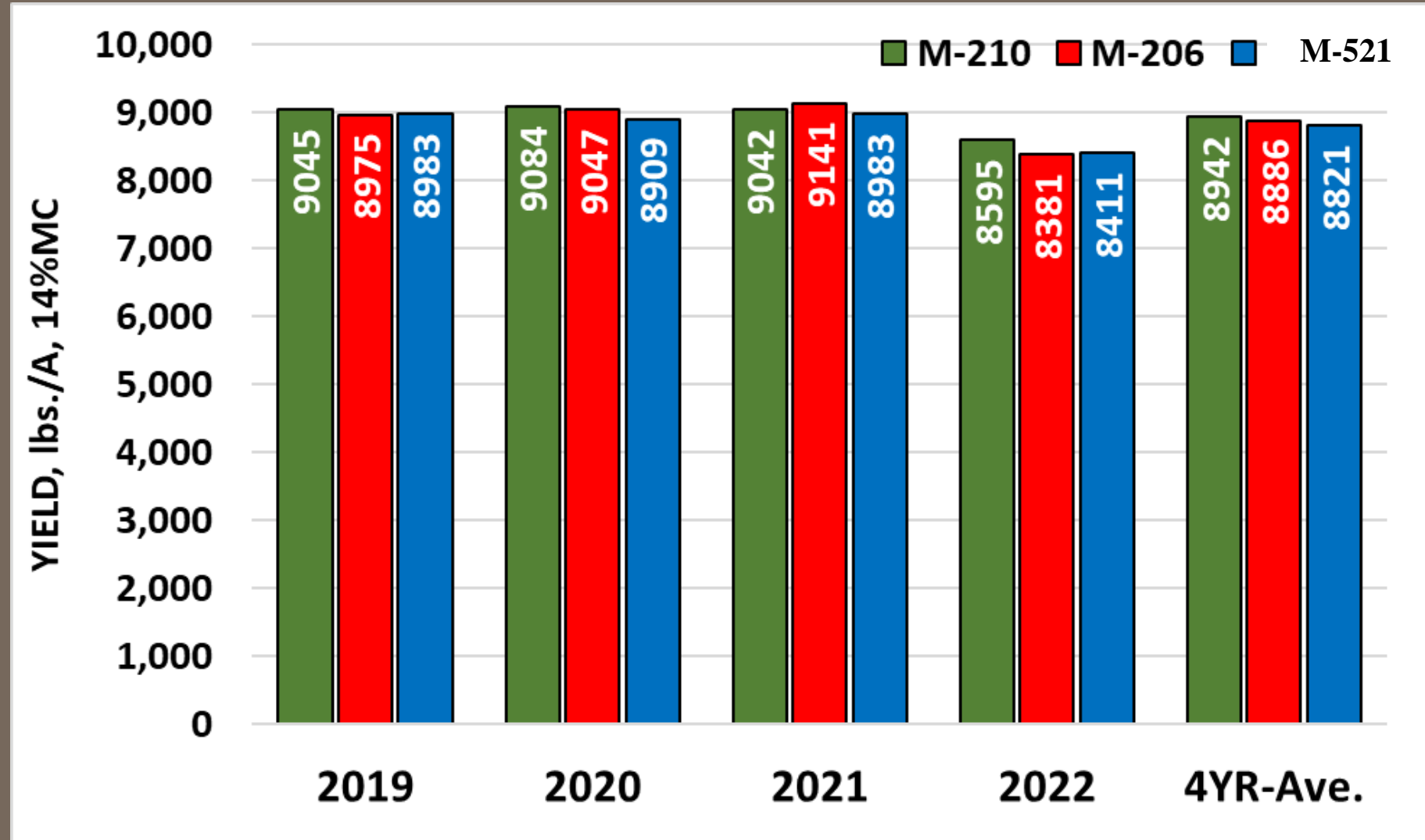
3 mills, 5 locations, ~300 acres



TRAIT	3-year Mean Performance			SOURCE
	M-206	M-210	19Y4000	
Agronomics				
Seedling Vigor (1-5)	4.8	4.8	4.8	SW Tests
Days to 50% Heading	87	87	87	SW Tests
Height (cm)	97	96	96	SW Tests
Lodging (%)	38	30	31	SW Tests
Blanking (%)	2	1	1	San Joaquin
Grain Qualities				
Head Rice Length (mm)	5.84	5.84	5.84	Milling Tests
Head Rice Width (mm)	2.74	2.74	2.70	Milling Tests
Head Rice L/W Ratio	2.13	2.14	2.17	Milling Tests
Head Rice 1000-grain Wt. (g)	21.59	21.70	21.28	Milling Tests
Head Rice Chalk Kernel (%)	1.99	1.20	3.36	Milling Tests
Head Rice Whiteness	132	133	132	Milling Tests
Head Rice Vitreousness	124	125	123	Milling Tests
Head Rice Protein (%)	5.7	5.8	6.3	Milling Tests
Apparent Amylose Content	18.6	19.0	20.5	Milling Tests
Pasting Temp (°C)	90	89	91	Milling Tests
Disease Reaction				
Stem Rot (1-5; 5 as highly susceptible)	3.9	3.9	3.6	Disease Nursery

M-521, A Blast-resistant & Herbicide tolerant Calrose Medium grain (ROXY)

RM3447 = M-210/M-206-G9



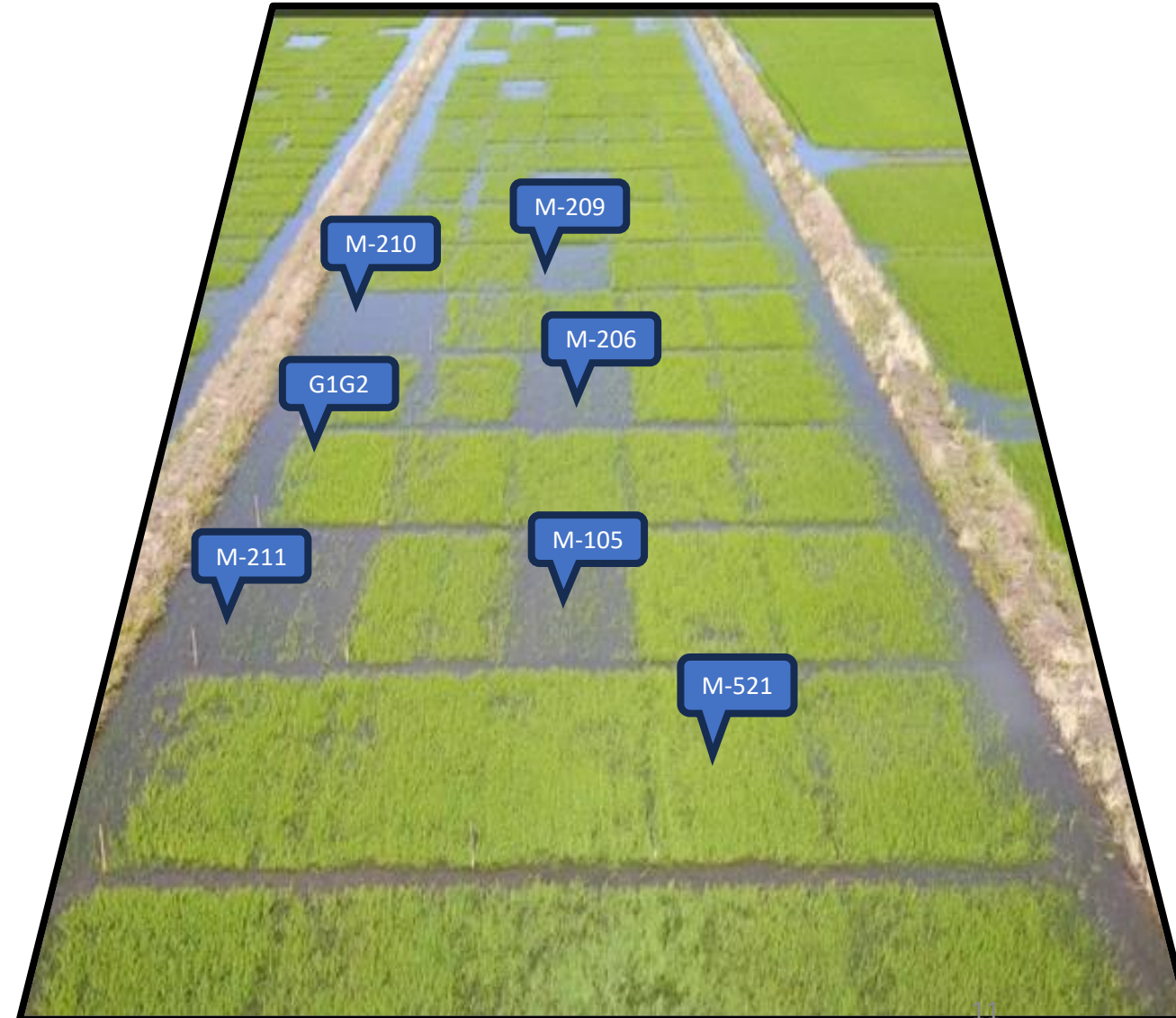
PROMISING ROXY LINES

Roxy-AYT FIELD (J2-B)

Planted 5/17/2023

Photo@37 dap (6/23/23)

23 ID	Yield (lbs./a)	MC	Seedling Vigor	Days to 50% to HDG	Height (cm)	Lodging (%)
23Y4180	10327	23	4.9	81	102	0
23Y4191	10279	22	4.9	80	98	0
23Y4170	10214	25	4.9	83	103	0
23Y4174	10145	22	5.0	79	100	3
M-521	9952	24	4.9	81	97	20
M-206	7308	24	3.1	82	101	0
M-105	5071	24	0.0	83	100	0
M-211	2841	15	0.0	82	95	3
M-209	2560	15	0.0	83	94	2
M-210	2174	14	0.0	83	90	0
MEAN	8282	23	4.1	81	99	14
5%LSD	2639	4	2.1	3	8	35
CV	19.7	10.1	31.6	1.9	5.0	156.6





ROXY seed increase
Nov 21 – approximately 4-leaf

20Y4033, PROMISING FRAGRANT CALROSE

(RM3850= M-206*2//A-202/M-206G7-3)

2021-23 SW Average	M-206	20Y4033
Grain Yield (lb/a)	8,706	8,585
Harvest MC, %	17	18
Seedling Vigor	4.8	4.8
Days to 50% Heading	88	87
Lodging Potential	39	56
Height (cm)	97	101
Panicle Blanking- SJ, GH (%)	1, 5	1, 2
Stem rot resistance	Sus (4.2)	Mod Res (2.7)
2023 Grain Data		
Milling Yield at 18-22MC	67% / 70%	62% / 71%
Total Whiteness	133	139
Vitreous Whiteness	125	127
Average Length	5.68	5.75
Average Width	2.45	2.53
L/W	2.32	2.27
1000-grain weight (g)	20.66	21.54
ChalkyKernel %	2.1	2.8
Taste value	70	71
Protein	7.3	7.3
Moisture	13.8	13.2
Amylose	19.5	19.6



18Y2070, Promising Arborio Rice

89Y235
Arborio-type

Arborio

18Y2070
ARBORIO TYPE

- 12% Yield advantage over 89Y235, 100% over Arborio
- With better milling yield than Arborio
- With smooth (glabrous) leaves and grains



SENSORY EVALUATION of 18Y2070 WITH ANSON MILLS, NC



Chef	Restaurant
Dawn Yanagihara	R&D / Editor
Chad Carter	Clemson Univ. - SC
Michael Tuohy	Private Chef - SF
Lora Zarubin	Private Chef - NY, NY
Bill Telepan - NYC	Metropolitan Museum Of Art - NYC
Paul Fehribach	Big Jones - Chicago, IL
Spencer Thomson	Umstead Hotel - Cary, NC
Brett Seuss	Market Place - Pinehurst, NC
CALAMORE	
Chef	Restaurant
Bruce Logue	BoccaLupo - Atlanta, GA
Evan Hanczor	Little Egg - Brooklyn NY
Mary Grace Viado	Village Tavern - NC
David Uygur	Lucia- Dallas, TX
Neal Harden	ABCV - NYC
Nick Anderer	Anton's - NYC
Lawrence Weeks	North of Bourbon -KY
Jae Jung	Kjun- NYC
Jarrett Stieber	Little Bear - Atlanta, GA
Hannah Johnson/Trevor Stockton	RT Lodge - Maryville, TN
Virginia Willis -	Chef/Stylist - GA
Amaryll Schwertner -	Boulette's Larder Ferry Building, SF

18Y2070 Cooking and Eating Quality Review

Trait	Score scale	Calamore	Arborio-1 (Arborio)	Arborio-2 (18Y2070)	Arborio-3 (89Y235)
Raw rice appearance	1= unacceptable, 3= acceptable, 5= preferred/desired	3.9	3.5	3.5	3.9
Aroma during cooking	1= unacceptable, 3= acceptable, 5= preferred/desired	3.7	3.3	3.5	3.6
Appearance after cooking	1= unacceptable, 3= acceptable, 5= preferred/desired	4.3	3.6	4.1	3.6
Cooked rice texture/mouthfeel	1= unacceptable, 3= acceptable, 5= preferred/desired	4.2	3.6	4.4	3.5
Cooked rice flavor/Taste	1= unacceptable, 3= acceptable, 5= preferred/desired	4.1	3.6	4.3	3.4
Arborio rice market acceptability	1= unacceptable, 3= acceptable, 5= preferred/desired	3.8	3.4	4.4	3.4
Average Total Score		24.0	21.0	24.1	21.0
# of Chef Participants		20		8	

“Calamore had more savory aroma than Italian Arborio.”

-Dawn Yanagihara, R&D / Editor

“Shiny white, al dente, kept shape. Tasty. Longer cook time than standard arborio, but great flavor/ texture.”

-Neal Harden, Chef, AbcV, NYC

“cooked rice favor had umami to it.”

-Bill Telepan, Metropolitan Museum of Art, NY

“holds a good al dente, sweet, nutty finish when cooked with veg stock.”

-Bruce Logue, BoccaLupo, GA

“nice floral nose, more aromatic than standard. Great flavor, deep rich rice starch and earthy flavor. Much more interesting/ compelling rice flavor than the standard arborio.” -Nick Anderer, Anton’s, NYC





The mission of the California Cooperative Rice Research Foundation

Our primary mission of CCRRF at the California Rice Experiment Station (RES) is development of improved rice varieties of all grain and market types to sustain high and stable grain yield and quality with minimum environmental impact for the benefit of California rice growers.

Read More

RES Rice Varieties

**M-211**
2020

**L-208**
2020

**S-202**
2019

**M-210**
2018

**Calaroma-201**
2018

Interactive Map of Rice Trials and Current Rice Data for 2023

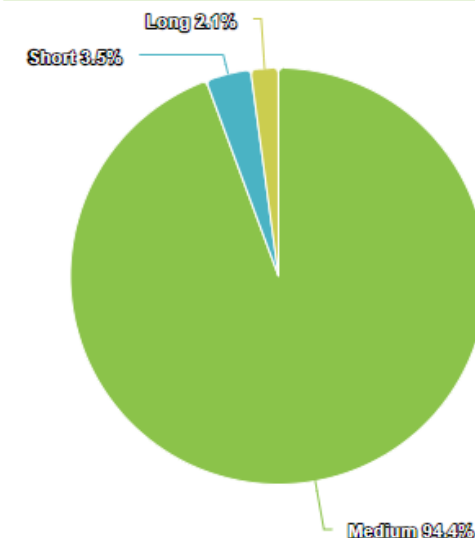
Rice Variety Trials by CA Locations



Estimated Rice Acreage Totals

Grain Type	Year	CA Est. Acres	% Acres
Medium	2023	485,000	94.4%
Short		18,000	3.5%
Long		11,000	2.1%
Total		514,000	
Medium	2022	218,000	85.5%
Short		30,000	11.8%
Long		7,000	2.7%
Total		255,000	

Estimated Rice Acreage by Grain Type



Rice Production and Trends of CCRRF Varieties

Rice Production of CCRRF Varieties from 2022-2023

[View Production Data](#)

Trend in CA Acreage of Small, Medium, and Long Grain Varieties

[View Trend Data](#)

RES Rice Variety Profile

[Performance](#) | [Grain Attributes](#) | [Paddy, Brown and Milled Grains](#)

Centennial Video





Rice Variety Trials By California Locations

Location: Rice Experiment Station

Rice Variety Trials by CA Locations

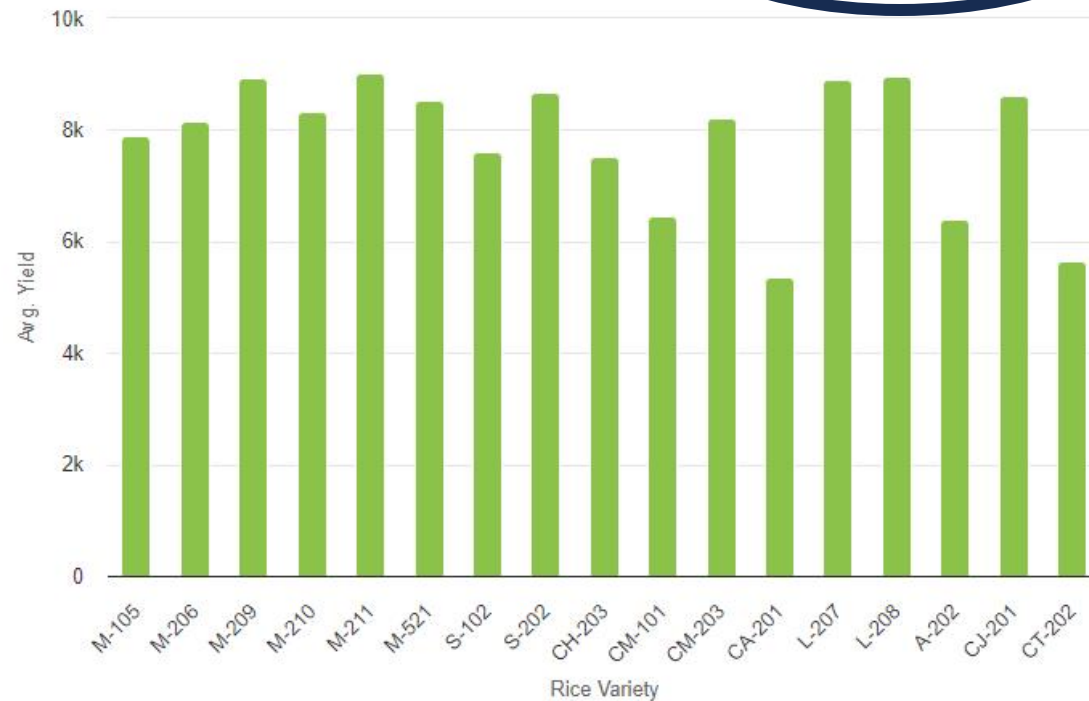
Currently Viewing Year:

2023 ▾



RICE MAP

Click on any Trial
Rice Location



Foundation Seed Portal

- Seed rice growers will have online account with the ability to:
 - Request foundation seed allocation from CCIA

Request Your Seed Allocations

Request for: **Tom McClellan**

In order to request your seed allocations, please complete all questions and click the **"Add Variety"** button to add a seed variety into your requested allocations. When finished adding varieties, please click the **"Submit My Request"** button.

Variety	Type	Requested Foundation Seed Allocation (cwt)	Source	Actions
M-105	Available	100	RES	Edit Delete
M-206	Available	N/A	Other	Edit Delete
L-205	Retired	N/A	RES	Edit Delete

[Add Variety](#)

In addition to making your variety requests, please answer the following questions regarding licensing and fees.

* Required Fields

Signing Agreements

Who will be signing the Warranty and Disclaimer? *

Tom McClellan

Who will be signing & paying the License Agreement? *

Farmers Rice Cooperative

Paying Fees

Who will be paying for Allocation? *

Tom McClellan

[Submit My Request](#)

Foundation Seed Portal

- Seed rice growers will have online account with the ability to:
 - Request foundation seed allocation from CCIA
 - Receive allocation correspondence from CCIA
 - Accept or modify allocation

Confirm Seed Allocations

Request for: **Tom McClellan**

Based on your request, the allocations listed below have been assigned and pending your approval below.

Variety	Type	Assigned Foundation Seed Allocation (cwt)	Source	Cost (cwt)	Total
M-105	Available	100	RES	\$50.00	\$5,000.00
M-206	Available	N/A	Other		
L-205	Retired	N/A	RES		\$2,009.00

Please confirm below if you would like to accept the assigned seed allocation (s). If accepted, we will send notifications to your inbox for signing agreements, additional license fees, and/or paying any deposits? *

- ☐ Yes, I accept this allocation.
- ☒ No, I wish to cancel or change this allocation

Please provide any information here with regards to cancelling or changing this allocation.

Submit

Foundation Seed Portal

- Seed rice growers will have online account with the ability to:
 - Request foundation seed allocation from CCIA
 - Receive allocation correspondence from CCIA
 - Accept or modify allocation
 - Sign warrantee & Disclaimer form; licensing agreements

Sign Warranty & Disclaimer

Warranty and Disclaimer for purchase of rice seed from Rice Experiment Station.

The California Cooperative Rice Research Foundation, Inc. (CCRRF) produces, processes, and sells a limited quantity of **seed** of public rice varieties annually as a service to the California rice industry. This seed is produced, processed, and labeled at the Rice Experiment Station (RES) in accordance with California standards for seed certification. Seed certification standards are established and monitored by California Crop Improvement Association. Purchasers of RES foundation, registered, or certified seed should read and understand the following Warranty and Disclaimer. [CCRRF recommends treatment of this seed to control bakanae disease.](#)

CCRRF expressly represents and warrants only that the seed it sells in the bulk containers conforms to the label and applicable standards for rice seed certification within recognized tolerances and as stated in the Articles of Registration. It is expressly agreed that CCRRF makes no other warranty, expressed or implied, with respect to the seeds distributed, or to the crop produced therefrom, or to the incidence of off-type (variants) in future generations. Purchaser remedies under this warranty are limited exclusively to replacement of non-conforming seed or the cost thereof. Incidental and consequential damages are expressly excluded. This warranty is the sole warranty and representation made by CCRRF.

The purchaser accepts the seed subject to the warranty contained herein and further acknowledges that prior to placing his signature hereon has read and understands the contents of this warranty and disclaimer.

Name

Tom McClellan

Date

11/15/2023

Signature of Purchaser

Use your mouse or keypad to sign within this box.

☒ Yes, I agree to this warranty & disclaimer.

Submit

Foundation Seed Portal

- Seed rice growers will have online account with the ability to:
 - Request foundation seed allocation from CCIA
 - Receive allocation correspondence from CCIA
 - Accept or modify allocation
 - Sign warrantee & Disclaimer form; licensing agreements
 - Pay deposits/balance

Pay Seed Deposit

California Cooperative Rice Research Foundation, Inc. (CCRRF)
Payment for Certified Classes of Seed

Bill To
Tom McClellan
123 someplace address
Richvale, CA 12345

Email
email@email.com

Phone
(530) 123-4567

Variety	Type	Assigned Foundation Seed Allocation (cwt)	Source	Cost (per cwt)	Total
M-105	Available	100	RES	\$50.00	\$5,000.00

Deposit Due: \$500.00 (10%)

A deposit of 10% is due for your assigned seed allocation. Please choose below to pay the deposit or full balance. *

- ☒ Pay 10% deposit
☐ Pay the full balance now

Payment Amount

\$500.00

Billing Information

Street Address *

Address Line 2 *

City *

State *

Zip *

Please select a method of payment. *

- ☒ Pay with Credit Card (#% Fee) or ACH Bank Account (No Fee)
☐ I prefer to pay by check

Credit Card

US Bank Account

Cardholder Name

Search for you Bank

Submit

Rice Experiment Station & Variety Update 2024

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Field Day August 28, 2024