Sugarcane Orange Rust: Its History and Impact in Florida

J. C. Comstock[1], N. C. Glynn[1], and R. W. Davidson[2]

[1]USDA-ARS Sugarcane Field Station, Canal Point, Florida
[2]Florida Sugar Cane League, Clewiston, Florida



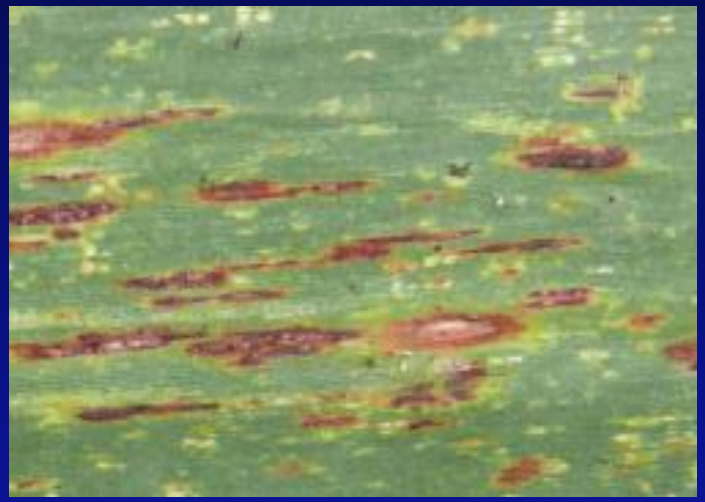

USDA
United States Department Of Agriculture
Agricultural Research Service

Comparison of Sugarcane Rusts in Florida

Brown Rust since 1978

Uredinia (Pustules)

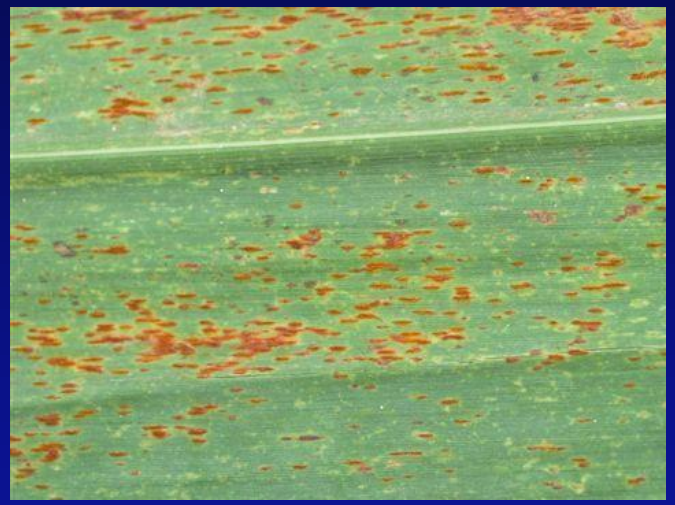
- Reddish-brown
- Elongate



Orange Rust since 2007

Uredinia (Pustules)

- Orange-brown
- More oval



USDA ARS United States Department Of Agriculture Agricultural Research Service

Brown and Orange Rust Pustules

Brown Rust



Orange Rust



100 x

Urediniospores of Sugarcane Rusts

Brown rust spores
Puccinia melancephala



Orange rust spores
Puccinia kuehnii



Pictures by Lisa Castlebury

Initial Status on Orange Rust in 2007

- Cultivar CP 80-1743 susceptible
- Cultivar CP 72-2086 moderately susceptible
- Cultivar CP 88-1762 resistant
- Cultivar CP 89-2143 resistant

In later years orange rust was observed on the last two cultivars

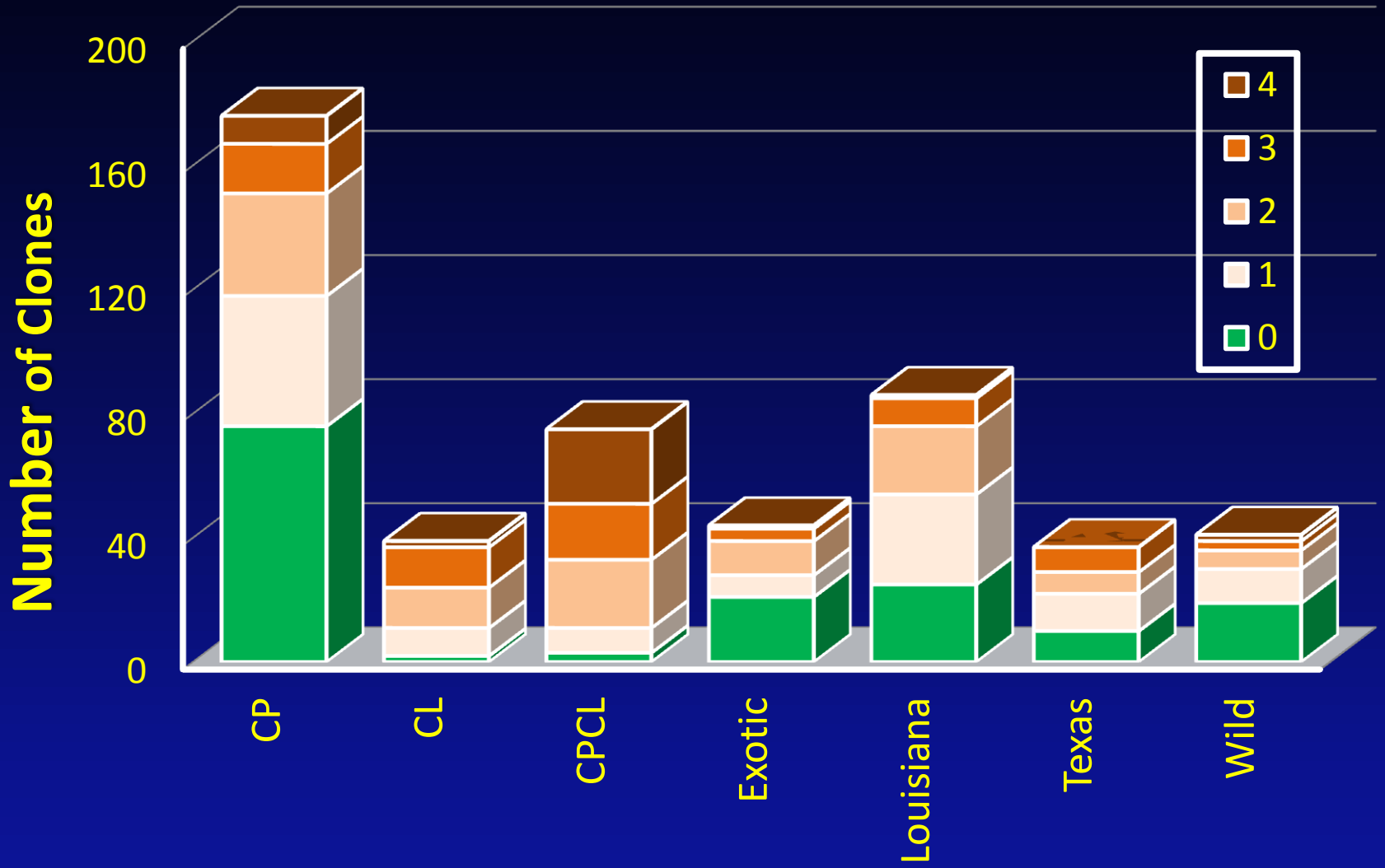
Annual Status of Sugarcane Orange Rust

- 2007
  - First detected in late June
  - Increased throughout crop
- 2008
  - Began in May lasted entire season
- 2009
  - Started late August-early September
- 2010
  - Started in March, small spike in May, then decreased until fall
- 2011
  - Low overall in Spring and Summer increasing in September/October at start of harvest

Commercial CP Cultivars

Cultivar	2010 Acreage (%)	Orange Rust Susceptibility
CP 88-1762	27.1	Highly Susceptible
CP 89-2143	25.5	Highly Susceptible
CP 80-1743	8.8	Highly Susceptible
CP 78-1628	8.5	Moderately Susceptible
CP 84-1198	3.8	Susceptible
CP 96-1252	2.8	Resistant
CP 72-2086	2.5	Susceptible
CP 00-1101	1.7	Resistant
CP 89-2376	0.8	Highly Susceptible

Orange Rust Susceptibility of Canal Point Parental Pool



Response to Orange Rust

- Intensified rust screening
  - Natural infection ratings taken at almost all stages
    - Plus variety collection and *S. spontaneum* clones
  - Artificial inoculation
    - Stage II
    - Stage III
    - Stage IV
- Restricted advancement of susceptible clones
- Increased molecular research
  - Marker development
  - Population development

Rust Ratings Clones Advanced to Stage III

Rust rating	2007	2008	2009	2010	2011
0	32 (23.5%)	86 (63.8%)	81 (60.0%)	109 (80.7%)	119 (88.1%)
0.5-0.9	33 (24.3%)	0 (0%)	40 (40.0%)	26 (19.3%)	0 (0%)
1.1-1.4	48 (35.3%)	40 (29.6%)	0 (0%)	0 (0%)	15 (11.1%)
1.5-1.9	21 (15.4%)	9 (6.7%)	0 (0%)	0 (0%)	4 (3.0%)
2.0	2 (1.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Check mean	0.8	1.6	1.5	1.2	0.4
Population mean	1.6	1.1	1.5	0.8	0.1

Rust Resistant Clones in Stage IV

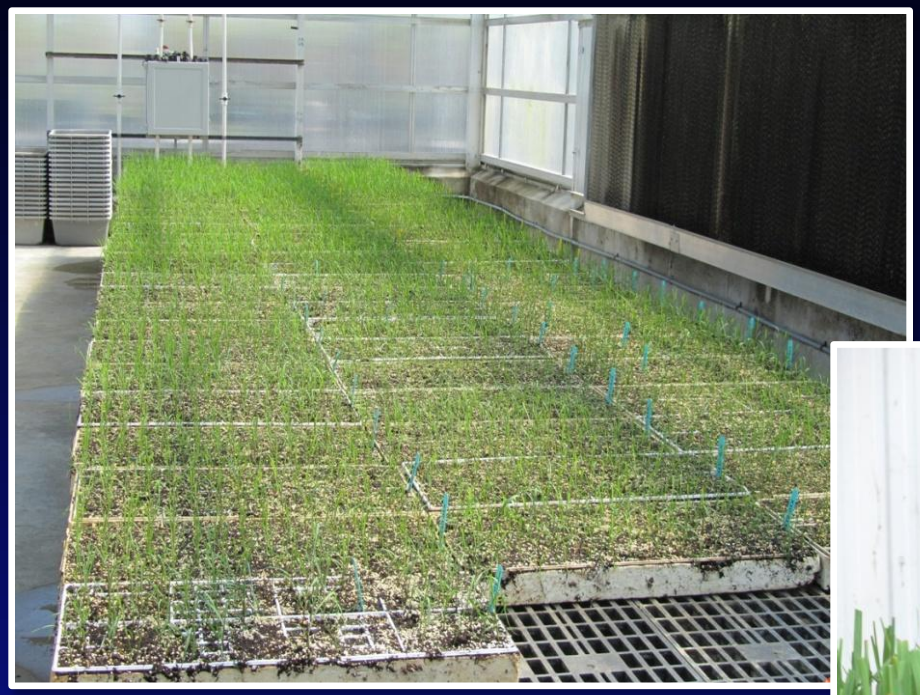
CP series	# of clones	% rust resistant
CP 02	13	38
CP 03	18	55
CP 04	17	64
CP 05	19	79
CP 06	18	72

Newly Released CP Cultivars

Cultivar	Orange Rust Susceptibility
CP 00-1101	Resistant
CP 00-2180	Resistant
CP 00-1446	Moderately Resistant
CP 01-1372	Resistant
CPCL 97-2730	Resistant
CPCL 99-4455	Resistant **(MR)**
CPCL 00-4111	Resistant
CP 03-1912	Resistant
CP 04-1566	Resistant
CP 04-1844	Resistant
CP 04-1935	Resistant
CPCL 02-0926	Resistant
CPCL 02-1295	Moderately Susceptible
CPCL 95-2287	Moderately Resistant

Selecting Resistant Progeny

Seedling Screening





Seedling Screening

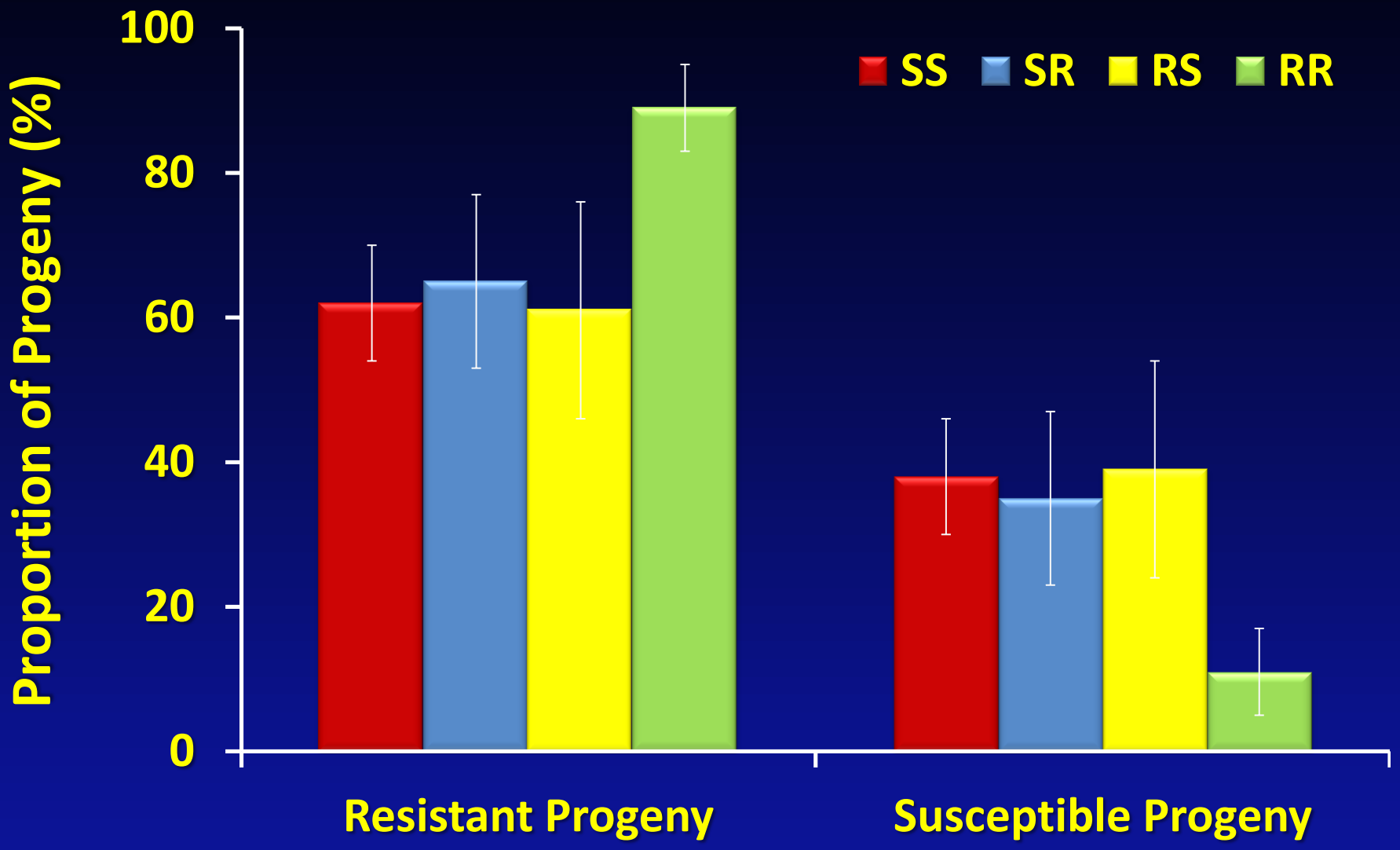








Orange Rust Resistance in Seedling Populations
(12 crosses, n = ~3,000)



Locations where Sugarcane Orange Rust Detected since 2007

- Florida (US) (June 2007)
- Costa Rica (July 2007)
- Guatemala (Sept. 2007)
- Nicaragua (Sept. 2007)
- Panama (Jan. 2008)
- Jamaica (Aug. 2008)
- El Salvador (Aug. 2008)
- Mexico (July 2008)
- Cuba (Nov. 2008)
- Belize (2009)
- Ivory Coast (July 2009)
- Brazil (Dec. 2009)
- Cameroon (May 2010)
- Colombia (July 2010)
- Dominican Republic
- Honduras

Current Status of Orange Rust

- Intense screening program for resistance
- Resistant cultivars being spread commercially
  - CP 00-1101
  - CP 01-1912
- Adjusting to orange rust
  - Some years (2009, 2010, 2011) only problem late
  - Using fungicides to control
- Developing molecular markers
- Resistant cultivars in pipeline

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Plus many others

Questions Please