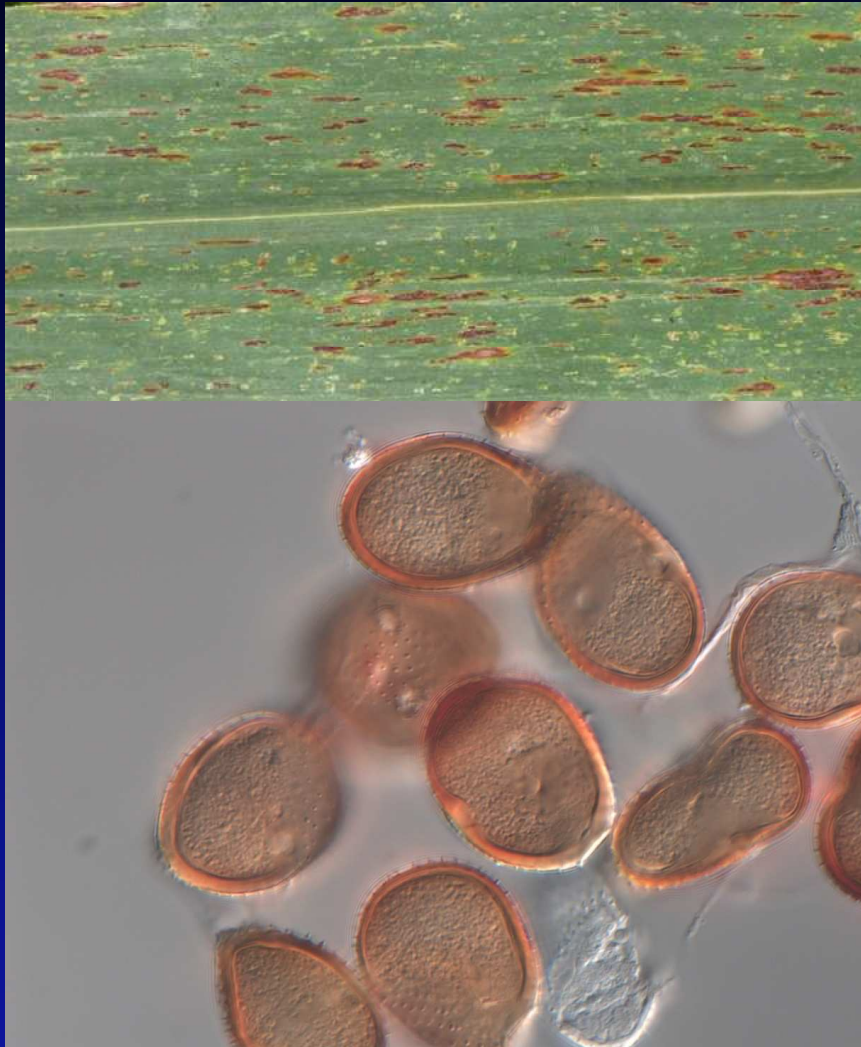


Resistance to Sugarcane Brown Rust: Opportunities and Challenges in Using the *Bru1* Resistance Gene

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Brown Rust History



- Arrived in Western Hemisphere in 1978
- Severe yield losses on B4362
- Frequent changes in cultivar rust reaction
- Caused loss of parental clones
- Races identified
- Currently causing losses on 3 cultivars in Florida

Brown Rust: Effect on Yield

Cultivar	Fresh Wt. Loss (%) ¹	Fresh Wt. Loss (%) ²	Fresh Wt. Loss (%) ³
B4362	ND	16.4	40.9
CP 70-1133	ND	7.4	0.0
CP 72-1210	14.6	ND	ND
CP 78-1247	ND	7.4	12.3

ND --- No data

¹ Comstock and Shine, JASSCT 1992

² Comstock et. al. , Sugar Cane 1992

³ Comstock et. al. , Plant Dis. 1992

Cultivars Lost Due to Brown Rust

- CL 41-223
- CP 63-588
- CP 70-1133
- CP 72-1210
- CP 78-1247
- CP 74-2005
- CP 97-1977
- CP 97-1944
- CP 97-1989
- CP 98-1498
- CP 99-2099
- CP 00-1630
- CP 00-1748
- CP 00-1751
- CP 00-1527

Major Shift in CP Sugarcane Cultivar Development Program

- **Stricter level of brown rust resistance required**
- **Increased screening clones for resistance**
- **Tried to advance only resistant clones from Stage II**
- **Increased effort to breed for resistance**

Brown Rust Resistance Gene (*Bru1*)

Single, major resistance gene

Discovered by French scientists funded partly by the FSCL through ICSB

'Naturally' occurring gene present in sugarcane cultivars worldwide

Molecular test for *Bru1* can be used to choose parents and select progeny

***Bru1* Gene Test in CP Cultivars Susceptible to Brown Rust**

Cultivar	<i>Bru1</i>
CL 41-223	-
CP 70-1133	-
CP 72-1210	-
CP 74-2005	-
CP 97-1989	-
CP 99-2099	-
CP 00-1630	-
CP 00-1748	-
CP 00-1751	-

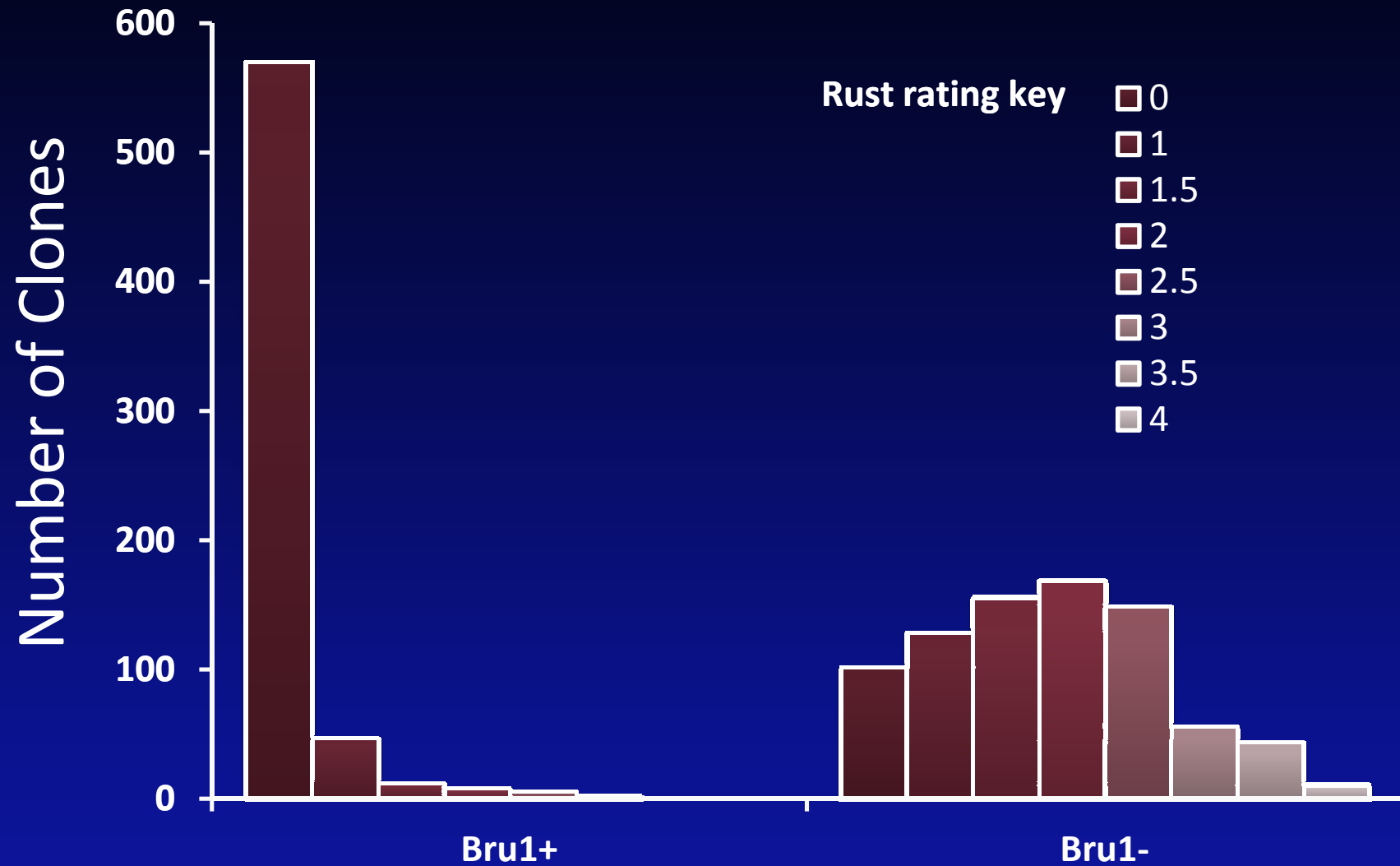
***Bru1* Gene Test for Current CP Cultivars**

Cultivar	2010 Acreage (%)	Brown Rust Susceptibility	<i>Bru1</i> Status
CP 88-1762	27.1	Resistant	+
CP 89-2143	25.5	Resistant	+
CP 80-1743	8.8	Resistant	+
CP 78-1628	8.5	Highly Susceptible	-
CP 84-1198	3.8	Susceptible(?)	-
CP 96-1252	2.8	Highly Susceptible	-
CP 72-2086	2.5	Resistant	+
CP 00-1101	1.7	Resistant	+
CP 89-2376	0.8	Resistant	+

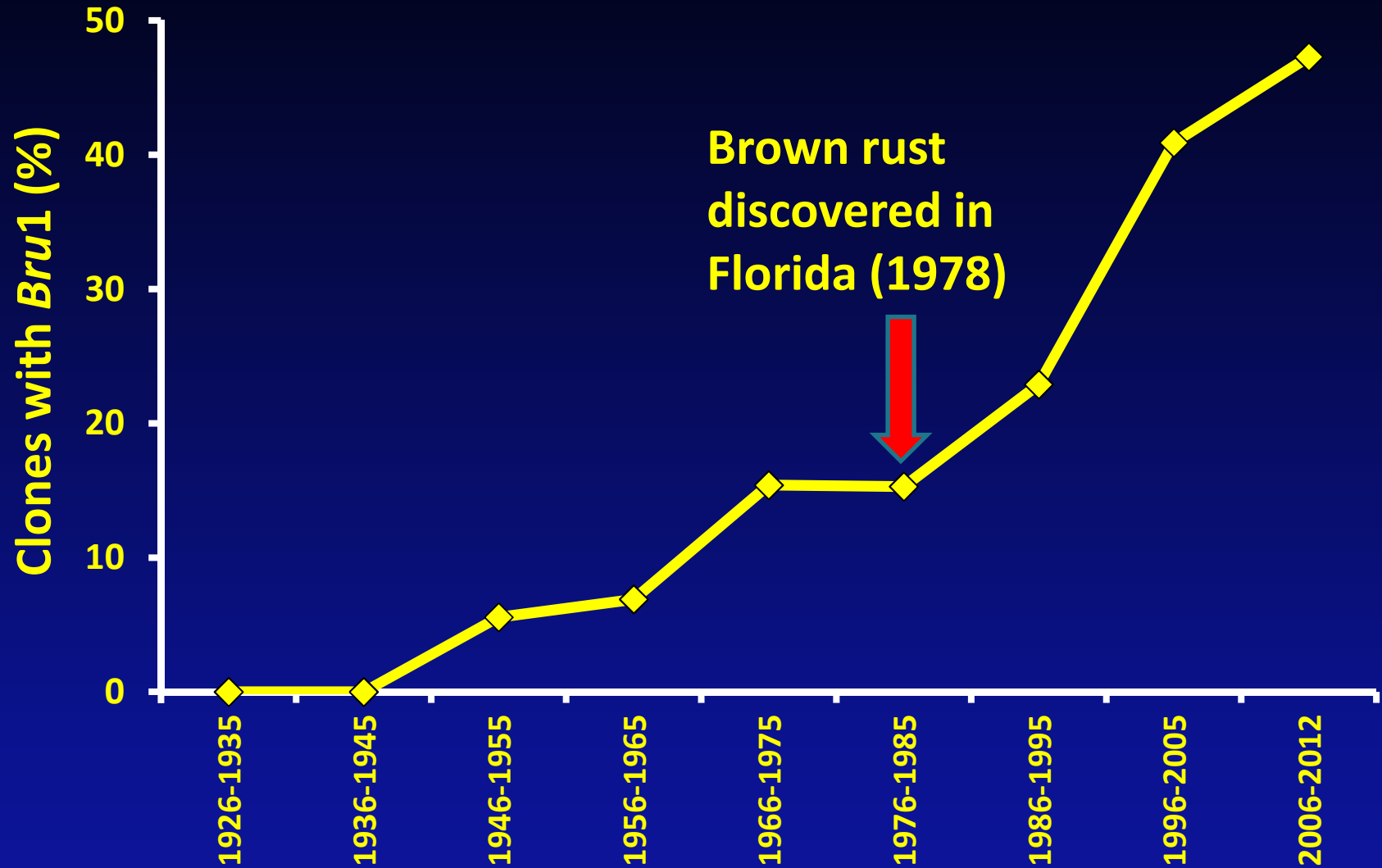
Bru1 Gene Test for Recently Released CP Cultivars (Cont.)

Cultivar	Brown Rust Susceptibility	<i>Bru1</i>
CP 00-1101	Resistant	+
CP 00-2180	Moderately Resistant	+
CP 00-1446	Moderately Resistant	-
CP 01-1372	Resistant (MR)	+
CPCL 97-2730	Resistant	+
CPCL 99-4455	Resistant	+
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	Resistant	+
CPCL 95-2287	Resistant (MR)	-

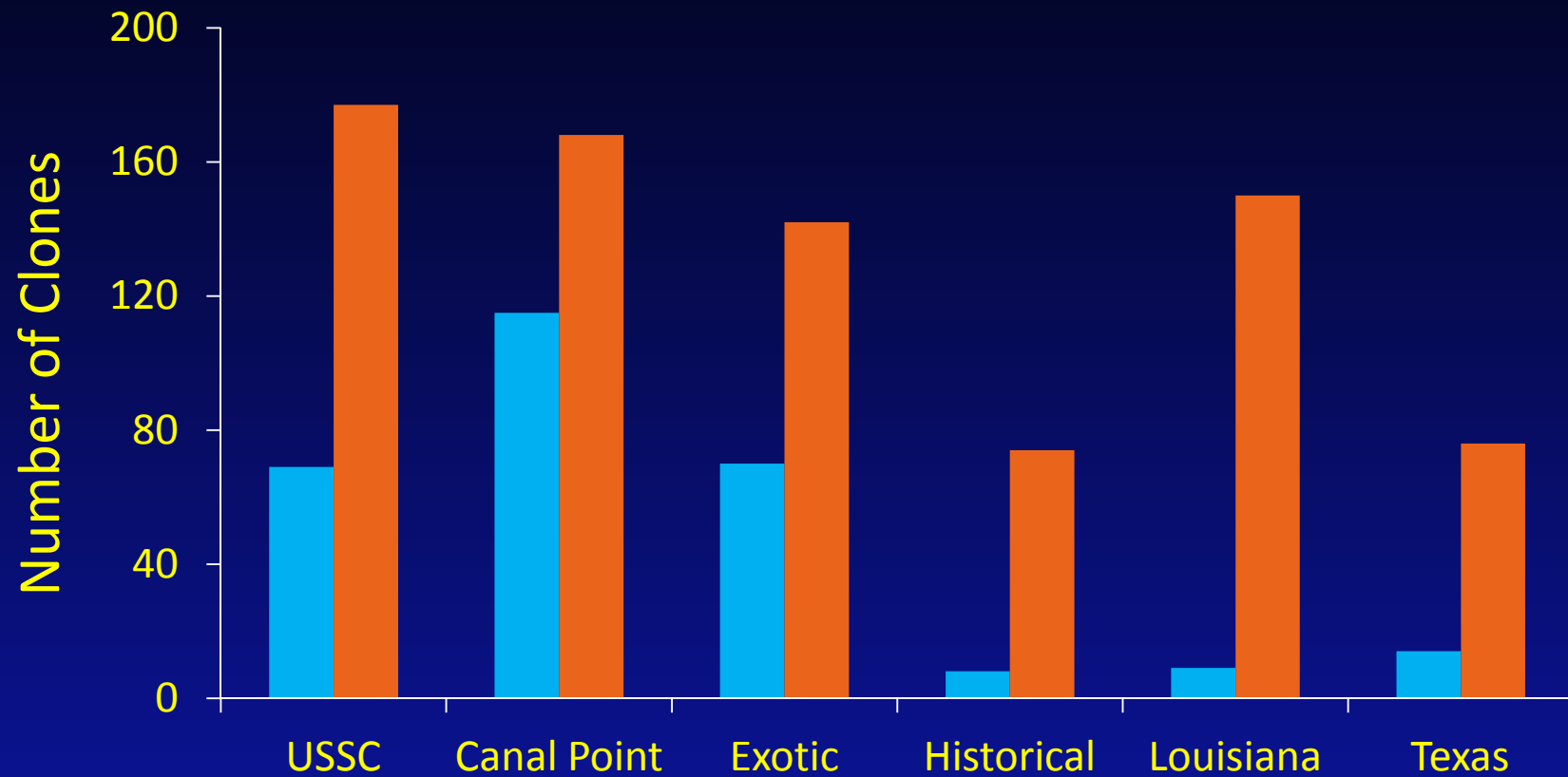
Brown Rust Reactions for *Bru1+* and *Bru1-* for 1,500 Clones in Stage 2 (2011)



Bru1 in Canal Point Parental Pool Separated by Decade of Year Assignment



Number of Clones with and without *Bru1* Gene in CP Parental Pool Separated by Origin



Summation of the Facts

- **Brown rust is a serious problem**
- **Been selecting for resistance based on symptoms**
- **Increased level of resistance**
- **Indirectly selecting for the *Bru1* gene**
- ***Bru1* is a major brown rust resistance gene**
- **Pathogenic races of brown rust have been identified in Florida. How did that happen?**

Pathogenic Races in Florida

- Experiments conducted in Florida, 1991-1992
- Six cultivars
 - B4362
 - CP 72-1210
 - CP 78-1247
 - CP 74-2005
 - CL 41-223
 - CL 73-239
- Five isolates were collected from each of the cultivars except CP 74-2005
- Five of the cultivars did **not** have the *Bru1* gene (CP 78-1247 was not available for testing)
- Thus, the *Bru1* gene was not involved in determining the races

Now What?

- Make use of *Bru1* gene in designing crosses
- Identify *Bru1* gene in Stage II clones
- Continue screening for brown rust using symptoms
- Identify any brown rust resistant clones that lack the *Bru1* gene
- Try to identify other resistance genes

Need Research Project to Identify Other Resistant Genes

- Major genes in cereals fail after time
- Brown rust resistance is a world wide concern because most resistance relies on *Bru1*
- Evidence suggests there are other resistance genes
 - *Bru2* has been reported by the French
 - Others probably exist
- Suggest research through ICSB

Thanks

- To the French scientists for their work on the *Bru1* gene
- To Angelique D' Hont for providing the procedures to detect the *Bru1* gene
- To Neil Glynn for letting me present this talk

**What are your thoughts on identifying
other resistance genes?**