

GERMPLASM CHARACTERIZATION FOR HIGH SUCROSE AND EARLY-RIPENING CHARACTERISTICS

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Harvest Period in Mauritius

- **From early June to Mid-Dec**
- **Sucrose content and juice purity: low early in the season**
- **To reduce cost of production and keep the sugar cane industry competitive and sustainable, one of the immediate options was to centralize milling activities**
 - Increasing milling capacity
 - Lengthening the milling season
 - ❖ Extending beyond mid-Dec will delay tillering phase and reduce elongation phase
 - ❖ Advancing harvesting is better, but very few varieties exhibit high sucrose content early in season

OBJECTIVES

- **Develop a methodology for characterisation of Early Ripening /High Sucrose (ER/HS) genotypes**
- **Use of early ripening high sucrose parents in crosses.**

METHODOLOGY – TRIAL 1

- 8 genotypes (4 M type, 4 foreign) with known sucrose accumulation pattern tested initially
- Trial details

Site	Environment	Soil Type	Year Planted
L'Esperance	Superhumid	B	2009
Olivia	Humid	P	2010
St Antoine	Subhumid	L2	2010

- Plot size : 4 rows of 10 m
- Split plot design with 3 reps
- Treatment
 - Main plot
 - Early - mid May (H1)
 - Middle , mid August (H2)
 - Late mid November (H3)
 - Sub plot
 - Prens variety

METHODOLOGY – TRIAL 2

- 199 genotypes tested (111 M type, 88 foreign varieties)

- Trial details

Reduit

- Annual rainfall of 1464 mm
 - Soil type : low humic latosol (L2).
 - Planted in 2010, under irrigation
 - Plot size : 1 row of 1.4 m
 - Split plot design with 3 reps
- Treatment
 - Main plot
 - Mid May (H1)
 - Mid August (H2)
 - Mid November (H3)
 - Sub plot
 - Variety

Data collection and sampling for cane quality characters in both trials

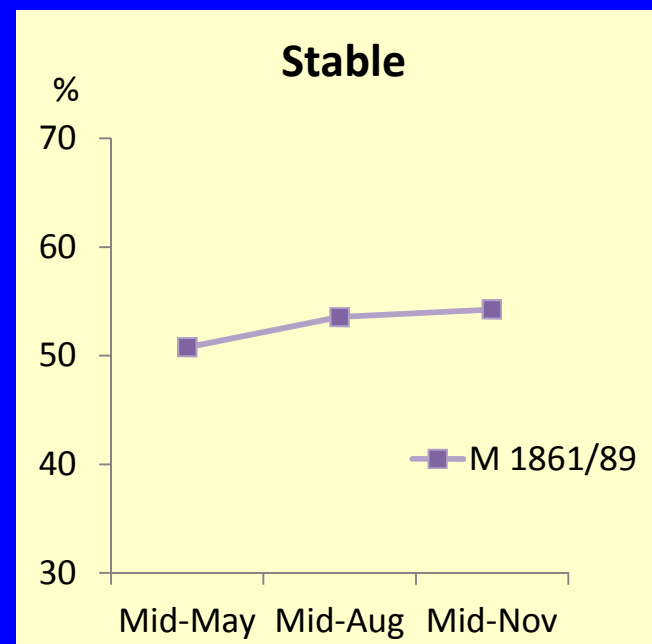
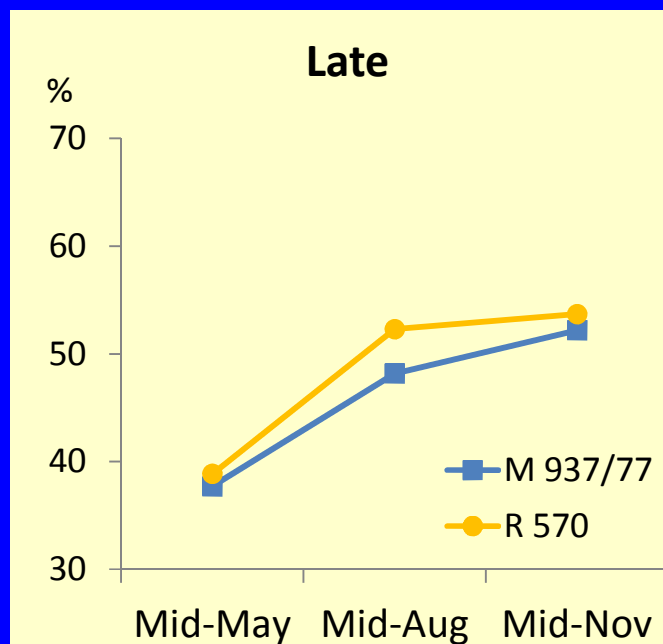
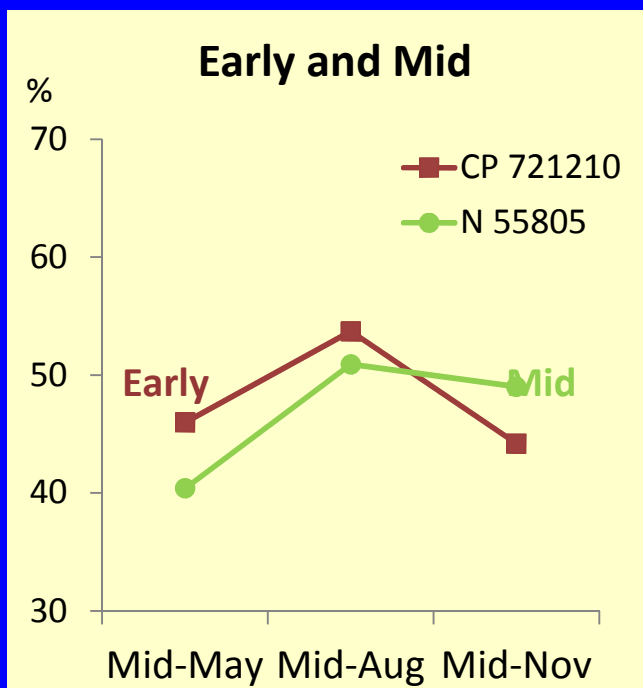
- **Data collected**
 - **Sample of 6 canes**
 - **Pol % Cane (P % C)**
(Saint Antoine, 1968)
 - **Brix % Cane (Bx % C)**
 - **Fibre % Cane (F % C)**
- **Data derived**
 - **Purity**
 - **Dry Matter % Cane (DM % C)**
 - **Pol % Cane Dry Matter (P % CDM)**
 - **Gain in P% CDM between harvest dates**
- **Crop cycle : R1**

RESULT – TRIAL 1 – humid zone

RIPENING CATEGORY

P % CDM

- Early
- Mid
- Late
- Stable



RESULTS – Trial 2 (199 clones)

- **P % CDM**
- **P % C**
- **Purity**

Harvest Date	Pol % CDM	Pol % C	J Purity (%)
H1	46.7	11.8	83.0
H2	54.0	15.2	89.3
H3	55.0	17.0	90.0
LSD (0.05)	0.7	0.2	1.0

RESULTS – Trial 2

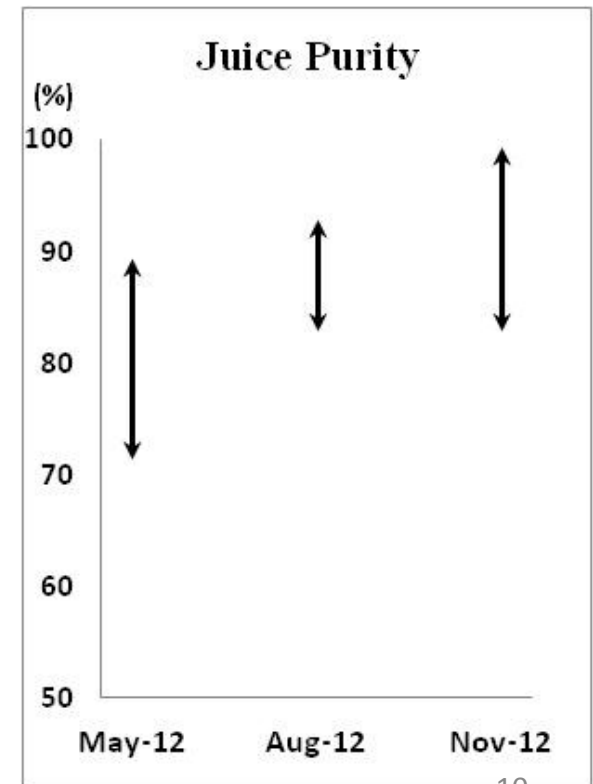
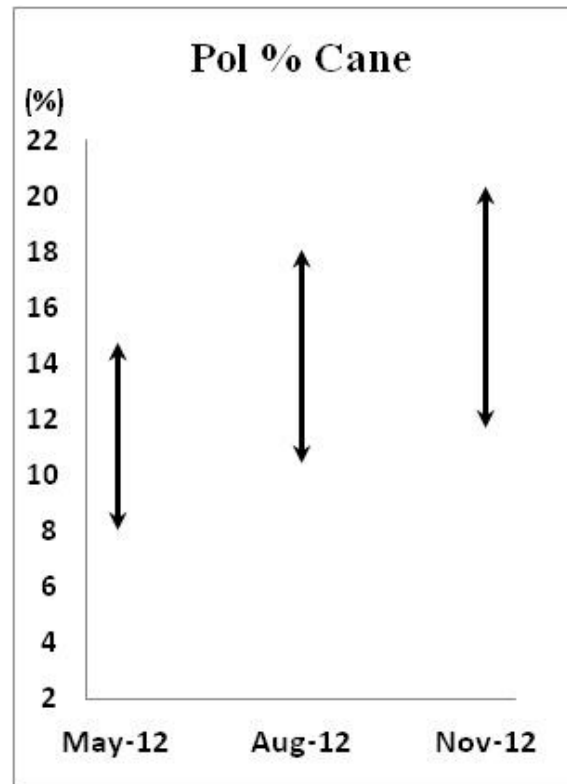
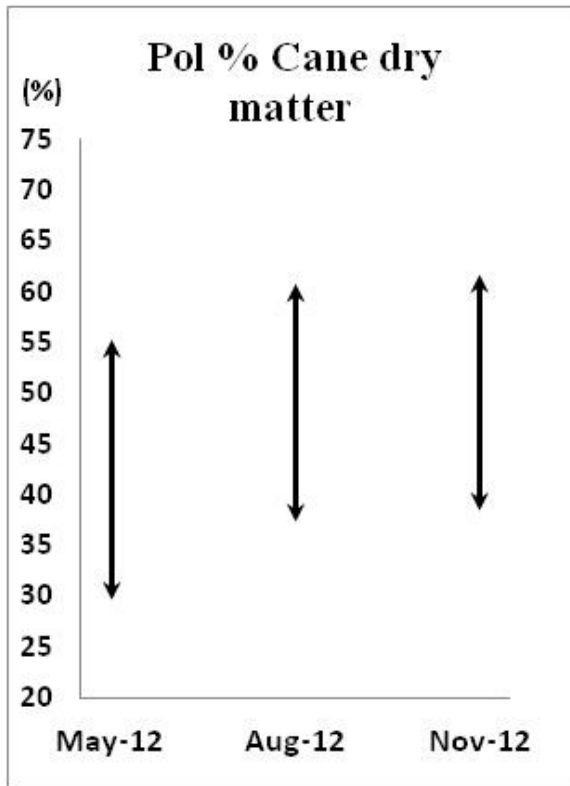
Analysis of Variance for ➤ P % CDM, P % C and J PTY

Source	d.f	Mean Square		
		P % CDM	P%C	J PTY (%)
Block	2	90.1	1.69	70.5
Harvest Date (A)	2	12271**	4250**	8909**
Error (A)	4	17.4	1.89	40.3
Variety (B)	198	77.2**	7.09**	31.1**
Interaction (AxB)	396	15.7**	2.63**	18.6**
Error (B)	1188	9.1	0.57	10.1

** Highly Significant (P 0.01)

RESULTS – Trial 2

- Range of
- P % DM
 - P % C
 - Purity
- For 199 parent varieties



EARLY GENOTYPES

1. P% CDM

- Increases from H1 to H2
- Decreases from H2 to H3

2. H1 P % C > 13

3. H1 J Purity > 85

4. P% CDM

- H1 P% CDM > 50 → High Potential
- $50 \leq \text{H1 P\%CDM} \leq 40$ → Low Potential

EARLY GENOTYPES

High Potential

❖ **H1 P%CDM \geq 50**

No of genotypes : 18
(6 M and 12 F)

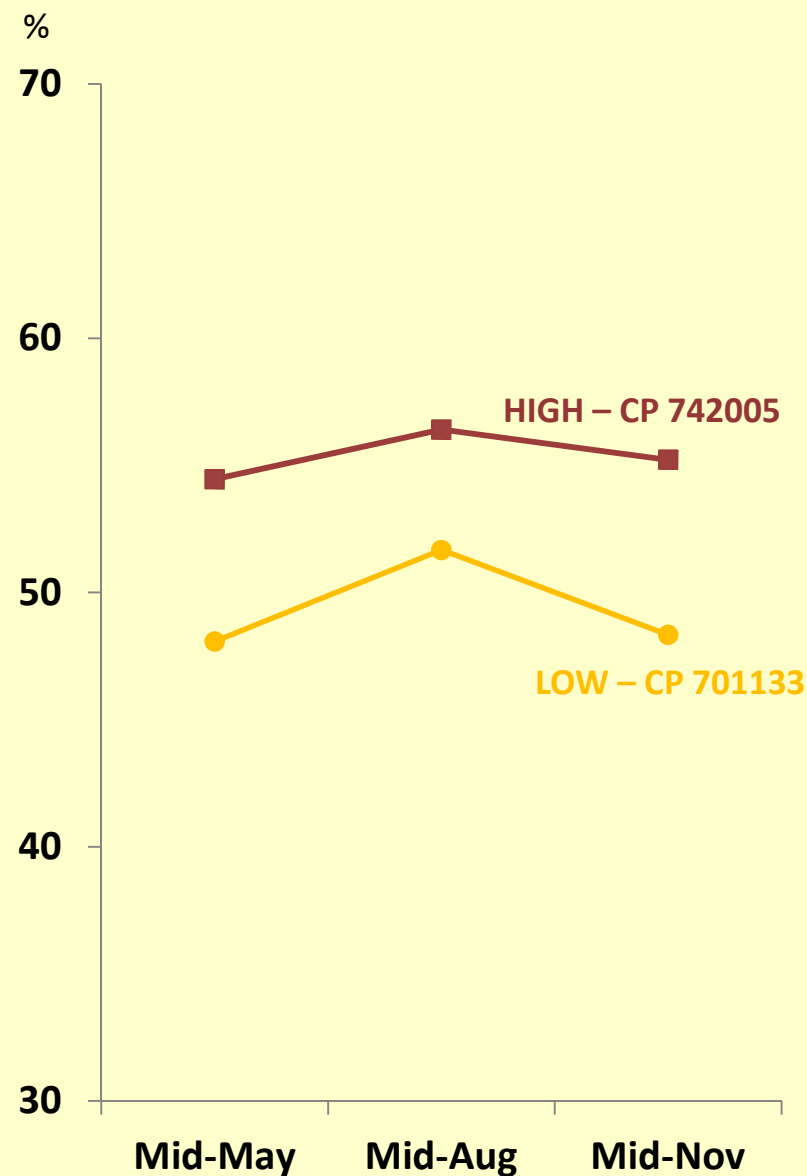
CG 9621	M 1360/93	CTC 5
CG 9847	M 1526/03	E 880520
CP 6137	M 1560/03	N 32
CP 691059	M 52/78	N 36
CP 721210	M 554/79	SP 701078
CP 74 2005	M 744/70	VMC 84524

Low Potential

❖ **50 < H1 P%CDM \leq 40**

No of genotypes : 6
(2 M and 4 F)

PoI % CDM - EARLY



MID GENOTYPES

1. P % CDM

- Increases from H1 to H2
- Decreases from H2 to H3

2. H1 P % C < 13

3. H2 J Purity > 85 and H2 P % C > 15

4. P % CDM H2

- H2 P% CDM ≥ 55 → High Potential
- $55 < \text{H2 P\%CDM} \leq 45$ → Low Potential

MID GENOTYPES

High Potential

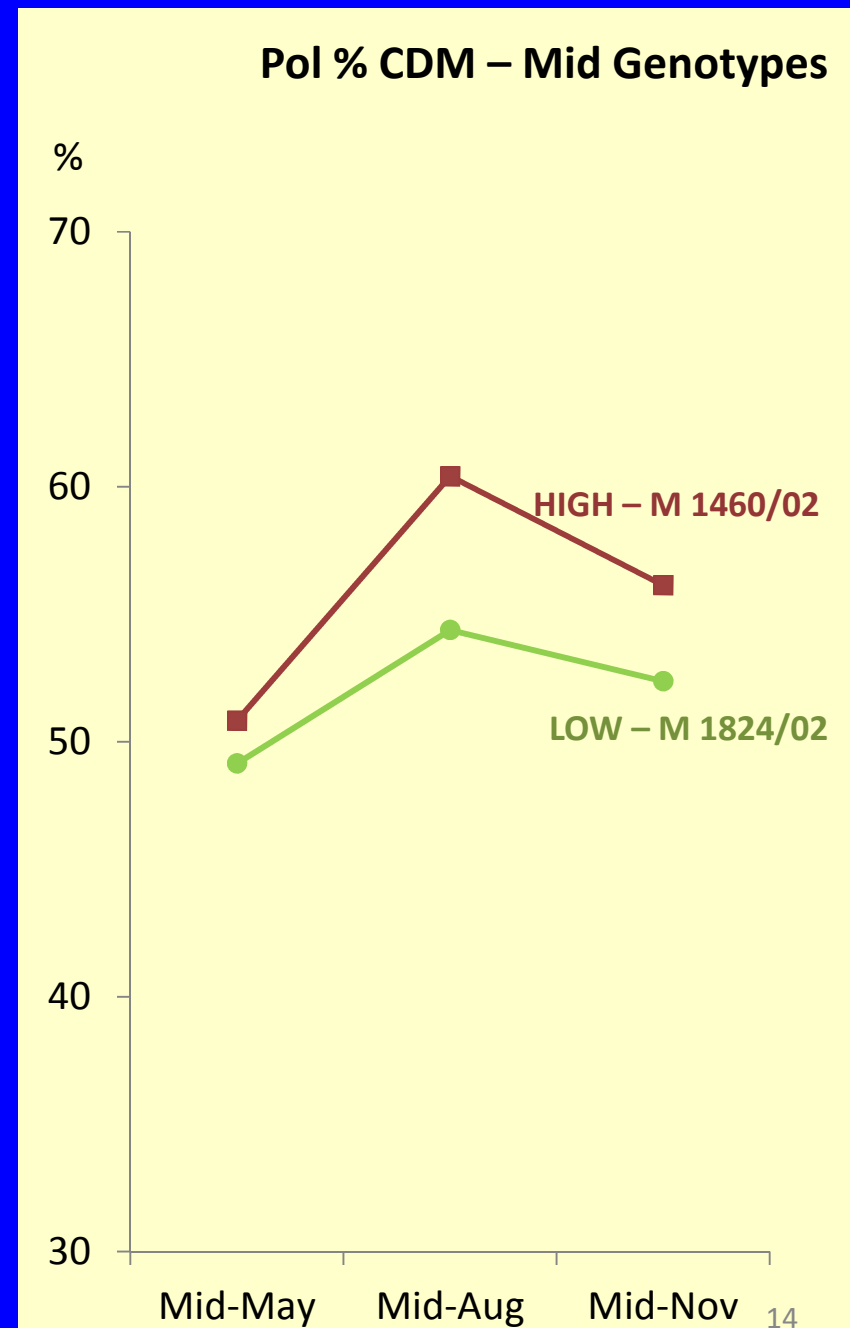
- **H1 P% CDM ≥ 55**

No of genotypes : 21
(10 M and 11 F)

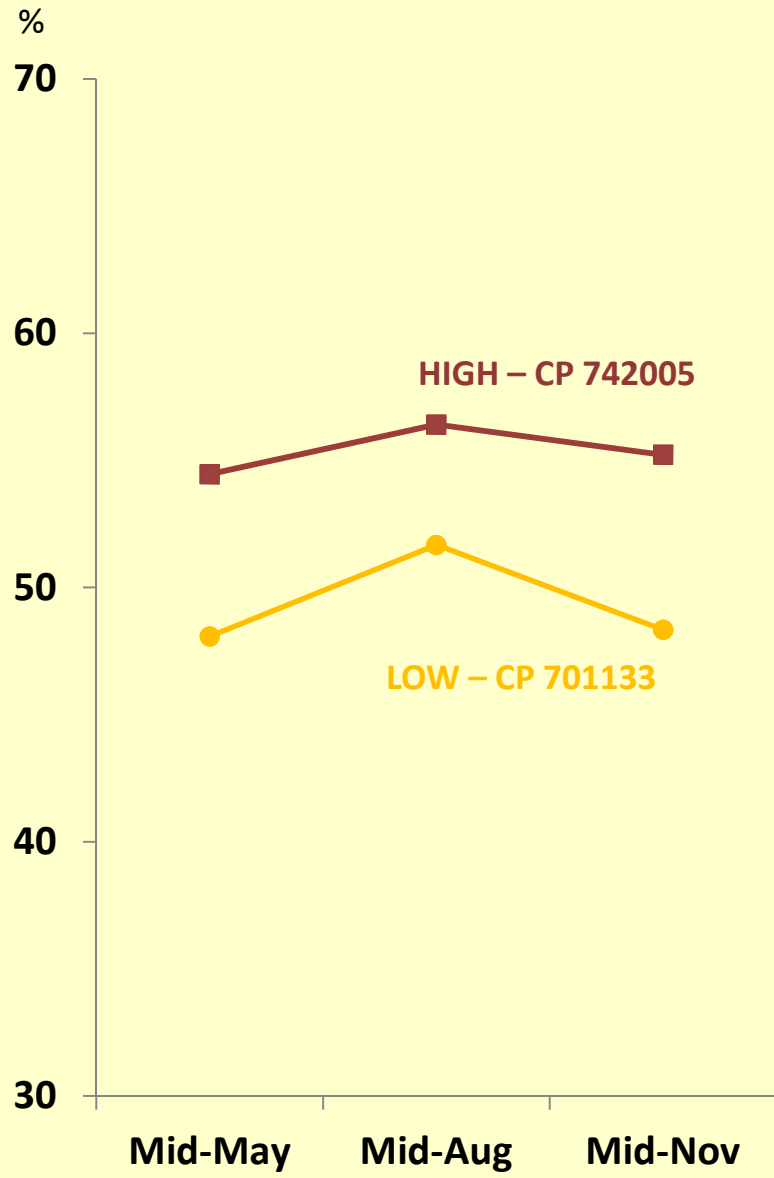
Low Potential

- **$55 < \text{H2 P\%CDM} \leq 45$**

No of genotypes : 11
(7 M and 4 F)



Pol % CDM - EARLY



Pol % CDM - Mid Genotypes

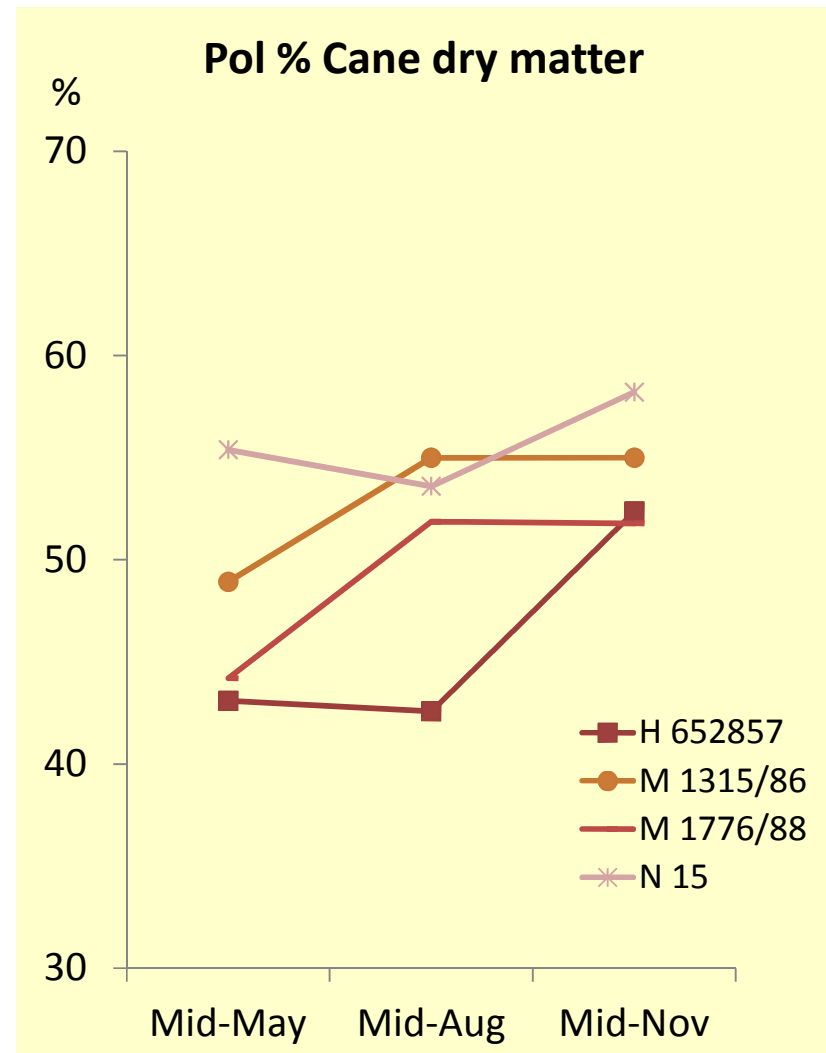


SUMMARY

CATEGORY	HIGH	LOW	TOTAL
EARLY	18 (9%)	6 (3%)	24 (12%)
MID	21 (11%)	11 (6%)	33 (17%)
LATE	85 (43%)	38 (19%)	123 (62%)
STABLE	0	2 (1%)	2
TOTAL	124	57	181

OUTLIERS

- **Abnormal trend** ➤ **2**
- **Outside set criteria** ➤ **16**



Second ratoon results

- Second ratoon results compared: very similar trend observed as 1st ratoon crop (10% of ER/HS type)
- Another batch of 200 parent varieties also being tested
- 8 parent varieties x 3 contrasting sites x 3 harvest dates x 2 crop cycles.
- 399 parent varieties (in 2 batches) x 3 harvest dates x 2 crop cycles (in a humid irrigated environment).
- Database creation for early ripening high sucrose.

Use in crosses

- **Two series of seedlings (series 1 and 2).**
- **Series 1 – 3rd clonal stage in 2014.**
 - **Some very early high sucrose clones identified.**
 - **Coupled with commercially acceptable traits, viz, yield potential, diameter and visual grade.**
 - **New parents produced and being multiplied.**
- **Series 2 – 2nd clonal stage in 2014.**

Series 1: Mean Pol % cane (mid June)
3rd clonal stage – (2x5-m plots x 3 reps) (2014)

Selected Combinations	No. selected	Pol % cane		
		Mean	Min	Max
4134	1	17.7	17.7	17.7
4175	9	16.8	15.6	20.4
4155	8	16.4	15.5	18.6
4153	2	16.3	15.7	16.9
4178	4	16.1	15.5	17.2
4129	8	16.1	12.6	18.0
M 52/78, commercial standard		15.8		
M 2593/92, commercial standard		13.1		

**Series 2 – Mean Pol % cane (mid May) of selected genetic combinations
at 1st clonal stage (2014)**

Selected Genetic combinations	No. selected	Pol % cane		
		Mean	Min	Max
4152	4	15.3	14.1	16.5
4148	13	14.8	14.2	15.8
4151	4	14.8	13.9	15.3
4451	5	14.7	13.9	15.5
4143	12	14.6	13.9	16.4
4338	19	14.5	12.8	16.8
4013	19	14.4	13.5	15.5
4149	21	14.3	13.3	15.5
4229	9	14.3	13.7	15.4
4057	11	14.1	12.0	16.7
M 2593/92	commercial standards	11.5		
M 52/78		13.1		

CONCLUDING REMARKS

- **Different ripening trends**
- **12% Early, 17% Mid and 62% Late**
- **9% of genotypes categorized as Early High sucrose type**
- **11% of genotypes categorized as Mid High sucrose type.**
- **New early ripening high sucrose varieties at 2nd and 3rd clonal stages of selection.**
- **New parents that combine very high pol % with commercial attributes.**
- **New crosses being attempted.**

Acknowledgements

ACP - Sugar Research Programme (Phase I)

