

# **Crown rot tolerance levels in current and future cultivars; how much varietal tolerance is there and how well do current ratings stack up?**

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GRDC Code: CRA001: Cultivar Crown Rot Tolerance Trials

## **Take Home Messages**

- Bellaroi showed significant yield losses in the presence of Crown Rot at all 3 sites.
- Yield performance for a number of potential new Wheat varieties look promising relative to Gregory in the presence of Crown Rot.
- Current Crown Rot resistance ratings are not true reflections of a varieties yield potential when exposed to varying levels of Crown Rot risk.
- There is merit in establishing a Crown Rot Tolerance rating system which accounts for the yield potential of a variety when exposed to Low, Medium or High Crown Rot risk.
- This objective data was financially subsidised by GRDC and the 3 seed companies demonstrating their commitment to breeding for higher yields using improved Crown Rot tolerance.

## **Background**

In 2007-2009 NGA ran a series of trials across the NW NSW to assess the impact of Crown Rot on winter cereal yields. 2007 had a very hot, dry finish and they showed some significant yield losses from the addition of Crown Rot inoculum. 2008 and 2009 were softer springs and Crown Rot had less impact on yield.

In 2011 and 2012 Crown Analytical Services, in collaboration with AGT Seeds, Longreach Plant Breeders and Heritage Seeds, replicated this trial methodology to screen selected current and future cultivars for yield performance in the presence of a known amount of Crown Rot inoculum.

The Crown Rot inoculum is added as sterilized durum seed which has been colonized with the fungus *Fusarium pseudograminearum* and applied at a rate of 2 g/m row.

14 new varieties plus 5 check varieties (Gregory, Wylie, Sunco, Bellaroi and Strzelecki) were assessed. Gregory was chosen as the "Standard" to which all others were compared, as a function of its current commercial popularity.

## **2012 Sites**

The aim is to plant these trials into commercial paddocks that by their rotation have low levels of background CR inoculum.

### Previous crop rotations:

#### **Weemalah** (approx 180mm Starting Soil Water)

2010	Sunbrook Wheat
2011	HatTrick Chickpeas (cultivated & Kelly chained over summer)
2012	Wheat

#### **Rowena** (approx 200mm Starting Soil Water)

2007	Sunvale Wheat
2008	Chickpeas
2009/10	Double Skip Cotton (on Long Fallow)
2011	No winter crop established
2012	Wheat

#### **Bellata** (217mm Starting Soil Water)

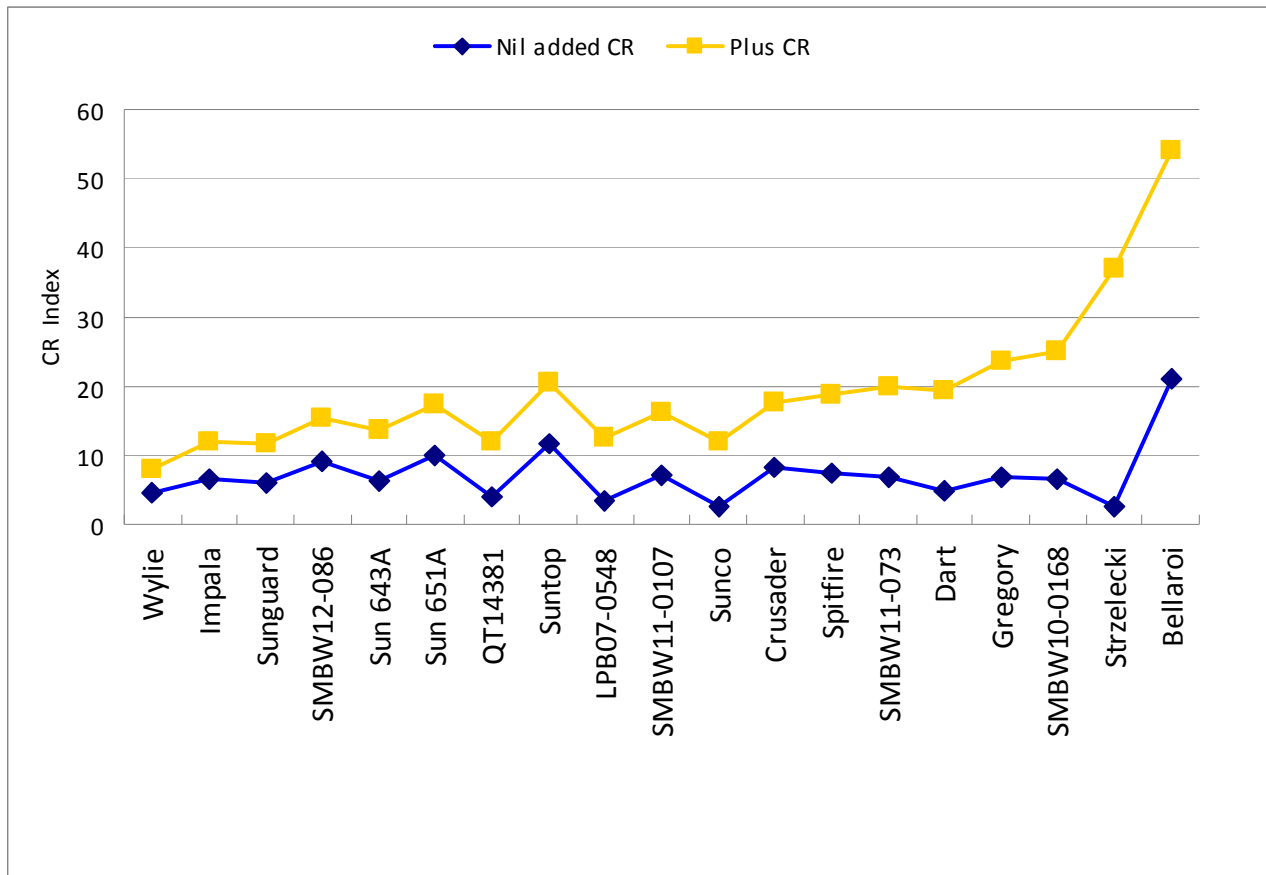
2009	Gregory Wheat
2010/11	Solid Sorghum (on Long Fallow)
2011	HatTrick Chickpeas (double cropped)
2012	Wheat

## **Assessments**

- Establishment.
- NDVI (biomass). Assessed at GS30.
- Basal Browning – Incidence (%) & Severity (0-5 rating). When combined (Incidence x Severity)/5 is a Crown Rot Index of 0-100. Assessed at GS90.
- Whiteheads. Assessed at GS85 and GS90.
- Yield.
- Quality (Protein, Test Weight, Screenings)

## Results

**Figure 1: Crown Rot Index by Variety 2012 (3 sites combined)**



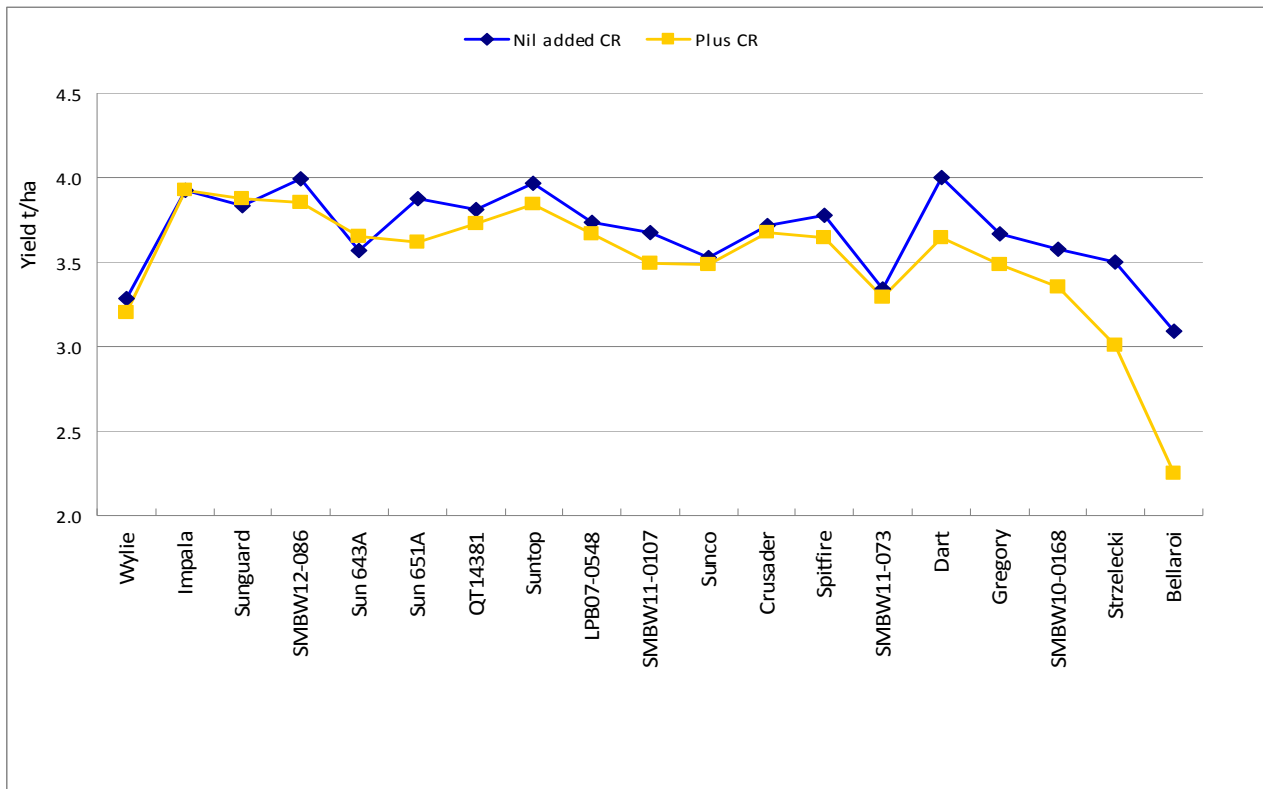
- Crown Rot Index /100 is a measure of Crown Rot incidence and severity.
- All varieties showed an increase in CR Index with added CR inoculum.
- Suntop had high incidence readings at one site.
- Wylie was the least impacted by Crown Rot. Bellaroi was the worst.

**Tables 1& 2: Yield loss by Crop x CR Index at each site**

Average Bread Wheat Yields x CR Index, 2012						
	Bellata		Weemalah		Rowena	
	CR Index	Yield	CR Index	Yield	CR Index	Yield
- CR	2.8	3.75	4.0	3.37	9.0	3.40
+CR	5.0	3.66	13.4	3.27	28.4	3.32
		-2.6%		-2.7%		-2.5%

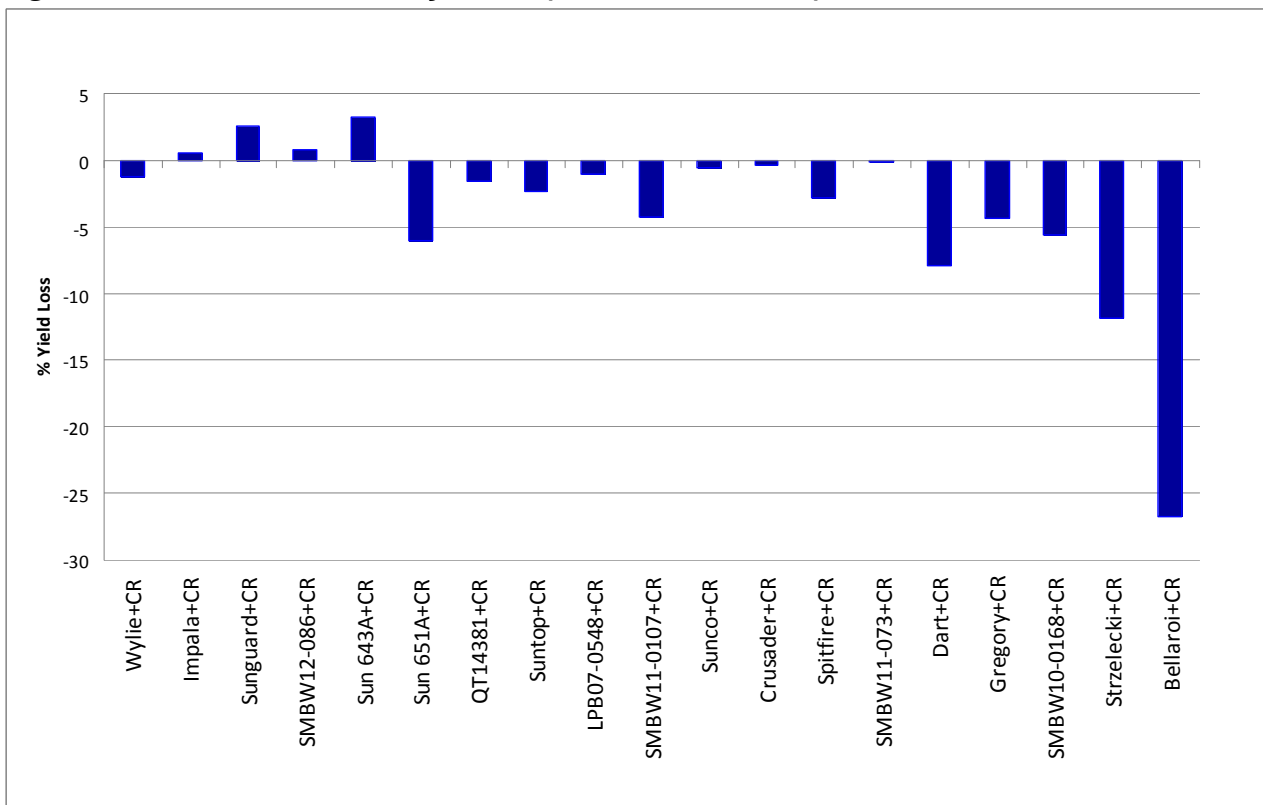
Average Durum Yields x CR Index, 2012						
	Bellata		Weemalah		Rowena	
	CR Index	Yield	CR Index	Yield	CR Index	Yield
- CR	20.7	3.50	20.4	3.03	16.9	2.68
+CR	58.9	2.49	48.9	2.25	48.7	1.99
		-28.9%		-25.6%		-25.7%

**Figure 2: Actual Yield by Variety (3 sites combined)**

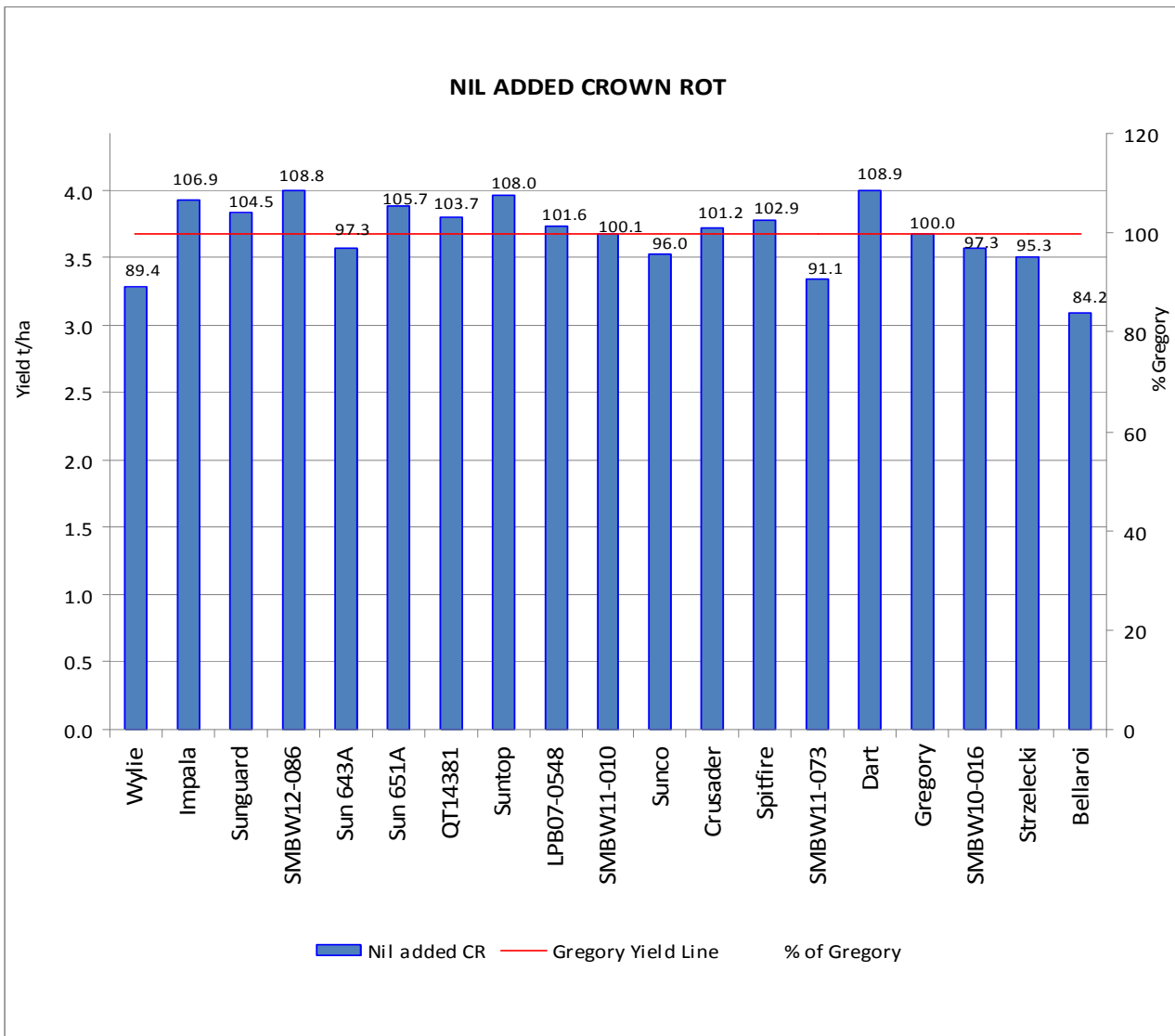


- Bellaroi Durum performance was significantly affected by Crown Rot.
- Average Bread Wheat Yield loss due to CR: 103 kg/ha (2.6%)
- Average Bellaroi Durum yield loss due to CR: 830 kg/ha (26.7%)
- Wylie was the second lowest yielding bread wheat despite not losing yield to CR.

**Figure 3: Yield Loss x Variety, 2012 (3 sites combined)**

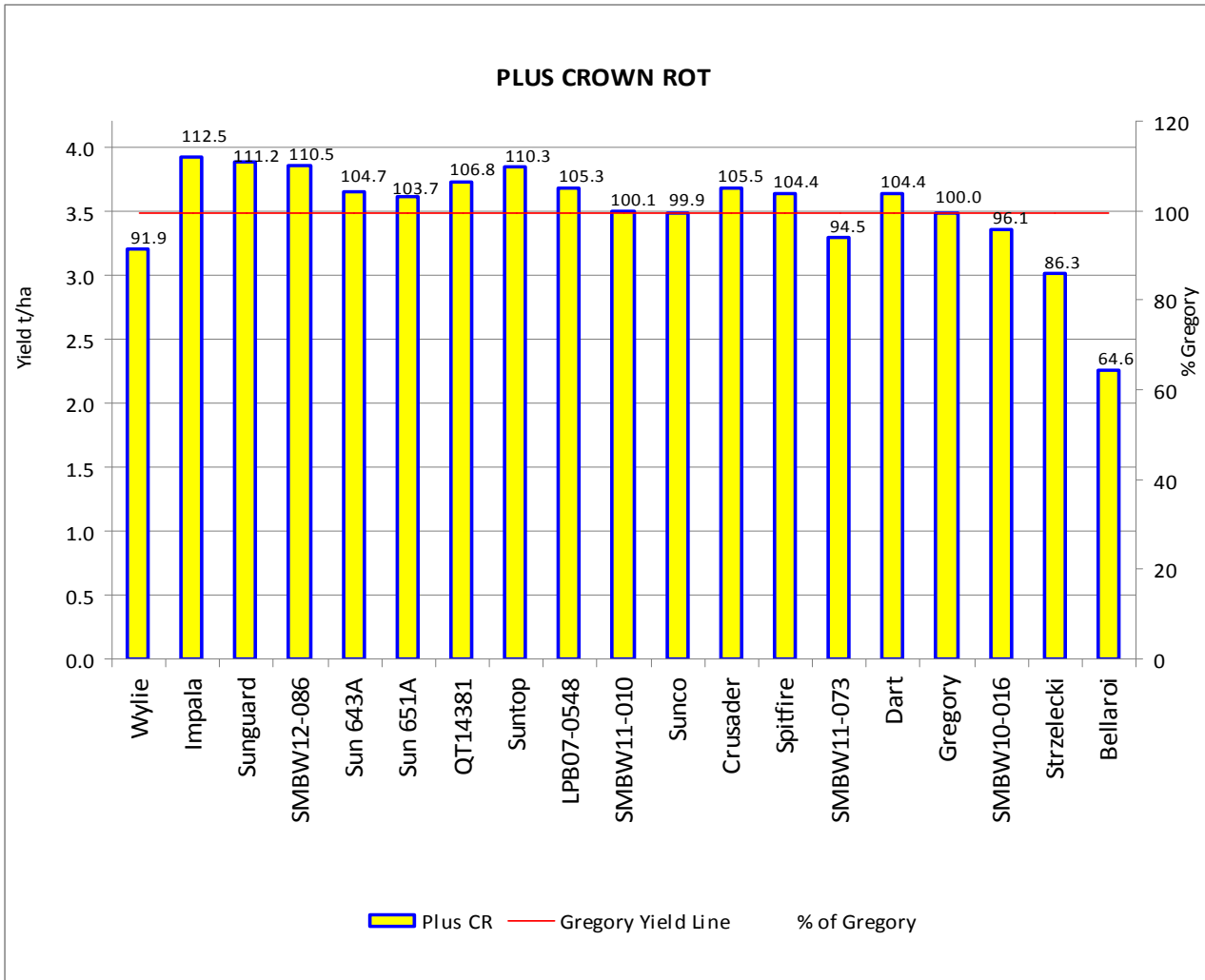


**Figure 4 - Yield (t/ha) by Variety compared to Gregory with Nil Added CR - 3 sites.**



- Gregory is shown as the standard due to its current commercial popularity.
- Strong Gregory yield under lower Crown Rot pressure.

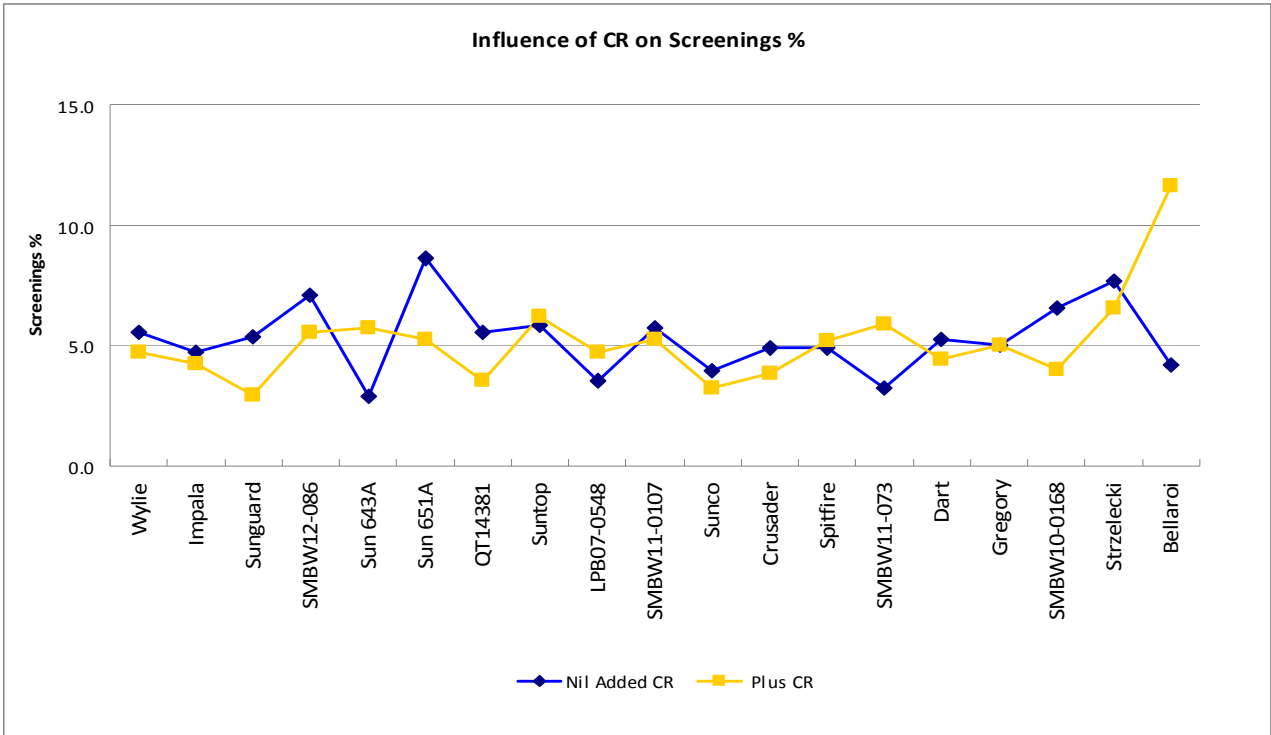
**Figure 5 - Yield (t/ha) by Variety compared to Gregory with Plus CR - 3 sites.**



- Gregory is shown as the standard due to its current commercial popularity.
- Positive yield trends for most of the new suite of varieties relative to Gregory in the higher presence of Crown Rot. In other words, the more CR tolerant varieties outperformed Gregory when exposed to higher inoculum levels.

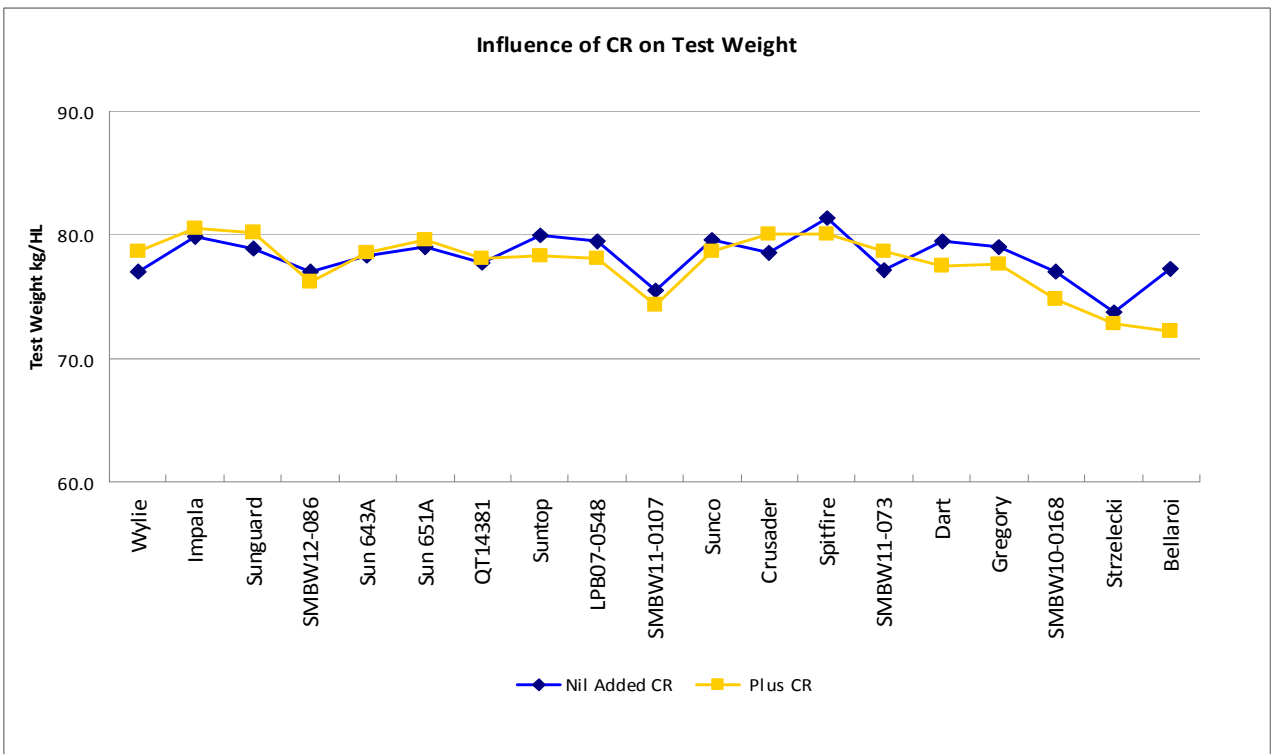
# Quality

**Figure 6 – Influence of CR on Screenings % – 3 sites.**



- Screenings doubled in Bellaroi Durum due to added CR
- Inconsistent trends in Bread Wheat

**Figure 7 – Influence of CR on Test Weight (kg/HL) – 3 sites.**



- No issue apart from Bellaroi Durum

## **Are the Current Crown Rot Resistance Ratings a suitable guide?**

**Table 3: Current Crown Rot Resistance Ratings v CAS 2012 Yields.**

Variety	NSW Rating	Qld Rating	CAS - PLUS CR Yield 2012
Wylie	MR- MS	MR-MS	91.9
Sunguard	MR-MS(p)	MS	111.2
Suntop	MR- MS	-	110.3
Sunco	MS	MS	99.9
Crusader	MS	S	105.5
Spitfire	MS	MS	104.4
Dart	MS – S	-	104.4
Impala	MS - S	MS	112.5
Gregory	S	S	100.0
Strzelecki	S	S	86.3
Bellaroi	VS	VS	64.6

- Note some differences in the ratings between NSW and Qld
- There are discrepancies between actual wheat yields and their CR resistance rating when exposed to Crown Rot.
- There is merit in establishing a Crown Rot Tolerance rating system which accounts for the yield potential of a variety when exposed to Low, Medium or High Crown Rot risk.
- More work will be required to define what constitutes Low, Medium & High Crown Rot Risk. It will be a combination of Inoculum load, Plant Available Water Content at sowing and a combination of soil physical and chemical parameters that influence the crops water extraction capability during grain fill.

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