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Weeds

Crop-topping Cereals at Cummins

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RESEARCH

Location: Cummins
Stuart Modra
LEADA

Rainfall
Av. Annual: 422 mm
Av. GSR: 342 mm
2009 Total: 450 mm
2009 GSR: 380 mm

Yield
Potential: 5.5 t/ha (W)
Actual: 5.6 t/ha (W)
Potential: 5.0 t/ha (B)
Actual: 5.0 (B)

Paddock History
2008: Field Peas

Soil Type
Red clay loam

Plot size
10 m x 1.5 m x 3 reps

Yield Limiting Factors
Nitrogen

Economic
Production risk: Grain quality downgrades

Key messages

- **Crop-topping wheat with glyphosate can result in yield loss and grain size reduction if done too early.**
- **Later crop-topping timings can produce grain quality and yield similar to untreated grain.**

Why do the trial?

Annual ryegrass is a significant weed problem, particularly on lower Eyre Peninsula where favourable spring conditions can allow the weed to thrive, causing many headaches for the farming system. Research from the Mid North High Rainfall Zone (MNHRZ) indicated that glyphosate can be applied to wheat during late grain fill as a crop-topping operation to reduce ryegrass seed set with minimal grain damage.

Growers and local agronomists on lower Eyre Peninsula were keen to investigate the impact of glyphosate as a crop-topping operation and the follow-on effects on grain yield and quality.

Physiological maturity of wheat occurs at around 45% grain moisture, which is when grain fill is completed, with drying down the only process left until harvest. By the time the grain has dropped to 45% moisture, the optimum window for grass weed control is likely to have passed. The trial aimed to compare crop-topping timings relative to physiological maturity in wheat and barley.

How was it done?

Wyalkatchem wheat and Keel barley were sown by small plot equipment at the LEADA focus site, south of Cummins on 22 May 2009. A target plant population of 250 and 200 plants/m^2 respectively were sown.

The plots were sown with 100 kg/ha DAP, with 100 kg/ha urea broadcast on 9 July. Roundup PowerMax was applied at 1.2 L/ha through Lechler IDK nozzles producing a medium/coarse droplet spectrum with a water rate of 100 L/ha. Moisture levels at the time of application were assessed by randomly sampling whole heads before spraying plots and drying in a fan forced herbage drying oven at 70^{o}C for 48 hours.

The trial was harvested with small plot harvest equipment and grain quality was assessed using equipment at Minnipa Agricultural Centre.

What happened?

By the time crop-topping window approached, the barley had an infestation of net form of net blotch, which reduced the green leaf area on the barley, reducing potential herbicide uptake.

The wheat was very slow to dry out at Cummins in 2009. This is most likely due to the high levels of available soil moisture during grain fill. The cool conditions during early grain fill also helped to extend the grain fill period, resulting in very large grain in the untreated plots. This extension to the grain fill period also exacerbated the differences in the treatments.

The plots sprayed in the earlier timings looked as if they would not yield any grain at all given the rapid brown out of the crop after the glyphosate was applied. The late timings had less visual effects on the crop, however the glyphosate was useful for evening up crop maturity and potentially allowing for earlier harvest.

Wheat

Glyphosate timing had a severe impact on grain yield (Table 1 and Figure 1). Timing 3 and 4 yielded less than the nil, but more than timing 1 and 2. Timing 2 yielded less than the all the later timings and the nil. Timings 5 and 6 did not suffer any grain yield loss and yielded the same as the untreated plots. The earliest timing, however, provided the most spectacular yield decline, yielding only 23% of the untreated plots.

Glyphosate timing had an impact on the 1000 grain weight, screenings and test weight. The smallest grain in terms of 1000 grain weight was produced from the earliest timing of glyphosate application, with grain size increasing with later timings (Table 1).The two last timings (5 and 6) produced the same size grain as the untreated plots, ranging between 45.1 and 47.3 g/1000 seeds.

Screenings were impacted by the timing of the crop-topping operation. It was more of a cliff face effect than the linear effect on 1000 grain weight. Timing 1 produced the highest screenings (60.6%). The second highest was timing 2 (27.3%). Timings 3, 4, 5 & 6 had similar screenings levels as the untreated plots.

Test weight was affected by the timing of glyphosate application. Timing 5 and 6 produced similar test weight to the untreated plots. Timing 3 and 4 produced lower test weights than the nil, Timing 5 and 6. Timing 2 produced a test weight even lower than Timing 3 and 4, but not as low as Timing 1. The test weight for Tming 2 was below 68 kg/hL, which is the threshold for AGP classification. The bird seed produced by Timing 1 was even below the threshold for Feed 1, (62 kg/hL). This wheat may be able to be sold on the domestic market, however only with a value similar to Feed 2 or 3 barley.

Barley

The grain yield and quality results in the barley trial were not as dramatic as in the wheat. This was in part due to the lower grain moisture at the time of application and also the level of leaf disease in the crop. Timings 3, 4 and 5 all yielded the same as the nil treatment.

Table 1 Effect of crop-topping Wyalkatchem wheat on grain yield and quality, 2009

Spray Timing	Date of Spray	Moisture at application (%)	Yield (t/ha)	1000 Grain weight (g)	Protein (%)	Screenings (%)	Test weight (kg/hL)
Nil			5.68	47.3	10.2	2.5	82.6
1	3 Oct	63	1.35	15.4	15.5	60.6	60.4
2	8 Oct	64	2.32	23.9	13.0	27.3	67.1
3	19 Oct	58	4.29	35.7	11.0	3.6	75.8
4	23 Oct	57	4.66	40.9	10.3	2.2	78.5
5	29 Oct	47	5.33	45.1	10.5	2.0	82.2
6	4 Nov	42	5.63	46.7	9.8	2.6	82.5
LSD (P≤0.001)			*0.48*	*2.6*	*0.7*	*6.3*	*2.7*

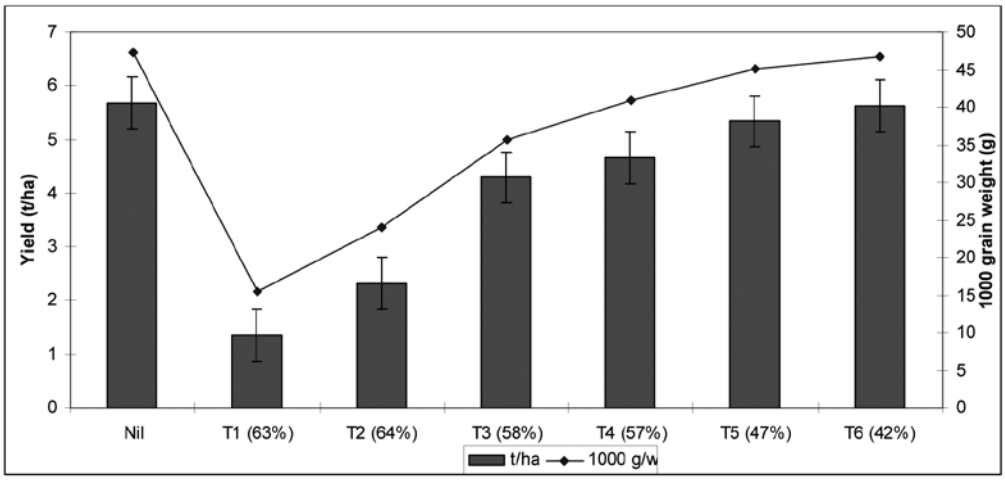

Figure 1 Wyalkatchem wheat yield and 1000 grain weight impact on crop topping timing

Table 2 Effect of crop topping Keel barley on grain yield and quality, 2009

Spray Timing	Date of Spray	Moisture at application (%)	Yield (t/ha)	1000 Grain weight (g)	Protein (%)	Screenings (%)	Test weight (kg/hL)
Nil			5.08	44.1	10.8	3.0	71.0
T1	3 Oct	55	4.21	37.8	11.1	6.9	67.3
T2	8 Oct	51	4.15	39.7	11.1	6.1	68.5
T3	19 Oct	43	4.80	44.0	10.7	2.4	71.0
T4	23 Oct	39	4.68	44.0	10.3	2.5	71.6
T5	29 Oct	22	4.86	43.6	10.8	3.6	70.7
LSD (P=0.05)			*0.44*	*1.21*	*0.32*	*2.08*	*1.32*

Timings 1 and 2 produced lower yields than the later timings and the nil. 1000 grain weight at timing 1 was less compared to all other treatments. Timing 2 produced smaller grain than timings 3, 4, 5 and the untreated plots.

Timing 3, 4, 5 and the untreated plots all produced similar screenings % and test weights. Timing 1 and 2 produced higher screening levels and lower test weights than all other treatments.

The grain quality in the barley was sufficient to see it all reach a grade of Feed 1.

What does this mean?

The optimum timing for crop topping wheat is a compromise between crop damage and ryegrass control. The optimal timing for ryegrass seed set reduction will be around flowering, which can occur before the optimal timing for crop safety in wheat.

In seasons with warmer, drier springs, the crop will dry out faster, however the ryegrass will be going through maturity quicker too, so the compromise will remain similar.

Barley would be the crop of choice for crop-topping due to the earlier maturity. However, there are no glyphosate based products registered for crop-topping barley. Hopefully in the future growers may have the option for crop-topping feed grades of barley, however at this stage glyphosate treated feed barley should not be sold into the export market.

Diquat (Reglone) is registered for pre-harvest weed control in wheat and barley, however the label states that the crop needs to be at full maturity which restricts its usefulness. The other problem with diquat is that it is a contact based herbicide and will offer limited control of weeds below the crop canopy. Diquat is also expensive and tends to have weak activity on grass weeds. Trials conducted at the MNHRZ using Reglone for crop-topping have only achieved 20-30 % ryegrass seed set control on average, with the best result being 60%.

Roundup PowerMax is the only glyphosate product currently registered for crop-topping wheat. The conditions for use restrict its usage to grain moisture levels of 28% or less. Nufarm are currently reviewing the label for Roundup PowerMax in relation to crop-topping and implications on grain yield, grain quality and final quality of bread produced from crop topped wheat.

One area where growers can come “unstuck” with relying on whole head plus grain moisture percentage to assess whether the crop is ready to spray with glyphosate and whether it is dried out sufficiently. If the oven does not dry the samples out satisfactorily, then the calculated moisture levels may be significantly lower than the actual moisture levels. It is worthwhile to make sure that the samples are adequately dried out.

At this stage there are very limited options to get adequate weed control through crop topping and abide within the guidelines of the label. Hopefully in the future this option will be opened through the relevant channels. Until that point, growers should use crop-topping as a tool within the Roundup PowerMax label recommendations.

If a cereal paddock is badly infested with grass weeds, the main objective should be total weed seed set control. Hay cutting and brown manuring are the best methods to ensure that good weed control can result in guaranteeing low weed burdens in the future, crop-topping will not offer the same level of control found with these other options.

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