Canola hay: reducing the risk of canola production

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TAKE HOME MESSAGES

- A trial was undertaken at Longerenong, Wimmera, Victoria, to compare canola types (Clearfield hybrids vs triazine tolerant varieties) and time of cutting for hay quality and yields, and to financially compare these with harvesting the crop for grain. The trial s part of the Better Canola project, funded by the Grains Research and Development Corporation and the Australian Oilseeds Federation.
- Canola can produce excellent quality hay (and silage).
- Cutting at late flowering is a good compromise between quality and quantity.
- Cutting after late flowering reduced hay quality but had little effect on hay quantity.
- The hybrid Clearfield varieties produced higher hay and grain yield than the triazine tolerant varieties.
- The option of hay reduces the risk of growing canola and enables the rotational benefits (weed control, disease break) of canola to be achieved at a lower financial risk.

Introduction

Canola yields have been variable in North Central and north western Victoria in the past ten seasons due to the run of below average rainfall years and a lack of early sowing opportunities. In some of these years, particularly 2002 and 2006 and now 2007, cutting canola crops for hay has provided an alternative risk management strategy for some growers and significantly improved the income from that crop compared with running it through to grain.

The demand for hay from the dairy industry and the gradual acceptance of canola hay or silage as a feed source for dairy cows creates a new fallback option for canola and reduces the risk associated with taking canola to grain. In years where grain yields are likely to be low, hay demand is likely to be strong. This was the case again in 2007.

This option could encourage growers who have removed canola from the rotation to reintroduce this valuable option. Canola is an excellent weed and disease management tool.

The value of a canola hay crop is driven by demand, quality and dry matter. In order to maximise potential returns, it is essential to understand the management requirements for maximising quality and dry matter. There are several factors that may influence this end result and some of these were investigated as of part of an Australian Oilseed Federation and GRDC funded Better Canola project.

Edited by Felicity Pritchard, Oilseeds Industry Development Officer.

2007 CANOLA & JUNCEA CANOLA TRIALS

The aims were to investigate the effect of time of cutting and variety on canola dry matter, quality and the profitability of hay compared with grain production.

Method

Trial 1

The trial was conducted at Birchip Cropping Group's Wimmera Research and Demonstration site at Longerenong College.

In addition, a commercial canola crop at the same location, sown 6 weeks earlier, was used to repeat the time of cutting aspect of the trial.

100kg/ha urea was pre-drilled. 1.2L/ha Trifluralin 480 and 0.5L/ha of the insecticide endosulphan were applied post-sowing pre-emergence (PSPE) on all plots. 1L/ha atrazine 500 plus 1L/ha simazine 500 PSPE on triazine tolerant plots only.

Four varieties/hybrids were sown in the fully replicated trial, in a split-plot design with three replicates. The triazine tolerant varieties, ATRBarra (early-mid) and Tornado TT (mid) were sown at 4kg/ha on 22 May 2007. The Clearfield hybrids, Pioneer®45Y77 (mid maturity) and Pioneer®46Y78 (mid-late) were sown at 3kg/ha, as lower sowing rates are recommended for hybrids. 110 kg/ha of Supreme Z 15 S was applied with the seed, giving a total nutrient application (including the urea) of 60 kg/ha N, 14 kg/ha P, 14 kg/ha S and 0.8 kg/ha Zn. Emergence from the trial was poor, related to sowing depth, and the trial was re-sown on 12 June.

Plots were assessed for early vigour, plant density and ground cover six weeks after emergence. Grass weeds were removed by hand.

To simulate hay production, dry matter was determined at late flowering (17 October) and mid pod-fill (1 November). Due to its earlier maturity, Pioneer®44Y77 was closer to late pod fill at the second time of cutting.

Plant height, plant density and ground cover were assessed at the first hay cut and plant height was again assessed at the second hay cut. At each time of cutting, samples were analysed for feed quality using the Feed Test service. Grain was harvested on 20 Nov 2007 and oil and protein were determined.

Trial 2

The time of cutting and grain vs hay comparison was repeated in a portion of a Tornado TT canola crop on the Longerenong College farm using a randomised complete block design with 4 replications. The crop had been sown on 1 May at 4 kg/ha with 65 kg/ha MAP. There was a very high level of stored nitrogen so urea was not required. Pre-emergent chemical applications were 1.5 L/ha trifluralin as TriflurX and 1.0 L/ha chlorpyrifos as Lorsban. Post-emergent chemical application consisted of 250 mL/ha clethodim as Select® + 20 mL/ha halohyfop-R as Verdict®, 1.0 L/ha atrazine+ 120 ml/ha clopyralid as Lontrel™ + 1% Uptake™ and 80 mL/ha of the insecticide dimethoate. All measurements were the same as described above except an additional hay cut was taken at mid flowering (6 September) as well as late flowering (27 September) and mid pod-fill (17 October).

Results

Note that data for the triazine tolerant (TT) varieties and Clearfield hybrids have been compared in the one trial, despite the application of simazine and atrazine to the TT varieties only. This is because the rates used of the triazine herbicides should have no affect on the TT varieties, and weeds were also controlled by hand, so there should be no differences in weed control between the TT varieties and the Clearfield hybrids.

Time of cutting

In trial 2, cutting at mid flowering produced higher quality (higher protein, digestibility and energy and lower fibre) than cutting at late flowering but less hay yield (Table 1). In contrast, the hay cut at late flowering produced higher yields and although the quality was not as high as the mid flowering cut, good quality feed was still produced - with high energy and protein levels. Cutting at mid pod fill produced similar dry matter to the late flowering timing but quality had deteriorated significantly. This detected change in quality is consistent with previous results (Phillips, 2007).

Table 1:

Dry matter and quality of canola hay cut at early and late flowering in trial 1.

Time of cutting	Date	Dry matter (t/ha)	Residual dry matter (%)	Crude protein (%)*	Neutral detergent fibre (%)*	Dry matter digestibility (%)*	Metabolisable energy (MJ/kg)
mid flowering	6 Sep	3.1	87	28	24	86	13
late flowering	27 Sep	3.9	91	18	33	74	11
mid pod fill	17 Oct	4.0	91	15	38	68	10
LSD (p<0.05)		0.6		3	3	4	0.7

* adjusted to dry matter basis

Variety and time of cutting

The Clearfield hybrids produced more hay at both timings than the triazine tolerant varieties (Table 2). The hybrids also produced more grain than the triazine tolerant varieties but there was no difference in oil content.

Within each canola type, there was no difference between the varieties for biomass at either time of cutting or for grain yield. Pioneer®45Y77 and Pioneer®46Y78 exhibited greater ground cover at late flowering (82 and 85% respectively) than ATRBarra (66%) and Tornado TT (69%). They were also taller and had greater depth of pod.

Table 2:

Hay and grain yield (t/ha) and oil content (%) for four canola varieties at Longerenong, 2007

System		Clearfield hybrid		Triazine tolerant		LSD
Variety/hybrid		45Y77	46Y78	ATRBarra	Tornado TT	(p<0.05)
Measurement	Harvest	Hay				
Late flowering hay yield	17 Oct	4.4	3.9	3.2	2.9	0.6
Mid pod fill hay yield	1 Nov	3.8	3.7	3.1	2.8	0.7
Grain						
Seed yield	20 Nov	1.10	1.07	0.66	0.66	0.2
Seed oil (%)		35.5	36.5	37.1	36.1	nsd*

*no significant difference

Hay quality was not affected by variety (Table 3) but was affected by time of cutting (Table 4) although there were no significant differences in protein for the two times of cutting. There was no significant interaction between variety and time of cutting, however, Pioneer®45Y77 displayed poorer quality than the other varieties at the second time of cutting. This was most likely due to its earlier maturity, therefore being

closer to ripeness than the other varieties. Table 4 illustrates the drop in quality resulting from the later time of cutting which is consistent with the findings from trial 2.

Table 3:

Effect of variety/hybrid on hay quality for trial 1 (mean of two times of cutting).

Quality measurement	Clearfield hybrid		Triazine tolerant		LSD
	45Y77	46Y78	ATR-Barra	Tornado	(p<0.05)
Crude protein %*	15.0	17.3	16.8	16.6	NS**
Neutral detergent fibre %*	45.0	41.6	41.0	41.0	NS
Dry matter digestibility %*	63.2	66.8	66.5	66.9	NS
Metabolisable energy (MJ/kg dry matter)	9.3	9.8	9.8	9.9	NS

*Dry matter basis; ** Not significant

Table 4:

Effect of timing of hay cutting on hay yield (t/ha) and quality (mean of all varieties/hybrids x herbicide system).

Timing	Late flowering cut	Mid pod fill cut	LSD(p<0.05)
Dry matter yield	3.6	3.4	nsd**
Residual dry matter (%)	91.4	94.6	0.5
Crude protein (%)	17.1	15.8	nsd**
Neutral detergent fibre (%)	35.8	48.5	3.0
Dry matter digestibility (%)	71.6	60.1	3.8
Metabolisable energy (MJ/kg)	10.7	8.7	0.64

*Dry matter basis; ** Not significantly different

Commercial practice

In the commercial paddock trial (trial 2), hay production regardless of the time of cutting was more profitable than harvesting the crop for grain (Table 5). A frost in mid October caused significant damage to the seed formation and reduced yield potential. Cutting at late flowering produced a more profitable result than early flowering at a given hay price. Canola cut at early flowering was better quality but produced lower hay yields, requiring a $60/t premium to compensate for this.

Table 5:

Gross margin for grain compared with canola hay cut at early or late flowering using two hay prices for trial 2*.

End Product	Yield (t/ha)	Oil (%)	Commodity Price ($/t)	Gross Income ($/ha)	Total Costs ($/ha)	Gross Margin ($/ha)
Grain	0.4	35.3	535	214	240	-26
Early flowering cut hay	3.1	na	270	837	362	476
			200	620	360	260
Late flowering cut hay	3.9	na	270	1053	392	661
			200	780	390	390

**NB: costs include $162/ha for haymaking at 3.1 t/ha and $192/ha at 3.9 t/ha;$200/ha production costs (no N applied in this paddock due to high stored N) $40/ha harvesting and windrowing costs. Grain price Marma Lake Dec 07.*

Although not presented in Table 5, the gross margin for the mid pod fill cut was similar to the late flowering cut (as dry matter production was similar) assuming the same price could be achieved for the hay given the drop in quality.

In the variety by timing trial, the profitability of hay compared with grain was dependent on the choice of a Clearfield hybrid or a triazine tolerant variety and hay price (Table 6). For the Clearfield hybrids, hay was more profitable than grain at the higher hay price of $270/t (which was achievable in mid October) but it was not as clear-cut at the lower hay price of $200/t. Conversely, for the lower (grain) yielding triazine tolerant varieties, hay was a more profitable option, with the grain yield required to exceed the gross margin from hay being greater than the achieved grain yield for each time of cutting and for both hay prices.

Table 6:

Gross margin for grain compared to canola hay cut late flowering (LF) or mid pod fill (MP) using two hay prices for four varieties.

End-product	Prices ($/t)	Yield (t/ha)	Gross Margin ($/ha)	Grain Yield required to match hay gross margin (t/ha)	Yield (t/ha)	Gross Margin ($/ha)	Grain Yield required to match hay gross margin (t/ha)
Clearfield hybrids							
		Pioneer®45Y77			Pioneer®46Y78		
Grain*	545	1.10	287	1.1		272	
LF cut hay	200	4.4	391	1.3	3.9	309	1.1
	270		696	1.8		579	1.6
MP cut hay	200	3.8	291	1.1	3.7	281	1.1
	270		553	1.6		538	1.6
Triazine Tolerant							
		ATRBarra			Tornado TT		
Grain*	545	0.66	70		0.66	70	
LF cut hay	200	3.2	227	0.9	2.9	181	0.9
	270		452	1.4		385	1.2
MP cut hay	200	3.1	215	1.0	2.8	158	0.9
	270		433	1.4		353	1.2

Production costs for IT hybrids $270/ha, TT $250/ha. Harvest costs $ 40/ha, Hay costs $50/t Grain price based on 36 % oil mid December Graincorp Marma Lake.

Hay production is not without risk (weather damage, volatile markets) but does provide a great salvage option in some seasons as was the case in 2007. Greater nutrient removal in hay should be considered when planning the following season's crop.

Cutting at late flowering is a good compromise between quality and quantity for maximising hay income however, later salvage cuts at mid pod fill (e.g after a frost event) can still prove profitable as was the case in these trials, as long as the reduction in quality does not hinder the sale of the hay.

In these trials, the commercial paddock was clearly better off cut for hay as were the two TT varieties in trial 1. The decision to cut the Clearfield hybrids was border-line if the price was low but favourable if a price above $200/t was achievable.

This illustrates that cutting crops for hay is a complex decision-making process involving seasonal outlook, soil moisture reserves and the likely price for both hay and grain as well as considering the logistics of hay making.

Biomass estimation prior to cutting assists decision making. In trial 2, dry matter yields were 18, 23 and 27% of fresh weight at mid flowering, late flowering and mid- pod fill

respectively. In trial 1, dry matter yields were 26% and 36% of fresh weight at late flowering and mid- pod fill respectively. These ratios are useful for assessing potential hay yield with out drying down plant material. Suggested rules of thumb for estimating dry matter are 20% of fresh weight for early flowering, 25% fresh weight for late flowering and 30-35% of fresh weight for mid pod fill.

Paying attention to detail in the hay making process is essential to produce a high quality saleable product. Chemical records and withholding periods of chemical applied in that season should be checked **before** cutting for hay. Canola hay should be conditioned to reduce curing time and increase palatability. This ensures a higher quality product. The reduction in curing time reduces the chance of weather damage and also reduces the chances of baling hay too wet which can lead to hay shed fires. Patience is indeed a virtue in hay making but is essential to ensure that high moisture hay is not baled prematurely.

Proactive marketing and the use of contracts for hay sales can also reduce some of the uncertainty associated with hay marketing. This trial also illustrates how variable hay quality can be so analysis of hay using FEEDTEST is suggested to aid in selling canola hay and is required by most dairy farmers.

Field days
Birchip Cropping Group southern field day and Better Canola Field day
Attended by 50 growers and agribusiness professionals
Speakers: Stu Gilroy, Canadian Canola Council; Felicity Pritchard, Oilseeds Industry Development Office, Kate McCormick, Consultant John Stuchbery and Associates (Better Canola Victorian Demonstration trial coordinator 2007)

Other Extension
This demonstration was reported on by Ground Cover (December edition) and Kondinin Magazine (February Edition?)
Results were presented at Birchip Cropping Group Trials Review day Feb 18 (150 growers) and Southern Review day Feb 21(20 growers) and GRDC Advisor updates Ballarat Feb 20.

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References
Phillips, N (2007) Canola hay & silage – cutting time and feed quality. NSW DPI