5. GRAZING TRIALS

5.1 The impact of grazing on grain yield of canola - Inverleigh & Lake Bolac, Vic

Location:
Inverleigh & Lake Bolac Research Sites

Funding:
GRDC, DAFF (through the Caring for our Country program) and CSIRO

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Background/Aim:
Grazing cereals has proved to be a major opportunity for mixed livestock and cropping farmers in Southern Victoria. If certain grazing principles are met, dry-matter can be harvested in early winter without reducing grain yield.

Canola may provide another possible feed source. While some work has been conducted in Southern NSW and South Australia by CSIRO, there is a need to validate this findings in the high rainfall zone of Southern Victoria under a range of sowing dates and grazing conditions.

The aims of the work are to:

- Evaluate the fit of commonly used and non commercial (dual purpose) canola varieties in Southern Victoria under a range of sowing dates
- Quantify the yield response of canola to a range of grazing conditions
- Develop grazing principles for canola in the high rainfall zone.

This experiment reports on the first year of a four year trial to determine the potential opportunity of grazing canola in the high rainfall zone. Longer term impacts of grazing on soil structure and weeds are also being investigated but are not reported in this paper.

Summary of findings:

- If sown by mid May, hybrid varieties produced dry matter for grazing in the order of 1.5 to 2.0 t/ha
- Grain yield was reduced for most varieties by grazing, compared to no grazing, but was thought to be a result of waterlogging and severe defoliation
- Waterlogging also affected the yield of ungrazed varieties, especially if sown in June
- Canola appears to be more sensitive than cereals to grazing under adverse weather and grazing conditions

Rainfall:
Average annual rainfall at Inverleigh was 610 mm and 749 mm at Lake Bolac. Above average falls occurred in August, with rainfall at Lake Bolac the highest monthly fall ever recorded.

Month	Inverleigh		Lake Bolac	
	2010	Long term average	2010	Long term average
April	57.2	39.3	47.2	35.0
May	31.6	49.0	23.2	44.8
June	43.6	48.6	36.2	45.7
July	32.0	53.2	38.6	47.9
August	78.0	57.4	169[1]	61.6
September	50.6	57.4	43.4	50.4
October	95.8	55.2	69.0	50.3
November	51.8	47.6	79.4	42.5
December	29.4	39.9	105.2	32.6

Varieties:
A range of conventional, Triazine tolerant (TT), Clearfield (CF) and Roundup Ready (RR) canola varieties were evaluated along with varieties that are not yet commercially available (represented by *).

Variety	Inverleigh		Lake Bolac	
	Trial 1	Trial 2	Trial 1	Trial 2
46Y20 (RR)	X	X	X	X
46Y78 (CF)	X	X	X	X
46Y83 (CF)		X		X
Argyll (TT)		X		X
CBI306*	X		X	
CBI406*	X		X	
CBIW208*	X		X	
Garnet	X		X	
Hyola 502 (RR)		X		X
Hyola 571 (CF)	X	X	X	X
Jardee (TT)	X	X	X	X
Lightning (TT)		X		X
Marlin (TT)	X	X	X	X
Taurus	X		X	
Tumby (TT)		X		X

Experimental design:
Number of trials: 4 (2 at Inverleigh, 2 at Lake Bolac)
Plot size: 12 m x 1.45 m
Replicates: 4
Grazing: Exclusion areas were erected on half of each plot to prevent grazing (ie an area of 6 m x 1.45 m)

	Inverleigh		Lake Bolac	
	Trial 1	**Trial 2**	**Trial 1**	**Trial 2**
Previous crop	Barley	Fallow	Wheat	Wheat
Herbicides (before sowing)	1.5 l/ha Roundup Powermax 150 ml/ha Striker			
Sowing dates	May 15	June 15	May 20	June 18
Fertiliser	100 kg/ha MAP	100 kg/ha MAP	100 kg/ha MAP	100 kg/ha MAP
Herbicides / Insecticides post sowing	100 ml/ha Fastac		250 ml/ha Dual Gold 100 ml/ha Fastac	
Start of grazing	1 Sept	7 Sept	27 Aug	3 Sept
Days grazed	7	4	7	4
Stocking rate (sheep/ha)	80	120	80	120

Results:

Sowing times

The two sowing times represented a 'traditional' sowing time and the second sowing time represented a common date to resow, if earlier sown canola had failed to establish adequately. The sowing times were less than ideal to maximise dry matter production but were conducted to evaluate the responses to grazing at the late sowing end of the grazing spectrum.

Seasonal / site condition

The Inverleigh site experienced lower rainfall around grazing than the Lake Bolac site, allowing it to drain sufficiently to avoid extended periods of waterlogging. Grazing occurred when the soil was saturated (and 40 mm of rain fell) but the visual impact was less severe than Lake Bolac. At Lake Bolac severe waterlogging conditions were encountered before, during and after grazing. Visual pugging effects were also severe.

Dry matter for grazing

The dry matter production available for grazing significantly varies between varieties and sowing times. This is not surprising given the range of hybrid and conventional varieties sown and the sowing times (Table 1).

Impact of grazing on grain yield

Grazing significantly reduced grain yield of most varieties. The impact was more pronounced at the Lake Bolac site (table 2) than at Inverleigh (Table 3).

Table 1: Dry matter available at grazing (kg/ha)

Variety	Inverleigh			Lake Bolac		
	Trial 1		Trial 2	Trial 1		Trial 2
Sowing date	May 15	June 15	June 15	May 20	June 18	May 20
46Y20 (RR)	1324	332	422	1919	336	1969
46Y78 (CF)	1881	633	1225	1762	391	1220
46Y83 (CF)			652			1912
Argyll (TT)			163			No estab
CBI306*	1637	597		2016	394	
CBI406*	1873	743		1311	393	
CBIW208*	1209	382		1544	332	
Garnet	2381	338		1689	359	
Hyola 502 (RR)			1412			2445
Hyola 571 (CF)	1689	411	628	1695	354	1766
Jardee (TT)	1335	152	310	1053	344	755
Lightning (TT)			266			463
Marlin (TT)	436	113	283	827	351	205
Taurus	2085	633		1650	391	
Tumby (TT)			573			502
LSD $_{p= 0.05}$	**624**		**374**	**387**		**683**

Table 2: Grain yield with and without grazing (Lake Bolac)

Trial	Trial 1				Trial 2	
Sowing date	May 20		June 18		May 20	
Grazing	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed	Grazed
46Y20 (RR)	992	284	503	143	1513	74
46Y78 (CF)	1530	357	308	135	1769	185
46Y83 (CF)					1565	309
Argyll (TT)					No estab	No estab
CBI306*	902	64	484	133		
CBI406*	1336	227	219	225		
CBIW208*	922	385	350	61		
Garnet	1077	258	139	127		
Hyola 502 (RR)					1731	270
Hyola 571 (CF)	1174	397	318	0	1244	52
Jardee (TT)	687	206	107	56	561	0
Lightning (TT)					1053	0
Marlin (TT)	348	189	48	0	458	0
Taurus	1233	250	256	162		
Tumby (TT)					537	0
LSD $_{p= 0.05}$	**245**				**244**	

Table 3: Grain yield with and without grazing (Inverleigh)

Trial	Trial 1				Trial 2	
Sowing date	May 15		June 15		June 15	
Grazing	Ungrazed	Grazed	Ungrazed	Grazed	Ungrazed	Grazed
46Y20 (RR)	1729	1185	1750	1575	671	858
46Y78 (CF)	1706	2071	2418	1790	2146	1406
46Y83 (CF)					1748	636
Argyll (TT)					661	0
CBI306*	1968	2024	2467	2120		
CBI406*	2367	1322	1931	2147		
CBIW208*	1977	1649	1929	2283		
Garnet	2692	2181	2134	1615		
Hyola 502 (RR)					1316	1157
Hyola 571 (CF)	1969	1382	1774	1241	1510	806
Jardee (TT)	1713	1856	2234	1132	656	0
Lightning (TT)					1414	659
Marlin (TT)	677	345	2157	1682	28	0
Taurus	2595	2167	1710	1844		
Tumby (TT)					1383	394
LSD $_{p= 0.05}$	Not significant				Not significant	

Discussion:

2010 provided an opportunity to test the tolerance of canola to grazing under severe growing conditions. The Lake Bolac sites were severely waterlogged at grazing. The two trials at Inverleigh experienced less severe conditions. At all sites the canola plants were grazed briefly but severely, removing all the leaves and some of the stem. While grazing would not be recommended under these waterlogged conditions or degree of leaf removal, defoliation and trampling by the animals enabled the worse case results to be measured.

There was a high degree of variability within treatments (high CV), resulting from the failure of some varieties to recover after grazing. They were given a zero yield which meant averages may have only been derived from three or two plots. Therefore the results must be viewed with caution.

The severity of the weather conditions was reflected in the lower yields, even from the non grazed canola, at Lake Bolac (Table 2) compared to the less challenging conditions at Inverleigh (Table 3). This was especially evident for the later sowing date.

Grazing had a significant impact on grain yield where the sowing time was later and the more severe waterlogging was encountered during grazing and in the post grazing recovery period. Only three commercial varieties grew large quantities of dry matter for grazing (1.3 to 2.0 t/ha) ***and*** were able to withstand grazing and not compromise yield (figure 1). These were Hyola 502, 46Y78 and Jardee. These results were measured at the Inverleigh site. Larger yield loss due to grazing occurred at Lake Bolac with these varieties.

One experimental line also achieved high dry matter production and yield after grazing (CBI306). This was also measured at the Inverleigh site.

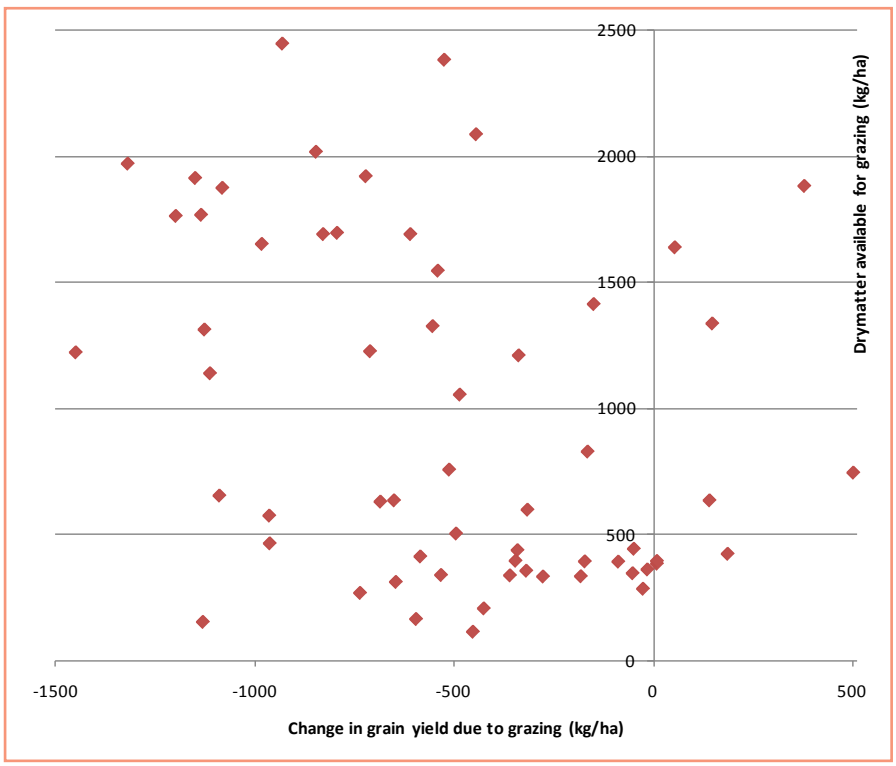
A critical aspect of grazing canola will be the interaction with various herbicides. The lengthy withholding period of some herbicides excludes potential grazing eg triazine herbicides have a 15 week with holding period if used pre emergent and 6 weeks post emergent, *Intervix* used with Clearfield technology has a 5 week withholding period when used post emergent. *Roundup* used on Roundup Ready canola has a 7 day withholding period.

Two of the three varieties that showed promise for grazing were either triazine tolerant or Clearfield varieties. The potential benefits of sowing these varieties to obtain weed control may limit the opportunity to use them for grazing.

It is premature to draw any conclusions about the impact of grazing on weed populations and soil structure. 2010 provided extreme conditions to 'damage' the soil and while significant pugging was visually evident, further testing is required to fully appreciate the long term effects.

Preliminary observations on weed populations do not indicate any significant increase in the *number* of weeds due to grazing. However the removal of the canola canopy, coupled with a slow canopy recovery, seemed to reduce competition which promoted more vigorous weed growth, especially toad rush.

Figure 1: Drymatter available for grazing and impact on grain yield by grazing (Inverleigh, and Lake Bolac, traditional and late sowing times)



Summary:
These results are only the first year of a four year testing regime. Varieties were sown later than ideal if you wanted to maximise drymatter production and grazing was severe and conducted under unfavourable conditions. Not surprisingly, yield suffered with most varieties. Nevertheless, it provides an 'extreme end' of the grazing regime. Future trials will examine the impact of grazing when sown earlier and with less severe grazing conditions and levels of defoliation.

Although not formally measured field observations suggest that crop maturity can be 'evened up' by grazing allowing for more timely windrowing in a 'patched up' crop.

As a comparison, no significant yield loss was measured, on adjacent cereal crops grazed at a similar time to the canola (data to be published next year). This would suggest the canola may be more sensitive to unfavourable grazing conditions than cereals. Factors which we would see as unfavourable at this stage would include:

- Late sown canola
- Water logged conditions at grazing or in the post grazing recovery period
- Complete defoliation of the plants
- Incorrect paddock selection - Low nutrient availability or poor seed bed preparation
- Incorrect variety selection. eg Varieties that have poor vigour like non hybrid TT's
- High weed populations and slow canopy closure.