7.2 CANOLA

7.2.1 EVALUATING SULPHUR SOURCES IN CANOLA (INVERLEIGH, VIC)

Research Agronomist:
Andrew Speirs, Hifert Ltd (Ph. 0428 685 172)

Location: Inverleigh Trial Site

Growing Season Rainfall: 388 mm

Rotation History: 2003 Wheat

Variety: Canola Beacon TT
Rate: 4 kg/h
Sown: 1st June 2004

Aim:
To investigate the effectiveness of elemental sulphur in canola, what percentage of the applied sulphur can be applied as fine (less than 250 micron) elemental sulphur without loss of grain yield or oil content. In this trial either 2 kg of sulphur or 28 kg of sulphur has been applied per hectare. The form of sulphur varies from 100 % sulphate (S so_4) to 100 % elemental (S.el).

Method:
A fully randomised complete block design, 10 replicates 6 treatments

Table 1: Treatment Details

Trt	Product mix	Nutrients applied (kg/ha)				
		N	P	S.el	Sso_4	St
1	MAP/SOA/Urea	60	25		28	28
2	Super M/Gold N	60	25	26	2	28
3	Super M/SOA/Urea	60	25	14	14	28
4	Super M/MAP/SOA/Urea	60	25	7	21	28
5	Super M/Gold N/Urea/SOA	60	25	21	7	28
6	MAP/Urea	60	25		1	1

Urea SOA or Gold N was deep banded under all treatments to balance the total nitrogen input to 60 kg/ha.

Last Soil Test Results

Test	Org. C %	P[9] mg/kg	K mg/kg	S mg/kg	pH H_2O	pH $CaCl_2$	Cu DTPA mg/kg	Zn DTPA mg/kg
Result	1.45	28.3	320	10.8	5.7	4.9	0.63	0.64
Status	Moder	Adeq	Adeq	Adeq	Mod Acidic	Mod acidic	Adeq	Marginal

Test	CEC meq/100 mg	Ca %	Mg %	Na %	S 0-60	SALT dS/m	N (kg/ha) 0-10	N (kg/ha) 0-60
Result	4.3	65.6	14.8	2.2	NT	0.092	23	
Status		Elevated	Adeq	Adeq				

[9] P test is Olsen, Colwell P 60 ppm, Phosphate buffering Index 49.3

Results and Discussion:

Table 3: Grain Yield

Trt	Product	Yield (t/ha)	WUE[10] (kg/mm)
1	MAP/SOA/Urea	1.491	5.34
2	Super M/Gold N	1.505	5.39
3	Super M/SOA/Urea	1.498	5.37
4	Super M/MAP/SOA/Urea	1.468	5.26
5	Super M/Gold N/Urea/SOA	1.555	5.57
6	MAP/Urea	1.571	5.63
LSD 5 %		0.159	
C.V		10.4 %	

Discussion:
This trial has not given us any clear results. The CV is satisfactory at 10.4 % with an LSD at the 5% level of 0.159 tonnes. There was not a sulphur response at the site with the 100 % sulphate sulphur treatment (T1) yielding virtually the same as the no sulphur treatment (T6). Soil sulphur levels in the 0–10 cm was 10.8 (adequate) but there may still have been a response in a high sulphur requiring crop such as canola. Based on WUE the yields are well down (4.18T versus max 2T), most likely due to the dry period experience during flowering, direct heading may have also resulted in some yield loss.

[10] Water use efficiency = (GSR (A-N) – 110 mm) x 0.015 which for 2004 equals 4.18 tonne

Conclusion:
This trial has not been able to add to our understanding as to how much sulphur can be applied as elemental sulphur as there was not a response to sulphur. So when working from a maintenance perspective there is no problem with 100% elemental sulphur in the form we have applied.

7.2.2 EVALUATING SULPHUR SOURCES IN CANOLA - HIFERT (LAKE BOLAC, VIC)

Research Agronomist:
Andrew Speirs, HiFert Ltd (Ph 0428 685 172)

Location: Lake Bolac

Growing Season Rainfall (Apr – Nov): 413 mm

Rotation History: 2003 Barley

Method:
A fully randomised complete block design, 10 replicates 6 treatments

Aim:
To investigate the effectiveness of elemental sulphur in canola, what percentage of the applied sulphur can be applied as fine (less than 250 micron) elemental sulphur without loss of grain yield or oil content. In this trial either 2 kg of sulphur or 28 kg of sulphur has been applied per hectare. The form of sulphur varies from 100 % sulphate (Ss) to 100 % elemental (Se).

Variety: Canola Beacon TT
Rate: 4 kg/ha on
Sown: 28th May 2004

Table 1: Treatment Details

Trt	Product mix	Nutrients applied (kg/ha)				
		N	P	S.el	Sso_4	St
1	MAP/SOA/Urea	60	25		28	28
2	Super M/Gold N	60	25	26	2	28
3	Super M/SOA/Urea	60	25	14	14	28
4	Super M/MAP/SOA/Urea	60	25	7	21	28
5	Super M/Gold N/Urea/SOA	60	25	21	7	28
6	MAP/Urea	60	25		1	1

Urea SOA or Gold N was deep banded under all treatments to balance the total nitrogen input to 60 kg/ha.

Last Soil Test Results

Test	Org. C %	P[11] mg/kg	K mg/kg	S mg/kg	pH H_2O	pH $CaCl_2$	Cu DTPA mg/kg	Zn DTPA mg/kg
Result	2.67	12.2	407	14.4	6.1	5.6	0.88	0.38
Status	High	Marg	Adeq	Adeq	Mod Acidic	Mod acidic	Adeq	Low

Test	CEC meq/100 mg	Ca %	Mg %	Na %	S 0-35	SALT dS/m	N (kg/ha) 0-10	N (kg/ha) 0-35
Result	8.2	80.1	5.7	2.1	41		58	114
Status		Elevated	Adeq	Adeq				

[11] P test is Olsen, Colwell P 25 ppm Phosphate buffering Index 58.9

Results and Discussion:

Table: 3 Grain Yields

Trt	Product	Yield (t/ha)	WUE[12] (kg/mm)
1	MAP/SOA/Urea	3.53	11.65
2	Super M/Gold N	3.50	11.55
3	Super M/SOA/Urea	3.51	11.58
4	Super M/MAP/SOA/Urea	3.57	11.78
5	Super M/Gold N/Urea/SOA	3.48	11.49
6	MAP/Urea	3.44	11.35
LSD 5%		**0.40**	
CV		**12 %**	

Results:
This site yielded very well, oil content is yet to be done. There was no response to applied sulphur, so it was not possible to compare the effect sulphur form may have had on grain yield. The total amount of sulphur in the profile was not high at 41 kg, however this was enough to satisfy a 3.5 tonne crop, which would remove 35 kg of sulphur. There would have also been some sulphur made available from the soil organic matter. WUE yield potential was 4.54 tonnes.

[12] Water use efficiency = (GSR (A-N) – 110 mm) x 0.015 which for 2004 equals 4.54 tonne

Conclusion:
This trial has not been able to add to our understanding as to how much sulphur can be applied as elemental sulphur as there was not a response to sulphur. So when working from a maintenance perspective there is no problem with 100% elemental sulphur in the form we have applied.

7.2.3 EVALUATING SULPHUR SOURCES IN CANOLA – HIFERT (HAMILTON, VIC)

Location: Hamilton

Research Agronomist:
Andrew Speirs, Hifert Ltd (Ph 0428 685 172)

Growing Season Rainfall (Apr – Nov): 485 mm

Variety: Canola Beacon TT
Rate: 4 kg/ha
Sown: 2nd June 2004 into a sticky wet seed bed.

Rotation History: 2003 Barley

Method:
A fully randomised complete block design, 10 replicates 6 treatments

Aim:
To investigate the effectiveness of elemental sulphur in canola, what percentage of the applied sulphur can be applied as fine (less than 250 micron) elemental sulphur without loss of grain yield or oil content. In this trial either 2 kg of sulphur or 28 kg of sulphur has been applied per hectare. The form of sulphur varies from 100 % sulphate (Ss) to 100 % elemental (Se).

Table 1: Treatment Details

Trt	Product mix	Nutrients applied (kg/ha)				
		N	P	S.el	Sso_4	St
1	MAP/SOA/Urea	60	25		28	28
2	Super M/Gold N	60	25	26	2	28
3	Super M/SOA/Urea	60	25	14	14	28
4	Super M/MAP/SOA/Urea	60	25	7	21	28
5	Super M/Gold N/Urea/SOA	60	25	21	7	28
6	MAP/Urea	60	25		1	1

Urea SOA or Gold N was deep banded under all treatments to balance the total nitrogen input to 60 kg/ha.

Results and Discussion:

Table: 2 Grain Yields

Trt	Product	Yield (t/ha)	WUE[13] (kg/mm)
1	MAP/SOA/Urea	1.62	4.32
2	Super M/Gold N	1.80	4.80
3	Super M/SOA/Urea	2.02	5.39
4	Super M/MAP/SOA/Urea	1.93	5.15
5	Super M/Gold N/Urea/SOA	1.85	4.93
6	MAP/Urea	1.65	4.40
LSD 5%		**0.47**	
CV		**26 %**	

Discussion:
The site yields were very similar to the district with little rain and hot weather in October severely limiting yield. The difficult seed bed also contributed to the high CV of 26 %. There was no response to applied sulphur The total amount of sulphur in the profile was high and a response to applied sulphur probably unlikely. WUE was low with the yield potential being 5.6 tonne and only achieving maximum of 2.02 t, most likely as a result of the dry hot flower period experienced.

[13] Water use efficiency = (GSR (A-N) – 110 mm) x 0.015 which for 2004 equals 5.6 tonne

Conclusion:
This trial has not been able to add to our understanding as to how much sulphur can be applied as elemental sulphur as there was not a response to sulphur. So when working from a maintenance perspective there is no problem with 100% elemental sulphur in the form we have applied.

7.2.4 MORE EFFICIENT NITROGEN FERTILISERS - INCITEC PIVOT LTD (INVERLEIGH, VIC)

Abstract:
A canola trial was set up at Inverleigh to investigate if a nitrogen product could be applied at sowing with a delayed release and if a product or application technology is available that can limit losses of nitrogen to the environment.

The trial suffered severe shattering with an estimated 30-40% of the grain ending up on the ground, creating varied and unreliable grain yield data. All at sowing N treatments with the exception of formaldehyde urea significantly reduced oil percentages as did post sowing urea treatments. These same treatments also gave significant increases in protein. The use of nitrification inhibitor on urea at sowing significantly increased protein.

Objectives:
- To identify crop response to urea, Easy N and formaldehyde urea across a range of application timings.
- To assess differences in nitrogen response when these products are treated with Entec® nitrification inhibitor.
- Develop and use measures of environmental performance of these products.

Researcher: Matthew Robertson, Incitec Pivot Ltd
Location: Inverleigh, Victoria
Growing Season Rainfall (April-Nov): 388mm.

Methodology:
- Completely randomised block design with three replicates.
- Plot size 20 x 2 m
- Shallow (0-10cm) and deep (10-30 and 30-60cm) soil analysis prior to sowing.
- Plant tissue analysis of whole tops at DC30 by removing 1 m of row (2x 50 cm cut) from either end of plots.
- All eight rows to be direct harvested with the end of the plots trimmed.

Table 1: Inverleigh Site Details

Variety	Surpass 501TT
Sowing date	1/6/2004
Sowing rate	4.4 kg / ha
Harvest date	10/12/04
Basal P	20 kg / ha
PH (1:5 water) 0-10 cm	5.9
Phosphorus	Olson P 21.9
Profile N kg / ha 0-60 cm	45
Organic Carbon %	1.0

Results:

The Inverleigh trial site again highlights the pitfalls of small plot trials with canola. With the site appearing to be ideal for a nitrogen trial with only 45 kg N/ha in the soil profile (0-60cm) a high coefficient of variation (25.7%) suggests that factors other than nutrition affected the trial. Plant emergence was less than satisfactory with the newly formed beds and the drying out of the seedbeds after sowing. Plants per square metre varied from 32 – 84 and had an excessive c.v.% of 44%.

The trial was brought into even maturity using Spray Seed and direct harvested. Prior to and during harvesting severe shattering of the pods occurred with an estimated 30-40% of the grain ending up on the ground and it is likely that this caused the large amount of variation in yield in combination with an unsatisfactory seedling emergence.

All at sowing N treatments with the exception of formaldehyde urea significantly reduced oil percentages as did post sowing urea treatments (table 2). Notably, these same treatments also gave significant increases in protein percentage. This reflects an established relationship of oil reduction in lieu of protein deposition. A third factor in this relationship however needs to be balanced where there is a negative correlation between protein and oil, there is a strong positive relationship between protein and yield (Walker and Foley, unpublished). Therefore nitrogen nutrition in canola needs a careful balance in order to optimise both yield and oil as it is impossible to maximise both. On the basis of these relationships, another interesting finding of the trial is the significant increase in protein (in the absence of any significant oil decline) where nitrification of urea is inhibited at sowing.

Table 2: Effect of Nitrogen Source, Timing and Application Method on Oil % and Protein %

Fertiliser Treatment	Application stage	Application method	Yield kg/ha	Oil %	Protein %
Control	Sowing	MRB	1045	48.07	17.33
Urea	Sowing	MRB	890	46.60	19.00
Entec urea	Sowing	MRB	770	46.20	20.10
Form urea	Sowing	MRB	1214	47.60	18.40
UAN	Sowing	MRB	1153	46.75	18.95
Entec UAN	Sowing	MRB	754	46.90	18.90
Urea	20/09/2004	Broadcast	919	46.77	18.77
Entec urea	20/09/2004	Broadcast	785	46.95	18.35
Form urea	20/09/2004	Banded	749	46.80	18.73
Form urea	20/09/2004	Foliar	1023	47.65	17.90
Entec UAN	20/09/2004	Foliar	913	47.50	17.97
UAN	20/09/2004	Foliar	637	47.70	17.80
UAN	20/09/2004	Banded	984	47.25	17.90
UAN + HA	20/09/2004	Foliar	725	47.47	17.70
Urea	29/09/2004	Broadcast	1131	46.53	18.87
Form urea	29/09/2004	Foliar	1080	47.85	17.65
Form urea	29/09/2004	Banded	1034	47.40	18.07
UAN	29/09/2004	Banded	852	47.73	17.87
UAN	29/09/2004	Foliar	888	47.15	18.45
UAN + HA	29/09/2004	Foliar	1089	47.27	17.90
F pr.			**0.193**	**0.002**	**0.001**
LSD			**395.5**	**0.82**	**0.86**
CV%			**25.7**	**1.00**	**2.80**

Conclusions:

Careful thought needs to be given to the harvest operations for future small plot canola trials with a view to generating reliable yield data through avoiding shattering. This trial reinforces the nature of the negative relationship between protein and oil in canola, highlighting the requirements for precise nitrogen management in order to optimise both yield and protein.

There is some evidence of the usefulness of nitrification inhibitors in canola which builds on more robust evidence generated from cereal trials in 2004.