



Bio-Sul Premium Plus

2017 TISSUE TRIALS

Carseland

Trial #109804 CC-12

Rate: Bio-Sul applied at 220 lbs/ac

Timing: 154 lbs S, Fall 2013

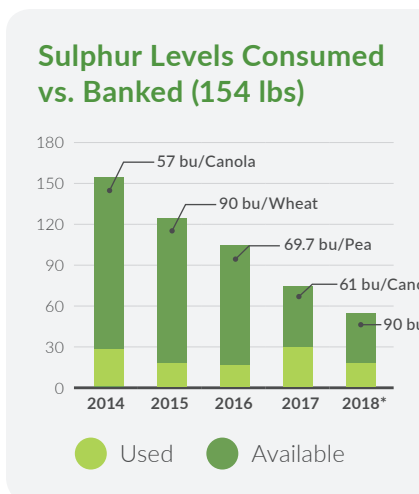
OM: 4.5 | PH: 6.5

Rotation: canola/wheat/pea/wheat/canola

2017 CANOLA Sample ID: 1-A Stage: Bud Plant Part: Leaves Appearance: Normal	2016 PEAS Sample ID: 1-check Plant Part: Top 6" Appearance: Normal	2015 WHEAT Sample ID: 1-A Stage: Jointing Plant Part: Top 6" Appearance: Normal	2014 CANOLA Sample ID: 1-SE 12 Stage: Rosette Plant Part: Leaves Appearance: Normal
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		% N	% NN	% S	% P	% K	% Mg	% Ca	% Na	B ppm	Zn ppm	Mn ppm	Fe ppm	Cu ppm	Al ppm	% Cl	% Mo
2017	July 10	6.17		1.27	0.56	2.73	0.43	2.29	0.23	32	58	201	120	6			
	<i>Normal</i>	4.0-5.2		0.5-0.8	0.3-0.5	3.5-5.0	0.2-0.4	1.5-3.3	0	20.4-31.2	30.4-52.8	68-112	158-298	4.0-7.0			
2016	June 15	5.34		0.29	0.66	3.59	0.36	1.16	0.05	20	40	45	244	8			
	<i>Normal</i>	3.8-5.0		0.2-0.4	0.3-0.5	2.3-3.4	0.2-0.5	0.8-1.8	0.2	25.5-39	28-48.7	59.5-98	117-221	9.6-16.8			
2015	July 1	5.04		0.56	0.36	2.48	0.18	0.68	0	6	27	73	104	7			
	<i>Normal</i>	3.4-4.5		0.2-0.4	0.3-0.5	2.7-3.9	0.1-0.3	0.3-0.6	0.02	8.5-13	24-41.7	68-112	81-153	5.6-9.8			
2014	July 3	6.62		1	0.92	4.73	0.35	2.52	0.04	24	50	90	262	6			
	<i>Normal</i>	4.3-5.7		0.5-0.8	0.4-0.7	4.0-5.9	0.2-0.5	1.6-3.5	0	21.3-32.5	33.6-58.4	76.5-126	248-468	4.8-8.4			

		N/S	N/K	P/S	P/Zn	K/Ca	K/Mg	K/Mn	Fe/Mn	Ca/B	Ca/Mg	Ca/Cu	Ca/Mn	Ca/Zn	Mn/Cu
2017	Actual ratio	4.9	2.3	0.4	96.6	1.2	6.4	135.8	0.6	715.6	5.3	3816.7	113.9	394.8	33.5
	<i>Expected ratio</i>	7.3	1.1	0.7	100.5	1.8	14.7	476.7	2.5	938.0	8.3	4400.0	268.9	581.6	16.4
2016	Actual ratio	14.8	1.5	1.8	165	3.1	10	797.8	5.4	580	3.2	257.8	257.8	290	5.6
	<i>Expected ratio</i>	14.0	1.5	1.2	95.4	2.2	7.4	363.2	2.2	409.3	3.4	167.6	167.6	344.4	6.0
2015	Actual ratio	12.3	2	0.9	133.3	3.7	13.8	339.7	1.4	1133.3	3.8	971.4	93.2	251.9	10.4
	<i>Expected ratio</i>	13.6	1.2	1.4	127.3	6.7	17.0	366.7	1.3	460.5	2.6	642.9	55.0	150.7	11.7
2014	Actual ratio	9	1.4	1.2	184	1.9	13.5	525.6	2.9	1050	7.2	4200	280	504	15.0
	<i>Expected ratio</i>	6.4	1.0	0.7	113.6	2.0	12.8	488.9	3.5	941.4	6.5	3833.3	249.9	550.1	15.3



CONCLUSION

- The normal range on all four samples over the four-year period were within or exceeded the respective range of sulphur.
- N/S ratio for tissues are tight.
- This application has enabled plant growth to flourish with zero lack of S since application in the fall of 2013.
- Bio-Sul at 154 lbs + of actual S per acre is the solution to match any crop demand in any rotation for multiple years.
- In the chart to the left, we have shown the relationship between the usage vs. the actual amount of S for each crop throughout the current rotation.
- At the end of this rotation we will still have 44 lbs of sulphur available.
- Bio-Sul Premium Plus delivered adequate sulphur to each crop in this rotation.
- There is no lack of S detected within the tissues under this trial to date.

Note: 220 lbs = 154 lbs of S
 *Forecast based on history of crops in this rotation.

Fraser Home

Trial #82018

Rate: Bio-Sul applied at 220 lbs/ac

Timing: 154 lbs (S), Fall 2013

OM: 3.0 | PH: 7.0

No bridge strategy applied.

2017 WHEAT

Sample ID: 1-A
Plant Part: Top 6"
Appearance: Normal

2016 PEAS

Sample ID: 1-A
Plant Part: Top 6"
Appearance: Normal

2015 WHEAT

Sample ID: 1-A
Stage: Tillering
Appearance: Normal

2014 CANOLA

Sample ID:
1-Fraser Home
Stage: Rosette
Plant Part: Leaves
Appearance: Normal

		% N	% NN	% S	% P	% K	% Mg	% Ca	% Na	B ppm	Zn ppm	Mn ppm	Fe ppm	Cu ppm	Al ppm	% Cl	% Mo
2017	June 27	5.48		0.38	0.47	3.88	0.23	0.42	0.03	2	21	80	207	9			
	Normal	2.5-3.3		0.2-0.4	0.3-0.5	2.3-3.4	0.1-0.2	0.3-0.7	0.03	8.5-13.0	25.6-44.5	35.7-58.8	54-102	7.2-12.6			
2016	June 10	5.3		0.47	0.73	4.5	0.41	1.26	0.021	21	36	55	617	10			
	Normal	3.8-5.0		0.2-0.4	0.3-0.4	2.3-3.4	0.2-0.5	0.8-1.8	0.2	25.5-39	28-48.7	59.5-98	117-221	9.6-16.8			
2015	July 08	4.75		0.39	0.36	3.11	0.2	0.39	0.007	10	29	101	116	8			
	Normal	3.7-4.9		0.2-0.4	0.3-0.5	3.0-4.3	0.1-0.3	0.3-0.6	0.02	10.2-15.6	26.4-45.9	85-140	90-170	6.4-11.2			
2014	July 03	5.96		0.9	0.61	3.85	0.43	1.73	0.264	27	28	105	123	4			
	Normal	4.3-5.7		0.6-1.0	0.4-0.7	4.0-5.9	0.2-0.5	1.6-3.5	0	21.3-32.5	33.6-58.4	76.5-126	248-467	4.8-8.4			

		N/S	N/K	P/S	P/Zn	K/Ca	K/Mg	K/Mn	Fe/Mn	Ca/B	Ca/Mg	Ca/Cu	Ca/Mn	Ca/Zn	Mn/Cu
2017	Actual ratio	14.4	1.4	1.2	223.8	9.2	16.9	485	2.6	2100	1.8	466.7	52.5	200	8.9
	Expected ratio	10	1	1.3	107.4	5.8	16.4	605.3	1.7	460.5	2.8	500	104.8	141.3	4.8
2016	Actual ratio	11.3	1.2	1.6	202.8	3.6	11.0	818.2	11.2	600	3.1	1260	229.1	350	5.5
	Expected ratio	14	1.5	1.2	95.4	2.2	7.4	363.2	2.2	409.3	3.4	1000	167.6	344.4	6
2015	Actual ratio	12.2	1.5	0.9	124.1	8	15.6	307.9	1.2	390	2	487.5	38.6	134.5	12.6
	Expected ratio	13.7	1.2	1.3	115.7	7.9	18.7	322.7	1.2	358.1	2.4	525	41.1	127.9	12.8
2014	Actual ratio	6.6	1.6	0.7	217.9	2.2	9	366.7	1.2	640.7	4	4325	164.8	617.9	26.3
	Expected ratio	6.4	1.0	0.7	113.6	2.0	12.8	488.9	3.5	941.4	6.5	3833.3	249.9	550.1	15.3



CONCLUSION

- From tissues it is easy to recognize the sustainability of Bio-Sul throughout this rotation.
- This is an example of a successful pea crop that in many cases that would never have sulphur applied.
- A 70 bu pea crop requires 30 lbs of sulphur. This fact is generally ignored or misunderstood and peas almost never receive enough S.

Parkland

Trial #50531-E11

Rate: Bio-Sul applied at 220 lbs/ac

Timing: 154 lbs (S), Fall 2013

OM: 5.0 | PH: 6.0

Rotation: canola/wheat/canola/wheat/canola

2017 WHEAT

Sample ID: 1-A
Stage: Tillering
Plant part: Top 6"
Appearance: Normal

2016 CANOLA

Sample ID: 1-A
Stage: Rosette
Plant Part: Leaves
Appearance: Normal

2015 WHEAT

Sample ID: 1-A
Stage: Flag leaf, boot
Plant part: Leaves
Appearance: Normal

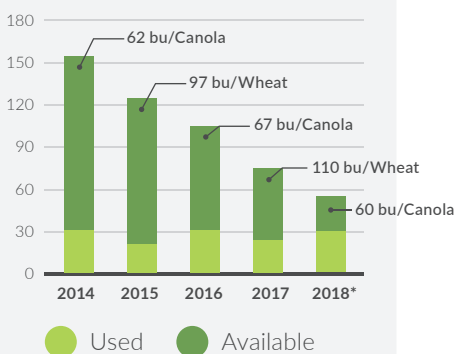
2014 CANOLA

Sample ID: 1-A
Stage: Bud
Plant Part: Leaves
Appearance: Normal

		% N	% NN	% S	% P	% K	% Mg	% Ca	% Na	B ppm	Zn ppm	Mn ppm	Fe ppm	Cu ppm	Al ppm	% Cl	% Mo
2017	July 05	5.02		0.41	0.37	3.30	0.20	0.48	0.005	4	31	152	145	5			
	Normal	3.7-4.9		0.2-0.4	0.3-0.5	3.0-4.3	0.1-0.3	0.3-0.6	0.0169	10.2-15.6	26.4-45.6	85-140	90-170	6.4-11.2			
2016	June 17	7.14		1.35	0.75	5.13	0.56	2.76	0.075	26	56	45	164	7			
	Normal	4.3-5.7		0.6-1.0	0.4-0.6	4.0-5.9	0.2-0.5	1.6-3.5	0	21.3-32.5	33.6-58.4	76.5-126	248-468	4.8-8.4			
2015	July 01	5.29		0.55	0.28	2.11	0.26	0.7	0.001	10	38	118	119	5			
	Normal	3.2-4.3		0.2-0.4	0.3-0.5	2.4-3.5	0.1-0.2	0.3-0.7	0.034	8.5-13	22.4-38.9	59.5-98	72-136	6.4-11.2			
2014	July 08	5.92		0.85	0.46	4.55	0.38	2.18	0.094	28	55	125	124	5			
	Normal	4.0-5.2		0.5-0.8	0.3-0.5	3.5-5.0	0.2-0.4	1.5-3.3	0	20.4-31.4	30.4-52.8	68-112	158-298	4.0-7.0			

		N/S	N/K	P/S	P/Zn	K/Ca	K/Mg	K/Mn	Fe/Mn	Ca/B	Ca/Mg	Ca/Cu	Ca/Mn	Ca/Zn	Mn/Cu
2017	Actual ratio	12.2	1.5	0.9	119.4	6.9	16.5	217.1	1.0	1200	2.4	960	31.6	154.8	30.4
	Expected ratio	13.7	1.2	1.3	115.7	7.9	18.7	322.7	1.2	358.1	2.4	525.0	41.1	127.9	12.8
2016	Actual ratio	5.3	1.4	0.6	139.3	1.9	9.2	884.5	2.8	1061.5	4.9	3942.9	475.9	492.9	8.3
	Expected ratio	6.4	1.0	0.7	113.6	2.0	12.8	488.9	3.5	941.4	6.5	3833.3	249.9	550.1	15.3
2015	Actual ratio	9.6	2.5	0.5	73.7	3.0	8.1	178.8	1.0	700	2.7	1400	59.3	184.2	23.6
	Expected ratio	12.9	1.3	1.3	122.7	6.0	17.0	377.1	1.3	460.5	2.8	562.5	62.9	161.5	9.0
2014	Actual ratio	7.0	1.3	0.5	83.6	2.1	12	364	1.0	778.6	5.7	4360	174.4	396.4	25
	Expected ratio	7.3	1.1	0.7	100.5	1.8	14.7	476.7	2.5	938	8.3	4400	268.9	581.6	16.4

Sulphur Levels Consumed vs. Banked (154 lbs)



Note: 220 lbs = 154 lbs of S

*Forecast based on history of crops in this rotation.

CONCLUSION

- The normal range on samples over the three year period are in the high end of the respective range. Exceeding the upper range of (S) in all four tissues in trial for the years 2014-2016.
- N/S ratios are very tight.
- This application has enabled plant growth to flourish with zero lack of S since application in the fall of 2013.
- We will sufficiently achieve this rotation with excess after the fifth year and the achievement of three canola crops.
- Through history we can calculate the usage vs. supply.
- In the crop rotation above, we have shown the relationship between the usage versus the actual amount of S available to each crop throughout the rotation.
- Bio-Sul Premium Plus delivers adequate sulphur release to each crop in a rotation.
- There is no lack of S detected within the tissues under this trial to date.
- There are extremely positive results throughout each tissue.

This is a great solution for improving crop results year over year.

Standard

Trial #109757-17

Timing: ES applied at 100 lbs/ac, Fall 2012;
Bio-Sul applied at 220 lbs/ac, Fall 2015
as a bridge strategy | OM: 2.5 | PH: 7.5

Rotation: canola/wheat/wheat/canola

2017 PEAS

Sample ID: 1-A
Plant Part: Top 6"
Appearance: Normal

2016 CANOLA

Sample ID: 1-A
Stage: Bud
Plant Part: Leaves
Appearance: Normal

2015/2014 WHEAT

Sample ID: 1-A
Stage: Jointing
Plant Part: Top 6"
Appearance: Normal

2013 CANOLA

Sample ID: 1-CH 17
Stage: Rosette
Plant Part: Leaves
Appearance: Normal

		% N	% NN	% S	% P	% K	% Mg	% Ca	% Na	B ppm	Zn ppm	Mn ppm	Fe ppm	Cu ppm	Al ppm	% Cl	% Mo
2017	June 27	5.10		0.31	0.63	3.72	0.32	0.53	0.05	18	42	42	288	7			
	Normal	3.8-5.0		0.2-0.4	0.3-0.5	2.3-3.4	0.2-0.5	0.8-1.8	0.2	25.5-39	28-48.7	59.5-98	117-221	9.6-16.8			
2016	June 28	6.38		0.82	0.58	2.76	0.42	2.1	0.511	30	41	119	149	5			
	Normal	4.0-5.2		0.5-0.8	0.3-0.5	3.5-5.0	0.2-0.4	1.5-3.3	0	20.4-31.4	30.4-52.8	68-112	158-298	4-7			
2015	June 24	3.69		0.34	0.37	3.2	0.19	0.27	0.013	4	30	65	120	7			
	Normal	3.4-4.5		0.2-0.4	0.3-0.5	2.7-3.9	0.1-0.3	0.3-0.7	0.02	8.5-13	24-41.7	68-112	81-153	5.6-9.8			
2014	July 08	5.41		0.37	0.42	3.46	0.2	0.68	0.185	1	22	39	110	6			
	Normal	3.4-4.5		0.2-0.4	0.3-0.5	2.7-3.9	0.1-0.3	0.3-0.7	0.02	8.5-13	24-41.7	68-112	81-153	5.6-9.8			
2013	June 28	6.5		0.62	0.62	5.03	0.5	2.18	0.67	29	39	108	256	5			
	Normal	4.3-5.7		0.6-1.0	0.4-0.7	4.0-5.9	0.2-0.5	1.6-3.5	0	21.3-32.5	33.6-58.4	76.5-126	248-468	4.8-8.4			

		N/S	N/K	P/S	P/Zn	K/Ca	K/Mg	K/Mn	Fe/Mn	Ca/B	Ca/Mg	Ca/Cu	Ca/Mn	Ca/Zn	Mn/Cu
2017	Actual ratio	16.5	1.4	2.0	150	7.0	11.6	885.7	6.9	294.4	1.7	757.1	126.2	126.2	6.0
	Expected ratio	14.0	1.5	1.2	95.4	2.2	7.4	363.2	2.2	409.3	3.4	1000	167.6	344.4	6.0
2016	Actual ratio	7.8	2.3	0.7	141.5	1.3	6.6	231.9	1.3	700	5	4200	176.5	512.2	23.8
	Expected ratio	7.3	1.1	0.7	100.5	1.8	14.7	476.7	2.5	938	8.3	4400	268.9	581.6	16.4
2015	Actual ratio	10.9	1.2	1.1	123.3	11.9	16.8	492.3	1.9	675	1.4	385.7	41.5	90	9.3
	Expected ratio	13.6	1.2	1.4	127.3	6.7	17	366.7	1.3	460.5	2.6	642.9	55	150.7	11.7
2014	Actual ratio	14.6	1.6	1.1	190.9	5.1	17.3	887.2	2.8	6800	3.4	1133.3	174.4	309.1	6.5
	Expected ratio	13.6	1.2	1.4	127.3	6.7	17	366.7	1.3	460.5	2.6	642.9	55	150.7	11.7
2013	Actual ratio	10.5	1.3	1	159	2.3	10.1	465.7	2.4	751.7	4.4	4360	201.9	559	21.6
	Expected ratio	6.4	1	0.7	113	2	12.8	488.9	3.5	941.4	6.5	3833.3	249.9	550.1	15.3



CONCLUSION

- This field was originally spread with ES in the fall of 2012 at a rate of 100 lbs/ac ahead of the 2013 canola crop.
- N/S and P/S ratios of ES are not at the same positive levels as Bio-Sul applied in the fall of 2015.
- Upon assessment of ongoing tissues within the trials, assuming three years of sustainability and performance with ES, the ES did not compare to Bio-Sul in the Canola 2016 tissue.

2017 trial results submitted and reviewed by Elston Solberg.

bio-cycle.ca