Managing Acidity

Stuart McAlpine, Contract Research, Development and Extension, Optima Agriculture

Key messages

- In-furrow remediation could be useful in managing acidity generated by fertiliser placement in the furrow
- CalSap® is a liquid product which can be used to manage acidity generated by fertiliser in the furrow.

Aim

Examine the effect of variable rates of fertiliser on acidity in the furrow and how CalSap® interacts with soil pH over a period of time at different locations in the profile.

Background

CalSap® is a liquid product designed to prevent further acidification from banded fertiliser in the soil. In this case the liquid was banded at seeding with the liquid nitrogen. The suggested application rates for a sandy soil are 4-5 L/ha. In this farmer demonstration the Dodd's compared different rates of CalSap® (0, 5 and 10 L/ha) and different rates of fertiliser.

Optima CalSap® is 6% calcium, fully soluble, and has an organic chemistry base that makes the product reactive and efficient. With a pH of 12.5 this process also makes the product soil and plant safe. Previous trial data has demonstrated that CalSap's® high reactivity and alkalinity is a useful tool in changing pH levels where the seed and fertiliser is placed. Optima have undertaken the measurement of pH within the soil profile. This process has been repeated at numerous sites in Western Australia. It was decided to take measurements at a constant depth at all sites. This process is now being refined to reflect the differences in product replacement from farmer to farmer. The management of furrow pH will lead to better nutrient recovery and therefore improved efficiency from the applied fertiliser. An improved pH in the root zone will allow for potential increases in biological activity and less root pruning. Soluble calcium provides additional benefits to plants and soil over simple acid neutralisation when applied to the root zone. Optima CalSap® should not be seen as a lime replacement to remediate existing acidity but one component of a strategy to address acidity on the farm.

Trial Details

Property	Mike and Narelle Dodd, west Buntine
Plot size & replication	300m x 14m unreplicated
Soil type	Yellow sand (pear tree)
Soil pH ($CaCl_2$)	0-15cm: 4.5 15-40cm: 4.3
EC (dS/m)	0.05
Sowing date	05/06/13
Seeding rate	55 kg/ha Corack
Fertiliser	05/06/13: 80 kg/ha mix of 70% Agflow and 30% Muriate of potash, top dressed with 60 kg/ha Muriate of Potash
Soil Amelioration	27/03/13: 2 t/ha Limesand, full cut cultivation
Paddock rotation	2010: pasture, 2011: wheat, 2012: wheat
Herbicides	15/05/13: 2 L/ha Glyphosate 05/06/13: 1.5 L/ha Treflan 11/08/13: 800 L/ha Velocity
Growing Season Rainfall	164mm

Trial Design

Seven runs of the airseeder bar were set up with different rates of fertiliser (0, 30, 60 L/ha UAN) and CalSap® (0, 5, 10 L/ha). Soil samples were taken to access soil pH within treatments and yield results were collected. This is an unreplicated large-scale farmer demonstration so results should be interpreted with caution.

Results

The highest yielding treatment was 1.82 t/ha and involved no liquid nitrogen and no CalSap® (Table 1). The lowest yield recorded was 1.56 t/ha for 30L/ha of liquid nitrogen and no CalSap®. This was an unreplicated farmer demonstration so it is difficult to tell if a difference in yield is random paddock variation or caused by application of product.

The first soil samples were taken on the 26/06/2013. Measurements were undertaken in the furrow to a depth of 50, 100 and 200mm. There were also measurements undertaken in between the furrow to a depth of 50 and 100mm. The following graph was taken at the first sampling time and represents the data taken in the furrow at 100mm. Figure 1 shows how the addition of 60 L/ha of UAN has dropped the pH to 3.8 from the nil treatment pH 4.6. The addition of CalSap has lifted the pH; 5 L/ha to pH 4 and 10 L/ha to pH 4.1.

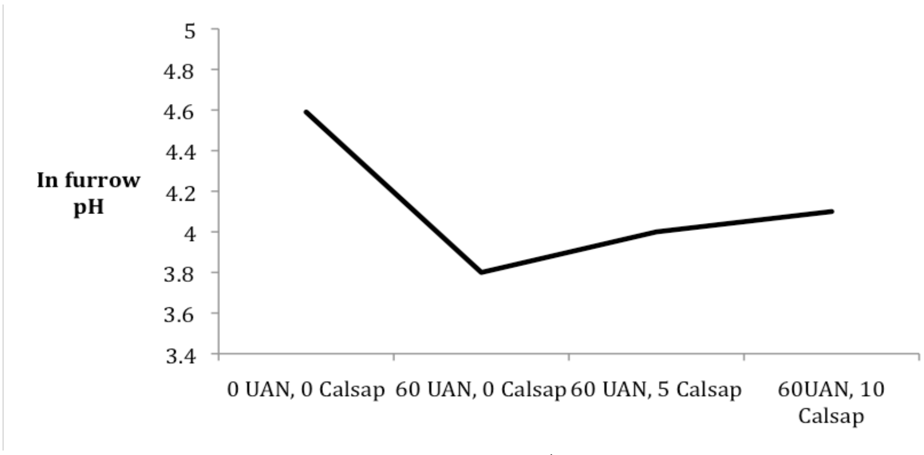

Figure 1: In furrow pH measurements taken on 26th of June 2013 after different rates of liquid nitrogen (UAN) and Calsap were applied at seeding on the 5th of June 2013.

Table 1: Wheat yield and quality results grown with three rates of CalSap® and different fertiliser rates applied at seeding, west Buntine 2013.

Plot	Flexi-N (L/ha)	CalSap® (L/ha)	Yield (t/ha)	Hectolitre Weight (g/hl)	Screenings (%)	Protein (%)
1	60	10	1.66	78	2	11.3
2	30	5	1.78	80	1	10.4
3	60	0	1.76	77	3	11.5
4	60	5	1.71	79	2	10.9
5	30	0	1.56	79	3	11.1
6	0	0	1.82	79	2	11.1

Economic Analysis

Table 2: Input costs for treatments compared to income generated from grain yield for trial west of Buntine in 2013. Seed costs is $19/kg, Compound fertiliser is $66/t. Grain Income $299/t.

Plot	UAN Applied (L/ha)	UAN cost ($/Ha)	CalSap® applied (L/ha)	CalSap Cost ($/ha)	Variable costs for treatments	Yield (t/ha)	Gross Income ($/ha)	Gross margin (Income Less trial treatment costs)
1	60	$39.60	10	$17.50	$142.99	1.66	$498.18	$355.19
2	30	$19.80	5	$8.75	$114.44	1.78	$532.73	$418.29
3	60	$39.60	0	$0.00	$125.49	1.76	$529.09	$403.60
4	60	$39.60	5	$8.75	$134.24	1.71	$512.73	$378.49
5	30	$19.80	0	$0.00	$105.69	1.56	$467.27	$361.58
6	0	$0.00	0	$0.00	$85.89	1.82	$545.45	$459.56

Comments
The demonstration site was particularly dry at seeding and June was the driest on record. The picture below taken on the 27 June 2013 demonstrates the effect of the different treatments on root and plant vigor. Plot 6, which was the only plot not to receive extra nitrogen from the UANapplication and was clearly the least vigorous plot at that time. Plot 6 also showed less vigour and it had the lowest application of UAN at 30 L/ha. Plot 6 went on to be the highest yielding plot. It must be remembered that this is only a demonstration and there were no replications. The plots also carried a high weed burden, which could have also compromised the results. The plots that have shown good early vigour seemed to be the lower yielding. With moisture being critical it may well be that the plots with early vigour have suffered from having to maintain that extra biomass and used up more of the moisture early. Deeper roots were observed in the CalSap® plots, but this may have also contributed to better early growth and more moisture being used. End of season rainfall was kind but was being used as it fell and was not enough to wet up the full profile.

2013 has been a good start to looking at understanding soil acidity and different processes that may be necessary to improve the efficiency of the amelioration program. It is hoped that work can continue on this site to improve our understanding of acid soils.

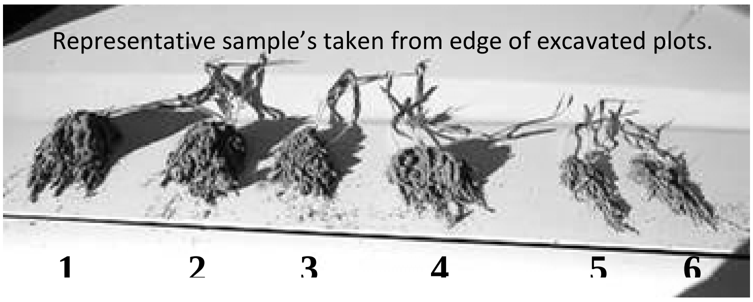

Figure 2: Root vigor comparison 27 June 2013 (Plot numbers marked on photo) for wheat grown at Buntine in 2013. 2: 60 L/ha UAN and 10 L/ha CalSap®, 3: 30 L/ha UAN and 5 L/ha CalSap®, 4: 60 L/ha UAN and no CalSap®, 5: 60 L/ha UAN and 5 L/ha CalSap®, 6: 30 L/ha UAN and no CalSap®, 6: No UAN and no CalSap®

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Contact
Stuart McAlpine, Optima Agriculture
stuartmcalpine@bigpond.com