

Improving Crop Establishment with In-furrow Liquids

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Key messages

Modern seeding practices – such as minimal tillage, dry seeding and low seeding rates, coupled with changing rainfall patterns has resulted in many seeding programs being carried out in marginal establishment conditions. Under these conditions, getting crops germinated evenly and emerged with adequate vigour has become increasingly challenging, with the resulting patchy establishment causing ongoing in-season issues with weed control, disease and pest infestation. Furthermore, high seed costs particularly in canola, has increased the economic incentive to improve germination & emergence rates.

SACOA has been involved in research into improving crop establishment for over a decade, focussing initially on the use of surface applied products to improve rainfall penetration in non-wetting soils. More recently, with the increasing popularity of liquid in-furrow injection seeding systems, the opportunity to place products designed to assist with seed germination and early plant vigour directly into the furrow has arisen.

SE14 – a new in-furrow moisture attractant and retention agent has been developed and trialled extensively over the last three years as a valuable tool to increase plant stands, early crop vigour and crop competitiveness with weeds. By increasing the soil moisture holding capacity in the root zone SE14 helps keep applied nutrients solubilized and available for plant uptake as well as keeping residual herbicides activated. This paper summarises the key benefits observed around plant number increase, early plant vigour, increased nutrient uptake, reduced weed competition, and yield and quality benefits. Plant number increases of 10-50%, yield increases of up to 25% and weed number decreases of 50% have been recorded in Western Australian sites throughout 2015.

Aims

Investigate the role of in-furrow applied moisture retention products in improving crop establishment & early vigour, nutrient usage and weed control, across a wide range of soil types and crops. Prove crop safety & compatibility with a range of products used at seeding including SE14 alone and in mixtures with liquid UAN, trace elements & fungicides. Prove yield and quality benefits. Collaborate with key non-wetting and soil constraints researchers involved in GRDC projects including DAW00244, DAW00204, CSP00139.

Method

A series of fully replicated independent trials were established over the 2014 & 2015 cropping seasons – in crops including wheat, barley, canola, sorghum, chickpeas & cotton across Western Australia (6 sites), Victoria (1 site), New South Wales (2 sites) & Queensland (2 sites). Treatments were developed in consultation with local agronomists and included a range of liquid in-furrow products used at seeding such as;

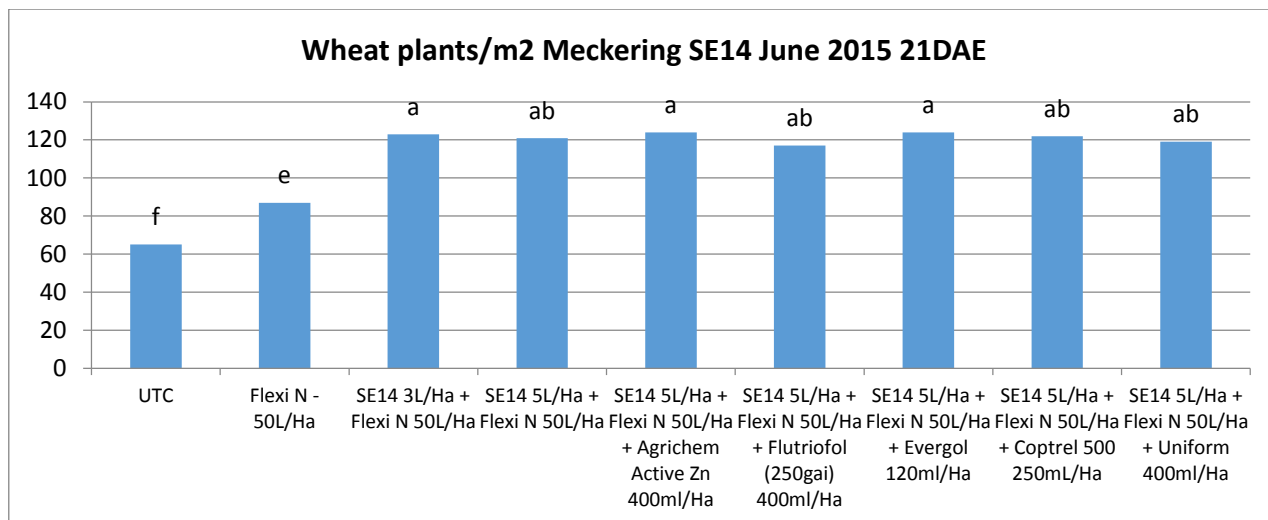
Liquid UAN (Flexi-N), Trace elements - Zinc & Copper, Agriphos, In-Furrow fungicides - Uniform, Evergol & Flutriafol, & Insecticides Pyrimor Super.

Trials were seeded using small plot seeding equipment with knife points, press wheels and liquid injection systems with 3 – 4 replicates in a randomised block design. Independent contractors conducting this work included Living Farm, Kalyx, AgriVision, Peracto and Pacific seeds.

In addition to the small plot replicated trials – a number of grower paddock scale evaluations were conducted throughout 2015 with 12 cereal, lupin and canola sites in Western Australia, 1 barley site in South Australia, & 3 sorghum & cotton sites in Queensland, where SE14 was evaluated using commercial equipment alongside grower standard practice.

Results

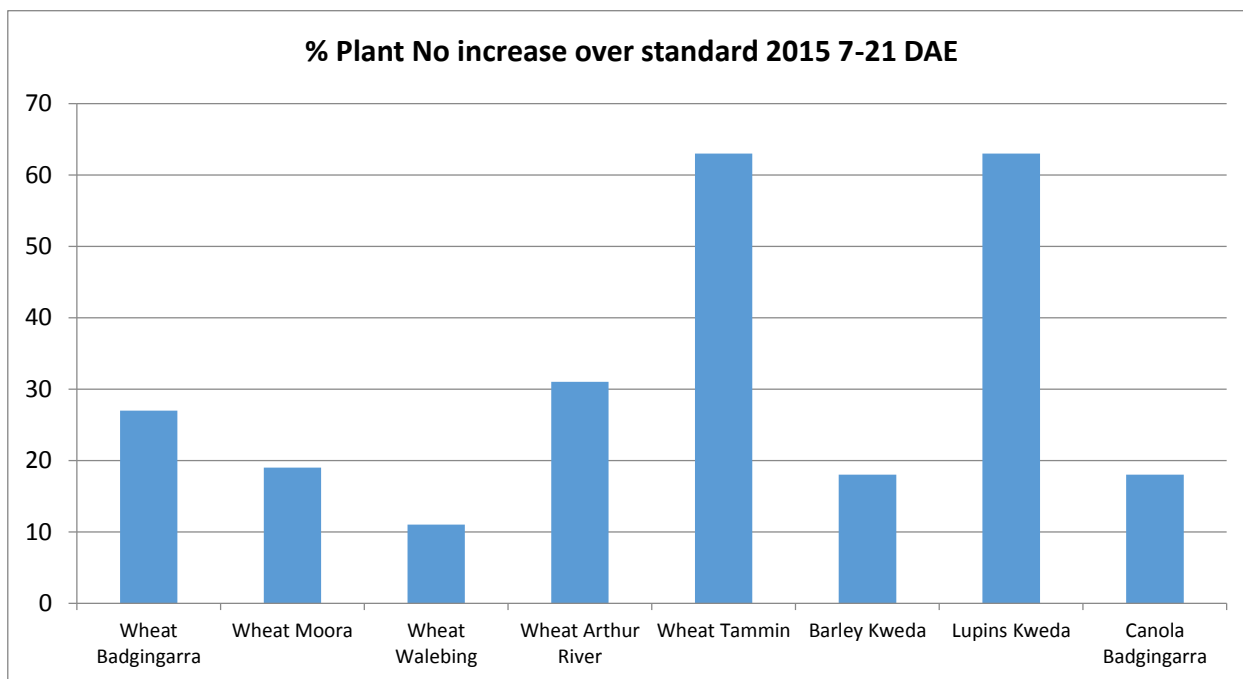
Plant Establishment – replicated trials



Source: Living Farm LF150498 Meckering 2015

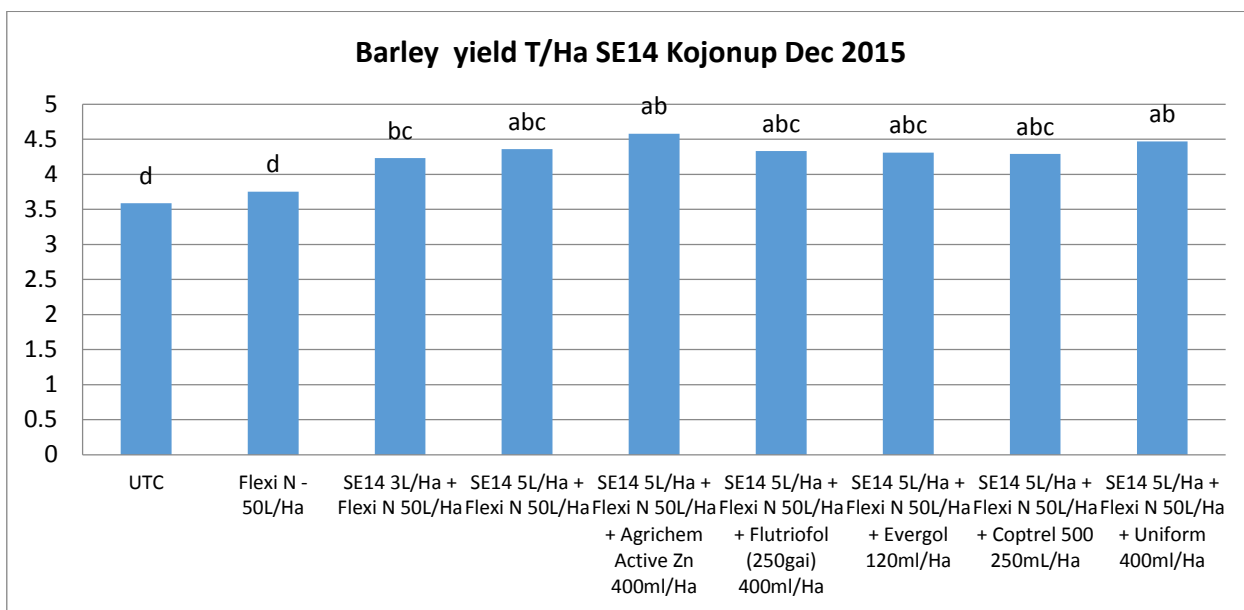
Plant counts conducted at both replicated and large scale demonstration trials during the 2015 cropping season showed SE14 to produce significant plant number increases of up to 60% over the standard treatment, averaging 30% across all sites. There was a direct correlation between liquid stream placement relative to the seed – with the highest plant number increases being recorded where the liquid stream was placed within 2cm of the seed.

Plant Establishment – large scale demonstrations



Source: SACOA large scale grower demonstration program 2015

Yield Replicated trials



Source: Living Farm LF1504100 Kojonup 2015

Positive yield increases were recorded at all replicated and large scale demonstration sites – with significant increases of up to 1.0T/Ha recorded at the Kojonup replicated barley site. In the large scale demonstration trials yield increases from 2 – 23% over the standard were recorded – with an average of 12% increase across all sites.

Yield Large scale demonstration trials

Site	Crop	Grower standard yield T/Ha	SE14 T/Ha	% Increase
Badgingarra	Wheat	3.610	3.968	10%
Walebing	Wheat	4.019	4.104	2%
Arthur River	Bass Barley	1.018	1.25	23%
*South Tammin	Lupins	1.431	1.602	12%



*Figure 1: Lupins South Tammin August 2015

Conclusion

This work has established the crop establishment benefits of the in-furrow product, SE14. Significant yield improvements were also recorded – the scale of which depended on conditions during grain fill. Given the extremely dry finish to the 2015 season in Western Australia it would be expected that yield benefits would be greater under softer finishing conditions.

A number of additional benefits resulting from the use of SE14 have been observed throughout this work – including improved nutrient uptake, decreased weed numbers – resulting from increased crop competitiveness & herbicide activation, decreased soil borne disease and improved legume nodulation. These are likely to have resulted from improved soil moisture relations in the root zone. More work to validate these effects, along with following year on row sowing, is planned for the 2016 season.

SE14 will be launched commercially by SACOA for the 2016 cropping season.

Key words

SE14, in-furrow, root-zone, establishment, plant number, yield, replicated trials, large scale demonstrations.

Acknowledgments

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GRDC Project Number: