SAKURA TOLERANCE IN BARLEY

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TAKE HOME MESSAGES

- The relatively new herbicide Sakura® is currently registered for use in wheat only; in barley this product caused a yield penalty.
- Effects may not be seen in early stages of plant growth, as Sakura affects the root system.
- Deep sowing did not have an interaction with Sakura application.

BACKGROUND

Sakura® (registered product of Bayer) has been recently made available to grain growers as an alternative to traditional pre-emergent herbicides. The formulation contains new chemistry (group K) and has a longer residual than traditional pre-emergent herbicides which allows it to have a greater effect on later germinating weeds.

Currently, Sakura is registered for use on wheat (not Durum) and triticale, incorporated by sowing (IBS). In these crops it controls ryegrass extremely well, and provides an alternative mode of action (group K) for reducing resistant weed populations. Sakura is also less volatile than Triflur X® and does not bind to stubble, making it an ideal pre-emergent herbicide in no-till (direct drill) stubble-retained paddocks. In addition, it has few plant back problems. All these attributes allow greater flexibility in crop rotations.

Sakura is not registered for use on barley. This trial sought to measure how barley crops (Hindmarsh and Scope) would respond to the product and if seeding depth influenced the degree of crop safety. Both varieties have short coleoptile lengths which affects their ability to emerge and produce early growth vigour.

Note: This trial was conducted for research purposes only. The following information is not for use or advice on commercial production farms.

AIM

To compare crop safety of Sakura on two barley varieties (Hindmarsh and Scope) sown at different depths.

METHOD

The experiment was established 20km east of Sea Lake on a Mallee sandy loam soil, with a plant available water of 59mm and starting soil nitrogen of 111kg/ha.

Location:	Sea Lake	
Replicates:	4	
Sowing date:	29 May	
Target seeding density:	130 plants/m^2	
Crop type:	Hindmarsh and Scope barley	
Fertiliser:	29 May	MAP + Impact (50kg/ha) (10% N, 21.9% P)
	18 June	Slam® (90kg/ha) (23% S, 19.5% N, 0.7% P)
Herbicides:	29 May	Sakura® (118g/ha) (IBS)
Fungicide:	11 Sept	Prosaro (300ml/ha) + wetter (0.25%)
Seeding equipment:	BCG cone seeder (knife points, press wheels, 30cm row spacing)	

Hindmarsh and Scope barley varieties were sown at two seeding depths: 2-3cm (shallow) and 6-7cm (deep). Sakura was applied with a hand-held boom at a rate of 118g/ha (recommended rate for wheat), with a water rate of 120L/ha, and was IBS (Table 1).

Emergence counts were conducted at GS12 (two leaf stage). Crop biomass was indicated using Normalised Difference Vegetation Index (NDVI) at GS12, GS30 (end of tillering) and GS49 (mid-late booting) with a hand held GreenSeeker® crop sensor (NTech Industries Inc., Ukiah California). In addition, cuts were used to measure dry matter production and shoot counts were completed at GS30, head numbers were measured at GS65 (mid flowering).

Grain yield was measured with a plot harvester (14 November) and grain quality analysed (protein, moisture, screenings, retention and test weight).

Table 1. Chemical application at sowing; applied to the varieties at two sowing depths.

Herbicide	Chemical rate	Herbicide timing	Variety	
			Scope	Hindmarsh
Control	Nil	–	Shallow sowing 2-3cm	
Sakura	118 g/ha	IBS		
Control	Nil	–	Deep sowing 6-7cm	
Sakura	118 g/ha	IBS		

RESULTS AND INTERPRETATION

This trial was done purely for research purposes, as Sakura is not registered for use in barley.

Rainfall

After good rainfall in March, growing season rainfall at the Sea Lake site (148mm) was well below the long-term average of 213mm (Table 2).

Table 2. Monthly rainfall (mm) data for the Sea Lake trial site in 2012.

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	GSR	Annual
12	4	58	5	9	13	54	19	14	35	4	6	148	233

From sowing (May 29) until July, rainfall was limited (Table 3) and the dry start to the season restricted the crops early growth. The first substantial rainfall event didn't come until between 10 and 12 July, however as Sakura can persist in the soil for up to 12 weeks after application (August 12), it is possible that this rain moved some of the Sakura through the root zone of the plants.

Table 3. Rainfall data from sowing 29 May until the first substantial rain event.

Date	5 June	22 June	10-12 July
Rainfall (mm)	5	8	27

NDVI measurements collected at GS12 (Figure 1) showed no significant difference between the chemical treatments or the two sowing depths. There was, however, a significant difference between the two varieties with Scope having a slightly higher NDVI than Hindmarsh. This result was expected due to the different growth habits of Scope and Hindmarsh. It is common for NDVI data to vary between varieties.

Later in the growing season (GS30 and 49), NDVI data showed a difference between the chemical treatments, sowing depth treatments and varieties, but there were no significant interactions. Where Sakura had been applied the NDVI percentage was less (compared to the nil treatment), indicating that there was less biomass. Meanwhile, the deeper (6-7cm) sown plots also had a reduced NDVI compared to the shallow (2-3cm) sown plants. As the two barley varieties selected for this trail have short coleoptile lengths this result (reduced vigour when sown deeper) was not unexpected. Again though, Scope had a higher NDVI than Hindmarsh due to the different variety effect.

The NDVI data collected provided a good insight into how Sakura works. Sakura did not affect the plant in early stages of growth (GS12) but as the roots came into contact with the Sakura layer it appears the plants growth was inhibited. This confirms that Sakura only affects the plant after germination. "Sakura interferes with, and reduces, very long chain fatty acid biosynthesis. The growing plants apical meristem (root growing point) and the coleoptile are interrupted after germination." (Bayer 2011). The NDVI findings correlate with the rainfall events in the first 12 weeks of growth. NDVI readings at GS30 and GS49 were taken after substantial rainfall events (Table 3) which, as suggested earlier, may have moved the Sakura herbicide into the crop row and past the plants roots allowing uptake by the barley.

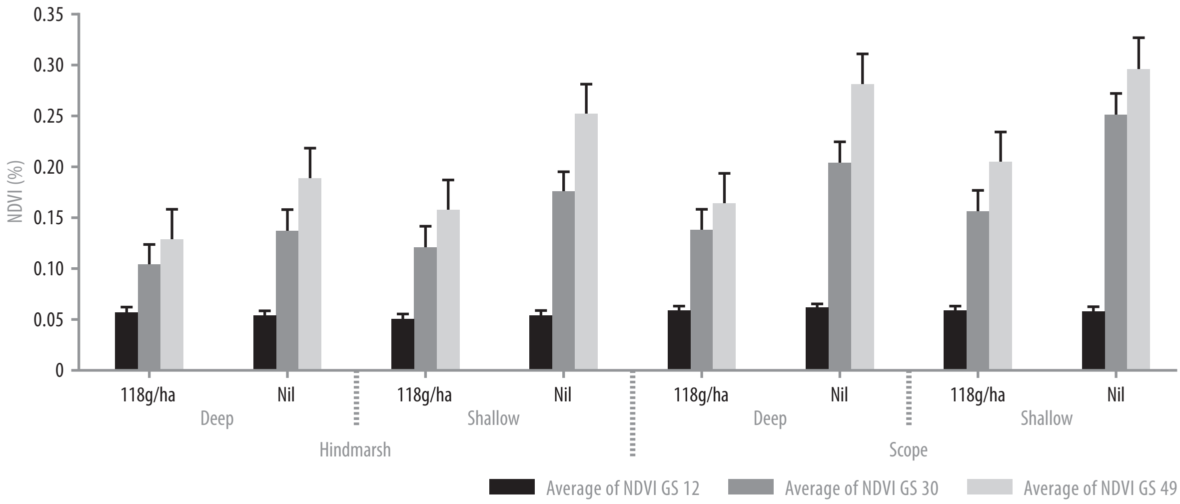

Figure 1. Normalised Difference Vegetation Index (NDVI) measurement taken at crop growth stages (GS) 12, 30, and 49.

Statistical analysis of NDVI GS12 (Variety: P=0.026, LSD=0.004, CV10.3%). Statistical analysis of NDVI GS30 (Chem rate: P<0.001, Variety: P<0.001, Depth: P=0.003 [LSD=0.019, CV16.1%]). Statistical analysis of NDVI GS49 (Chem rate: P<0.001, Variety: P<0.001, Depth: P=0.015 [LSD=0.029, CV18.9%]).

The initial biomass cuts (GS30), revealed a significant difference between the chemical rates and the depths of sowing. Where Sakura was applied at 118g/ha, the barley had a lower biomass (597kg/ha) compared with the nil treatment (828kg/ha). The deep sown treatments also had a lower biomass (637kg/ha) than the shallow sown treatments (788kg/ha).

The two chemical treatments also differed (significantly) in yield with the nil treatment yielding 2.5t/ha and the Sakura treated barley yielding 2.3t/ha – a 10.1% difference (Figure 2). In terms of yield, all other interactions were not significant and there was no significant difference between the two sowing depths or the varieties.

In light of the reduced biomass at GS30, a yield difference between the two sowing depths was initially expected. This was not the case. The head counts completed at GS65 showed there was a significant difference only between the chemical rates and not the depths of sowing. From this finding we can conclude that the deeper-sown plants either recovered or compensated for the early biomass reduction. The dry season finish may have also restricted yield in the plants with larger biomass.

With the data points collected, the reduced yield was attributed to the effect of Sakura on the plants' ability to produce their normal amount of biomass therefore producing fewer heads, and hence, a lower yield.

Table 3. Average biomass production, grain yield and protein on two barley varieties (Scope and Hindmarsh) at different rates of Sakura IBS and two depths of sowing.

Depth	Variety	Chemical rate	GS30 biomass (kg/ha)	Head counts (m^2)	Yield (t/ha)
Deep	Hindmarsh	118g/ha	568	331	2.3
		Nil	639	363	2.5
	Scope	118g/ha	508	369	2.2
		Nil	834	386	2.4
Shallow	Hindmarsh	118g/ha	629	353	2.4
		Nil	1003	377	2.6
	Scope	118g/ha	685	346	2.2
		Nil	834	374	2.6
		Sig. diff.			
		Chem rate	P=0.001	P=0.06	P=0.002
		Depth	P=0.022	NS	NS
		Variety	NS	NS	NS
		All interactions	NS	NS	NS
		LSD (P=0.05)			
		Chem rate	126	22 (P=0.10)	0.2
		Depth	126	–	–
		Variety	–	–	–
		All interactions	–	–	–
		CV%	24.1	10.1	8.8

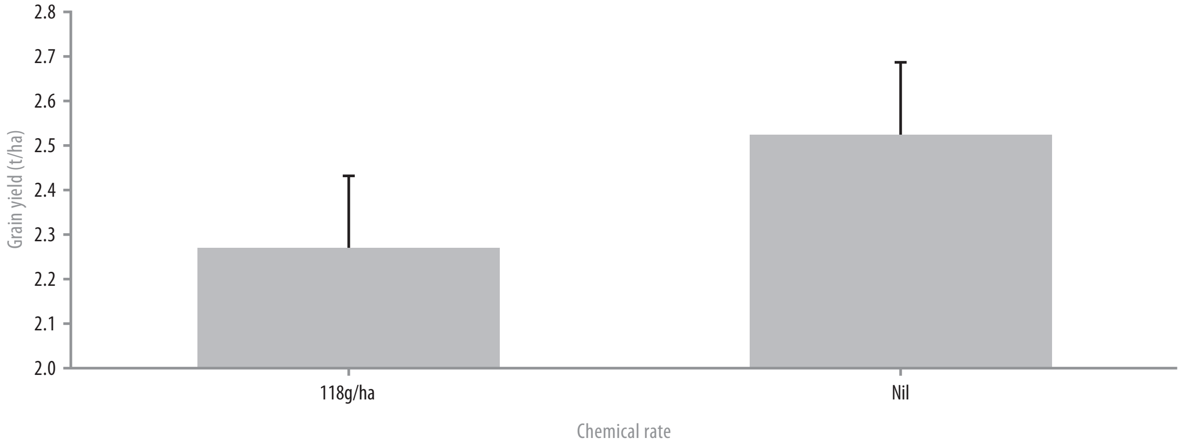

Figure 2. Average yield comparing the effect of Sakura 118g/ha IBS and the nil treatment.
Statistical analysis (Chem rate: P=0.002, LSD=0.15, CV8.8%).

REFERENCES

Bayer CropScience (2011), Sakura® 850 WR Herbicide Factsheet, www.sakuraherbicide.com.au/Resources/uploads/DataSheet/file9711.pdf, Date accessed 7/1/2013.

Bayer CropScience (2011), Sakura® Technical Guide.

ACKNOWLEDGMENTS

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