



Weed Management Studies in Sunflower

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Vikki Osten, Glen Wright & Megan McCosker

DPI's Agency for Food & Fibre Sciences, Emerald



Covering:

Basic background – weed control in sunflower

Recent trial work (2002 & 2003)

- herbicide efficacy and tolerance screening
- weed~crop competition study

Future DPI trials on weed management in sunflower

Background

Several effective grass herbicides are registered (fairly costly)

- fluazifop (Fusilade®)
- haloxyfop (Verdict®)
- and more

Few registrations for broad-leaf weed control

- trifluralin (various)
- paraquat (Gramoxone®)
- pendimethalin (Stomp®)
- Impractical to the cropping system (zero till v. incorporation need; application timing)

Many do not use in-crop herbicides



Background continued....

Fixed transect monitoring on-farm sunflower crops (CQSFSP)

- crops started clean but no in-crop herbicide used
- weed numbers increased from 0.2 to 14.6 plants m^{-2} within the season
- following summer this had increased to 44 plants m^{-2}

⇒ potential to build the weed seed bank

⇒ increased future costs of weeds



Sunflower – currently a weak link for weed management in farming systems

- remain as such until weed management is improved

Recent & current DPI trials

Our aim:

To develop effective integrated weed management strategies for sunflower that are appropriate to the farming systems.

Our research questions:

Can sunflower agronomy be manipulated to improve crop competitiveness?....can this be used in conjunction with herbicides to improve weed management?

Trial work continued.....

Two trials to date:

- 1. Herbicide efficacy and crop tolerance (2002)**
- 2. Weed~crop competition study (2003)**

Located on Emerald Research Station (DPI)

- 1-1.3 m deep vertosol
- irrigable sites
- replicated small plots
 - plot size: 4 m x 15 m (trial 1); 4m x 16 m (trial 2)
- both trials planted in March
- heads bagged to protect from birds

Herbicide efficacy / tolerance trial

3 herbicides x 2 rates + controls

- Stomp (pendimethalin) 2 & 4 L ha⁻¹
- Authority (sulfentrazone) 250 & 500 g ha⁻¹
- Frontier (dimethenamid) 0.7 & 1.4 L ha⁻¹
- Controls weedy & weed-free

Treatments applied 6 days prior to planting

- boom output 61 L ha⁻¹
- irrigated immediately after spraying

**Sunflower (var. Pioneer 65A25) planted on
1 m row spacing @ 4 seeds m⁻¹**

Efficacy / tolerance trial continued....

We measured & recorded: (DAP = days after planting)

- crop establishment (14 DAP)
- early crop biomass (22 DAP)
- visual weed control assessments (15, 43, 114 DAP)
- actual weed counts (58 DAP)
- crop yield (127 DAP)

Efficacy / tolerance trial continued....

Results

Impacts of the herbicides on sunflower

Treatment (with rate ha ⁻¹)	Crop establishment (plants m ⁻¹)	Early crop biomass (g m ⁻²)	Crop yield (t ha ⁻¹)
Authority 250 g	3.2	5.54	2.16
Authority 500 g	2.8	3.34	1.92
Frontier 0.7 L	3.2	6.39	1.86
Frontier 1.4 L	3.6	5.34	1.83
Stomp 2.0 L	2.8	6.02	2.19
Stomp 4.0 L	3.0	5.52	1.54
Nil herbicide weed-free	2.5	6.85	2.14
Nil herbicide weedy	2.5	4.85	1.76
LSD (P = 0.05)	ns	ns	ns

Efficacy / tolerance trial continued....

Results

Impacts of the herbicides on the weeds

Treatment (with rate ha ⁻¹)	Visual Weed Control (% kill)			Actual counts @ 58 DAP (number m ⁻²)
	15 DAP	43 DAP	114 DAP	
Authority 250 g	89	88	80	1.9
Authority 500 g	100	95	93	1.3
Frontier 0.7 L	93	95	93	1.8
Frontier 1.4 L	93	99	96	1.3
Stomp 2 L	99	98	97	1.3
Stomp 4 L	98	98	98	0.9
Nil herbicide weed-free	100	100	100	0
Nil herbicide weedy	0	0	0	5.7
LSD (P < 0.001)	n/a	n/a	n/a	0.26

Efficacy / tolerance trial continued....

Conclusions

- no herbicide significantly affected the sunflower
- majority treatments gave commercially acceptable weed control for the crop duration
- all herbicides reduced seed-bank replenishment
- weed spectra controlled were similar
- no advantage of Authority or Frontier over Stomp but offer alternative modes of action (groups G & K respectively) [*herbicide resistance avoidance*]
- Stomp is very effective when applied pre-plant using the planting rain for incorporation



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2002 trial Stomp 2 L ha⁻¹ (foreground)

Photo by Glen Wright, DPI





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2002 trial weedy control with Glen Wright Photo by Megan McCosker, DPI



Weed~crop competition study

**2 varieties x 2 populations x 2 row spacings
x 2 weed conditions**

- Hysun 38 and Hysun 47
- 30 000 and 45 000 plants ha-1
- 50 and 100 cm rows
- weedy and weed-free

Immediately post-planting, glyphosate used to create the weed-free condition; then maintained by hand weeding

Weedy plots had small weeds @ planting

Competition study continued....

We measured and recorded:

- crop establishment (23 DAP)
- weeds in weedy plots mapped (41 DAP)
- weed biomass (43 DAP)
- crop biomass (48 DAP)
- crop yield will be measured in July

Competition study

Results

Treatment factor	Crop establishment (plants m ⁻²)	Crop biomass (g m ⁻²)	Weed biomass (g m ⁻²)
Variety:			
Hysun 38	5.44	175.0	82.8
Hysun 47	3.26	75.1	99.2
LSD (P=0.05)	0.71	30.09	ns
Target population:			
30 000 plants ha ⁻¹	3.66	117.8	87.6
45 000 plants ha ⁻¹	4.69	132.2	94.4
LSD (P=0.05)	0.71	ns	ns
Row spacing:			
50 cm	4.69	123.2	84.4
100 cm	4.02	126.9	97.6
LSD (P=0.05)	ns	ns	ns
Weediness:			
weedy	4.20	94.7	
weed-free	4.51	155.3	
LSD (P=0.05)	ns	30.09	

Competition study

Conclusions

- Weeds did not impact on establishment
- Weeds did reduce crop biomass by 39%
- Variety had no significant impact on the weeds (Hysun 38 had 16% less weed matter)
- Crop population had no significant impact on weeds
- Row spacing had no significant impact on the weeds (narrower rows had 14% less weed matter)
- Irrespective of the weeds, Hysun 38 is more robust than Hysun47 (for an early March planting)

⇒ **No crop competitive advantages evident for the agronomic attributes studied** (but this is only one trial !)



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2003 trial weed-free 1 m v. weedy 0.5 m

Photo by Glen Wright, DPI





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2003 trial weed-free 1 m v. weedy 0.5 m Photo by Glen Wright



Future sunflower weed work by DPI

Yes.....we still need more information in order to answer our research questions.

We intend to:

- **further explore herbicide based weed management**
 - fine tune application timing of pendimethalin
 - post-plant, post-emergence studies with various herbicides (including Frontier, Authority + others)
- **conduct more competition studies**
 - utilising different weed emergence times
 - examine more row spacings and crop populations
- **tie the two together for integrated strategies**
 - could allow reductions in herbicide rates ???

Thank you.

A happy crop!

Photo by Glen Wright, DPI

