



Weedseeker

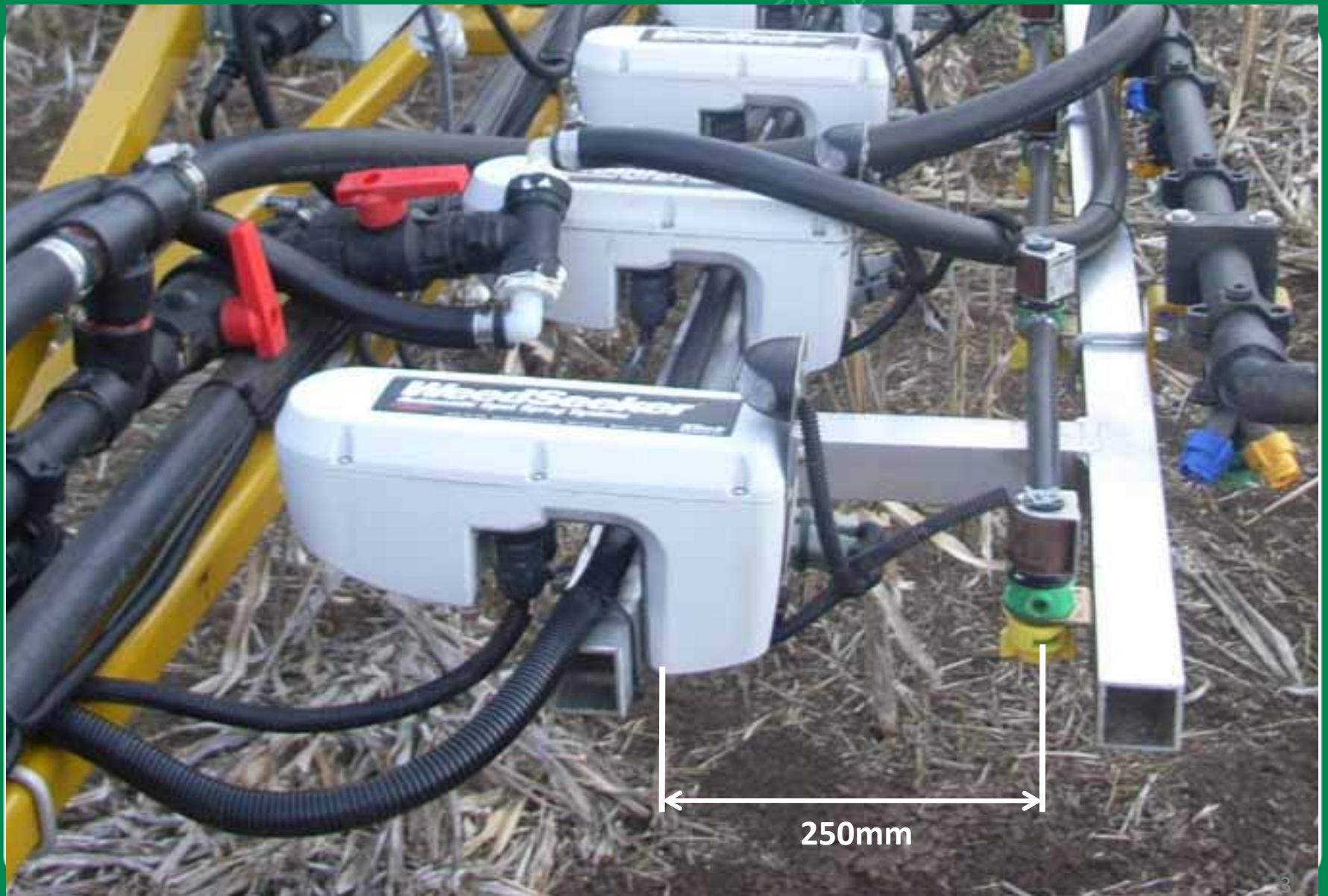
Herbicide mixes for summer and
winter fallow

Grant Thompson

Landmark / Crop Circle Consulting Geraldton

Weedseeker Spray Rates

- Spray Pressure (3 Bar / 45psi maximum)
- 100 litres/Ha if the whole boom is on.
- Increase Chemical rates by at least 30% -
- no nozzle overlap on small weeds

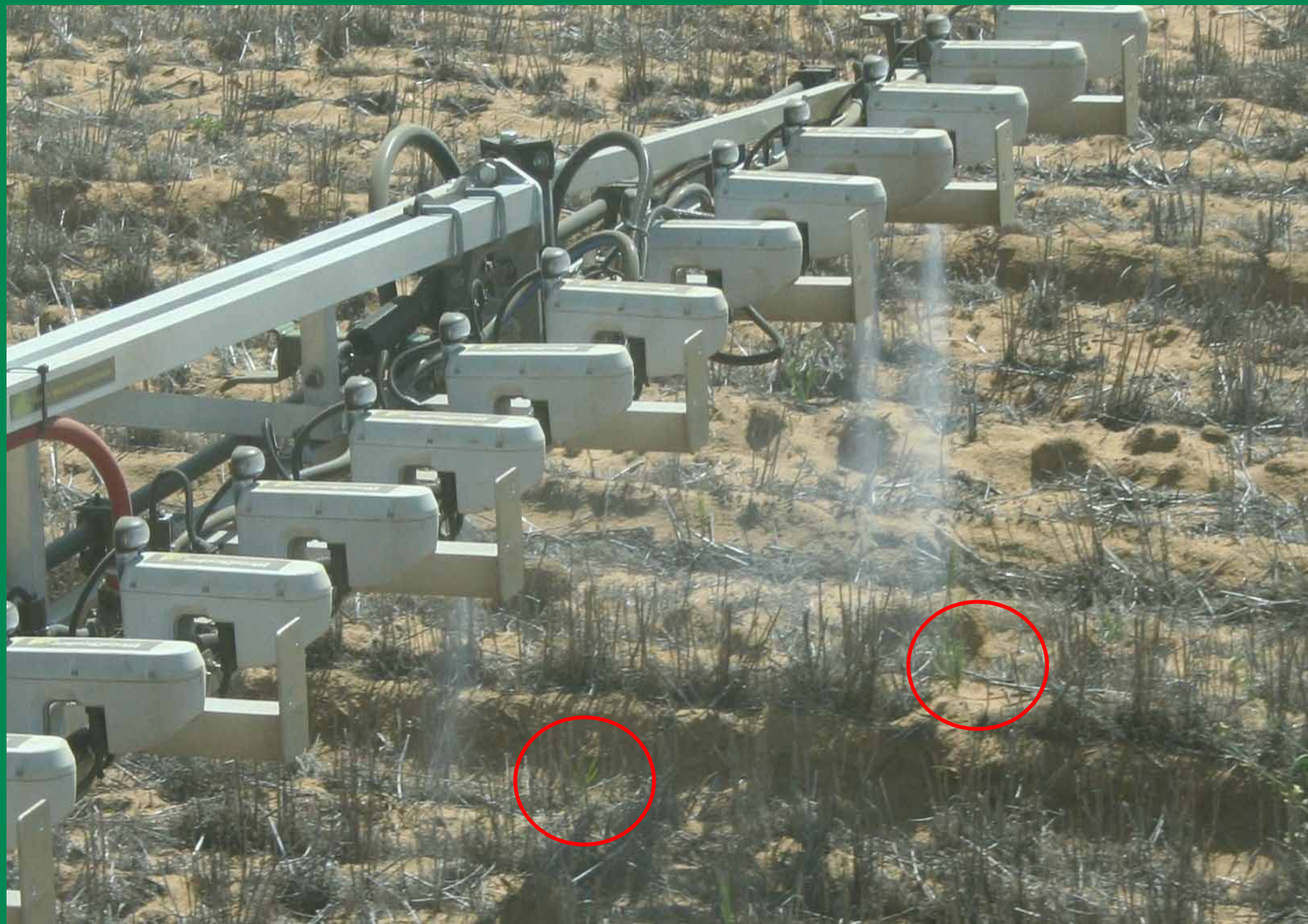


Weedseekers on Sp sprayer (ideal for for croptopping and desiccating etc





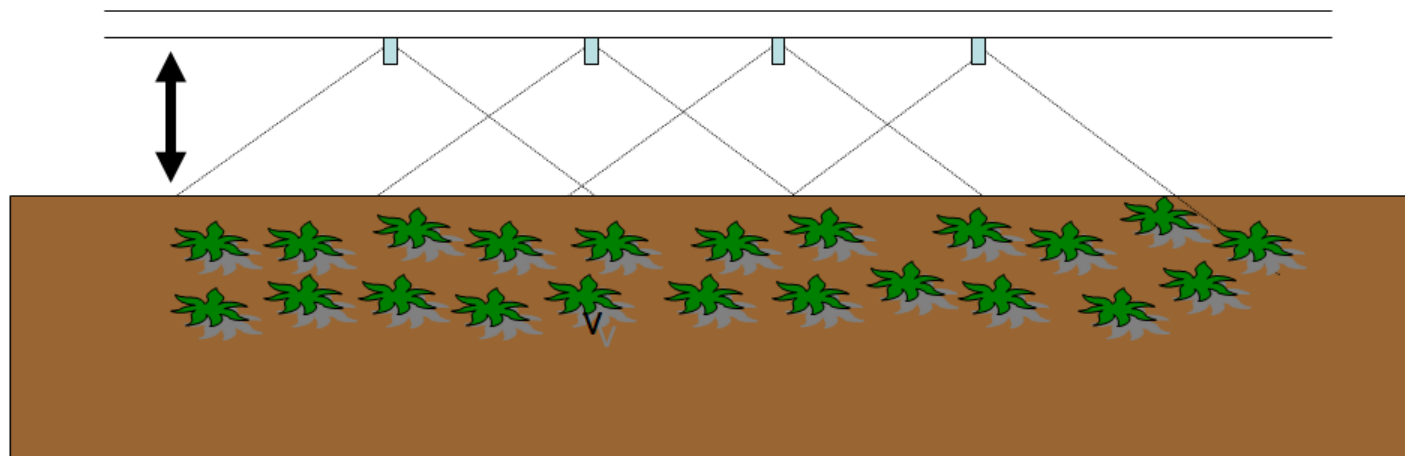






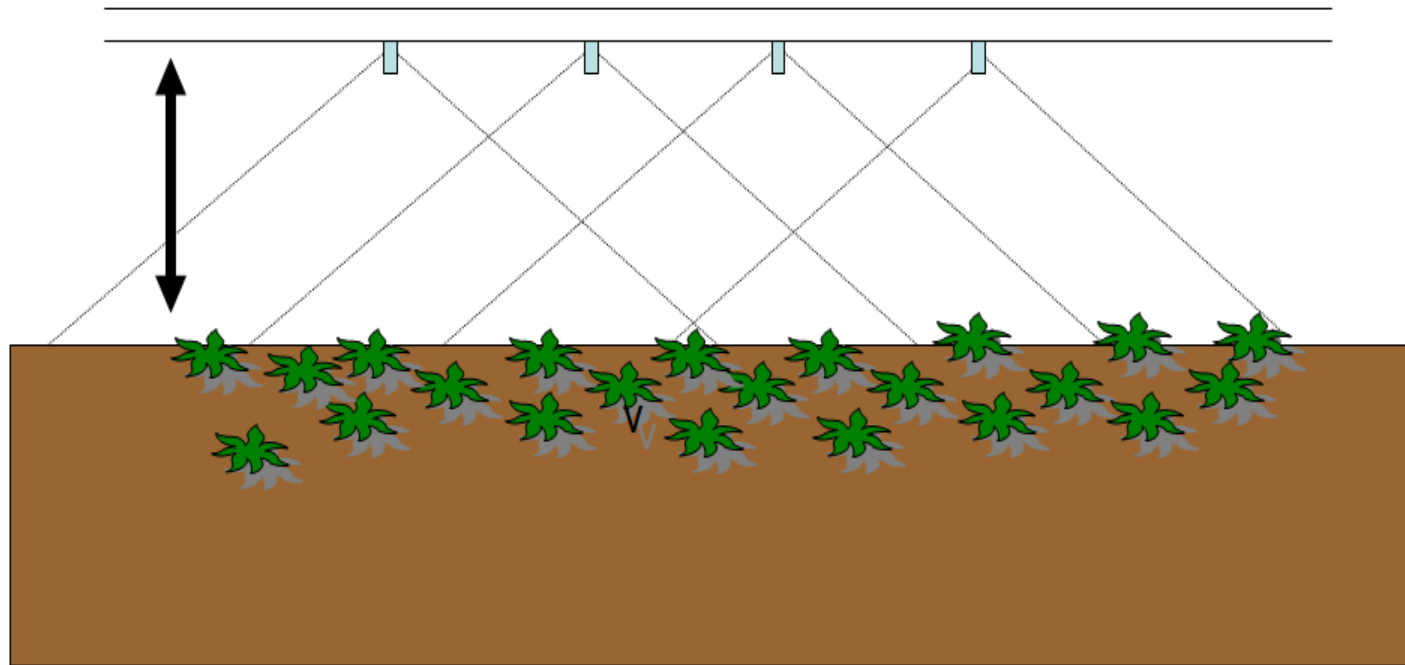
Conventional Booms rely on overlap

Single Overlap

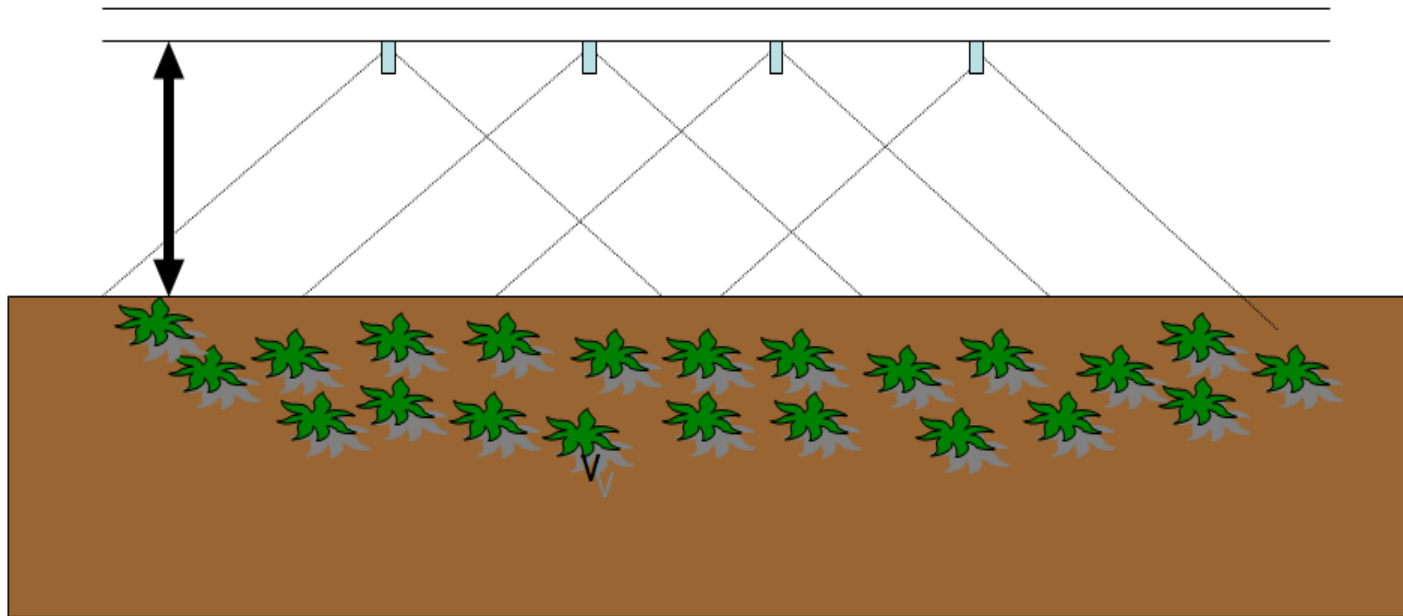


Issues with boom height

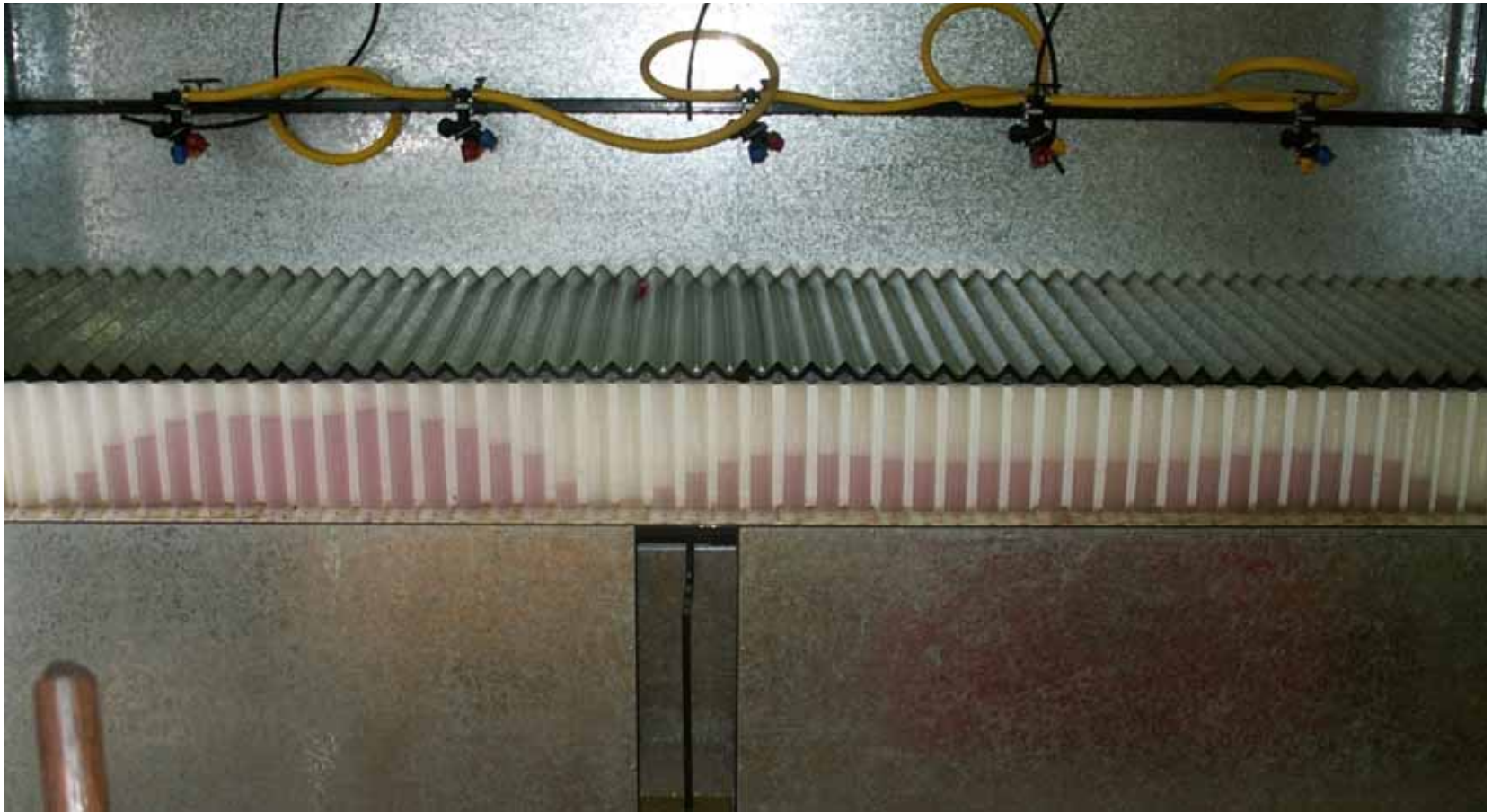
Double Overlap



Between double and single overlap



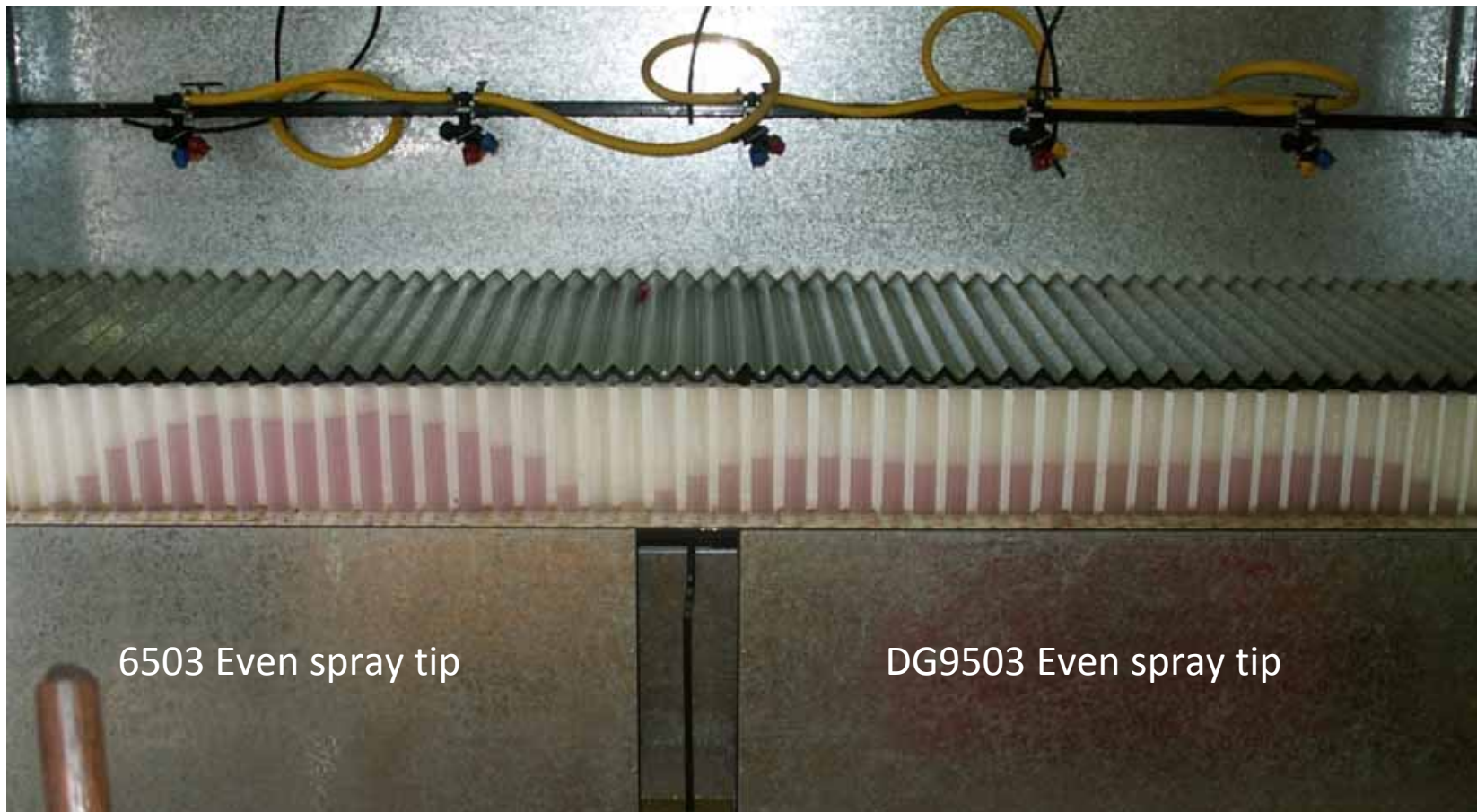
Nozzle Selection



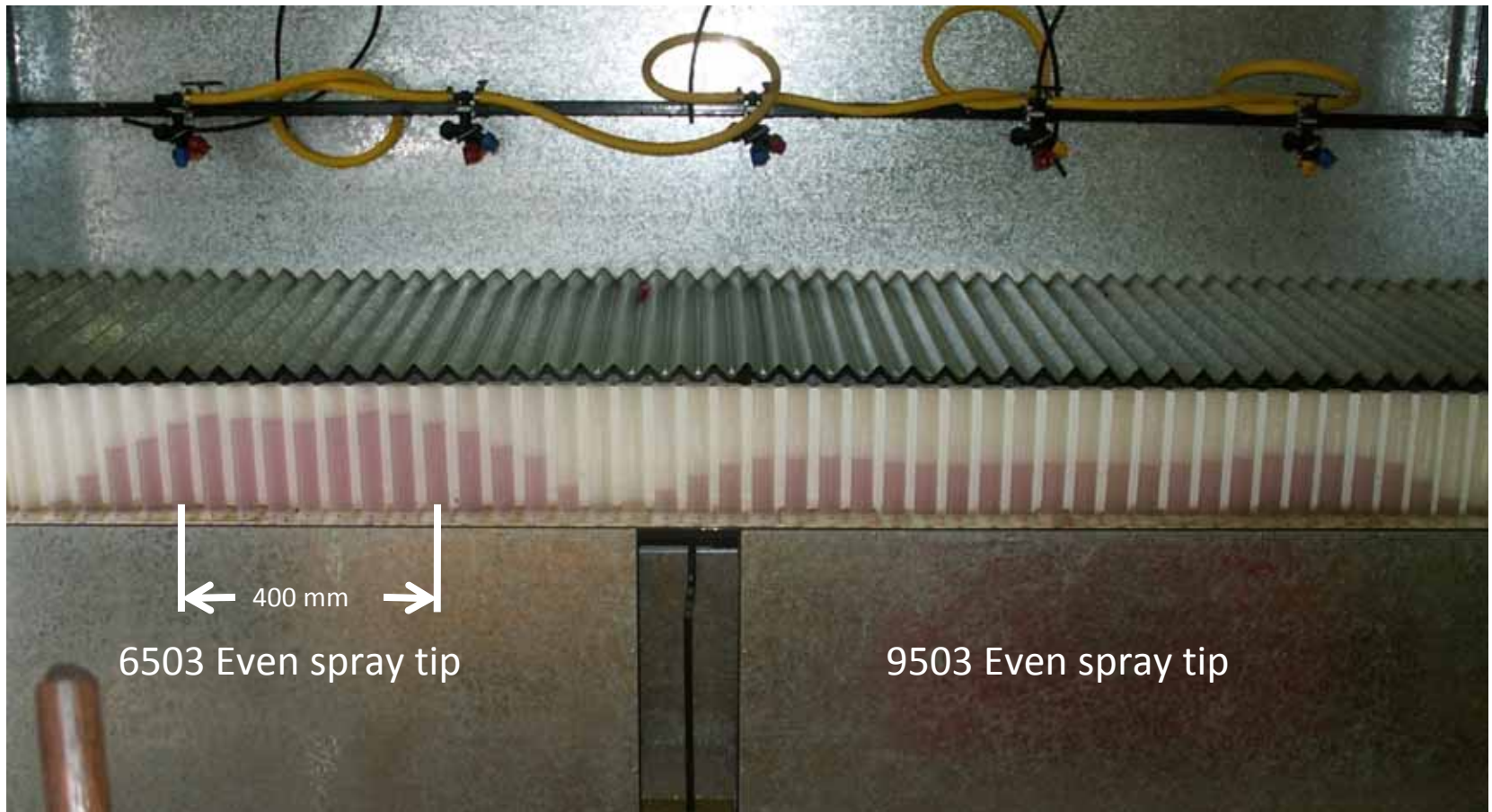
Nozzle Selection



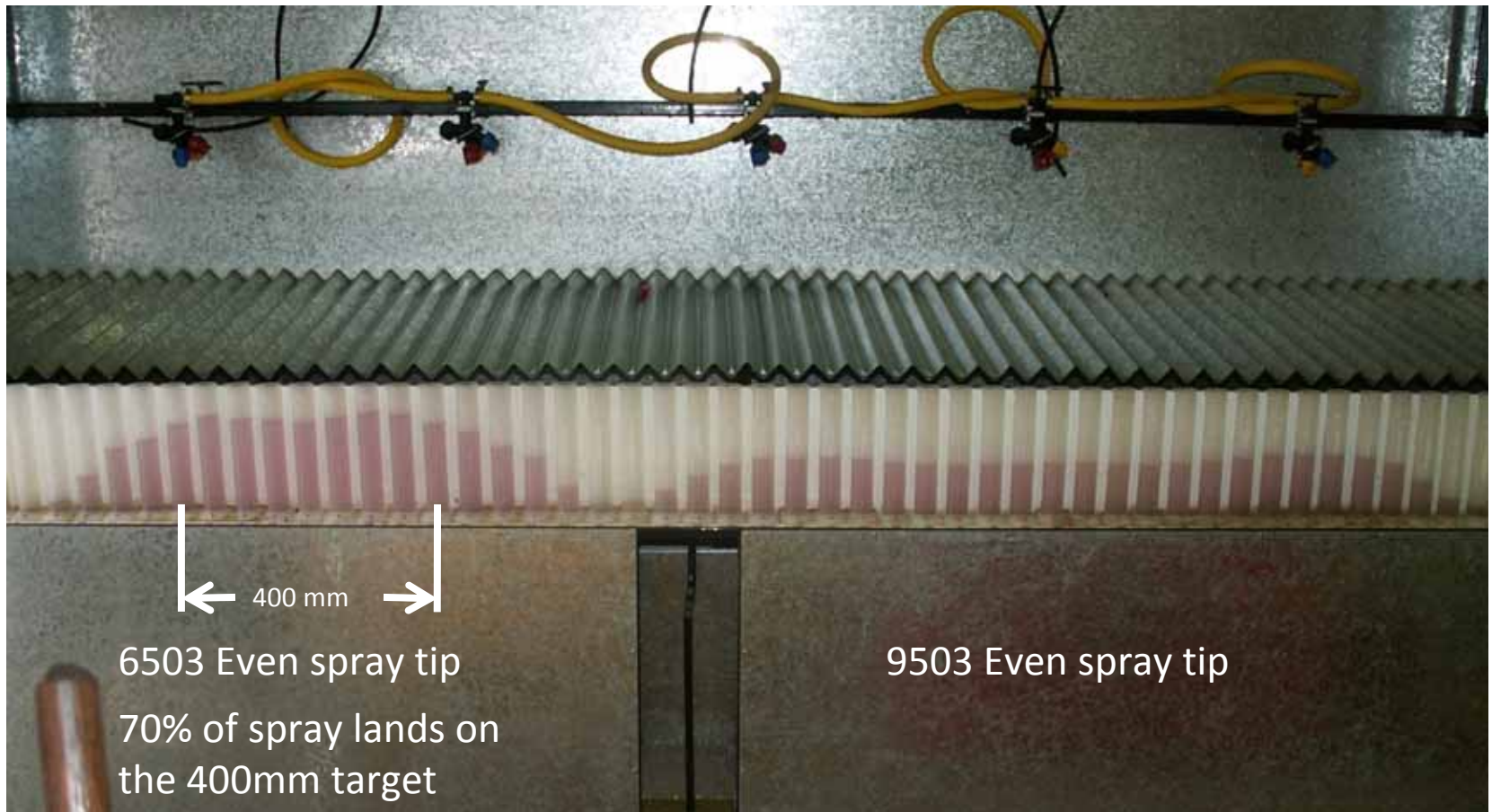
Nozzle Selection



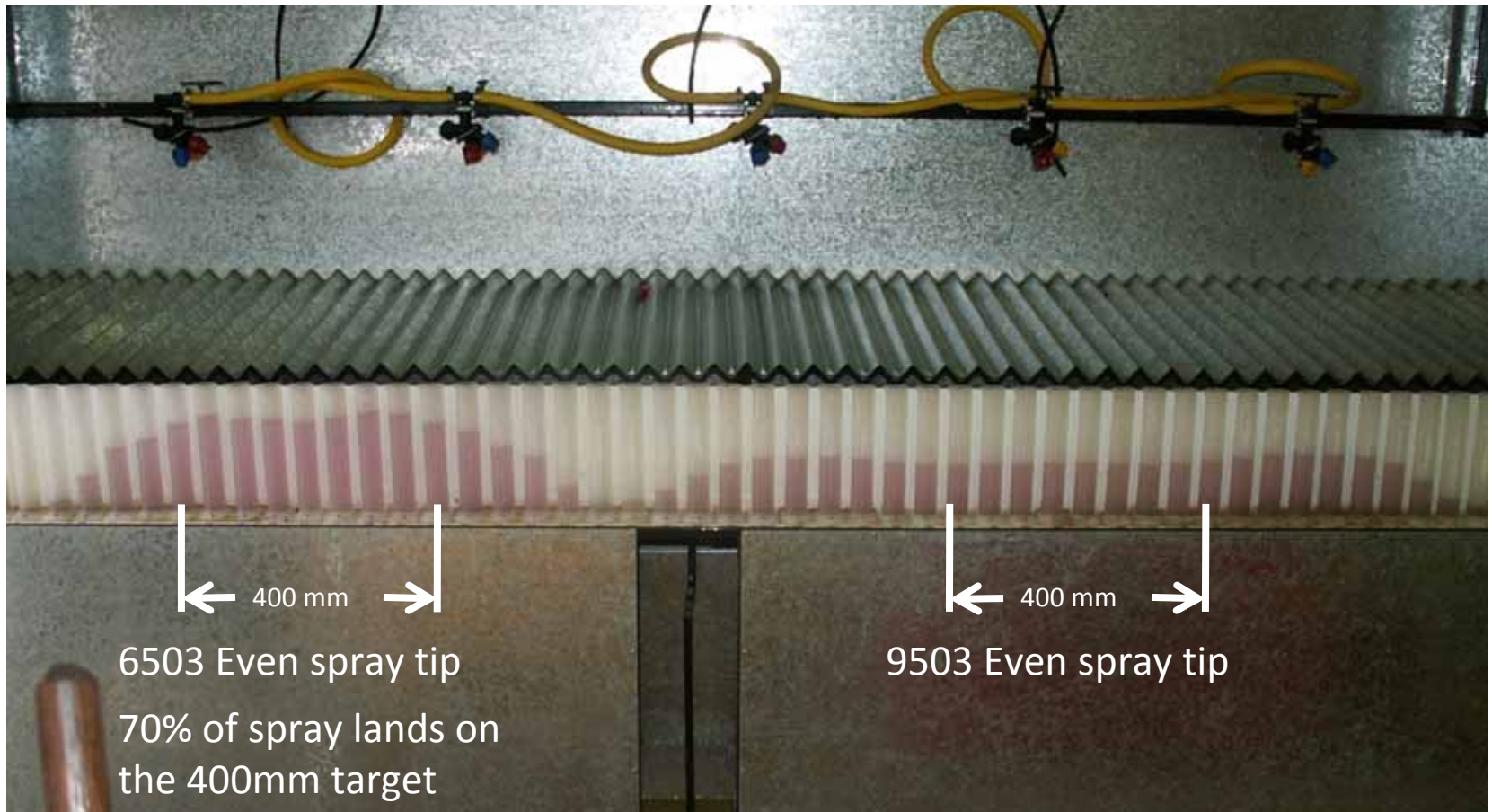
Nozzle Selection



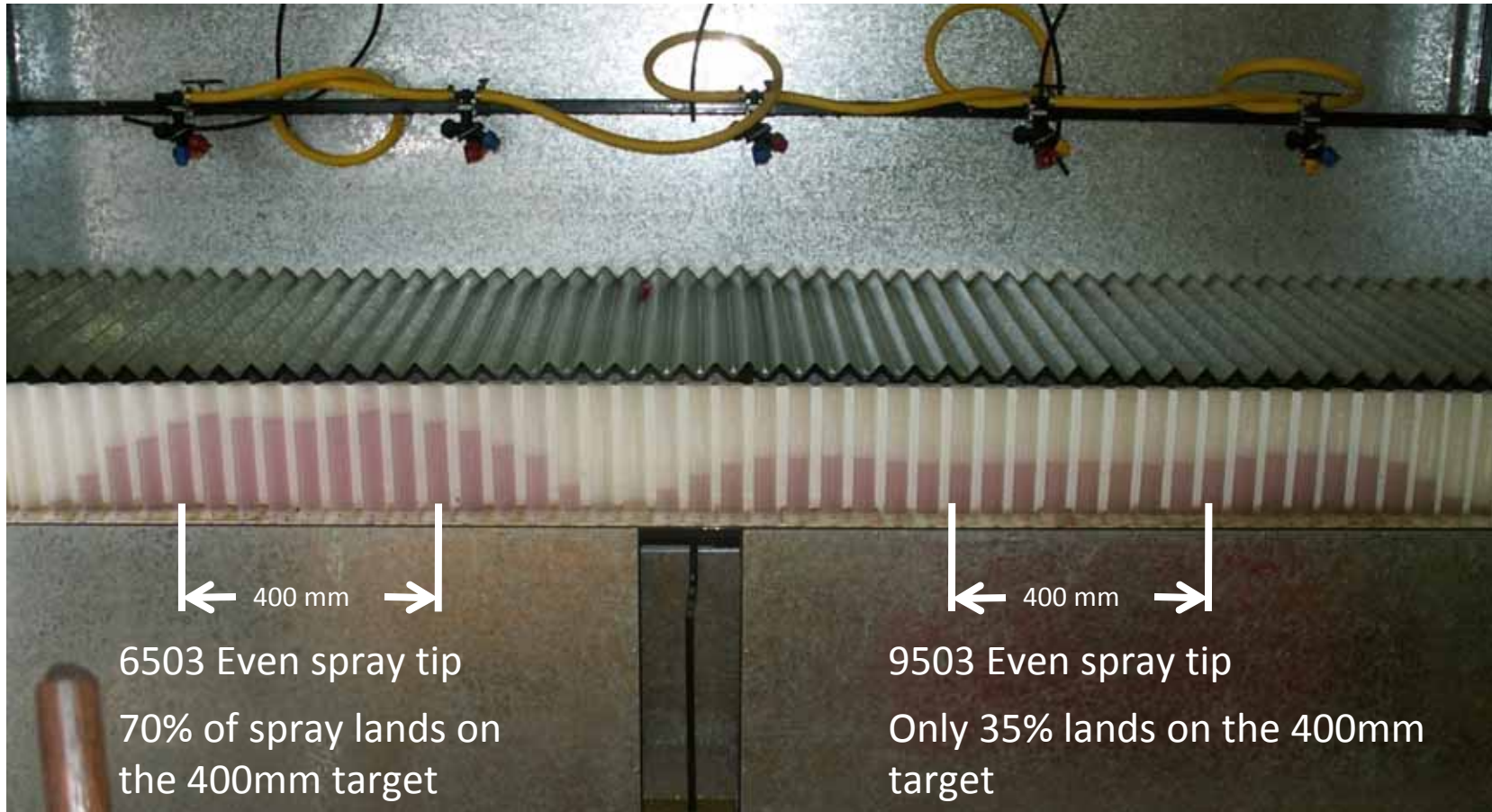
Nozzle Selection



Nozzle Selection



Nozzle Selection



Weedseeker Nozzle choice



- Because only 1 nozzle fires at a time on a small target, you cannot rely on single overlap from the next nozzle
- Because the boom is 70cm above the target, a single 110 degree nozzle is too wide
- The 65 degree 03+ EVEN nozzle is the correct choice
 - it doesn't have a pre-orifice chamber so its spray pattern is instantaneous and even when the solenoid fires the jet, and is still coarse spray pattern
 - ACK – Bill Gordon Consulting

Weedseeker may allow us to-

- Use of alternative modes of action at much higher rates
- Faster burndown/ better residue breakdown?
- Different herbicide resistance groups
- Lethal rates through weedseeker as a spot spray of 5-10% area at 100L/ha,
- Too costly at 100% area through boom at broad-acre rates at 50-70L/ha

Hand boom from USA







Weedseeker Herbicide trials Summer 2010

Herbicides used –

- Glyphosate 540 g/L, Gramoxone –paraquat 250g/L,
- Basta – Glufosinate, Alliance – paraquat and Amitrole,
- Ally – Metsulfuron methyl, Kamba 500 – Dicamba 500g/L,
- Garlon – Triclopyr, Grazon – triclopyr and picloram,
- Tordon 75D – picloram and 24D, Hammer – Carfentrazone Ethyl,
- Estericide 680 – low volatile 24D ester 680g/L,
- Diuron Sc 500g/L,
- Hotshot – fluroxypyr and aminopyralid, ,
- Sharpen - saflufenacil
- Bonza oil – paraffinic oil + fatty acid derivatives + nonoxynol surfactant.

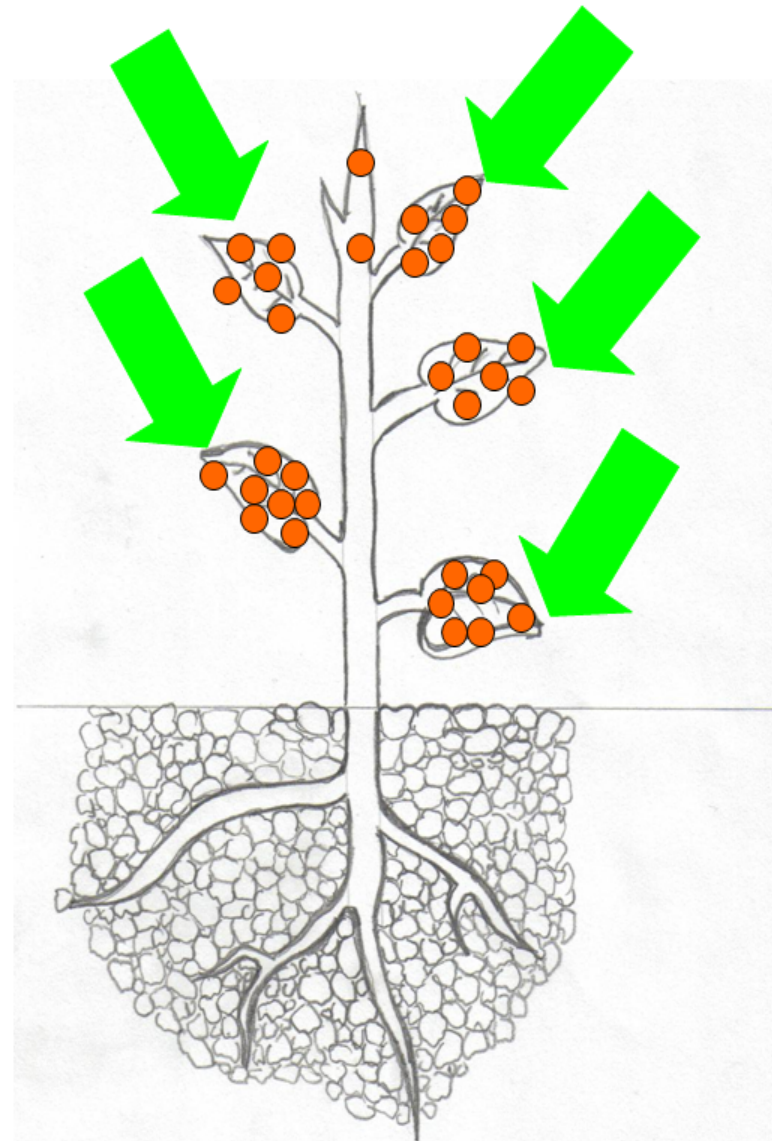
Other modes of action

Group L

inhibitors of photosynthesis
at photosystem I

Bipyridyls (paraquat, diquat)

- Contact herbicides activated by sunlight - minimal translocation if cells destroyed (there is some translaminar movement at night).
- Destroy cell membranes and disrupt photosynthesis,
- Thorough coverage required, older plants with well established roots will probably recover.

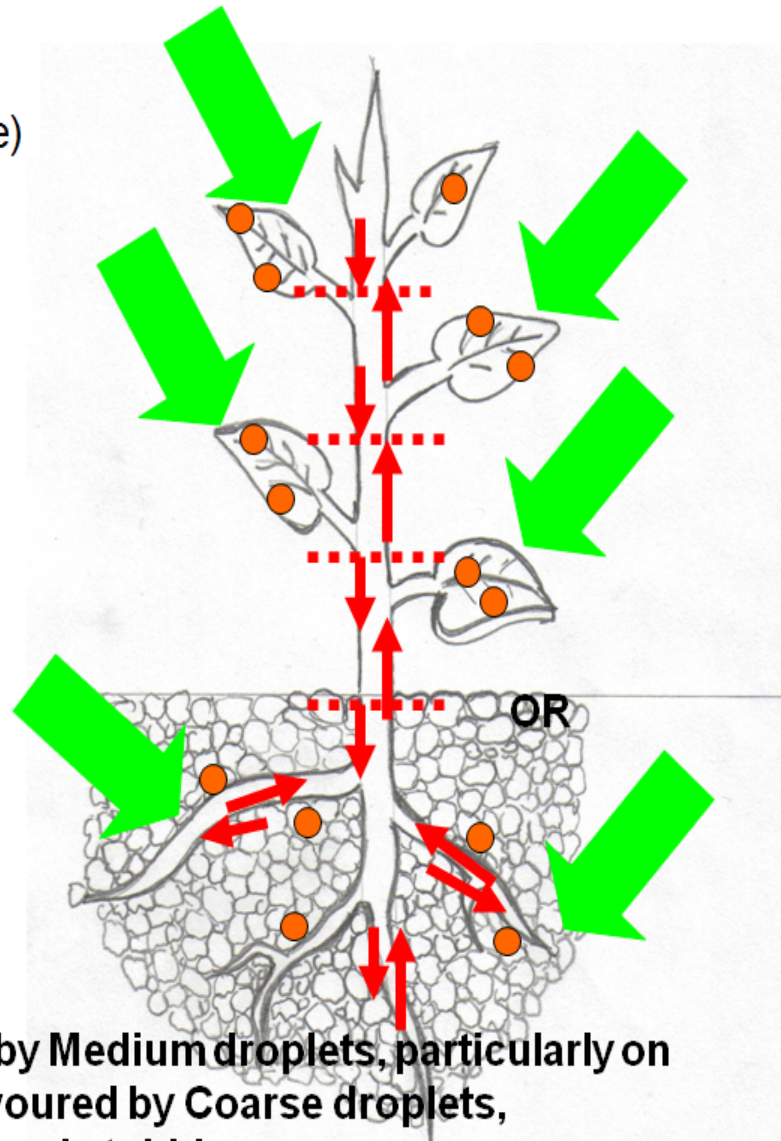


Group B

ALS Inhibitors

(inhibit the enzyme acetolactate synthase)

- Imidazolinones (spinnaker),
Sulfanamides (broadstrike),
Sulfonyl Ureas (Ally, glean, logran)
- All can inhibit formation of specific branched chain amino acids.
- Move in the xylem and phloem to areas of new growth, has root and shoot uptake. Can be soil or foliage applied.
- Kills a wide range of weeds
- Selectivity may be lost when crop stressed



Retention and evenness is favoured by Medium droplets, particularly on larger broadleaves, penetration is favoured by Coarse droplets, particularly in large grasses, cereals and stubble.

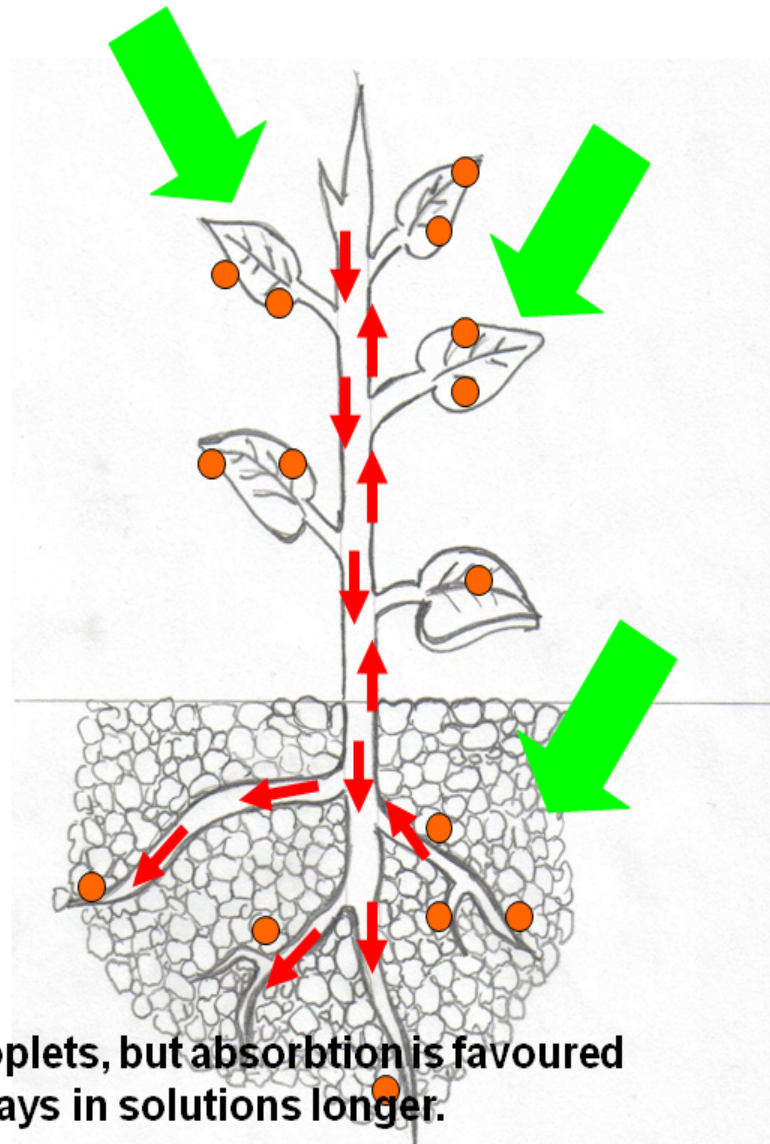
Group I

disruptors of cell growth

Benzoic acids (dicamba),
Phenoxy acetic acids (2,4-D, MCPA),
Pyridines (starane, tordon)

- Most post emergent, broadleaf control
- Upset hormone balance and cell growth (multiple sites in plant).
- Move in xylem and phloem to areas of new growth. Primarily absorbed through foliage, but roots possible
- Excessive rates can cause localised damage and restrict translocation
- Pyridines have greater soil activity, act as general growth inhibitors, especially to the roots.

Retention is favoured by medium droplets, but absorption is favoured by coarse droplets, as the product stays in solutions longer.

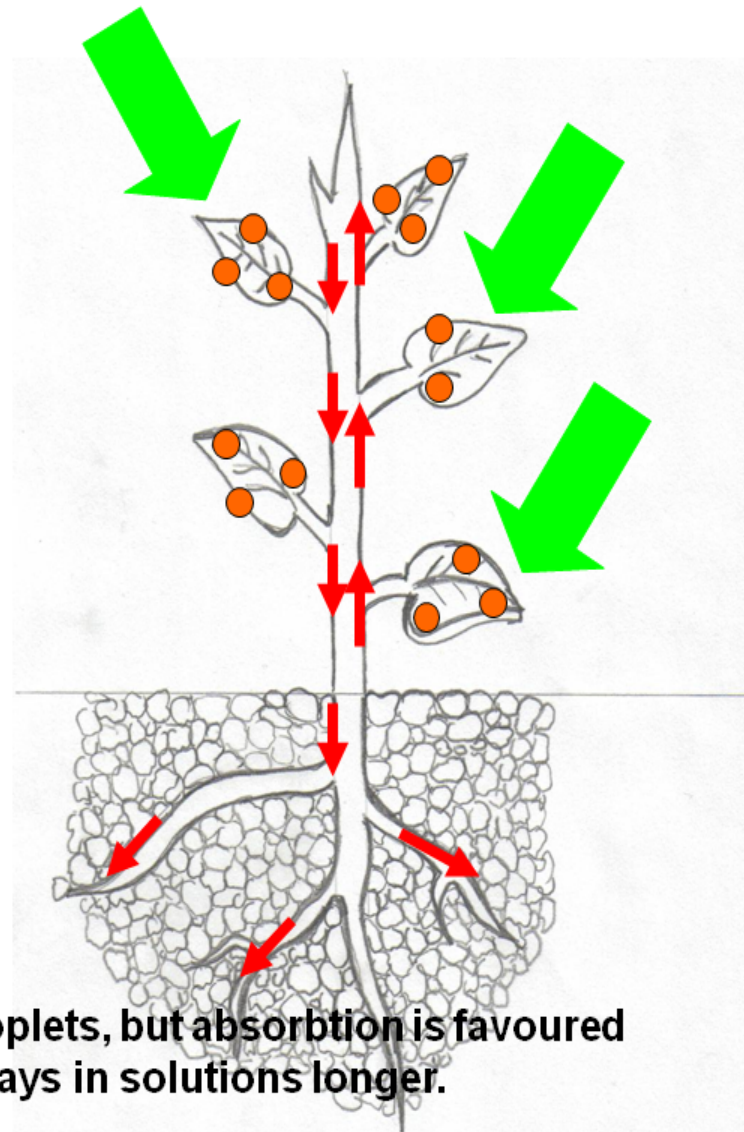


Group M

inhibitors of EPSP synthase

- Phosphorus Compounds (Glyphosate)
- Glyphosate is an organic acid formulated as an amine salt
- Post emergent, non-selective
- Acts on an enzyme pathway to disrupt the production of 3 essential amino acids.
- Moves freely, mainly in the phloem, some say xylem as well (some up & all the way DOWN), no soil activity.....probably the most mobile of all herbicides once in the plant...if plant not stressed

Retention is favoured by medium droplets, but absorption is favoured by coarse droplets, as the product stays in solutions longer.



Weedseeker herbicide mixes for GRDC NEFF trials



20 treatments over 2 weed types



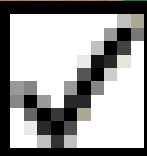
untreated



Roly poly 8 DAA – 10L/Ha Basta (group N)!



Roly Poly 8DAA 10L Paraquat Grp L



Roly Poly 8DAA 10L Alliance Grp L & Q



Roly Poly 8DAA 5L Diuron



X

Roly Poly 125ml Hammer 8DAA Grp G



X

Roly Poly 500ml Sharpen 8 DAA Grp G?



X

Roly Poly 1L Garlon 8DAA Grp I

X



Roly Poly 1L Tordon D 8DAA Grp I

X



Roly Poly 8DAA 20g Ally



Summer weeds

(in proceedings)

NEFF GRDC WEEDSEEKER HERBICIDE OPTIONS FOR SUMMER WEEDS							
		Control (1-10) at 16 and 55 days after application.				(1poor, 10 excellent)	
		BY GRANT THOMPSON CROP CIRCLE CONSULTING 2010					
No.	Treatment	Rate	Melons Afghan (1-10) 16DAA	Melons Afghan (0 - 10) 55DAA	rolypoly (0 - 10) 16DAA	rolypoly (0 - 10) 55DAA	
1	Garlon Bonza	200 ml 1 %	9	10	6	4	
2	Garlon Bonza	1000 ml 1 %	10	10	5	5	
3	Roundup Pmax	10000 ml	10	10	10	10	
4	Hammer + BS1000	125 ml + 0.1 %	5	4	5	5	
5	Paraquat 250	10000 ml	8	5**	10	10	
6	Grazon Bonza	300 ml 1 %	2	2	3	2	
7	Grazon Bonza	1000 ml 1 %	10	10	5	5	
8	Sharpen Bonza	500 ml 1 %	2	2	6	3**	
9	Diuron BS100	5000 ml 0.1 %	5	6	1	0	
10	Starane Advance Rup Powermax BS1000	900 ml 3000 ml 0.1 %	7	7	7	5	
11	Alliance	10000 ml	7	3**	10	10	
12	Basta	10000 ml	10	7	10	10	
13	Ester 680 Bonza	10000 ml 1 %	8	8	6	8	
14	Metsulfuron Bonza	20 g 1 %	7	9	10	10	
15	Tordon 75D Bonza	1000 ml 1 %	10	10	7	6	
16	Tordon 75D Bonza	10000 ml 1 %	10	10	6	6	
17	Alliance Ester 680 Bonza	10000 ml 2000 ml 1 %	9	5**	10	10	
18	nil roly poly Powermax Ester 680 Garlon Ally LI700	5000 ml 2000 ml 300 ml 5 g 0.5 %	10	10	Not Applied	Not Applied	
19	Kamba 500 Bonza	4000 ml 1 %	10	10	6	4	
20	Hotshot	3000 ml	10	10	5	4	
		LSD 0.01	5	5	5	5	
		LSD 0.05	4	4	3	4	
		CV	29	33	33	40	
ACK - Bill Campbell Nufarm, Bernie Quade Landmark							
**regrowth occurred							

Roly Poly – (*Salsola kalivar. kali*)

- The non selective herbicides **Roundup Powermax** at 10L/ha, **Gramoxone** at 10L/Ha, **Basta** at 10L/Ha and **Alliance** at 10L/Ha all provided very fast and effective control of large **Roly Poly**.
- **Ally** (Metsulfuron Methyl) at 20g with oil also provided very good control of Roly Poly and is particularly cheap.
- **Hammer** and **Sharpen** provided some initial burndown on the outside margins of the **Roly Poly** plants, but due to their rapid activity in bright sunny and warm conditions, provided little systemic activity and the plants continued growing from the centre.

Roly Poly – (*Salsola kalivar. kali*)

- **Grazon, Garlon** and **Tordon** provided impressive early yellowing and retardation of **Roly Poly**, but during the dry conditions after spraying, showed minimal activity after the initial effects and plants survived.
- The high rates of **Grazon, Tordon** and **Diuron** caused unacceptable damage of the following wheat crop at the Roly Poly site, and would not be advised in this scenario.

Afghan Melon - (*Citrullus lanatus*(Thunb.) Matsum.)

- **Garlon , Grazon, Tordon, Hotshot and Kamba 500** all provided very good rapid control of Afghan Melons. **Roundup Powermax** at 10L/Ha also provided effective control.
- **Ally** (Metsulfuron Methyl) at 20g with oil also provided reasonable control of **Afghan melon** at 55days after application and would make a cheap and handy tankmix partner in this case.

Afghan Melon - (*Citrullus lanatus*(Thunb.) Matsum.)

- **Basta, Gramoxone** and **Alliance** provided impressive initial burndown, but the **Afghan melons** continued growing and control was not satisfactory at 55 days after application.
- The high rates of **Grazon, Tordon, Kamba 500** and **Hotshot** caused unacceptable damage of the following wheat crop at the melon site , and would not be advised in this scenario.

Summer spray residues



Residues of Tordon D – low and high rates



WHEAT BIOMASS REDUCTION FROM HERBICIDE RESIDUES AFTER SUMMER TREATMENTS

BIOMASS REDUCTION (1-10) ON 2ND JULY 2010 - CROP 4 LEAF.

No.	Treatment	Rate		Melon Site Biomass Redn (1-10)	Roly Poly Site Biomass Redn (1-10)
1	Garlon Bonza	200 ml 1 %		0	0
2	Garlon Bonza	1000 ml 1 %		0	0
3	Roundup Pmax	10000 ml		0	0
4	Hammer + BS1000	125 ml + 0.1 %		0	0
5	Paraquat 250	10000 ml		0	0
6	Grazon Bonza	300 ml 1 %		0	0
7	Grazon Bonza	1000 ml 1 %		7	5
8	Sharpen Bonza	500 ml 1 %		0	0
9	Diuron BS100	5000 ml 0.1 %		0	3
10	Starane Advance Rup Powermax BS1000	900 ml 3000 ml 0.1 %		0	0
11	Alliance	10000 ml		0	0
12	Basta	10000 ml		0	0
13	Ester 680 Bonza	10000 ml 1 %		0	0
14	Metsulfuron Bonza	20 g 1 %		0	0
15	Tordon 75D Bonza	1000 ml 1 %		5	0
16	Tordon 75D Bonza	10000 ml 1 %		9	7
17	Alliance Ester 680 Bonza	10000 ml 2000 ml 1 %		0	0
18	nil roly poly Powermax Ester 680 Garlon Ally LI700	5000 ml 2000 ml 300 ml 5 g 0.5 %		0	0
19	Kamba 500 Bonza	4000 ml 1 %		4	0
20	Hotshot	3000 ml		4	0

Note - no rainfall received after application of herbicides, opening rain 22nd May.

Crop furrow sown with Auseeder DBS, minimal leaching during May and June.



Weedseeker Herbicide trials

Winter 2010

Winter weeds



Winter grasses



Herbicides used –



- Glyphosate 450 g/L,
- Gramoxone – paraquat 250g/L,
- Basta – Glufosinate,
- Alliance – paraquat and Amitrole,
- Ally – Metsulfuron methyl,
- Grazon – triclopyr and picloram,
- Hammer – Carfentrazone Ethyl,
- Estericide 680 – low volatile 24D ester 680g/L,
- Hotshot – fluroxypyr and aminopyralid,
- Stiker – oxyfluorfen,
- Sprayseed – paraquat and diquat,
- Gesaprim - Atrazine 600g/L,
- Glean – Chlorsulfuron,
- BS1000 wetting agent – 1000g/L non ionic surfactant.

2L

Glyphosate 450gai

4L



2L

Sprayseed

4L



4L Alliance



8L Basta



20g Ally



4L Glyphosate 20g Ally



4L Glyph + 50ml Hammer

2L Glyph + 800 Ester 680 +
50ml Hammer



2L Glyph + 2L Atrazine 600



2L Glyph + 2L Atrazine 600 +
800 Ester 680



Winter weeds mixes – 3 weeds

trts	rate ml/ha	mix 1	rate ml/ha	mix 2	rate ml/ha	mix 3	BROME CONTROL (1-10)		RYEGRASS CONTROL (1-10)		RADISH CONTROL (1-10)	
							9DAA	35DAA	9DAA	35DAA	9DAA	35DAA
1	2000	GLYPHOSATE 450GAI					5.67	9.67	5.33	9.67	4.67	3.33
2	4000	GLYPHOSATE 450GAI					5.00	10.00	5.33	9.67	5.33	8.33
3	2000	GRAMOXONE					9.00	10.00	8.00	4.67	5.67	1.33
4	4000	GRAMOXONE					9.00	9.67	8.67	7.33	6.67	1.33
5	2000	SPRAYSEED					9.00	9.33	7.00	6.00	5.33	2.67
6	4000	SPRAYSEED					9.00	10.00	8.67	9.00	7.33	1.67
7	2000	GRAMOXONE	800	ESTER 680			9.00	10.00	9.00	9.00	7.67	3.67
8	2000	GLYPHOSATE 450GAI	800	ESTER 680			5.00	9.33	5.33	10.00	4.67	8.67
9	2000	SPRAYSEED	800	ESTER 680			9.00	9.33	7.67	4.33	6.00	2.67
10		NIL					0.00	0.00	0.00	0.00	0.00	0.00
11	2000	GLYPHOSATE 450GAI	2000	Atrazine			3.67	6.00	4.00	9.00	5.33	7.33
12	2000	SPRAYSEED	2000	Atrazine			8.67	10.00	8.00	5.00	7.33	1.00
13	2000	SPRAYSEED	2000	Atrazine	800	ESTER 680	8.67	9.67	8.00	7.33	8.33	6.00
14	2000	GLYPHOSATE 450GAI	2000	Atrazine	800	ESTER 680	3.00	6.67	3.00	6.33	3.00	3.67
15	2000	GLYPHOSATE 450GAI	800	ESTER 680	10g	Ally	5.00	9.00	5.33	9.33	4.33	8.33
16	2000	GLYPHOSATE 450GAI	800	ESTER 680	50	HAMMER	4.67	9.00	5.33	10.00	3.33	8.67
17	4000	BASTA					5.67	3.33	6.00	2.33	2.67	2.33
18	8000	BASTA					6.33	6.33	6.00	6.00	6.33	2.00
19	2000	GLYPHOSATE 450GAI	3000	HOTSHOT			5.67	8.67	5.00	7.67	2.33	3.67
20	20g	ALLY					0.33	0.00	0.33	0.00	0.67	1.00
21	4000	GLYPHOSATE 450GAI	20g	ALLY			5.00	9.67	5.33	9.67	4.33	5.67
22	2000	GLYPHOSATE 450GAI	800	ESTER 680	30g	GLEAN	5.00	8.67	4.33	10.00	3.33	6.33
23	2000	SPRAYSEED	800	ESTER 680	10g	Ally	8.67	9.67	8.67	6.67	7.67	2.67
24	4000	GLYPHOSATE 450GAI	50	HAMMER			5.00	9.33	4.67	9.00	3.67	4.67
25	4000	ALLIANCE					9.00	9.33	9.00	7.00	7.00	1.33
26	4000	ALLIANCE	800	ESTER 680			9.00	10.00	9.00	8.67	7.00	3.33
27	4000	GLYPHOSATE 450GAI	100	STRIKER			5.33	9.33	5.67	9.67	4.67	4.67
28	4000	GRAMOXONE	250	STRIKER			9.00	10.00	9.00	9.67	6.67	1.33
29	4000	GRAMOXONE	3000	HOTSHOT			9.00	10.00	9.00	9.00	7.00	1.67
30	2000	GLYPHOSATE 450GAI	300	grazon			5.33	8.00	5.67	6.33	2.67	4.33
31	4000	GLYPHOSATE 450GAI	500	starane			5.00	9.33	5.67	10.00	3.00	2.33
32	2000	GRAMOXONE	500	starane			9.00	10.00	9.00	8.33	6.33	2.67
33	2000	GRAMOXONE	500	starane	1000	Atrazine	8.67	10.00	8.00	6.00	6.33	2.33
34	2000	STRIKER					0.67	0.00	0.67	0.00	1.67	0.00
						LSD 0.01	3.44	6.86	3.44	6.25	3.63	4.54
						LSD 0.05	2.58	5.16	2.59	4.70	2.72	3.41
						Coefficient of Variation	44.30	68.80	46.49	73.80	58.50	91.67

Brome Grass – (*Bromus Spp*)



- Glyphosate at 2L & 4L/ha, Gramoxone and Sprayseed at 2L and 4L/ha and Alliance at 4L/ha provided acceptable control of tillering brome grass in the spray fallow situation.
- Addition of 2L Atrazine (600gai) to the 2L of Glyphosate (no Amsul added) caused a large reduction in brome control.
- Addition of Ester 680 to this mix (trt 14) also provided worse control due to the apparent biological antagonism.

Brome Grass – (*Bromus Spp*)



- Addition of 2L Atrazine to 2L Sprayseed improved the final brome control from 93 to 100%.
- Basta does not appear to have a fit in this situation at either 4 or 8L/Ha.
- Use of much higher rates through a spot spraying system may be effective and could provided resistance management options.
- Addition of 100ml Striker (oxyflurofen) to 4L Glyphosate did not appear to improve Brome control.

Ryegrass – (*Lolium rigidum*)



- 2L and 4L of Glyphosate provided the best levels of control on annual ryegrass.
- 2L and 4L of Gramoxone or Sprayseed and 4L Alliance provided impressive initial burndown of ryegrass, but significant regrowth occurred after this and control was ultimately unacceptable.
- Addition of 250ml Striker to the 4L Gramoxone treatment did not improve ryegrass control.
- Striker alone at 2L/ha was ineffective on ryegrass.

Wild Radish – (*Raphanus raphanistrum*)



- Control of wild radish in this population proved quite difficult with herbicides in the winter spray fallow scenario.
- Very poor control with **20g Ally** shows that this population is tolerant to the common Grp B herbicide Metsulfuron-methyl.
- Unacceptable radish control was achieved with **2L Glyphosate 450gai**.
- The 4L/ha of Glyphosate 450gai treatment achieved the second highest level of control, which is supported by in-field observations from other agronomists and farmers that high rates of Glyphosate are needed to control **multiple resistant radish** plants.
- Addition of 800ml of **24-D Ester 680** to 2L of Glyphosate improved control of wild radish from **33%** to **87%**, showing that there was still some reasonable additive control from this tankmix. However, on a totally susceptible population, this herbicide mix would be considered an effective lethal rate.

Wild Radish – (*Raphanus raphanistrum*)



- Addition of 50ml **Hammer** (Carfentrazone) to the 4L of Glyphosate treatment reduced radish control from **83%** to **47%**. Clearly the use of rapid burndown herbicides like Hammer did not allow for sufficient translocation of Glyphosate in these bright sunny conditions and regrowth of the radish occurred.
- The addition of 50ml Hammer to the 2L Glyphosate and 800ml Ester 680 mix did not cause any reduction in efficacy on radish, suggesting the presence of 24D is required in the mix if Hammer needs to be added for weed control of other species.
- Addition of **100ml of Striker** to the 4L of Glyphosate mix reduced radish control from **83%** to **47%**, suggesting that the burndown effect of Striker reduced Glyphosate translocation and efficacy.

Wild Radish – (*Raphanus raphanistrum*)

- Treatments containing the bipyridils (**Paraquat or Diquat**) provided impressive initial burndown of wild radish, but ultimately only served to remove the bulk of other weeds in the sward and allowed the radish to re-grow relatively uncontested with access to more soil resources.
- Final radish control was no different when comparing **Gramoxone and Sprayseed** at the 2L and 4L rates, however initial burndown at 9DAA was slightly better when Sprayseed was used.
- Interestingly, the addition of 20g Ally to the 4L/Ha Glyphosate treatment reduced radish control from **83%** to **57%**. Considering that 20g Ally treatment alone gave very poor control (7%) of radish, the reduction in control (*not significant at $p \leq 0.05$*) suggests some level of biological antagonism between the high rate of Ally and the efficacy of the Glyphosate on this population.

Wild Radish – (*Raphanus raphanistrum*)

- Further work is needed on the relative efficacy of Glyphosate on wild radish when multiple or stacked genetics for herbicide resistance is present.
- In field observations from other agronomists (*Bostock pers.comm, 2010*) suggest that wild radish that is resistant to several herbicide groups is more difficult to kill with Glyphosate than a totally susceptible individual.



- Other weedseeker applications

How good would an SP sprayer with weedseekers be for desiccating green radish in mature wheat and lupin crops!!!



Photos radish desiccated in wheat with glyphosate – Yuna



Paddocks harvested no radish desiccation- YUNA



Radish in wheat – desiccated before harvest – great job



No desiccation with Roundup before harvest – continued growth of radish



Acknowledgments

- **Bernie Quade Landmark**, for assistance with spraying summer weeds
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- **References:**
- **Peter Bostock** – Farm Services Manager, Landmark W.A – **Personal Communication.**

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Thankyou –
any questions?