1984

Comparison of conventional boomspray and C.D.A. equipment for weed control in cereals

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EXPERIMENTAL SUMMARIES

1984

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WEED AGRONOMY BRANCH

PLANT RESEARCH DIVISION

DEPARTMENT OF AGRICULTURE

WESTERN AUSTRALIA

1.	84NO67	Ryegrass
2.	84NO68	Capeweed
3.	84ME69	Capeweed
4.	84(40-41)	Ryegrass & Radish
5.	C.D.A.	Capeweed
6.	Boomspray	Capeweed

TRIAL TITLE:	Comparison of conventional boomspray and C.D.A. equipment for weed control in cereals.	
EXPERIMENT NO:	84NO67	
OFFICERS:	Peirce, Rayner, District Office staff	
LOCATION:	Wyalkatchem	
CROP:	Wheat	
GROWTH STAGE WHEN SPRAYED:	2-2 1/2 leaf	
SOIL MOISTURE STATUS		
Surface:	Dry	
Depth:	Wet	
Temp. Dry bulb (°C):	17	
Wet bulb (°C):	14	
RELATIVE HUMIDITY (%):	70	
WIND SPEED (km/hr)	7-14	
WIND DIRECTION:	NE	
RAINFALL:	none in previous 24 hours	
DATE SPRAYED:	23rd July, 1984	
TIME SPRAYED:	11.00 a.m. - 1.30 p.m.	
EQUIPMENT:	Dual cab Toyota Landcruiser	
NOZZLE TYPE:	C.D.A. blue tip	BOOMSPRAY 8001 LP
SPRAYING PRESSURE (KPA):	75	140
SPRAYING SPEED (km/hr):	7	15
VOLUME OF APPLICATION (l/ha):	30	33
OILS: (a) Ulvapron		
(b) Terec X5		
CHEMICAL:	Hoegrass	

Tr	Rate hoegrass mL/ha	Oil	Oil %	Ryegrass /m^2	Harvest kg/ha	Net returns $/ha -chemical costs
1. C.D.A.	500	a	1	218	1 512	196.84
2. "	500	a	2	107	1 528	199.00
3. "	500	b	1	123	1 440	187.12
4. "	500	b	2	103	1 580	206.02
5. "	500	nil	-	220	1 400	181.72
6. C.D.A.	1000	a	1	72	1 620	204.15
7. "	1000	a	2	77	1 560	196.05
8. "	1000	b	1	45	1 448	180.93
9. "	1000	b	2	37	1 580	198.75
10. "	1000	nil	-	87	1 640	206.85
11. Boomspray	500	a	1	80	1 488	188.20
12. "	500	a	2	220	1 380	179.02
13. "	500	b	1	143	1 568	204.40
14. "	500	b	2	165	1 592	207.64
15. "	500	nil	-	237	1 340	173.62
16. Boomspray	1000	a	1	115	1 432	178.77
17. "	1000	a	2	83	1 480	185.25
18. "	1000	b	1	108	1 528	191.73
19. "	1000	b	2	118	1 540	193.35
20. "	1000	nil	-	110	1 328	164.73
21. Control				498	978	133.15

Coefficient of variation 7.1%
(Yield)

Weed Control (Ryegrass) - 1000 mL rate of hoegrass gave better control than the 500 mL rate. Addition of an oil enhanced the control of ryegrass.

The oil (Terec X5) gave a superior control of ryegrass.

The controlled droplet applicators gave a better control than the low pressure hydraulic nozzles.

Yield - The yield from the C.D.A. treated crop was superior to that treated using a boomspray.

There was little or no response to the addition of a crop oil to the C.D.A. treatments.

However the addition of a crop oil to the boomspray treatments improved the yield. The yield response to the addition of the crop oil Terec X5 using the boomspray was greater than that for Ulvapron.

TRIAL TITLE:	Comparison of conventional boomspray and C.D.A. equipment for weed control in cereals.
EXPERIMENT NO:	84NO68
OFFICERS:	Peirce, Rayner, District Office staff
LOCATION:	Bolgart - M. Brookhurst
CROP:	Wheat
GROWTH STAGE WHEN SPRAYED:	3-5 leaf
SOIL MOISTURE STATUS	
Surface:	Dry
Depth:	Damp
Temp. Dry bulb (°C):	16
Wet bulb (°C):	14
RELATIVE HUMIDITY (%):	81
WIND SPEED (km/hr)	7-14
WIND DIRECTION:	NE
RAINFALL:	No rain in previous 24 hours
DATE SPRAYED:	23rd July, 1984
TIME SPRAYED:	3.00 pm - 5.30 p.m.
EQUIPMENT:	Dual cab Toyota Landcruiser

	C.D.A. blue tip	BOOMSPRAY 8001 LP
NOZZLE TYPE:		
SPRAYING PRESSURE (KPA):	75	140
SPRAYING SPEED (km/hr):	7	15
VOLUME OF APPLICATION (l/ha):	30	33

OILS: (a) Ulvapron
(b) Lovis

CHEMICAL: Buckshot

Tr		Rate mL/ha	Buchshot Oil	Oil %	Capeweed /m^2	Harvest kg/ha	Net returns $/ha -chemical costs
1.	C.D.A.	750	a	1	12	2 248	299.20
2.	"	750	a	2	12	2 149	285.83
3.	"	750	b	1	7	2 213	294.47
4.	"	750	b	2	12	2 181	290.15
5.	"	750	nil	-	12	2 040	271.12
6.	C.D.A.	1500	a	1	5	2 560	313.96
7.	"	1500	a	2	3	2 389	335.56
8.	"	1500	b	1	6	2 549	338.13
9.	"	1500	b	2	5	2 568	338.13
10.	"	1500	nil	-	5	2 368	311.13
11.	Boomspray	750	a	1	9	2 541	338.75
12.	"	750	a	2	8	2 354	313.15
13.	"	750	b	1	11	2 293	305.27
14.	"	750	b	2	9	2 434	324.31
15.	"	750	nil	-	8	2 426	323.23
16.	Boomspray	1500	a	1	2	2 354	309.24
17.	"	1500	a	2	2	2 480	326.25
18.	"	1500	b	1	2	2 434	320.04
19.	"	1500	b	2	2	2 413	317.20
20.	"	1500	nil	-	4	2 434	320.04
21.	Control				20	2 344	316.51

Coefficient of variation 7.5%
(Yield)

Price of wheat $135/tonne

Plant counts

The 1.5L/ha rate of chemical gave a significantly better control of capeweed than the 750 mL/ha rate.

Better control of capeweed was obtained by the boomspray treatment using the hydraulic nozzles compared to the controlled droplet applicators.

There was a much greater response to capeweed control by increasing the chemical rate through the boomspray compared to the controlled droplet applicators.

Yield

The 1500 mL rate of herbicide gave a higher yield than the treatments having 750 mL/ha.

TRIAL TITLE:	Comparison of conventional boomspray and C.D.A. equipment for weed control in cereals.	
EXPERIMENT NO:	84ME69	
OFFICERS:	Peirce, Rayner, District Office staff	
LOCATION:	Merredin - N. & R. Hooper	
CROP:	Wheat - Halberd	
GROWTH STAGE WHEN SPRAYED:	4-4 1/2 leaf	
SOIL MOISTURE STATUS		
Surface:	Damp	
Depth:	Damp	
Temp. Dry bulb (°C):	20	
Wet bulb (°C):	15	
RELATIVE HUMIDITY (%):	59	
WIND SPEED (km/hr)	0-8	
WIND DIRECTION:	NE	
RAINFALL:	Nil in previous 24 hours	
DATE SPRAYED:	27th June, 1984	
TIME SPRAYED:	11.00 a.m. - 2.30 p.m.	
EQUIPMENT:	Dual cab Toyota Landcruiser	
NOZZLE TYPE:	C.D.A. blue tip	BOOMSPRAY 8001 LP
SPRAYING PRESSURE (KPA):	70	135
SPRAYING SPEED (km/hr):	6	15
VOLUME OF APPLICATION (l/ha):	32.5	32.7
OILS: (a) Ulvapron		
(b) Lovis		
CHEMICAL:	Diuron & M.C.P.A.	

Tr		Rate Diuron & M.C.P.A. mL/ha	Oil	Oil %	Capeweed /m^2	Harvest kg/ha	Net returns $/ha -chemical costs
1.	C.D.A.	175 + 200	a	1	26	1 496	200.66
2.	"	175 + 200	a	2	22	1 421	190.53
3.	"	175 + 200	b	1	27	1 583	212.40
4.	"	175 + 200	b	2	24	1 418	190.13
5.	"	175 + 200	nil	-	26	1 541	206.73
6.	C.D.A.	350 + 400	a	1	13	1 339	178.16
7.	"	350 + 400	a	2	13	1 560	208.00
8.	"	350 + 400	b	1	18	1 440	191.80
9.	"	350 + 400	b	2	16	1 455	193.82
10.	"	350 + 400	nil	-	16	1 620	216.10
11.	Boomspray	175 + 200	a	1	32	1 226	164.21
12.	"	175 + 200	a	2	36	1 234	165.29
13.	"	175 + 200	b	1	32	1 256	168.26
14.	"	175 + 200	b	2	38	1 163	155.70
15.	"	175 + 200	nil	-	36	1 189	159.21
16.	Boomspray	350 + 400	a	1	12	1 320	175.60
17.	"	350 + 400	a	2	8	1 324	176.14
18.	"	350 + 400	b	1	17	1 395	185.72
19.	"	350 + 400	b	2	9	1 403	186.80
20.	"	350 + 400	nil	-	8	1 309	174.11
21.	Control				56	1 078	145.56

Coefficient of variation 4.6%
(Yield)

Price of wheat $135.00/tonne

Plant counts

The half dose rate of diuron and MCPA was significantly less effective in controlling the capeweed than the recommended dose of 350 + 400 mL.

There was a response to the type sprayer used at the recommended dose rate. The control of capeweed was improved by using the conventional hydraulic spray nozzles compared to the controlled droplet applicators.

Yield

The recommended dose rate of diuron + MCPA gave a significantly higher yield than treatments using the low rates of chemical.

Overall, the controlled droplet treatments gave a significantly higher yield, however there was some indication that treatments using oils as an additive did cause some phytotoxic damage to the crop.

TRIAL TITLE:	Comparison of conventional boomspray and C.D.A. equipment for weed control in cereals.	
EXPERIMENT NO:	84C40-41	
OFFICERS:	Peirce, Rayner, District Office staff	
LOCATION:	West Northampton - G. Teakle	
CROP:	Wheat	
GROWTH STAGE WHEN SPRAYED:	4-5 leaf	
SOIL MOISTURE STATUS		
Surface:	Damp	
Depth:	Damp	
Temp. Dry bulb (°C):	21	
Wet bulb (°C):	20	
RELATIVE HUMIDITY (%):	92	
WIND SPEED (km/hr)	0-2	
WIND DIRECTION:	NW	
RAINFALL:	Light rain in previous 24 hours	
DATE SPRAYED:	25th July, 1984	
TIME SPRAYED:	1.00 p.m. - 3.30 p.m.	
EQUIPMENT:	Dual cab Toyota Landcruiser	
NOZZLE TYPE:	C.D.A. blue tip	BOOMSPRAY 8001 LP
SPRAYING PRESSURE (KPA):	75	140
SPRAYING SPEED (km/hr):	7	15
VOLUME OF APPLICATION (l/ha):	30	30
OILS: (a) Ulvapron		
(b) Lovis		
CHEMICAL:	Combine 110	

Tr	Combine	L/ha	Oil	Oil %	(Ryegrass) Plant counts /m^2	(Radish) Plant counts /m^2	Harvest kg/ha	Net returns $/ha -chemical costs
1.	C.D.A.	1	a	1	30	27	1 520	195.35
2.	"	1	a	2	30	27	1 440	184.55
3.	"	1	b	1	44	26	1 627	209.79
4.	"	1	b	2	46	29	1 653	213.30
5.	"	1	nil	-	51	25	1 546	198.86
6.	C.D.A.	2	a	1	26	23	1 840	228.70
7.	"	2	a	2	16	19	2 053	257.45
8.	"	2	b	1	13	16	2 000	250.30
9.	"	2	b	2	19	13	2 027	253.94
10.	"	2	nil	-	18	15	2 053	257.45
11.	Boomspray	1	a	1	24	24	2 000	260.15
12.	"	1	a	2	21	20	1 920	249.35
13.	"	1	b	1	33	21	2 027	263.79
14.	"	1	b	2	32	23	1 893	245.70
15.	"	1	nil	-	30	25	1 546	198.86
16.	Boomspray	2	a	1	24	15	2 213	279.05
17.	"	2	a	2	24	13	2 320	293.50
18.	"	2	b	1	32	8	2 160	271.90
19.	"	2	b	2	33	11	2 213	271.05
20.	"	2	nil	-	34	11	1 973	246.65
21.	Control				69	41	779	104.42

Coefficient of variation 6.6%
(Yield)

Price of wheat $135.00/tonne

Plant counts

A log (x + 1) transformation conducted before results analysed

Radish - The 2L/ha rate was significantly better than the 1 L/ha rate.

The boomspray using the low pressure hydraulic nozzles gave better control than the C.D.A.

Ryegrass - The 2 L/ha rate gave better weed control than the 1 L/ha rate.

The addition of the crop oil Ulvapron improved the control of ryegrass.

The C.D.A. was more effective than the boomspray in controlling ryegrass as the rate of herbicide increased from 1 L to 2 L/ha. In this particular trial there was a negative response to increasing the rate of herbicide applied through the hydraulic nozzle.

Cereal Yield

The superior weed control at the 2 L/ha rate was reflected in a significant yield increase.

The addition of a crop oil increased the cereal yield. This response was greatest when the low pressure hydraulic nozzles were used. There was little or no response by the addition of oil to the C.D.A. treatments.

Overall the boomspray treatments were significantly better than the controlled droplet applicators.

TRIAL TITLE:	Effectiveness of Roundup C.T. with and without crop oils applied through Controlled Droplet Applicators (C.D.A.).
OFFICERS:	Peirce, Rayner, District Office staff
LOCATION:	Wongan Hills Research Station
CROP:	Pasture, predominately capeweed
GROWTH STAGE WHEN SPRAYED:	
SOIL MOISTURE STATUS	
Surface:	Damp
Depth:	Wet
Temp. Dry bulb (^{o}C):	15.5
Wet bulb (^{o}C):	14.5
RELATIVE HUMIDITY (%):	90
WIND SPEED (km/hr)	0
WIND DIRECTION:	
RAINFALL:	2mm in previous 24 hours
DATE SPRAYED:	22nd May, 1984
TIME SPRAYED:	4.50 p.m. - 6.10 p.m.
EQUIPMENT:	Dual cab Toyota Landcruiser
NOZZLE TYPE:	Blue tip
SPRAYING PRESSURE (KPA):	65
SPRAYING SPEED (km/hr):	15
VOLUME OF APPLICATION (l/ha):	11.5
OILS: (a) Ulvapron (b) Terec X5	
CHEMICAL:	Roundup C.T.

Roundup C.T. with and without crop oils through C.D.A. equipment.

Tr	Chemical	Rate mL/ha	Oil	Rate mL/ha	Capeweed % Control
1.	Roundup C.T.	400	a	30	62
2.	"	400	a	60	62
3.	"	400	a	300	63
4.	"	400	b	15	70
5.	"	400	b	30	77
6.	"	400	b	60	62
7.	"	400	nil		70
8.	Roundup C.T.	600	a	30	68
9.	"	600	a	60	82
10.	"	600	a	300	73
11.	"	600	b	15	87
12.	"	600	b	30	81
13.	"	600	b	60	
14.	"	600	nil		87
15.	Control				9

Oils a - Ulvapron
b - Terec X5

The results suggest that there may be a slight benefit by not using any oil.

Oil b did not decrease activity of Roundup C.T. as much as oil a.

The 600 mL rate of Roundup C.T. gave better control than the 400 mL rate.

TRIAL TITLE:	Effectiveness of Roundup C.T. with and without crop oils applied through a conventional boomspray.
OFFICERS:	Peirce, Rayner, District Office staff
LOCATION:	Wongan Hills Research Station
CROP:	Pasture, predominately capeweed
GROWTH STAGE WHEN SPRAYED:	
SOIL MOISTURE STATUS	
Surface:	Damp
Depth:	
Temp. Dry bulb (°C):	17
Wet bulb (°C):	15
RELATIVE HUMIDITY (%):	82
WIND SPEED (km/hr)	0
WIND DIRECTION:	
RAINFALL:	2mm in previous 24 hours
DATE SPRAYED:	22nd May, 1984
TIME SPRAYED:	2.30 p.m. - 3.50 p.m.
EQUIPMENT:	Dual cab Toyota Landcruiser
NOZZLE TYPE:	11001
SPRAYING PRESSURE (KPA):	200
SPRAYING SPEED (km/hr):	9
VOLUME OF APPLICATION (l/ha):	40
OILS: (a) Ulvapron	
(b) Terec X5	
CHEMICAL:	Roundup C.T.

Application of Roundup C.T. with and without crop oils applied through a conventional boomspray.

Tr	Chemical	Rate mL/ha	Oil	Rate mL/ha	Capeweed % Control
1.	Roundup C.T.	400	a	1	82
2.	"	400	b	0.2	80
3.	"	400	nil		82
4.	Roundup C.T.	600	a	1	93
5.	"	600	b	0.2	85
6.	"	600	nil		90
7.	Roundup C.T.	800	a	1	95
8.	"	800	b	0.2	95
9.	"	800	nil		95
10.	Roundup C.T.	1000	a	1	90
11.	"	1000	b	0.2	97
12.	"	1000	nil		94
13.	Control				2

Weed control improved as the rate of chemical increased from 400 to 800 mL. Increasing the rate from 800 to 1000 did not improve the weed control.

No improvement with oil additions.
No consistant difference between oil a & b.

The treatments were chosen to compare the C.D.A. (Controlled Droplet Applicators) with a conventional hydraulic nozzle at comparable volumes of output.

Previous years experience has shown that the best results using a C.D.A. was obtained by setting the droplet spectrum on the 250 µm range. This in theory should give a droplet pattern producing all the droplets in between the sizes 150-350 µm. This means that some 50% of the volume contains droplets 150-250 µm and the remaining 50% the volume contains droplets of 250-350 µm size.

For the series of experiments this season it was decided to select a conventional nozzle which would produce the worst pattern of droplets, which, according to the 'experts', would give the poorest results. That is, the pattern would contain very few small droplets and the spray produced would be primarily formed of larger droplets. In this case 50% of the volume would be made up from droplets greater than 350 µm diameters. This particular series of nozzles is designed to operate at low pressures and still maintain the correct 80° fan angle. The ability to operate at low pressures reduced the amount of drift prone droplets.

The plant count data taken was analysed using a log (x + 1) transformation. The harvest data was also analysed and the coefficient of variation presented for each experiment.

The returns for each treatment has been calculated by deducting the cost of the herbicide.

Summary of results

A farmnote 22/85 has been prepared which summarised virtually all the major findings from the volume of application, rate of application, droplet size and type of application equipment tests that have been conducted.

From the 1984 work it would still appear that there is no major benefits to be obtained by using the controlled droplet applicator devices over the conventional hydraulic nozzles which are used by most farmers.

The addition of oils did on some instances give a marginal improvement in weed control which was reflected in small yield increases. This was most noticable when Hoegrass was applied for ryegrass control. However, on most cases the addition of a crop oil for in-crop weed control gave eratic results.

Of some concern was the apparent crop phytoxicity when crop oils were added to the diuron + M.C.P.A. treatments applied by C.D.A. It could be suggested that this type of crop damage will be obtained with any of the powdered or flowable herbicides and even greater damage obtained with oil additions to diuron + 2,4-D mixtures.