



Know-how for Horticulture™

**Weed management
in capsicums and
chillis**

Phillip Frost
Serve-Ag Pty Ltd

oject Number: VG00034

VG00034

This report is published by Horticulture Australia Ltd to pass on information concerning horticultural research and development undertaken for the vegetable industry.

The research contained in this report was funded by Horticulture Australia Ltd with the financial support of the vegetable industry, Serve-Ag Pty Ltd (on behalf of Industry contributors).

All expressions of opinion are not to be regarded as expressing the opinion of Horticulture Australia Ltd or any authority of the Australian Government.

The Company and the Australian Government accept no responsibility for any of the opinions or the accuracy of the information contained in this report and readers should rely upon their own enquiries in making decisions concerning their own interests.

ISBN 0 7341 0848 6

Published and distributed by:
Horticultural Australia Ltd
Level 1
50 Carrington Street
Sydney NSW 2000
Telephone: (02) 8295 2300
Fax: (02) 8295 2399
E-Mail: horticulture@horticulture.com.au

© Copyright 2004



Know-how for Horticulture™



FINAL REPORT

Weed Management in Capsicums and Chillies

Client: Horticulture Australia Ltd

Author: Phillip Frost B.Agr.Sc.(Hons.)
and Tim Hingston

Project Number: VG00034

Report Date: 30 November 2003

Serve-Ag Research Head Office
16 Hillcrest Road (PO Box 690)
Devonport Tas 7310 Australia
Telephone: +61 3 6423 2044
Facsimile: +61 3 6423 4876
Email: sar@serve-ag.com.au
Web: www.serve-ag.com.au

Horticulture Australia Ltd Project VG00034

30 November 2003

Principal Investigator - Mr Phillip Frost
Serve-Ag Research
16 Hillcrest Road
Devonport Tasmania 7310
Ph:(03) 6423 2044
Fax: (03) 6423 4876
Email: pfrost@serve-ag.com.au

This report was funded by Horticulture Australia Ltd to develop management strategies for weed control in capsicums and chillies.

Any recommendations contained in this publication do not necessarily represent current Horticulture Australia policy. No person should act on the basis of the contents of this publication, whether as to matters of fact or opinion or other content, without first obtaining specific, independent professional advice in respect of the matters set out in this publication.

Funding Sources:

- Horticulture Australia Ltd

Table of Contents

MEDIA SUMMARY	1
TECHNICAL SUMMARY	2
RECOMMENDATIONS.....	3
INTRODUCTION.....	3
BACKGROUND	3
AIMS.....	3
MATERIALS AND METHODS	4
TRIAL SITE DETAILS.....	4
WEED LIST	6
PRODUCT LIST.....	7
APPLICATION EQUIPMENT	7
ASSESSMENTS	8
RESULTS	9
TABLE 1 - CROP TOLERANCE, PRE-TRANSPLANT APPLIED HERBICIDES (NO PLASTIC)	9
TABLE 2 - CROP TOLERANCE, POST-TRANSPLANT APPLIED HERBICIDES	10
TABLE 3 - CROP TOLERANCE AND WEED EFFICACY, UNDER PLASTIC MULCH	11
TABLE 4 - WEED EFFICACY, % CONTROL (NO PLASTIC)	12
TABLE 5 - WEED EFFICACY, EWRS RATINGS (NO PLASTIC).....	13
TABLE 6 - MEAN YIELD AT HARVEST, FORTHSIDE (2002/03, SITE 9)	14
TABLE 7 - MEAN YIELD AT HARVEST, VARIETY TRIAL - BOWEN (2002/03, SITE 6).....	15
TABLE 8 - RESIDUE ANALYSIS RESULTS (CAPSICUM FRUIT), SITES 3 & 7 2002/03	15
DISCUSSION	16
TECHNOLOGY TRANSFER.....	18
TABLE 9 - TECHNOLOGY TRANSFER ACTIVITIES.....	19
APPENDICES.....	20
APPENDIX I - HERBICIDE GROUPS.....	20
APPENDIX II - RATING SCALES	21
APPENDIX III - CROP TOLERANCE DATA.....	22
APPENDIX IV - WEED CONTROL DATA - % CONTROL COMPARED TO UNTREATED CONTROL	26
APPENDIX V - WEED CONTROL DATA - EWRS RATINGS	28
APPENDIX VI - CROP TOLERANCE AND WEED EFFICACY DATA, PLASTIC MULCH TRIALS	29
APPENDIX VII - YIELD DATA	30
APPENDIX VIII - ACKNOWLEDGMENTS.....	33
PHOTOGRAPHS	34

Media Summary

Capsicums and chillies are grown commercially throughout Australia from transplants, although most of the production is in Queensland. Effective weed management strategies are limited for capsicum and chilli producers. Current weed management practices include the use of plastic, selective grass herbicides or tillage. There are currently no herbicides registered for broadleaf weed control in capsicums or chillies. The development of effective broadleaf weed herbicides, to be used as part of an integrated weed management program in capsicum and chilli production in Australia, is essential.

This project identified, screened and collected efficacy, crop safety and residue data for a range of new herbicides for capsicum and chilli production. A total of 13 trials were conducted over three growing seasons throughout major Australian production regions. Trials were conducted in North West Tasmania, Perth (Western Australia), Atherton (North Queensland) and Bowen (North Queensland). The most effective herbicides identified from this work were Stomp (pendimethalin), Command (clomazone) and Raft (oxadiargyl), which all gave excellent results when applied pre-crop transplanting to weed-free soil. All three products provided effective pre-emergent control of a range of common broadleaf and grass weeds across a number of sites.

Authority (sulfentrazone), Pledge (flumioxazine), Affinity (carfentrazone), Goal WP (oxyfluorfen), Lexone (metribuzin), Balance (isoxaflutole), Basagran (bentazone) and Raptor (imazamox) were also screened, but they were not further evaluated due to crop safety issues.

Raft and Command are recommended for registration in capsicum and chillies. These products can potentially be used under plastic mulch, in the inter-row, or applied to bare soil if the crop is grown without plastic mulch. Further work is recommended with Stomp under plastic before recommendations are made on this product.

Technical Summary

Capsicums and chillies are grown commercially throughout Australia from transplants, although over 70% of Australia's capsicum and chilli production is in Queensland. The major production regions are in Bowen–Burdekin and Bundaberg. Effective weed management strategies are limited for capsicum and chilli producers. Current weed management practices include the use of plastic, selective grass herbicides or tillage. There are currently no herbicides registered for broadleaf weed control in capsicums or chillies. The development of effective broadleaf weed herbicides, to be used as part of an integrated weed management program in capsicum and chilli production in Australia, is essential.

This project identified, screened and collected efficacy, crop safety and residue data for a range of new herbicides for capsicum and chilli production. A total of 13 trials were conducted over three seasons throughout major Australian production regions. Trials were conducted in North West Tasmania, Perth (Western Australia), Atherton (North Queensland) and Bowen (North Queensland). The most effective herbicides identified from this work were Stomp (pendimethalin), Command (clomazone) and Raft (oxadiargyl), which all gave excellent results when applied pre-crop transplanting to weed-free soil. All three products provided effective pre-emergent control of a range of common broadleaf and grass weeds across a number of sites.

A variety trial was conducted to evaluate crop tolerance to Stomp, Command and Raft applied pre-transplant and Basagran (bentazone) applied post-transplant. Command, Stomp and Raft, applied at double the proposed use rates on soils with very low levels of organic carbon and clay, did not cause any crop phytotoxicity. Yield and quality of capsicum and chillies was not affected by these herbicides. Basagran showed crop damage and a yield reduction of approximately 50% in marketable fruit in both capsicum and chillies. The yield reduction was mainly due to Basagran reducing the foliage on the plant, which led to sunburn on fruit, making it unmarketable. A further trial conducted with these herbicides applied under plastic showed Command and Raft to be safe, while there was some phytotoxicity with some of the Stomp treatments.

Authority (sulfentrazone), Pledge (flumioxazine), Affinity (carfentrazone), Goal WP (oxyfluorfen), Lexone (metribuzin), Balance (isoxaflutole) and Raptor (imazamox) were also screened, but they were not further evaluated due to crop safety issues.

Analysis of Command and Stomp residues in capsicum fruit showed these herbicides were not detected at a limit of quantification of 0.01 mg/kg at two sites. Residue samples were also collected for Raft, however these are yet to be analysed.

Raft and Command are recommended for registration in capsicum and chillies. These products can potentially be used under plastic mulch, in the inter-row, or applied to bare soil if the crop is grown without plastic mulch. Further work is recommended with Stomp under plastic before a recommendation can be made on this product.

Recommendations

- Command (480 EC) is recommended for registration in capsicum and chilli crops, to be applied pre-transplanting at rates of 500 mL to 1 L/ha.
- Raft (400 SC) is recommended for registration in capsicums and chillies at rates of between 500 mL and 1 L/ha, applied pre-transplant.
- Further crop safety work is required with Stomp applied under plastic before it can be recommended for further development.

Introduction

Background

Capsicums and chillies are a high value, intensively produced crop with significant and growing export markets. The value of capsicum production at the farm gate was \$47.1 m in 1998/99, an increase of \$8.7 m from the previous year. Production tonnage has increased from 20,207 tonne in 1992 to 30,398 tonne in 1998, produced over an area of approximately 2300 hectares.

Grown commercially from transplants, capsicums and chillies are grown throughout Australia, although over 70% of Australia's capsicum and chilli production is in Queensland. The major production regions are in Bowen–Burdekin and Bundaberg.

Effective weed management strategies are limited for capsicum and chilli producers. Current weed management practices include the use of plastic, selective grass herbicides or tillage. Plastic mulch is commonly used, not only for weed suppression but also for maintaining soil temperature and moisture retention. Tillage is also sometimes used for weed control, however an over reliance on tillage can lead to soil structural issues, loss of soil moisture and damage to the crop.

The only herbicides registered for use in capsicums are for post-emergent grass control. Dacthal (chlorthal dimethyl) was previously registered, however it was taken off the market and never re-registered for use in capsicums. There are currently no herbicides registered for broadleaf weed control in capsicums or chillies.

The development of effective broadleaf weed herbicides, to be used as part of an integrated weed management program in capsicum and chilli production in Australia, is essential.

Aims

- To identify a range of new herbicides for capsicum and chilli production.
- To evaluate new herbicides for crop safety and weed efficacy.
- To evaluate new herbicides in major capsicum and chilli production regions throughout Australia.
- To collect efficacy, crop safety and residue data to support registration / permit applications for new herbicides.

Materials and Methods

Trial Site Details

Annual Report	2001/2002			
Site No.	1	2	3	4
Grower	Alan and Jenny Napier	Forthside Vegetable Research Station	Vince Mete	QDPI Research Station
Location	Chilli Lane, Bowen, Queensland	Forthside, Tasmania	Emerald Creek, North Queensland	Warwick Road, Delta, Queensland
Soil Type	Sandy loam	Ferrosol	Sandy loam	Brown clay loam
Crop	Capsicum	Capsicum	Capsicum	Capsicum
Variety	Merlin	Belltower	Merlin	Toledo
Trial Design	RCB	RCB	RCB	RCB
Replicates	2	4	3	3
Plot Size	1 row x 25 m	1.6 m x 8 m	2 rows x 9 m	1 row x 5 m
Plant Spacing	30 cm	30 cm	30 cm	30 cm
Row Spacing	Double row planting	2 rows per bed	2 rows per bed	Double row planting
Planting Date	01/09/00	14/12/00	21/06/01	04/07/01
Harvest Date	-	-	-	-
Residue Samples Collected	09/11/00	02/03/01	-	-
% Organic Carbon	0.5	3.1	-	-
Cation Exchange Capacity (meq / 100 g)	-	-	-	-

RCB = randomised complete block

Materials and Methods (Cont.)***Trial Site Details (Cont.)***

Annual Report	2002/2003								
Site No.	1	2	3	4	5	6	7	8	9
Grower	B Piasini	P Stackleroth	FVRS	T & H Holl	V Mete	P Chauntler	P Chauntler	P Chauntler	FVRS
Location	Carabooda, Western Australia	Delta, Queensland	Forthside, Tasmania	Wanneroo, Western Australia	Emerald Creek, North Queensland	Bowen (Variety trial), Queensland	Bowen (Under plastic), Queensland	Bowen (Inter-row), Queensland	Forthside, Tasmania
Soil Type	Grey sand	Sandy alluvial	Ferrosol	Grey sand	Sandy loam	Sandy alluvial	Sandy alluvial	Sandy alluvial	Ferrosol
Crop	Capsicum	Capsicum	Capsicum	Capsicum	Capsicum	Capsicum Chilli	Capsicum	Capsicum	Capsicum
Variety	Gedeon	Toledo	Belltower	Gedeon	Toledo	Various	Warlock	Warlock	Belltower
Trial Design	RCB	RCB	RCB	RCB	RCB	RCB	RCB	RCB	RCB
Replicates	3	3	4	4	4	2	3	3	4
Plot Size	6 m x 1 m	5 m x 1 row	9 m x 1.65 m	6 m x 1 m	6 m x 2 rows	5 m x 1 row	1 bed x 6 m	2 Inter-rows x 6 m	1 bed x 9 m
Plant Spacing	30 cm	15 cm	40 cm	30 cm	30 cm	20 cm	20 cm	20 cm	45 cm
Row Spacing	Single row	Single row	60 cm	Single row	80 cm	Double row *	Double row *	Double row *	60 cm
Planting Date	3/12/01	28/06/02	4/12/02	31/12/02	25/06/02	31/07/03	25/04/03	25/04/03	12/12/01
Harvest Date	-	-	25/03/03	-	-	8/10 & 15/10/03 ** 30/09 & 7/10/03 ***	-	-	11/04/02
Residue Samples Collected	-	-	25/03/03	-	-	-	31/07/03	-	-
% Organic Carbon	1.20	3.38	-	-	0.99	0.62	0.41	-	-
CEC (meq / 100 g)	0.94	21.1	-	-	7.41	5.88	3.70	-	-

* (1.5 m between bed centres)

** capsicum

*** chilli

RCB = randomised complete block

FVRS = Forthside Vegetable Research Station

CEC = Cation Exchange Capacity

Materials and Methods (Cont.)

Weed List

BAYER CODE *	WEED
ACNHI	<i>Acanthospermum hispidum</i> (starburr)
AMACH	<i>Amaranthus hybridus</i> (green amaranth)
AMASS	<i>Amaranthus</i> spec. (pigweed)
BIDPI	<i>Bidens pilosa</i> (cobblers pegs)
BRSRA	<i>Brassica rapa</i> (wild turnip)
CAPBU	<i>Capsella bursa-pastoris</i> (shepherd's purse)
CCHEC	<i>Cenchrus echinatus</i> (Mossman River grass)
CHEAL	<i>Chenopodium album</i> (fat hen)
CYPRO	<i>Cyperus rotundus</i> (nutgrass)
DIGAD	<i>Digitaria ciliaris</i> (summer grass)
DIGSA	<i>Digitaria sanguinalis</i> (crabgrass)
ELEIN	<i>Eleusine indica</i> (crowsfoot grass)
ECHSS	<i>Echinochloa</i> spec. (barnyard grass)
ERAME	<i>Eragrostis cilianensis</i> (stink grass)
ERAMX	<i>Eragrostis mexicana</i> (Mexican lovegrass)
GASPA	<i>Galinsoga parviflora</i> (potato weed)
LOLSS	<i>Lolium</i> spec. (ryegrass)
NICPH	<i>Nicandra physaloides</i> (apple of Peru)
POROL	<i>Portulaca oleracea</i> (pigweed)
RAPRA	<i>Raphanus raphanistrum</i> (wild radish)
SOLNI	<i>Solanum nigrum</i> (black nightshade)
SOLSS	<i>Solanum</i> spec. (nightshade)
SONOL	<i>Sonchus oleraceus</i> (sow thistle)
TRBTE	<i>Tribulus terrestris</i> (caltrop)
TRTPO	<i>Trianthema portulacastrum</i> (black or giant pigweed)
UROPA	<i>Urochloa panicoides</i> (liverseed grass)
VERPE	<i>Veronica persica</i> (speedwell)

* Codes as outlined in "Important Crops of the World and their Weeds" (2nd edn. 1992), published by Business Group Crop Protection, Bayer Ag, Germany.

Materials and Methods (Cont.)

Product List

PRODUCT NAME	ACTIVE INGREDIENT (ai) **	CONCENTRATION OF ACTIVE	FORMULATION	CHEMICAL GROUP *
Affinity	carfentrazone	240 g/kg	Water Dispersible Granule	G
Authority	sulfentrazone	750 g/kg	Water Dispersible Granule	G
Balance	isoxaflutole	750 g/kg	Water Dispersible Granule	F
Basagran	bentazone	480 g/L	Aqueous Concentrate	C
Citowett	alkylaryl polyglycol ether	100%	Liquid	-
Command	clomazone	480 g/L	Emulsifiable Concentrate	F
Command ME	clomazone	335 g/L	Micro Encapsulated	F
Dual Gold	s-metolachlor	960 g/L	Emulsifiable Concentrate	K
Frontier	dimethenamid	900 g/L	Emulsifiable Concentrate	K
Frontier-P	dimethenamid-p	720 g/L	Emulsifiable Concentrate	K
Goal WP	oxyfluorfen	400 g/kg	Wettable Powder	G
Lexone	metribuzin	750 g/kg	Water Dispersible Granule	C
Pledge	flumioxazine	500 g/kg	Wettable Powder	G
Raft	oxadiargyl	400 g/L	Suspension Concentrate	G
Raptor	imazamox	750 g/kg	Water Dispersible Granule	B
Stomp	pendimethalin	330 g/L	Emulsifiable Concentrate	D

* The chemical group, used for resistance management, was developed by Avcare (Appendix i).

** Common name

Application Equipment

Equipment	Small plot pressurised sprayers
Nozzles	Flat fan jets
Volume	100 - 370 L/ha
Pressure	200 - 420 kPa

Materials and Methods (Cont.)

Assessments

1. CROP TOLERANCE ASSESSMENTS (EWRS Rating)

- TIMING - 5 - 58 days after application
- SAMPLE SIZE - Whole Plot
- METHOD - Visual assessment
- RATING SCALE - Appendix ii
- SUMMARISED RESULTS - Tables 1 - 3
- COMPLETE DATA - Appendix iii & vi
- PHOTOGRAPHS - Photographs 1-8

2. WEED ASSESSMENTS (% Control Compared to Untreated Control)

- TIMING - 5 - 58 days after application
- SAMPLE SIZE - Various sized quadrats
- METHOD - Number of weeds counted, converted to number of weeds per m² and expressed as percentage control compared to the untreated control.
- SUMMARISED RESULTS - Tables 3 & 4
- COMPLETE DATA - Appendix iv & vi
- PHOTOGRAPHS - Photographs 1-8

3. WEED ASSESSMENTS (EWRS Rating)

- TIMING - 5 - 58 days after application
- SAMPLE SIZE - Whole Plot
- METHOD - Visual assessment
- RATING SCALE - Appendix ii
- SUMMARISED RESULTS - Table 5
- COMPLETE DATA - Appendix v
- PHOTOGRAPHS - Photographs 1-8

4. YIELD ASSESSMENTS

- TIMING - Harvest
- SAMPLE SIZE - 10 plants per plot (2002/03, Site 9)
Whole plot (2002/03, Site 6)
- METHOD - Hand picked and graded into marketable and unmarketable fruit
- SUMMARISED RESULTS - Tables 6 & 7
- COMPLETE DATA - Appendix vii

Results**Table 1 - Crop tolerance, pre-transplant applied herbicides (no plastic)**

Treatment (weed stage)	Crop Tolerance (EWRS)	No. of trials
Pre-weed emergence		
Authority 400 g	7.7	2
Authority 500 g	1.8	1
Balance 120 g	9.0	1
Command 250 mL	1.0	2
Command 500 mL	1.0	5
Command 1 L	1.1	15
Command 2 L	1.0	8
Command 500 mL + Raft 1 L	1.0	1
Command 1 L + Raft 1 L	1.0	1
Command 250 mL + Stomp 1.5 L	1.0	2
Command 500 mL + Stomp 2 L	1.3	3
Command 500 mL + Stomp 3 L	1.3	5
Command 1 L + Stomp 3 L	1.0	1
Dual Gold 2 L	3.5	2
Frontier 2 L	5.5	2
Frontier 3 L	6.0	1
Pledge 150 g	6.5	3
Raft 500 mL	4.0	1
Raft 1 L	1.4	17
Raft 2 L	1.1	9
Stomp 1.5 L	1.2	2
Stomp 2 L	1.4	2
Stomp 3 L	1.1	17
Stomp 6 L	1.4	8

Results (Cont.)**Table 2 - Crop tolerance, post-transplant applied herbicides**

Treatment (weed stage)		Crop Tolerance (EWS)	No. of trials
Pre-emergent	Post-emergent		
Dual Gold 1 L		1.0	1
Dual Gold 2 L		1.9	2
Frontier 1 L		1.0	1
Frontier 2 L		2.3	1
Frontier-P 1.4 L		1.5	1
Goal WP 1 kg		5.8	1
Raft 1 L		5.3	1
Stomp 1.5 L		1.0	1
Stomp 3 L		1.0	1
	Affinity 60 g	9.0	1
	Basagran 1 L	1.0	1
	Basagran 2 L	5.1	10
	Basagran 1 L + Citowet 125 mL/100 L	4.5	3
	Basagran 2 L + Citowet 125 mL/100 L	4.2	4
	Lexone 686 g	7.5	1
	Raptor 45 g	3.8	1

Results (Cont.)**Table 3 - Crop tolerance and weed efficacy, under plastic mulch**

Treatment (weed stage)	Crop Tolerance		Mean % Control Compared to Untreated Control (No. of trials)				
	(EWRS rating)	No. of trials	AMACH	AMASS	DIGAD	SOLSS	TRBTE
Pre-emergent							
Command 500 mL	1.2	2	83(1)	92(1)	100(1)	63(1)	100(1)
Command 1 L	1.3	2	92(1)	100(1)	100(1)	88(1)	100(1)
Command 1.43 L (ME formulation)	1.0	1	100(1)	100(1)		100(1)	
Command 500 mL + Raft 1 L	2.3	1			100(1)		100(1)
Command 500 mL + Stomp 3 L	1.0	1			100(1)		100(1)
Raft 1 L	2.0	1			100(1)		100(1)
Stomp 2 L	1.7	1			100(1)		100(1)
Stomp 3 L	5.3	1			100(1)		92(1)

Results (Cont.)

Table 4 - Weed efficacy, % control (no plastic)

TREATMENT	WEED STAGE	Mean % Control Compared to Untreated Control (No. of trials)																		
		ACNHI	AMACH	BRBRA	DIGAD	DIGSA	CAPBU	CCHEC	CHEAL	CYPRO	ECHSS	ELEIN	ERAMX	GASPA	NICPH	POROL	SOLNI	SONOL	TRBTE	TRTPO
Pre-Crop Transplant																				
Command 250 mL	Pre					63(1)							47(1)		0(1)		0(1)			
Command 500 mL	Pre			0(1)	100(1)	73(1)	97(1)	93(1)	69(2)			91(2)	58(1)	79(1)	56(1)	12(2)	78(1)			83(1)
Command 1 L	Pre	87(1)	50(3)	100(1)	100(3)		99(1)	100(1)	94(2)	0(1)	100(1)	100(3)	100(1)		85(1)	100(2)	51(5)		34(3)	100(2)
Co 250 mL + St 1.5 L	Pre					96(1)							80(1)		100(1)		0(1)			
Co 500 mL + St 2 L	Pre			67(1)	100(1)		98(1)	100(1)	91(2)			93(2)		100(1)		56(2)				100(1)
Co 500 mL + St 3 L	Pre			92(1)	100(1)	100(1)	93(1)	42(1)	98(2)			100(2)	92(1)	100(1)	100(1)	54(2)	100(1)			100(1)
Co 1 L + St 3 L	Pre	50(1)	100(1)		100(1)							100(1)			100(1)	95(1)			72(1)	
Co 1 L + Raft 1 L	Pre	75(1)	100(1)		100(1)							100(1)			100(1)	95(1)			85(1)	
Command 2 L	Pre		65(1)		100(1)					0(1)	100(1)				100(1)	78(1)			63(1)	
Raft 500 mL	Pre					99(1)							95(1)		100(1)		100(1)			
Raft 1 L	Pre	87(1)	90(3)	92(1)	91(3)	100(1)	98(1)		99(2)	20(1)	83(1)	84(3)	78(1)	98(1)	100(1)	100(3)	95(5)	100(1)	74(3)	92(2)
Raft 2 L	Pre		100(1)		100(1)					60(1)	78(1)				100(1)	100(1)			81(1)	
Stomp 1.5 L	Pre					99(1)							0(1)		100(1)		44(1)			
Stomp 2 L	Pre			67(1)	99(1)		88(1)	0(1)	88(2)			93(2)		88(1)		52(2)				100(1)
Stomp 3 L	Pre	69(1)	95(3)	96(1)	99(3)	97(1)	88(1)	0(1)	95(2)	50(1)	100(1)	95(3)	100(1)	95(1)	100(1)	100(3)	70(5)	44(1)	66(3)	100(2)
Stomp 6 L	Pre		100(1)		100(1)					50(1)	100(1)				100(1)	100(1)			69(1)	
Post-Crop Transplant																				
Raft 1 L	Pre		81(1)									89(1)				100(1)			100(1)	86(1)
Basagran 1 L	Post					9(1)							53(1)		63(1)		89(1)			
Basagran 2 L	Post		100(1)		19(1)	27(1)				40(1)	22(1)		57(1)		100(2)	100(1)	100(1)		100(1)	
Basagran 1 L *	Post		29(1)		36(1)			0(1)	100(1)			0(2)	11(1)		99(1)		94(2)		83(1)	7(2)
Basagran 2 L *	Post				78(1)			7(1)	100(1)			0(2)			100(1)		100(1)			50(1)

*+ Citowet 125 mL/100 L Co = Command St = Stomp Ra = Raft

Results (Cont.)**Table 5 - Weed efficacy, EWRS ratings (no plastic)**

TREATMENT	WEED STAGE	Mean % Control Compared to Untreated Control (No. of trials)									
Pre-Crop Transplant		BIDPI	CCHEC	CHEAL	ELEIN	GASPA	LOLSS	NICPH	SOLNI	UROPA	VERPE
Command 250 mL	Pre					6.0 (1)			9.0 (1)		
Command 500 mL	Pre					6.7 (1)			8.0 (2)		
Command 1 L	Pre	1.0 (1)	1.3 (1)	2.9 (2)	1.3 (1)		5.5 (1)	2.3 (1)	4.0 (2)	1.3 (1)	1.3 (1)
Co 250 mL + St 1.5 L	Pre					6.7 (1)			6.0 (1)		
Co 500 mL + St 2 L	Pre								7.0 (1)		
Co 500 mL + St 3 L	Pre					5.7 (1)			5.5 (2)		
Co 500 mL + Ra 1 L	Pre								2.5 (1)		
Raft 1 L	Pre	3.3 (1)	2.0 (1)	1.0 (2)	1.3 (1)	7.0 (1)	4.8 (1)	1.0 (1)	3.5 (3)	1.3 (1)	2.5 (1)
Raft 2 L	Pre								1.3 (1)		
Stomp 1.5 L	Pre					9.0 (1)			7.0 (1)		
Stomp 3 L	Pre	6.0 (1)	2.0 (1)	2.1 (2)	1.6 (1)	8.7 (1)	7.8 (1)	1.6 (1)	4.7 (3)	1.6 (1)	1.3 (1)
Post-Crop Transplant											
Stomp 1.5 L	Pre					9.0 (1)			7.7 (1)		
Basagran 2 L	Post								2.3 (1)		
Basagran 1 L *	Post	1.6 (1)	7.0 (1)	2.0 (1)	6.3 (1)			1.6 (1)		6.0 (1)	
Basagran 2 L *	Post			1.0 (1)		4.3 (1)	9.0 (1)		4.5 (2)		8.3 (1)

*+ Citowet 125 mL/100 L Co = Command St = Stomp Ra = Raft

Results (Cont.)**Table 6 - Mean yield at harvest, Forthside (2002/03, Site 9)**

Treatment (Crop and weed stage at application)			Number Marketable Fruit per 10 plants	Weight Fruit / 10 Plants (kg)
Pre Transplant Pre-weed emergence	Post-transplant Pre-weed emergence	Post-transplant Post-weed emergence		
Command 500 mL			31.8 d	5.0 c
Command 1 L			48.0 abc	6.5 abc
Raft 1 L			57.3 a	8.5 a
Stomp 2 L			46.3 abcd	6.3 bc
Stomp 3 L			52.5 ab	7.7 ab
Command 500 mL + Stomp 2 L			50.5 abc	6.8 abc
Command 500 mL + Stomp 3 L			45.0 abcd	6.9 abc
	Stomp 3 L		0.0 e	0.0 d
	Frontier-P 1.4 L		47.5 abc	7.7 ab
	Dual Gold 2 L		44.0 abcd	6.7 abc
		Basagran 2 L + Citowett 125 mL/100 L	38.3 bcd	5.4 c
Untreated Control			37.3 cd	5.0 c
p-value			0.0000	0.0000

Results (Cont.)**Table 7 - Mean yield at harvest, variety trial - Bowen (2002/03, Site 6)**

TREATMENT TIMING (Crop and weed stage)			MEAN MARKETABLE FRUIT YIELD PER PLOT (& STANDARD ERROR)							
No.	Pre-transplant pre-weed emergence	Post-transplant post-weed emergence	Capsicum cv. Warlock			Chilli cv. Blister				
			No of fruit per plot	Fruit weight (kg) per plot		No of fruit per plot	Fruit weight (kg) per plot			
2	Command 2 L		42.0	0.0	9.9	0.5	191.0	6.0	8.8	1.6
4	Stomp 6 L		40.0	0.0	9.8	1.9	175.5	0.0	9.1	0.1
6	Raft 2 L		39.5	0.5	9.5	1.0	180.0	14.5	8.9	6.4
7		Basagran 2 L	27.5	0.5	5.0	0.5	70.0	8.0	4.4	8.8
8	Untreated Control		40.0	0.0	10.0	1.8	175.0	8.5	8.7	6.8

Table 8 - Residue analysis results (capsicum fruit), Sites 3 & 7 2002/03

Site No.	Product	Rate/ha	Result
3 - Tasmania	Command	1 L	less than 0.01 mg/kg
3 - Tasmania	Untreated Control	-	less than 0.01 mg/kg
3 - Tasmania	Stomp	3 L	less than 0.01 mg/kg
3 - Tasmania	Untreated Control	-	less than 0.01 mg/kg
7 - Bowen	Command	1 L	less than 0.01 mg/kg
7 - Bowen	Untreated Control	-	less than 0.01 mg/kg
7 - Bowen	Stomp	3 L	less than 0.01 mg/kg
7 - Bowen	Untreated Control	-	less than 0.01 mg/kg
7 - Bowen	Raft	1 L	to be analysed
7 - Bowen	Untreated Control	-	to be analysed

Note – full details of residue trials in separate residue reports

Discussion

Command

Command (480 g ai clomazone) is a Group F herbicide registered in Australia for the control of selected annual weeds in various crops including potatoes, beans, cucurbits, poppies and tobacco. This product has both pre and early post-emergence activity on a number of broadleaf and grass weeds. Command is registered, pre-transplant, in both capsicums and chillies at rates of 500 mL to 2.3 L/ha in the USA.

Australian trials conducted as part of this project showed Command to be a particularly effective herbicide for control of weeds in both capsicum and chilli crops. Weeds currently on the Command label include blackberry nightshade (*Solanum nigrum*), potato weed (*Galinsoga parviflora*), wild hops (*Nicandra physaloides*) and pigweed (*Portulaca oleracea*). Trials also showed Command to be active on summer grass (*Digitaria ciliaris*) and barnyard grass (*Echinochloa spec.*) at rates of between 500 mL and 1 L/ha (Table 4). Command applied at rates of 250 mL/ha provided some control but was not as effective as the higher rates. Tank mixing Stomp with Command improved the weed spectrum.

No crop phytotoxicity was observed in any trials with Command applied pre-transplant at rates of up to 2 L/ha. Although it is not highly volatile, Command does have some potential to volatilise off moist soil / plant surfaces under certain conditions. Volatility could potentially be an issue when Command is used under plastic, as hot humid conditions may promote movement of Command through the planting holes, potentially causing bleaching to the foliage of the capsicum plants. Trials conducted over two seasons in Bowen showed that Command caused no phytotoxicity when used under plastic (Table 3).

Residue data from two sites showed Command was not detectable in Capsicum fruit (limit of detection (LOD) 0.01 mg/kg) (Table 8).

Command is recommended for development in capsicum and chilli crops, to be applied pre-transplanting at rates of 500 mL to 1 L/ha.

Stomp

Stomp (330 g ai pendimethalin) is a Group D herbicide registered in Australia for the control of annual grasses and selected broadleaf weeds in a wide range of crops. Stomp is a soil active herbicide with minimal post-emergent weed activity.

Stomp controlled a range of weeds in trials including summer grass and pigweed. Rates of 3 L/ha and above were required for effective control of most weeds (Table 4).

Stomp applied at rates of up to 6 L/ha was safe to the crop at all sites except one, where Stomp caused some crop stunting when applied under plastic at a rate of 3 L/ha. This result is particularly strange given that in the same trial a tank mix of Command 500 mL with Stomp 3 L/ha did not cause any phytotoxicity (Table 3). Other sites where Stomp showed good crop safety were not under plastic. It is not known why Stomp caused crop damage when applied under plastic at this site, as a variety trial was conducted on the same site on the same capsicum variety at double the rate (6 L/ha) and no evidence of phytotoxicity was observed (Table 2). This may be due to an interaction with Stomp and plastic mulch, which needs further investigation if Stomp is to be developed for use in capsicums or chillies.

Raft

Raft (400 g ai oxadiargyl) is a Group G herbicide registered in Australia for control of summer grass and winter grass in couch turf grass. It is currently being evaluated in a range of other crops. Raft has pre and early post-emergent activity on a range of broadleaf weeds, as well as grasses. Trials showed Raft to effectively control most of the weed species present in the trials at rates of between 500 mL and 2 L/ha. Raft did not control nut grass (*Cyperus spec.*) (Table 4).

Raft showed a high level of crop safety in both capsicums and chillies at rates of up to 2 L/ha, with no negative effects on crop yield or quality. Raft is recommended for development in capsicums and chillies at rates of between 500 mL and 1 L/ha applied pre-transplant.

Discussion (cont.)

Basagran

Basagran (480 g ai bentazone) is a Group C herbicide registered in Australia for broadleaf weed control in crops including peanuts and navy beans. Basagran was the only post-emergent herbicide that was safe on the crop in initial screening trials. Further evaluation of Basagran showed crop damage and yield reduction at some sites in Northern Queensland, with approximately a 50% reduction in marketable fruit in both capsicum and chillies compared to the untreated control (Table 7). The yield reduction was mainly due to Basagran reducing the foliage on the plant, leading to sunburn on fruit, which made it unmarketable. Warm sunny conditions are known to increase the activity of Basagran and this may explain why this product caused crop damage in trials in Northern Queensland.

Due to crop safety issues, Basagran is not recommended for further evaluation or development in capsicum or chilli crops.

Dual Gold

Dual Gold (960 g ai S-metolachlor) is a Group K herbicide registered in Australia for pre-emergence control of selected annual grasses and some broadleaf weeds in a wide range of broadacre and horticultural crops. Dual Gold was trialed at rates up to 2 L/ha. The product caused crop damage at some sites, and was not further evaluated.

Frontier and Frontier-P

Frontier (900 g ai dimethenamid) and Frontier-P (720 g ai dimethenamid-p) are Group K herbicides. Registration for dimethenamid-p is currently being sought in Australia for control of selected grasses and broadleaf weeds in various crops including beans, peas, cucurbits and sweet corn. Frontier and Frontier-P were trialed pre-transplant. The products caused crop damage at some sites, so it was not further evaluated.

Other products screened

Authority (sulfentrazone), Pledge (flumioxazine), Affinity (carfentrazone), Goal WP (oxyfluorfen), Lexone (metribuzin), Balance (isoxaflutole) and Raptor (imazamox) were also screened, but due to crop safety issues they were not further evaluated.

Influence of soil type on crop safety

A significant portion of Australian production of capsicums and chillies is on light textured low organic matter soils, particularly in Perth, Western Australia and around Bowen in North Queensland. These soils present a worse case scenario for crop safety with soil active herbicides due to the limited ability of these soils to bind the herbicides. A number of trials were conducted on these light textured soils around Bowen and Perth to confirm crop safety of Stomp, Command and Raft. The soils had clay contents of only a few percent, organic carbon levels of less than 1% and cation exchange capacities of less than 4 meq / 100 g soil. No negative effects on plant vigor, crop yield or quality occurred at these sites with Command, Stomp or Raft, suggesting that these products are safe on light textured soils at normal use rates.

Integration of herbicides with plastic mulch

A number of capsicum and chilli growers use plastic mulch. The plastic is used for a number of agronomic reasons including soil temperature, moisture retention and weed control. The plastic mulch provides some weed suppression but control of weeds between the plastic rows and also in the hole around the plant is an issue (Photograph 8). Trials were conducted with Stomp, Command and Raft looking at control of weeds both under the plastic and also in the inter-rows. Both Command and Raft showed excellent results in terms of weed efficacy and crop safety when applied in this situation (Table 3). Stomp at 3 L/ha did cause some crop damage when applied under the plastic and it is not known why this occurred, as there was no damage in the Command 500 mL + Stomp 3 L/ha treatment (see previous discussion). It may have been an interaction with the plastic but this is uncertain.

Technology Transfer

Grower and Industry Information Sessions

Regular field days, conference presentations and industry seminars were held throughout the project (Table 9). These sessions were well attended by growers, agronomic and field staff and other researchers.

The fact that product registration of the key products from this project will not occur until after completion of the project affected the technology transfer process. Technology transfer efforts were mainly directed at the companies associated with the various products, to ensure registration. Results from the project will, however, form a key part of the training process that will occur as part of the commercial development of products.

Product Development

The evaluation and development of new herbicides was a key focus of this project. Regular meetings and discussions with product manufacturers were held throughout the project, initially to identify suitable products to trial and then to facilitate the development of these products. Registration of these products will continue to be pursued after completion of this project.

Publications

A range of written material was produced throughout the project, such as milestone reports, project updates and conference proceedings (Table 9).

Technology Transfer (Cont.)

Table 9 - Technology Transfer Activities

Date	Field Days
September 2003	Local growers viewed trials at Bowen in North Queensland.
February 2002	Representatives from BASF Australia Ltd viewed trial site.
February 2002	Representatives from BASF Australia Ltd viewed trial site.
March 2002	Field visit with Vegetable R&D Committee members, Industry Development Officers and representatives from Horticulture Australia Limited at Forth, Tasmania.
November 2001	Field day at trial site as part of the Forthside Vegetable Research Station open day.
Conference Presentations	
September 2002	Poster presented at the 13th Australian Weeds Conference held in Perth, Western Australia.
Industry Seminars	
July 1999	Presentation at the Agricultural Research and Advisory Committee presentations – Devonport, Tasmania.
July 1999	Presentation of initial findings at the Tasmanian Vegetable ARAC seminar.
August 2002	Presentation at the Agricultural Research and Advisory Committee presentations – Devonport, Tasmania.
Meetings / Discussions	
February 2002	Meeting held with BASF regarding development of Stomp.
November 2002	Meeting held with Bayer regarding development of Raft herbicide in Australia.
September 2001	Meeting held with FMC (Chemicals) regarding development of Command.

Appendices**Appendix i - Herbicide Groups**

Herbicide grouping based on mode of action (Developed by Avcare)

Group	Mode of Action	Chemical Group
A	Inhibitors of acetyl CoA carboxylase	aryloxyphenoxypropionate ("fops") cyclohexanedione ("dims")
B	Inhibitors of acetolactate synthase	sulfonyl urea imidazolinone sulfonamid
C	Inhibitors of photosynthesis at photosystem II	triazine triazinone urea nitrile benzothiadiazole acetamide pyridazinone phenyl-pyridazinone uracil
D	Inhibitors of tubulin formation	dinitroaniline benzoic acid
E	Inhibitors of mitosis	thiocarbamate carbamate organophosphorus
F	Inhibitors of carotenoid biosynthesis	nicotinilide triazole pyridazinone
G	Inhibitors of protoporphyrinogen oxidase	diphenyl ether oxidiazole
H	Inhibitors of protein synthesis	thiocarbamate
I	Disrupters of cell growth	phenoxy benzoic acid pyridine
J	Inhibitors of fat synthesis	alkanoic acid
K	Herbicides with diverse sites of action	amide organoarsenic carbamate aminopropionate benzofuran phthalamate nitrile
L	Inhibitors of photosynthesis at photosystem I	bipyridyl
M	Inhibitors of EBSP synthase	glycine (glyphosate; glyphosate-trimesium)
N	Inhibitors of glutamine synthetase	glycine

Appendices (Cont.)**Appendix ii - Rating Scales**

EWRS SCALE FOR CROP TOLERANCE		
RATING	% EFFECT	
1	0	Healthy plant
2	0.1 - 2	Very mild symptoms
3	2.1 - 5	Mild but clearly recognisable symptoms
4	5.1 - 10	More severe symptoms without necessarily an effect on yield
	-----	Limit of commercial acceptability
5	10.1 - 18	Reduction in yield expected
6	18.1 - 30	Heavy damage to total kill
7	30.1 - 45	
8	45.1 - 70	
9	70.1 - 100	

EWRS SCALE FOR WEED CONTROL		
RATING	% EFFECT	
1	100	Complete weed kill
2	99.9 - 98	
3	97.9 - 95	
4	94.9 - 90	
	-----	Limit of commercial acceptability
5	89.9 - 82	
6	81.9 - 70	
7	69.9 - 55	
8	54.9 - 30	
9	29.9 - 0	Little to no effect on weeds

The EWRS (European Weed Research System) scale is based on comparison of the treated plots with the untreated control plot. The aim is to assess as accurately as possible the decrease in the natural number of plants per weed species (still visible in the untreated plot). This decrease in the weed population corresponds to the action of the product. The EWRS scale is logarithmic, the intervals decreasing as the action increases. This enables detailed assessment in the range of effective herbicide action.

Reference: Puntener W. 1981. Manual for Field Trials in Plant Protection. Second Edition. Ciba-Geigy Limited, Basle, Switzerland.

Appendices (Cont.)**Appendix iii - Crop Tolerance Data**

Crop Timing	Weed Timing	Product	Report	Site	Variety	CROP (EWRS)
pre-transplant	pre-emergent	Authority 400 g	2001/02	3	Merlin	9.0
pre-transplant	pre-emergent	Authority 400 g	2001/02	4	Toledo	6.3
pre-transplant	pre-emergent	Authority 500 g	2001/02	2	Belltower	1.8
pre-transplant	pre-emergent	Balance 120 g	2001/02	2	Belltower	9.0
pre-transplant	pre-emergent	Command 1 L	2001/02	2	Belltower	1.8
pre-transplant	pre-emergent	Command 1 L	2001/02	3	Merlin	2.0
pre-transplant	pre-emergent	Command 1 L	2001/02	4	Toledo	1.0
pre-transplant	pre-emergent	Command 1 L	2002/03	2	Toledo	1.0
pre-transplant	pre-emergent	Command 1 L	2002/03	3	Belltower	1.0
pre-transplant	pre-emergent	Command 1 L	2002/03	6	Blister	1.0
pre-transplant	pre-emergent	Command 1 L	2002/03	6	Bombardier	1.0
pre-transplant	pre-emergent	Command 1 L	2002/03	6	El Charo	1.0
pre-transplant	pre-emergent	Command 1 L	2002/03	6	Merlin	1.0
pre-transplant	pre-emergent	Command 1 L	2002/03	6	Paz	1.0
pre-transplant	pre-emergent	Command 1 L	2002/03	6	Pirola	1.0
pre-transplant	pre-emergent	Command 1 L	2002/03	6	Tycoon	1.0
pre-transplant	pre-emergent	Command 1 L	2002/03	6	Warlock	1.0
pre-transplant	pre-emergent	Command 1 L	2002/03	8	Warlock	1.0
pre-transplant	pre-emergent	Command 1 L	2002/03	9	Belltower	1.0
pre-transplant	pre-emergent	Command 1 L + Raft 1 L	2002/03	8	Warlock	1.0
pre-transplant	pre-emergent	Command 1 L + Stomp 3 L	2002/03	8	Warlock	1.0
pre-transplant	pre-emergent	Command 2 L	2002/03	6	Blister	1.0
pre-transplant	pre-emergent	Command 2 L	2002/03	6	Bombardier	1.0
pre-transplant	pre-emergent	Command 2 L	2002/03	6	El Charo	1.0
pre-transplant	pre-emergent	Command 2 L	2002/03	6	Merlin	1.0
pre-transplant	pre-emergent	Command 2 L	2002/03	6	Paz	1.0
pre-transplant	pre-emergent	Command 2 L	2002/03	6	Pirola	1.0
pre-transplant	pre-emergent	Command 2 L	2002/03	6	Tycoon	1.0
pre-transplant	pre-emergent	Command 2 L	2002/03	6	Warlock	1.0
pre-transplant	pre-emergent	Command 250 mL	2002/03	1	Gedeon	1.0
pre-transplant	pre-emergent	Command 250 mL	2002/03	4	Gedeon	1.0
pre-transplant	pre-emergent	Command 250 mL + Stomp 1.5 L	2002/03	1	Gedeon	1.0
pre-transplant	pre-emergent	Command 250 mL + Stomp 1.5 L	2002/03	4	Gedeon	1.0
pre-transplant	pre-emergent	Command 500 mL	2002/03	1	Gedeon	1.0
pre-transplant	pre-emergent	Command 500 mL	2002/03	2	Toledo	1.0
pre-transplant	pre-emergent	Command 500 mL	2002/03	3	Belltower	1.0
pre-transplant	pre-emergent	Command 500 mL	2002/03	4	Gedeon	1.0
pre-transplant	pre-emergent	Command 500 mL	2002/03	9	Belltower	1.0
pre-transplant	pre-emergent	Command 500 mL + Raft 1 L	2002/03	3	Belltower	1.0

Appendices (Cont.)**Appendix iii - Crop Tolerance Data (Cont.)**

Crop Timing	Weed Timing	Product	Report	Site	Variety	CROP (EWRS)
pre-transplant	pre-emergent	Command 500 mL + Stomp 2 L	2002/03	2	Toledo	1.3
pre-transplant	pre-emergent	Command 500 mL + Stomp 2 L	2002/03	3	Belltower	1.0
pre-transplant	pre-emergent	Command 500 mL + Stomp 2 L	2002/03	9	Belltower	1.5
pre-transplant	pre-emergent	Command 500 mL + Stomp 3 L	2002/03	1	Gedeon	1.0
pre-transplant	pre-emergent	Command 500 mL + Stomp 3 L	2002/03	2	Toledo	2.3
pre-transplant	pre-emergent	Command 500 mL + Stomp 3 L	2002/03	3	Belltower	1.0
pre-transplant	pre-emergent	Command 500 mL + Stomp 3 L	2002/03	4	Gedeon	1.0
pre-transplant	pre-emergent	Command 500 mL + Stomp 3 L	2002/03	9	Belltower	1.0
pre-transplant	pre-emergent	Dual Gold 2 L	2001/02	3	Merlin	4.0
pre-transplant	pre-emergent	Dual Gold 2 L	2001/02	4	Toledo	3.0
pre-transplant	pre-emergent	Frontier 2 L	2001/02	3	Merlin	6.3
pre-transplant	pre-emergent	Frontier 2 L	2001/02	4	Toledo	4.7
pre-transplant	pre-emergent	Frontier 3 L	2001/02	2	Belltower	6.0
pre-transplant	pre-emergent	Pledge 150 g	2001/02	2	Belltower	3.3
pre-transplant	pre-emergent	Pledge 150 g	2001/02	3	Merlin	9.0
pre-transplant	pre-emergent	Pledge 150 g	2001/02	4	Toledo	7.3
pre-transplant	pre-emergent	Raft 1 L	2001/02	2	Belltower	1.0
pre-transplant	pre-emergent	Raft 1 L	2001/02	3	Merlin	2.6
pre-transplant	pre-emergent	Raft 1 L	2001/02	4	Toledo	1.3
pre-transplant	pre-emergent	Raft 1 L	2002/03	1	Gedeon	1.0
pre-transplant	pre-emergent	Raft 1 L	2002/03	2	Toledo	2.0
pre-transplant	pre-emergent	Raft 1 L	2002/03	3	Belltower	1.0
pre-transplant	pre-emergent	Raft 1 L	2002/03	4	Gedeon	4.3
pre-transplant	pre-emergent	Raft 1 L	2002/03	6	Blister	1.0
pre-transplant	pre-emergent	Raft 1 L	2002/03	6	Bombardier	1.0
pre-transplant	pre-emergent	Raft 1 L	2002/03	6	El Charo	1.0
pre-transplant	pre-emergent	Raft 1 L	2002/03	6	Merlin	1.0
pre-transplant	pre-emergent	Raft 1 L	2002/03	6	Paz	1.0
pre-transplant	pre-emergent	Raft 1 L	2002/03	6	Pirola	1.0
pre-transplant	pre-emergent	Raft 1 L	2002/03	6	Tycoon	1.0
pre-transplant	pre-emergent	Raft 1 L	2002/03	6	Warlock	1.0
pre-transplant	pre-emergent	Raft 1 L	2002/03	8	Warlock	1.0
pre-transplant	pre-emergent	Raft 1 L	2002/03	9	Belltower	1.0
pre-transplant	pre-emergent	Raft 2 L	2002/03	3	Belltower	1.0
pre-transplant	pre-emergent	Raft 2 L	2002/03	6	Blister	1.0
pre-transplant	pre-emergent	Raft 2 L	2002/03	6	Bombardier	1.0
pre-transplant	pre-emergent	Raft 2 L	2002/03	6	El Charo	1.0
pre-transplant	pre-emergent	Raft 2 L	2002/03	6	Merlin	1.0
pre-transplant	pre-emergent	Raft 2 L	2002/03	6	Paz	1.0
pre-transplant	pre-emergent	Raft 2 L	2002/03	6	Pirola	1.5
pre-transplant	pre-emergent	Raft 2 L	2002/03	6	Tycoon	1.0
pre-transplant	pre-emergent	Raft 2 L	2002/03	6	Warlock	1.0

Appendices (Cont.)***Appendix iii - Crop Tolerance Data (Cont.)***

Crop Timing	Weed Timing	Product	Report	Site	Variety	CROP (EWRS)
pre-transplant	pre-emergent	Raft 500 mL	2002/03	4	Gedeon	4.0
pre-transplant	pre-emergent	Stomp 1.5 L	2002/03	1	Gedeon	1.0
pre-transplant	pre-emergent	Stomp 1.5 L	2002/03	4	Gedeon	1.3
pre-transplant	pre-emergent	Stomp 2 L	2002/03	2	Toledo	1.7
pre-transplant	pre-emergent	Stomp 2 L	2002/03	9	Belltower	1.0
pre-transplant	pre-emergent	Stomp 3 L	2001/02	2	Belltower	1.0
pre-transplant	pre-emergent	Stomp 3 L	2001/02	3	Merlin	2.0
pre-transplant	pre-emergent	Stomp 3 L	2001/02	4	Toledo	1.0
pre-transplant	pre-emergent	Stomp 3 L	2002/03	1	Gedeon	1.0
pre-transplant	pre-emergent	Stomp 3 L	2002/03	2	Toledo	1.7
pre-transplant	pre-emergent	Stomp 3 L	2002/03	3	Belltower	1.0
pre-transplant	pre-emergent	Stomp 3 L	2002/03	4	Gedeon	1.5
pre-transplant	pre-emergent	Stomp 3 L	2002/03	6	Blister	1.0
pre-transplant	pre-emergent	Stomp 3 L	2002/03	6	Bombardier	1.0
pre-transplant	pre-emergent	Stomp 3 L	2002/03	6	El Charo	1.0
pre-transplant	pre-emergent	Stomp 3 L	2002/03	6	Merlin	1.0
pre-transplant	pre-emergent	Stomp 3 L	2002/03	6	Paz	1.0
pre-transplant	pre-emergent	Stomp 3 L	2002/03	6	Pirola	1.0
pre-transplant	pre-emergent	Stomp 3 L	2002/03	6	Tycoon	1.0
pre-transplant	pre-emergent	Stomp 3 L	2002/03	6	Warlock	1.0
pre-transplant	pre-emergent	Stomp 3 L	2002/03	8	Warlock	1.0
pre-transplant	pre-emergent	Stomp 3 L	2002/03	9	Belltower	1.0
pre-transplant	pre-emergent	Stomp 6 L	2002/03	6	Blister	1.5
pre-transplant	pre-emergent	Stomp 6 L	2002/03	6	Bombardier	1.0
pre-transplant	pre-emergent	Stomp 6 L	2002/03	6	El Charo	1.5
pre-transplant	pre-emergent	Stomp 6 L	2002/03	6	Merlin	1.0
pre-transplant	pre-emergent	Stomp 6 L	2002/03	6	Paz	2.0
pre-transplant	pre-emergent	Stomp 6 L	2002/03	6	Pirola	1.5
pre-transplant	pre-emergent	Stomp 6 L	2002/03	6	Tycoon	2.0
pre-transplant	pre-emergent	Stomp 6 L	2002/03	6	Warlock	1.0

Appendices (Cont.)**Appendix iii - Crop Tolerance Data (Cont.)**

Crop Timing	Weed Timing	Product	Report	Site	Variety	CROP (EWRS)
post-transplant	pre-emergent	Dual Gold 1 L	2002/03	1	Gedeon	1.0
post-transplant	pre-emergent	Dual Gold 2 L	2001/02	4	Toledo	2.7
post-transplant	pre-emergent	Dual Gold 2 L	2002/03	9	Belltower	1.0
post-transplant	pre-emergent	Frontier 1 L	2002/03	1	Gedeon	1.0
post-transplant	pre-emergent	Frontier 2 L	2001/02	4	Toledo	2.3
post-transplant	pre-emergent	Frontier-P 1.4 L	2002/03	9	Belltower	1.5
post-transplant	pre-emergent	Goal WP 1 kg	2001/02	2	Belltower	5.8
post-transplant	pre-emergent	Raft 1 L	2001/02	4	Toledo	5.3
post-transplant	pre-emergent	Stomp 1.5 L	2002/03	1	Gedeon	1.0
post-transplant	pre-emergent	Stomp 3 L	2002/03	9	Belltower	1.0
post-transplant	post-emergent	Affinity 60 g	2001/02	2	Belltower	9.0
post-transplant	post-emergent	Basagran 1 L	2002/03	4	Gedeon	1.0
post-transplant	post-emergent	Basagran 1 L + Citowet 125 mL/100 L	2001/02	3	Merlin	3.6
post-transplant	post-emergent	Basagran 1 L + Citowet 125 mL/100 L	2001/02	4	Toledo	2.7
post-transplant	post-emergent	Basagran 1 L + Citowet 125 mL/100 L	2002/03	2	Toledo	7.3
post-transplant	post-emergent	Basagran 2 L	2002/03	3	Belltower	3.5
post-transplant	post-emergent	Basagran 2 L	2002/03	4	Gedeon	1.3
post-transplant	post-emergent	Basagran 2 L	2002/03	6	Blister	6.5
post-transplant	post-emergent	Basagran 2 L	2002/03	6	Bombardier	5.0
post-transplant	post-emergent	Basagran 2 L	2002/03	6	El Charo	6.0
post-transplant	post-emergent	Basagran 2 L	2002/03	6	Merlin	5.5
post-transplant	post-emergent	Basagran 2 L	2002/03	6	Paz	6.0
post-transplant	post-emergent	Basagran 2 L	2002/03	6	Pirola	6.5
post-transplant	post-emergent	Basagran 2 L	2002/03	6	Tycoon	5.5
post-transplant	post-emergent	Basagran 2 L	2002/03	6	Warlock	5.5
post-transplant	post-emergent	Basagran 2 L + Citowet 125 mL/100 L	2001/02	2	Belltower	5.3
post-transplant	post-emergent	Basagran 2 L + Citowet 125 mL/100 L	2002/03	1	Gedeon	1.0
post-transplant	post-emergent	Basagran 2 L + Citowet 125 mL/100 L	2002/03	2	Toledo	9.0
post-transplant	post-emergent	Basagran 2 L + Citowet 125 mL/100 L	2002/03	9	Belltower	1.5
post-transplant	post-emergent	Lexone 686 g	2001/02	2	Belltower	7.5
post-transplant	post-emergent	Raptor 45 g	2001/02	2	Belltower	3.8

Appendices (Cont.)

Appendix iv - Weed control data - % control compared to Untreated Control

Crop Timing	Weed Timing	Product	Report	Site	ACHNI	AMACH	AMASS	BRSRA	DIGAD	DIGSA	CAPBU	COHEC	CHEAL	CYPRO	ECHSS	ELEIN	ERAMX	GASPA	NICPH	POROL	SOLNI	SONOL	TRBTE	TRTPO	
pre-transplant	pre	Command 1 L	2001/02	4		19											100				12		33	100	
pre-transplant	pre	Command 1 L	2002/03	2												100					28			100	
pre-transplant	pre	Command 1 L	2002/03	5					100			100	100						85						
pre-transplant	pre	Command 1 L	2002/03	6		41			100					0	100						100	67		13	
pre-transplant	pre	Command 1 L	2002/03	8	87	89			100							100					100	79		55	
pre-transplant	pre	Command 1 L	2002/03	9				100			99		88									70			
pre-transplant	pre	Command 1 L + Raft 1 L	2002/03	8	75	100			100							100					100	95		85	
pre-transplant	pre	Command 1 L + Stomp 3 L	2002/03	8	50	100			100							100					100	95		72	
pre-transplant	pre	Command 2 L	2002/03	6		65			100					0	100						100	78		63	
pre-transplant	pre	Command 250 mL	2002/03	4						63								47			0		0		
pre-transplant	pre	Command 250 mL + Stomp 1.5 L	2002/03	4						96								80			100		0		
pre-transplant	pre	Command 500 mL	2002/03	2												85						24		83	
pre-transplant	pre	Command 500 mL	2002/03	4						73								58		56		78			
pre-transplant	pre	Command 500 mL	2002/03	5					100			93	92			96			79						
pre-transplant	pre	Command 500 mL	2002/03	9				0			97		47									0			
pre-transplant	pre	Command 500 mL + Stomp 2 L	2002/03	2												85						100		100	
pre-transplant	pre	Command 500 mL + Stomp 2 L	2002/03	5					100			100	100						100						
pre-transplant	pre	Command 500 mL + Stomp 2 L	2002/03	9				67			98		81									12			
pre-transplant	pre	Command 500 mL + Stomp 3 L	2002/03	2												100						100		100	
pre-transplant	pre	Command 500 mL + Stomp 3 L	2002/03	4						100								92			100		100		
pre-transplant	pre	Command 500 mL + Stomp 3 L	2002/03	5					100			42	100			100			100						
pre-transplant	pre	Command 500 mL + Stomp 3 L	2002/03	9				92			93		96									8			
pre-transplant	pre	Raft 1 L	2001/02	4		77											78					100		83	100
pre-transplant	pre	Raft 1 L	2002/03	2												85						92			83
pre-transplant	pre	Raft 1 L	2002/03	4						100								98			100		100		
pre-transplant	pre	Raft 1 L	2002/03	5					100			0	100			100			100						
pre-transplant	pre	Raft 1 L	2002/03	6		94			81					20	83						100	89		69	
pre-transplant	pre	Raft 1 L	2002/03	8	87	100			91							67					100	95		70	

Appendices (Cont.)

Appendix iv - Weed control data - % control compared to Untreated Control (Cont.)

Crop Timing	Weed Timing	Product	Report	Site	ACHNI	AMACH	AMASS	BRSRA	DIGAD	DIGSA	CAPBU	COHEC	CHEAL	CYPRO	ECHSS	ELEIN	ERAMX	GASPA	NICPH	POROL	SOLNI	SONOL	TRBTE	TRTPO
pre-transplant	pre	Raft 1 L	2002/03	9				92			98		98								99			
pre-transplant	pre	Raft 2 L	2002/03	6		100			100					60	78					100	100		81	
pre-transplant	pre	Raft 500 mL	2002/03	4						99								95		100		100		
pre-transplant	pre	Stomp 1.5 L	2002/03	4						99								0		100		44		
pre-transplant	pre	Stomp 2 L	2002/03	2												85					100			100
pre-transplant	pre	Stomp 2 L	2002/03	5					99			0	96			100			88					
pre-transplant	pre	Stomp 2 L	2002/03	9				67			88		79								3			
pre-transplant	pre	Stomp 3 L	2001/02	4		84											100				75		67	100
pre-transplant	pre	Stomp 3 L	2002/03	2												85					100			100
pre-transplant	pre	Stomp 3 L	2002/03	4						97								95		100		44		
pre-transplant	pre	Stomp 3 L	2002/03	5					100			0	100			100			100					
pre-transplant	pre	Stomp 3 L	2002/03	6		100			100					50	100					100	100		63	
pre-transplant	pre	Stomp 3 L	2002/03	8	69	100			97							100				100	68		68	
pre-transplant	pre	Stomp 3 L	2002/03	9				96			88		89								6			
pre-transplant	pre	Stomp 6 L	2002/03	6		100			100					50	100					100	100		69	
post-transplant	pre	Raft 1 L	2001/02	4		81											89				100		100	86
post-transplant	post	Basagran 1 L	2002/03	4						9								53		63		89		
post-transplant	post	Basagran 1 L + Citowet 125 mL/100 L	2001/02	4		29											11				87		83	14
post-transplant	post	Basagran 1 L + Citowet 125 mL/100 L	2002/03	2												0					100			0
post-transplant	post	Basagran 1 L + Citowet 125 mL/100 L	2002/03	5					36			0	100			0			99					
post-transplant	post	Basagran 2 L	2002/03	4						27								57		100		100		
post-transplant	post	Basagran 2 L	2002/03	6		100			19					40	22					100	100		100	
post-transplant	post	Basagran 2 L + Citowet 125 mL/100 L	2002/03	2												0					100			50
post-transplant	post	Basagran 2 L + Citowet 125 mL/100 L	2002/03	5					78			7	100			0			100					

Appendices (Cont.)

Appendix v - Weed Control Data - EWRS Ratings

Crop Timing	Weed Timing	Product	Report	Site	BIDPI	CHEC	CHEAL	ELEN	GASPA	LOLSS	NICPH	SOLNI	UROPA	VERPE
pre-transplant	pre-emergent	Command 1 L	2001/02	2			3.5			5.5		3.0		1.3
pre-transplant	pre-emergent	Command 1 L	2001/02	3	1.0	1.3	2.3	1.3			2.3		1.3	
pre-transplant	pre-emergent	Command 1 L	2002/03	3								5.0		
pre-transplant	pre-emergent	Command 250 mL	2002/03	1					6.0			9.0		
pre-transplant	pre-emergent	Command 250 mL + Stomp 1.5 L	2002/03	1					6.7			6.0		
pre-transplant	pre-emergent	Command 500 mL	2002/03	1					6.7			9.0		
pre-transplant	pre-emergent	Command 500 mL	2002/03	3								7.0		
pre-transplant	pre-emergent	Command 500 mL + Raft 1 L	2002/03	3								2.5		
pre-transplant	pre-emergent	Command 500 mL + Stomp 2 L	2002/03	3								7.0		
pre-transplant	pre-emergent	Command 500 mL + Stomp 3 L	2002/03	1					5.7			6.0		
pre-transplant	pre-emergent	Command 500 mL + Stomp 3 L	2002/03	3								5.0		
pre-transplant	pre-emergent	Raft 1 L	2001/02	2			1.0			4.8		1.3		2.5
pre-transplant	pre-emergent	Raft 1 L	2001/02	3	3.3	2.0	1.0	1.3			1.0		1.3	
pre-transplant	pre-emergent	Raft 1 L	2002/03	1					7.0			6.3		
pre-transplant	pre-emergent	Raft 1 L	2002/03	3								2.8		
pre-transplant	pre-emergent	Raft 2 L	2002/03	3								1.3		
pre-transplant	pre-emergent	Stomp 1.5 L	2002/03	1					9.0			7.0		
pre-transplant	pre-emergent	Stomp 3 L	2001/02	2			2.5			7.8		3.8		1.3
pre-transplant	pre-emergent	Stomp 3 L	2001/02	3	6.0	2.0	1.6	1.6			1.6		1.6	
pre-transplant	pre-emergent	Stomp 3 L	2002/03	1					8.7			5.0		
pre-transplant	pre-emergent	Stomp 3 L	2002/03	3								5.3		
post-transplant	pre-emergent	Stomp 1.5 L	2002/03	1					9.0			7.7		
post-transplant	post-emergent	Basagran 1 L + Citowet 125 mL/100 L	2001/02	3	1.6	7.0	2.0	6.3			1.6		6.0	
post-transplant	post-emergent	Basagran 2 L	2002/03	3								2.3		
post-transplant	post-emergent	Basagran 2 L + Citowet 125 mL/100 L	2001/02	2			1.0			9.0		4.0		8.3
post-transplant	post-emergent	Basagran 2 L + Citowet 125 mL/100 L	2002/03	1					4.3			5.0		

Appendices (Cont.)

Appendix vi - Crop Tolerance and Weed Efficacy Data, Plastic Mulch Trials

Crop Timing	Weed Timing	Product	Report	Site	Variety	CROP	AMACH	AMASS	DIGAD	SOLSS	TRBTE
pre-transplant	pre-emergent	Command 1 L	2001/02	1	Merlin	1.5	92	100		88	
pre-transplant	pre-emergent	Command 1 L	2002/03	7	Warlock	1.0			100		100
pre-transplant	pre-emergent	Command 1.43 L ME	2001/02	1	Merlin	1.0	100	100		100	
pre-transplant	pre-emergent	Command 500 mL	2001/02	1	Merlin	1.0	83	92		63	
pre-transplant	pre-emergent	Command 500 mL	2002/03	7	Warlock	1.3			100		100
pre-transplant	pre-emergent	Command 500 mL + Raft 1 L	2002/03	7	Warlock	2.3			100		100
pre-transplant	pre-emergent	Command 500 mL + Stomp 3 L	2002/03	7	Warlock	1.0			100		100
pre-transplant	pre-emergent	Raft 1 L	2002/03	7	Warlock	2.0			100		100
pre-transplant	pre-emergent	Stomp 2 L	2002/03	7	Warlock	1.7			100		100
pre-transplant	pre-emergent	Stomp 3 L	2002/03	7	Warlock	5.3			100		92

Appendices (Cont.)

Appendix vii - Yield Data

2002/03, Site 6 - Bowen, Yield Assessment for Capsicum cv. Warlock

Product	Rep	NUMBER OF MARKETABLE FRUIT (10 PLANTS PER REP)										Total	
		1	2	3	4	5	6	7	8	9	10		
Command	1	4	4	5	4	5	4	4	4	4	4	4	42
	2	4	4	4	4	4	4	4	4	4	5	4	41
	Mean	4.0	4.0	4.5	4.0	4.5	4.0	4.0	4.0	4.0	4.5	4.0	41.5
Stomp	1	3	4	4	4	4	4	4	4	4	4	5	40
	2	3	4	4	4	4	4	4	4	4	5	4	40
	Mean	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5	4.5	40.0
Raft	1	4	4	4	3	5	4	4	4	4	4	4	40
	2	3	4	3	3	4	5	4	4	5	4	4	39
	Mean	3.5	4.0	3.5	3.0	4.5	4.5	4.0	4.0	4.5	4.0	4.0	39.5
Basagran	1	1	2	2	3	4	2	3	3	5	3	28	
	2	3	4	2	5	2	2	2	3	2	2	27	
	Mean	2.0	3.0	2.0	4.0	3.0	2.0	2.5	3.0	3.5	2.5	27.5	
Untreated	1	4	4	4	4	4	4	4	4	4	4	40	
	2	4	4	3	4	4	4	4	4	5	4	40	
	Mean	4.0	4.0	3.5	4.0	4.0	4.0	4.0	4.0	4.5	4.0	40.0	

Product	Rep	WEIGHT OF MARKETABLE FRUIT (GRAMS) (10 PLANTS PER REP)										Total
		1	2	3	4	5	6	7	8	9	10	
Command	1	973	1036	1023	990	1092	985	1014	850	1002	985	9950
	2	1031	894	988	951	914	1055	979	948	1134	954	9848
	Mean	1002	965	1006	971	1003	1020	997	899	1068	970	9899
Stomp	1	759	1040	1048	837	844	1007	1020	996	969	1087	9607
	2	784	934	1004	948	929	1072	1054	1048	1132	1083	9988
	Mean	772	987	1026	893	887	1040	1037	1022	1051	1085	9798
Raft	1	901	877	938	709	1129	1009	975	1079	1005	927	9549
	2	738	923	790	667	897	1116	1110	995	1125	986	9347
	Mean	820	900	864	688	1013	1063	1043	1037	1065	957	9448
Basagran	1	214	310	340	618	678	364	616	546	837	544	5067
	2	572	878	404	849	394	346	365	517	340	310	4975
	Mean	393	594	372	734	536	355	491	532	589	427	5021
Untreated	1	1003	1043	952	1112	1031	1016	1034	957	1058	998	10204
	2	1008	813	717	929	1013	1114	1057	939	1185	1072	9847
	Mean	1006	928	835	1021	1022	1065	1046	948	1122	1035	10026

Appendices (Cont.)**Appendix vii - Yield Data (Cont.)****2002/03, Site 6 - Bowen, Yield Assessment for Chilli cv. Blister**

Product	Rep	NUMBER OF MARKETABLE FRUIT (10 PLANTS PER REP)										Total
		1	2	3	4	5	6	7	8	9	10	
Command	1	18	20	20	18	18	20	18	20	20	20	192
	2	18	20	19	18	18	20	18	20	20	19	190
	Mean	18.0	20.0	19.5	18.0	18.0	20.0	18.0	20.0	20.0	19.5	191.0
Stomp	1	20	17	18	17	20	18	20	17	20	17	184
	2	15	15	18	18	16	18	15	20	15	17	167
	Mean	17.5	16.0	18.0	17.5	18.0	18.0	17.5	18.5	17.5	17.0	175.5
Raft	1	15	18	20	20	18	14	18	18	15	14	170
	2	20	20	20	20	15	20	20	15	20	20	190
	Mean	17.5	19.0	20.0	20.0	16.5	17.0	19.0	16.5	17.5	17.0	180.0
Basagran	1	5	6	5	6	5	5	9	6	6	9	62
	2	7	11	7	6	8	11	7	8	6	7	78
	Mean	6.0	8.5	6.0	6.0	6.5	8.0	8.0	7.0	6.0	8.0	70.0
Untreated	1	16	19	16	19	16	16	17	17	17	17	170
	2	20	17	17	18	20	16	16	20	20	16	180
	Mean	18.0	18.0	16.5	18.5	18.0	16.0	16.5	18.5	18.5	16.5	175.0

Product	Rep	WEIGHT OF MARKETABLE FRUIT (GRAMS) (10 PLANTS PER REP)										Total
		1	2	3	4	5	6	7	8	9	10	
Command	1	815	717	775	901	826	1130	893	1103	707	775	8642
	2	830	896	809	928	861	1047	865	934	1021	764	8955
	Mean	823	807	792	915	844	1089	879	1019	864	770	8799
Stomp	1	837	950	805	797	1159	1010	823	779	1158	784	9102
	2	910	1015	740	811	706	1099	921	1139	1025	763	9129
	Mean	874	983	773	804	933	1055	872	959	1092	774	9116
Raft	1	743	832	1237	1230	647	703	813	653	722	692	8272
	2	952	685	816	1294	1011	687	837	1021	1284	964	9551
	Mean	848	759	1027	1262	829	695	825	837	1003	828	8912
Basagran	1	306	400	343	403	301	341	387	334	328	375	3518
	2	428	694	565	446	520	689	414	519	445	558	5278
	Mean	367	547	454	425	411	515	401	427	387	467	4398
Untreated	1	757	975	657	961	601	752	859	830	780	827	7999
	2	836	876	999	1079	1211	768	766	1211	828	781	9355
	Mean	797	926	828	1020	906	760	813	1021	804	804	8677

Appendices (Cont.)**Appendix vii - Yield Data (Cont.)****2002/03, Site 9 - Forthside, Yield Assessment for Capsicum cv. Belltower**

No.	Product (Rate/ha)	Crop and Weed Timing	Rep	Marketable Fruit (>100 g) / 10 plants	
				Number of fruit	Weight (kg)
1	Command 500 mL rep 3 unsprayed	Pre-transplant, Pre-weed emergence	1	33	6.06
			2	36	5.42
			3	34	5.02
			4	24	3.34
			Mean	31.8	5.0
2	Command 1 L	Pre-transplant, Pre-weed emergence	1	45	7.28
			2	57	6.96
			3	56	7.68
			4	34	3.98
			Mean	48.0	6.5
3	Raft 1 L	Pre-transplant, Pre-weed emergence	1	65	8.86
			2	55	8.24
			3	64	8.78
			4	45	7.96
			Mean	57.3	8.5
4	Stomp 2 L	Pre-transplant, Pre-weed emergence	1	36	6.06
			2	53	8.24
			3	48	5.54
			4	48	5.3
			Mean	46.3	6.3
5	Stomp 3 L	Pre-transplant, Pre-weed emergence	1	57	9.44
			2	44	7.18
			3	57	7.3
			4	52	7.02
			Mean	52.5	7.7
6	Command 500 mL + Stomp 2 L	Pre-transplant, Pre-weed emergence	1	32	5.56
			2	55	7.88
			3	65	8.42
			4	50	5.4
			Mean	50.5	6.8
7	Command 500 mL + Stomp 3 L	Pre-transplant, Pre-weed emergence	1	15	7.28
			2	52	5.52
			3	38	5.22
			4	75	9.7
			Mean	45.0	6.9
8	Stomp 3 L	Post-transplant, Pre-weed emergence	1	0	0
			2	0	0
			3	0	0
			4	0	0
			Mean	0.0	0.0
9	Frontier Optima 1.4 L	Post-transplant, Pre-weed emergence	1	48	8.98
			2	47	8.16
			3	43	6.52
			4	52	6.94
			Mean	47.5	7.7
10	Dual Gold 2 L	Post-transplant, Pre-weed emergence	1	37	4.08
			2	50	6.64
			3	43	6.14
			4	46	9.92
			Mean	44.0	6.7
11	Basagran 2 L + Citowett 125 mL/100 L	Post-transplant, Post-weed emergence	1	26	4.7
			2	33	5.18
			3	47	6.44
			4	47	5.1
			Mean	38.3	5.4
12	Untreated Control		1	34	4.4
			2	40	4.64
			3	36	5.38
			4	39	5.62
			Mean	37.3	5.0

Appendices (Cont.)

Appendix viii - Acknowledgments

The assistance of Lyndon Butler and Vaughan Trebilco (Forthside Vegetable Research Station), Bill Piasini, Pam Stackleroth, V. Mete, Peter Chauntler, Alan and Jenny Napier and Terry & Helen Holl who provided trial sites is gratefully acknowledged.

Serve-Ag staff who contributed to this project included Matt Sherriff, Brendan Finch, Rodney Burn, Pam Cox, Mary Trebilco, Ian Macleod, Tim Hingston and Sarah Lamprey.

The assistance of Mark Sumner (Serve-Ag WA), and Keith Lewis and David Kilpatrick (Serve-Ag BFS) who conducted trials in Queensland and Western Australia, is gratefully acknowledged.

The input and advice from Chris Monsour (Bowen Crop Monitoring Services) who also conducted the trial work in Bowen (North Queensland) is gratefully acknowledged.

Photographs

Photographs 1 - 8, 2002/03, Site 7



Photograph 1
Command 500 mL



Photograph 2
Command 1 L



Photograph 3
Command 500 mL + Raft 1 L



Photograph 4
Command 500 mL + Stomp 3 L



Photograph 5
Raft 1 L



Photograph 6
Stomp 2 L



Photograph 7
Stomp 3 L



Photograph 8
Untreated Control