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**SOME ASPECTS OF SEED PRODUCTION AND THE
EVALUATION OF HERBICIDES FOR TUBER PRODUCTION
OF THE HAMMETT 'FIGARO' SERIES SEMI-DWARF DAHLIA.**



**A thesis presented in partial fulfillment of the requirements for the degree of
Master of Horticultural Science
in Seed Technology
at Massey University,
Palmerston North,
New Zealand.**

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ABSTRACT

Seed yield and quality information was collected from 14 clones of a double flowering semi-dwarf (0.75-1m) bedding *Dahlia* series, bred by Dr Keith Hammett of Auckland, in the 1994-95 season at Palmerston North. Half-sib progeny were grown out to assess flower colour and doubleness in the 1995-96 season.

Seed yield (0.03-6.66g/plant) varied widely among the clones. Seed yield was affected more by the fertility of disc florets than by their number and so the highest seed production potential was likely to be maintained in clones of high bloom quality (degree of doubleness). Clones with yellow, orange or red flowers had greater fertility than clones with purple - magenta, white, or pale colours. This may well reflect a fertility-colour link related to the original hybridization of the garden *Dahlia* from two wild species. If such a link exists then careful manipulation of clonal ratios may be required to maintain a good overall balance of colours.

Maintaining seed quality required drying seed without delay, especially when seed was harvested under cooler conditions. Very low levels of primary dormancy were detected, but some clones produced seed which when germinated at a later date varied both in time to 50% germination (over six days) and spread of germination (over four days). This could have significant implications during plant establishment under nursery conditions, and dry storage or possibly a longer period of pre-chilling is suggested to reduce this variation. This requires further evaluation.

Oxyfluorfen, oxyfluorfen plus oryzalin, oxadiazon, and oxadiazon plus simazine herbicide treatments did not affect tuber yields and subsequent forced re-sprouting of seedling material under glasshouse conditions. Trifluralin and oryzalin reduced tuber yields, similar to the unweeded control. This was due to competition from inadequately controlled weeds, rather than any obvious toxic effects from these two herbicides. No visual phytotoxicity was observed in any of the treatments in either the initial growing season or the subsequent forced resprouting although the herbicides were not applied directly over the top of the plants.

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*“To everything there is a season,
A time for every purpose under heaven:
A time to be born, And a time to die;
A time to plant,
And a time to pluck what is planted...”*

Ecclesiastes 3:1-2 NKJV Bible

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TABLE OF CONTENTS

	Page
TITLE.....	i
ABSTRACT	ii
ACKNOWLEDGEMENTS.....	iii-iv
TABLE OF CONTENTS	v-x
LIST OF TABLES.....	xi-xii
LIST OF FIGURES	xii
LIST OF PLATES	xii-xiv
CHAPTER 1 SEED PRODUCTION.....	1-76
1.1 INTRODUCTION	1-4
1.1.1 Botanical Background.....	1
1.1.2 'F' Series Dahlias.....	1
1.1.3 Seed Production Investigations.....	2
1.1.4 Herbicide Trials.....	2
1.2 LITERATURE REVIEW.....	5-36
1.2.1 Introduction.....	5
1.2.2 Compositae.....	5
1.2.3 Heliantheae.....	5
1.2.4 Botanical Background.....	5-6
1.2.5 Inflorescence.....	6-7
1.2.6 'Seed'	8
1.2.7 Brief History	8-11
1.2.8 Dahlia Classification.....	11-12
1.2.9 Self-incompatibility	12-13
1.2.10 Hybrids	13
1.2.11 Flower Colour.....	14
1.2.12 Propagation.....	14-15
1.2.13 Temperature and Light Effects	15-16
1.2.14 Agronomic Requirements.....	16-18
1.2.14.1 Soils.....	16-17
1.2.14.2 Environment	17

1.2.14.3 Weed Control	17
1.2.14.4 Diseases, Insects and other Pests.....	17-18
1.2.15 Pollination.....	18-22
1.2.15.1 Pollinating Insects.....	18-19
1.2.15.2 Foraging Behaviour	20
1.2.15.3 Honey bees.....	20-21
1.2.15.4 Bumble bees	21-22
1.2.16 Floral Biology and Pollination Ecology	22-23
1.2.16.1 Floral Biology.....	22
1.2.16.2 Pollinators.....	23
1.2.17 Self Incompatibility Pollination Problems.....	24
1.2.18 Flower Seed Production.....	24-31
1.2.18.1 History.....	24
1.2.18.2 Seed Production.....	24-25
1.2.18.3 Climate	25
1.2.18.4 Soil and Fertilizers	25-26
1.2.18.5 Cultivation and Weed Control.....	26
1.2.18.6 Irrigation.....	26
1.2.18.7 Isolation.....	26
1.2.18.8 Sowing or Transplanting.....	26-27
1.2.18.9 Method of sowing and sowing depth.....	27
1.2.18.10 Plant Density.....	27-28
1.2.18.11 Harvesting	28-29
1.2.18.12 Harvesting techniques	29-30
1.2.18.13 Drying	30
1.2.18.14 Seed Cleaning	30-31
1.2.19 Germination Methods	31-32
1.2.20 Greenhouse germination.....	32
1.2.21 Seed Dormancy.....	32-33
1.2.22 Seed Storage.....	33
1.2.23 Seed Yield Components.....	33-34
1.2.24 Flower colour effects on yield and yield components	34-35

1.2.25 Inflorescence Disc:Ray Floret Ratios	35-36
1.3 MATERIALS AND METHODS.....	37-48
1.3.1 Seed Production Trial.....	37-45
1.3.1.1 Experimental Site.....	37
1.3.1.2 Climate Information	37
1.3.1.3 Soil Type and Land Preparation	37-38
1.3.1.4 Plant Material.....	38
1.3.1.5 Planting Design.....	40
1.3.1.6 Weed Control	40
1.3.1.7 Plant Protection	40-41
1.3.1.8 Seed Production Measurements.....	42-45
1.3.1.8.1 Pollinator Visitation	42,44
1.3.1.8.2 Seed Fertility.....	42
1.3.1.8.3 Seed Yield	42-43
1.3.1.8.4 Seed Quality	43,45
1.3.2 Half-Sib Lines Trial.....	45-48
1.3.2.1 Experimental Site.....	45
1.3.2.2 Soil Type and Land Preparation	45-46
1.3.2.3 Plant Material.....	46
1.3.2.4 Planting Design.....	46
1.3.2.5 Weed Control	46
1.3.2.6 Plant Protection	46,48
1.3.2.7 Growing out half-sib lines	47
1.4 RESULTS.....	49-65
1.4.1 Climatic Information	49
1.4.2 Agronomic Results.....	49-50
1.4.2.1 Flowering.....	49
1.4.2.2 Lodging.....	50
1.4.2.3 Seed Development	50
1.4.3 Pollinator activity.....	50,55
1.4.4 Seed head fertility.....	55-57
1.4.4.1 Ray Florets	55

1.4.4.2 Disc Florets	55
1.4.4.3 Total Florets	55,57
1.4.4.4 Percentage of Disc Florets per Inflorescence	57
1.4.4.5 Ray:Disc ratio	57
1.4.4.6 Seed Number	57
1.4.4.7 Disc Fertility	57
1.4.5 Seed Yield And Yield Components	58-59
1.4.5.1 Seed weight (TSW)	58
1.4.5.2 Seed Yield Per Plant	58
1.4.5.3 Viable Seed Yield Per Plant	58
1.4.5.4 Seed Number Per Plant	58
1.4.5.5 Yield Per Hectare	58
1.4.6 Seed Quality	60-63
1.4.6.1 Germination Percentage	60
1.4.6.2 Fresh Ungerminated	60
1.4.6.3 Dead	60
1.4.6.4 Tetrazolium (Viability Test)	60-61
1.4.6.5 Glasshouse Emergence	63
1.4.7 Flower Colour	63,64
1.4.8 Flower Doubleness	63,64
1.4.9 Population Colour Spread	63,65
1.5 DISCUSSION	66-76
CHAPTER 2 HERBICIDE EFFECTS ON TUBERS	77-116
2.1 INTRODUCTION	77-78
2.1.1 The Weed Control Strategy	77
2.1.2 Available Literature	77
2.1.3 The Problem	77-78
2.2 LITERATURE REVIEW	79-87
2.2.1 Introduction	79
2.2.2 Weeds Defined	79
2.2.3 Herbicides	79-80
2.2.4 Herbicides for Compositae Crops	80

2.2.5	Herbicides in Ornamental Bulb Crops.....	80-81
2.2.6	Dahlia.....	81-84
2.2.6.1	Introduction.....	81
2.2.6.2	Alachlor.....	81
2.2.6.3	Chlorthal-dimethyl (DCPA).....	81
2.2.6.4	Haloxypop.....	81,83
2.2.6.5	Oryzalin.....	83
2.2.6.6	Oxadiazon.....	83
2.2.6.7	Oxyfluorfen.....	84
2.2.6.8	Pendimethalin.....	84
2.2.6.9	Simazine.....	84
2.2.6.10	Trifluralin.....	84
2.2.7	Herbicides Used: Product briefs and associated information.....	85-87
2.2.7.1	Oxyfluorfen (Goal®).....	85
2.2.7.2	Oxadiazon (Foresite® 380).....	85-86
2.2.7.3	Ronstar™ SG (oxadiazon plus simazine).....	86
2.2.7.4	Oryzalin (Surflan® Flo).....	87
2.2.7.5	Trifluralin (Treflan®, Tridan®, Triflur 40).....	87
2.3	MATERIALS AND METHODS.....	88-94
2.3.1	Selection of Herbicides.....	88
2.3.2	Experimental Site.....	88-89
2.3.3	Soil Type and Land Preparation.....	89
2.3.4	Plant Material.....	89
2.3.5	Experimental Design.....	91
2.3.6	Herbicide Application.....	91
2.3.7	Plant Protection.....	93
2.3.8	Damage Assessments.....	93
2.3.9	Weed samples.....	93
2.3.10	Tuber Harvest and Resprouting.....	94
2.4	RESULTS.....	95-107
2.4.1	Weeds.....	95-103
2.4.1.1	Weeds in Plots.....	95

2.4.1.2 Weed Dry Weights.....	95-96
2.4.1.3 Weed Species Present	96,103
2.4.2 Herbicide Effects on Dahlia Tubers	103-107
2.4.2.1 Tuber Clump Fresh Weight	103
2.4.2.2 Tuber Number per Clump	104
2.4.2.3 Average Individual Tuber Weight.....	104
2.4.2.4 Re-sprouted Shoot Numbers per Clump.....	104
2.4.2.5 Tuber weight per Shoot	104
2.4.2.6 Shoot Number per Tuber	104
2.5 DISCUSSION	108-116
CHAPTER 3 GENERAL DISCUSSION AND CONCLUSION	117-121
BIBLIOGRAPHY.....	122-138
APPENDICES.....	139-152
Appendix 1 Climate Data	139-140
Appendix 1.1: Mean Monthly Temperatures	139
Appendix 1.2: Mean Monthly Rainfall.....	139
Appendix 1.3: Mean Monthly Sunshine.....	140
Appendix 1.4: Mean Monthly Wind Run.....	140
Appendix 2 Soil Test Results	141
Appendix 3 Plates of each clone used in the seed production experiment	142-146
Appendix 4 'Figaro' Series Cuttings.....	147
Appendix 5 Layout of Herbicide Site.....	148
Appendix 6 Herbicides in Ornamental Compositae Crops.....	149-151
Appendix 7 Phytotoxicity of Herbicides to Spring Flowering Bulbs	152

LIST OF TABLES

Table 1	New Zealand colour groups compared with overseas groupings.	11
Table 2	The influence of daylength on disc and ray florets in <i>Dahlia</i> ‘Finesse Anversoise’.....	16
Table 3	Seed Yield Components For <i>Dahlia</i> ‘Unwins Dwarf Mix’ and ‘Figaro White’.....	34
Table 4	Seed Yield Components For Individual Coloured Dahlias ‘Unwins Dwarf Mix’.....	35
Table 5	Plant Protection Spraying Programme (Seed Production 1995).	41
Table 6	Plant Protection Spraying Programme (Half-sib 1996).	48
Table 7	Seedhead Fertility.	56
Table 8	Seed Yield and Yield Components.....	59
Table 9	Seed Quality.....	62
Table 10	Percent Flower Colour and Doubleness in Half-Sib Lines.....	64
Table 11	Percentage of Population Colour Spread.....	65
Table 12	Summary of herbicides used on <i>Dahlia</i> plants published in the literature which are reported safe or cause only minor initial damage with subsequent plant recovery.....	82
Table 13	Description of the Herbicide Treatments.	92
Table 14	Weed Dry Weights (g/m^2) Amongst Herbicide Treatments in early July shortly before Tuber Lifting.....	101
Table 15	Weed Dry Weights Amongst Herbicide Treatments in early July shortly before Tuber Lifting.	102
Table 16	Herbicide Effects on Harvested <i>Dahlia</i> Tubers.....	105
Table 17	Mean monthly minimum and maximum air temperatures.....	139
Table 18	Mean monthly rainfall.	139
Table 19	Mean monthly sunshine.....	140
Table 20	Mean monthly wind run.	140
Table 21	Soil Test Results for the Two Experimental Sites.....	141
Table 22	‘Figaro’ Series Cuttings	147

Table 23 Summary of herbicides used on ornamental Compositae crops (except <i>Dahlia</i>) published in the literature which are reported safe or cause only minor initial damage with subsequent recovery.	149-151
Table 24 Phytotoxicity of Herbicides to Spring Flowering Bulbs.	152

LIST OF FIGURES

Fig. 1 Typical composite head cut vertically in half.....	7
Fig. 2 Disc and Ray Florets of the Sunflower.....	7
Fig. 3 Garden <i>Dahlia</i> garden forms.	10
Fig 4 Layout of Herbicide Site.	148

LIST OF PLATES

Plate 1 Clone 7055/3 in mid-April showing a larger disc size due to the influence of decreasing daylengths.	3
Plate 2 Highly double red on a plant produced from a seedling in herbicide trial.....	3
Plate 3 Baby pink of clone 7052/8.	3
Plate 4 Highly double yellow on a plant produced from a seedling in herbicide trial. .	3
Plate 5 Clone 7075/3.....	3
Plate 6 Clone 7052/11, since named 'Accolade'.	3
Plate 7 Looking across the herbicide trial - plants produced from seedlings.....	4
Plate 8 A general view of the clonal seed production site.....	4
Plate 9 Dr Keith Hammett and self at the 'Figaro Series' Clonal seed production site on 13/2/95.	39
Plate 10 Overhead irrigation using aluminium pipes in February 1995.....	39
Plate 11 Honeybee hive.	44
Plate 12 Honeybee working an inflorescence of clone 7075/3.	44
Plate 13 Bumblebee working an inflorescence of clone 7058/1.	44
Plate 14 Bumblebee hive supplied by Zonda Resources Ltd.	44

Plate 15 Clonal seed production site looking east during peak flowering mid-April 1997.....	51
Plate 16 Clonal seed production site looking west during peak flowering mid-April 1997.....	51
Plate 17 Clone 7058/1 which was susceptible to branch breakage.....	52
Plate 18 Clone 7058/2 was susceptible to lodging.....	52
Plate 19 Seed heads developing on clone 7073/1.....	53
Plate 20 Seed heads before closing.....	53
Plate 21 Seed head opening again.....	53
Plate 22 Botrytis infection on retained ray florets of clone 7052/11.....	53
Plate 23 Plant showing seed heads from green through to shattering.....	54
Plate 24 Plant showing still flowering inflorescences and maturing seed heads.....	54
Plate 25 Cut Dahlia seed and non-viable embryos.....	61
Plate 26 Examples of tetrazolium stained seeds judged to be non-viable.....	61
Plate 27 Examples of tetrazolium stained seeds judged to be viable.....	61
Plate 28 Herbicide Experimental Site looking approximately north-east 18 February 1995, 60 days after transplanting.....	90
Plate 29 Resprouted tubers in a PGU glasshouse at the end of the recording time....	90
Plate 30 Treatment 1 = hand-weeded, 17 April 1995.....	97
Plate 31 Treatment 2 = unweeded control, 17 April 1995.....	97
Plate 32 Treatment 3 = trifluralin, 17 April 1995.....	98
Plate 33 Treatment 4 = oxadiazon, 17 April 1995.....	98
Plate 34 Treatment 5 = oxadiazon + simazine, 17 April 1995.....	99
Plate 35 Treatment 6 = oxyfluorfen, 17 April 1995.....	99
Plate 36 Treatment 7 = oryzalin, 17 April 1995.....	100
Plate 37 Treatment 8 = oxyfluorfen plus oryzalin, 17 April 1995.....	100
Plate 38 Treatment 1 (hand-weeded) example of a cleaned tuber clump.....	106
Plate 39 Treatment 2 (unweeded control) example of a cleaned tuber clump.....	106
Plate 40 Treatment 3 (trifluralin) example of a cleaned tuber clump.....	106
Plate 41 Treatment 4 (oxadiazon) example of a cleaned tuber clump.....	106
Plate 42 Treatment 5 (oxadiazon + simazine) example of a cleaned tuber clump. ...	107
Plate 43 Treatment 6 (oxyfluorfen) example of a cleaned tuber clump.....	107

Plate 44 Treatment 7 (oryzalin) example of a cleaned tuber clump.	107
Plate 45 Treatment 8 (oxyfluorfen + oryzalin) example of a cleaned tuber clump. ...	107
Plate 46 Clone 7052/3.....	142
Plate 47 Clone 7052/6.....	142
Plate 48 Clone 7052/8.....	143
Plate 49 Clone 7052/11.....	143
Plate 50 Clone 7055/2.....	143
Plate 51 Clone 7055/3.....	144
Plate 52 Clone 7056/1.....	144
Plate 53 Clone 7058/1.....	144
Plate 54 Clone 7058/2.....	145
Plate 55 Clone 7072/2.....	145
Plate 56 Clone 7073/2.....	145
Plate 57 Clone 7073/3.....	146
Plate 58 Clone 7074/3.....	146
Plate 59 Clone 7075/3.....	146

CHAPTER ONE

1.1 INTRODUCTION

1.1.1 Botanical Background

The *Dahlia* is a member of the Compositae family, native to the mountains of Mexico and Central America, and consists of about 30 species of extremely diverse life forms. The common garden *Dahlia*, which has many forms, is a much cultivated hybrid, well known for its reliable, prolific, and extended flowering in a wide range of colours, sizes, and shapes.

The flower is actually a capitate inflorescence consisting of highly coloured ray florets ('petals') which are normally sterile, and disc florets (perfect or hermaphrodite flowers), although intermediate types do exist. Like many Compositae they are essentially self-sterile due to incompatibility mechanisms.

1.1.2 'F' Series Dahlias

In the 1950s and early 1960s, Royal Sluis Ltd, Netherlands started breeding bedding *Dahlias*, beginning with dwarf single and pompon types. The first cultivars introduced were in the 1970s with the 'Rigoletto' type, and ten years later, the 'Figaro' type was developed as an improvement (Veenstra, 1988).

Dr Keith Hammett a professional plant breeder in Auckland, New Zealand has been breeding and showing *Dahlias* for much of his life. Two of his most successful cultivars have been in the show class 'miniature decorative' up to 11.5cm (4.5in) in diameter category - 'Elizabeth Hammett' and 'Christine Hammett' which have won numerous national and international awards (Hammett, 1986a,b). In the mid-1980s, Dr Hammett began a breeding programme with Royal Sluis's Pink Figaro, which is widely regarded as being outstanding (Hobbs, 1990), together with six showpiece parents. The resultant 'F' or 'Figaro' series largely maintained a high quality double bloom on a shorter plant (up to 0.6m in height). This was mainly due to shorter internode length. A number of these, for example, 'Accolade' - a delightful white/ lilac decorative - have been selected for clonal propagation (Hooper, 1995). The 'F' series bloom shapes fall mainly into the ball, pompon, or decorative show classes (see Fig. 3).

1.1.3 Seed Production Investigations

In 1994, Dr Hammett approached the Massey University Seed Technology Centre expressing an interest in research being undertaken on the possibilities of *Dahlia* seed production. It was as a result of ensuing discussions that the work reported in this thesis was begun. Fourteen clones were used as the basis for an investigation into the seed production potential of this series, and each clone had seed yield and quality measurements detailed in the 1994-95 season. Measurements included: observations of insect visitation, seed head fertility, disc/ ray floret ratios, seed yields, germination, viability, sprouting damage, and speed and uniformity of glasshouse emergence.

Seed (half-sib lines) from ten of the 14 original clones was then grown out in the 1995-96 season to provide a measurement of the quality of plants which consumers would be growing, mainly in home gardens. The most important criteria are to maintain a high degree of inflorescence doubleness, and a good cross section of colours, as well as a dwarf and compact plant habit.

Partly as a result of this study and Han's (1996) further investigations, this series was trialled as a commercial seed line during the 1996-97 season.

Various examples of clones and seedlings are given on the next two pages as well as in Appendix 3.

Plate 1 - clone 7055/3 in mid-April showing a larger disc size due to the influence of decreasing daylengths.

Plate 2 - highly double red on a plant produced from a seedling in herbicide trial.

Plate 3 - baby pink of clone 7052/8.

Plate 4 - highly double yellow on a plant produced from a seedling in herbicide trial.

Plate 5 - clone 7075/3.

Plate 6 - clone 7052/11, since named 'Accolade'.

Plate 7 - looking across the herbicide trial - plants produced from seedlings.

Plate 8 - a general view of the clonal seed production site.

1.1.4 Herbicide Trials

As an adjunct to the seed production investigation a herbicide tolerance study was also conducted to determine whether a range of New Zealand available residual herbicides applied pre-emergence had any deleterious effects on tuber yield and subsequent resprouting ability. This work is reported in chapter two.



Plate 1



Plate 2



Plate 3



Plate 4



Plate 5



Plate 6



Plate 7: Seedling variation in the herbicide trial.



Plate 8: An over view of the clonal seed production site.