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FLOWER BLIGHT OF CHRYSANTHEMUMS : THE  
CAUSAL FUNGI AND THEIR CONTROL

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of the requirements for the degree  
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by

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PREFACE

The commercial chrysanthemum commonly grown in New Zealand is botanically identified as Chrysanthemum morifolium Ramat. and is believed to have originated in China. As the family name Compositae suggests the individual flower ('flower head') is a composite arrangement of two types of florets, namely ray florets with well developed petals, and disc florets with tubular or poorly developed petals.

Production of commercial chrysanthemums basically comprises three categories:

- (i) cut flowers;
- (ii) cuttings;
- (iii) container or pot plants.

Chrysanthemums are probably grown by more floriculturists than any other flower crop. Much of its popularity is attributed to the wide range of colours and forms and the fact that it can be grown either as a pot plant or for cut flowers. Another important characteristic of the chrysanthemum is the long keeping quality of the flowers, a feature which is much appreciated by retailers and consumers. In the United States of America the chrysanthemum or 'mum' is the most popular flower, surpassing both the rose and carnation in total wholesale value.

A survey of the area in New Zealand used for production of flowering, bulbous, and softwooded plants was undertaken by

the Department of Agriculture, covering the period from 1st September to 31st August 1967. The result of the survey as it applies to chrysanthemums is as follows:

(A) Outdoor plants

- (i) Area for cut flowers = 24.71 hectares
- (ii) Area for plant sale = 0.81 hectares

(B) Glasshouse plants

- (i) Area for cut flowers = 8702 m<sup>2</sup>
- (ii) Area for plant sale = 741 m<sup>2</sup>

According to this survey chrysanthemum is only surpassed by narcissus and gladiolus in importance as an outdoor plant, and second only to carnation as a glasshouse plant.

In New Zealand chrysanthemums flowering during June, July and August require protection from the weather and are generally grown under polythene or in glasshouses whereas during the remainder of the year they are grown outdoors. However, there is a trend to more all year-round growing under glass and this can be attributed to the response for chrysanthemums to environmental manipulation. Chrysanthemums are a 'short day plant' having a critical daylength requirement of  $13\frac{1}{2}$  hours for flower bud initiation and  $14\frac{1}{2}$  hours for flower development. Furthermore, the British early flowering varieties are temperature responsive in terms of flower initiation. Hence, by controlling temperature or daylength, year-round flowering under glass is now possible.

There are a number of diseases of chrysanthemums, some

of the most important being those of the flower itself. Overseas the fungi which have been reported as pathogenic to chrysanthemum flowers are species of Alternaria, Mycosphaerella, Botrytis, Itersonilia, Stemphylium, Helminthosporium, Fusarium, and Puccinia. In New Zealand only the first five genera have been recorded as pathogens of chrysanthemum flowers. The fact that several different fungi can cause flower blight and that each fungus produces symptoms almost identical to the others has made specific identification and control of flower blight rather difficult. Various workers have indicated losses can be minimized by the adoption of favourable cultural practices, use of fungicidal sprays and resistant cultivars. Protectant fungicides with a broad spectrum of activity, such as mancozeb, zineb, chlorothalonil, captafol, and captan appear most likely to give control of a disease caused by such a taxonomically diverse group of fungi.

In view of the fact that very little experimental work has been conducted in New Zealand on the flower blight fungal complex of chrysanthemums a study was undertaken with the following objectives:

- (1) To isolate and test pathogenicity of the fungi associated with flower blight.
  - (2) To study the morphological and cultural characteristics of the causal fungi relevant to their specific identification.
  - (3) To investigate the efficiency of certain available fungicides for disease control.
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# TABLE OF CONTENTS

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	Page
PREFACE	iii
SUMMARY	1
1. DETERMINATION OF THE FUNGI CAUSING FLOWER BLIGHT OF CHRYSANTHEMUMS	3
1.1 ISOLATION TO CULTURE MEDIA	3
1.1.1 Materials and Methods	4
1.1.2 Results and Discussion	5
1.1.3 Conclusion	11
1.2 PROOF OF PATHOGENICITY	11
1.2.1 Production of Inoculum	12
1.2.2 Host Inoculation	16
1.2.3 Symptom Production	18
1.2.4 Reisolation and General Conclusion	26
LITERATURE CITED	33
2. LABORATORY STUDIES ON THREE FUNGI CAUSING FLOWER BLIGHT	37
2.1 <u>PLEOSPORA</u> SP. (IMPERFECT STATE <u>STEMPHYLIUM</u> SP.)	37
2.1.1 Induction of Sporulation	41
2.1.2 Effect of Temperature on Conidial Morphology	50
2.1.3 Conidium ontogeny	54
2.1.4 Mycology	58
2.1.5 General Conclusion	63
2.2 <u>MYCOSPHAERELLA</u> <u>LIGULICOLA</u> (IMPERFECT STATE <u>ASCOCHYTA</u> <u>CHRYSANTHEMI</u> )	63
2.2.1 Effect of Media on Growth and Sporulation	64
2.2.2 Effect of Temperature on Sporulation and Pycnidiospore Morphology	74

2.2.3	Effect of Light on Sexual and Asexual Sporulation	76
2.2.4	Effect of Near-Ultraviolet Light on Pseudothecial Production	79
2.2.5	Mycology	80
2.2.6	General Conclusion	86
2.3	<u>ITERSONILIA PERPLEXANS</u>	87
2.3.1	Mycology	89
2.3.2	Observations on the Stages in the Development of a Clamp connection	96
2.3.3	General Conclusion	98
	LITERATURE CITED	99
3.	CONTROL OF THE FLOWER BLIGHT FUNGAL COMPLEX OF CHRYSANTHEMUMS	102
3.1	LABORATORY SCREENING OF FUNGICIDES AGAINST THE CHRYSANTHEMUM FLOWER BLIGHT FUNGI	103
3.1.1	Poison Food Technique	104
3.1.2	Agar Plate Spore Germination	108
3.2	FIELD TRIAL	134
	LITERATURE CITED	143
APPENDICES		
I	COMPOSITION AND PREPARATION OF CULTURE MEDIA	146
II	RAINFALL, HUMIDITY AND TEMPERATURE RECORDINGS FOR PALMERSTON NORTH, APRIL AND MAY 1972	151



# LIST OF TABLES

	Page
TABLE 1 Isolation of five fungi from chrysanthemum petals: the relative effectiveness of tissue treatment and addition of antibiotics to laboratory potato dextrose agar.	10
TABLE 2 The effect of inoculation method and near-ultraviolet radiation on Sporulation of <u>Stemphylium vesicarium</u> .	15
TABLE 3 Summary of flower diseases of florists' chrysanthemums and the associated fungi.	30 & 31
TABLE 4 Method of inoculation of five fungi causing flower blight of chrysanthemums.	32
TABLE 5 Reproductive features of <u>Stemphylium botryosum</u> and <u>Stemphylium vesicarium</u> .	39 & 40
TABLE 6 Effect of different light regimes on sexual ( <u>Pleospora</u> sp.) and asexual ( <u>Stemphylium</u> sp.) sporulation in PDA <sub>0</sub> cultures, after 13 days.	43
TABLE 7 Effect of duration of near-ultraviolet light on sexual ( <u>Pleospora</u> sp.) and asexual ( <u>Stemphylium</u> sp.) sporulation in PDA <sub>0</sub> cultures, after 11 days.	45
TABLE 8 Influence of incubation temperature on the production of ascospores by <u>Pleospora</u> sp.	49
TABLE 9 The effect of incubation temperature on conidial morphology of <u>Stemphylium</u> sp. (isolate S <sub>3</sub> ) from diseased chrysanthemum flowers.	52
TABLE 10a Effect of media type on the growth and cultural characteristics of <u>Mycosphaerella ligulicola</u> isolate M <sub>1</sub> at 25 C.	70
TABLE 10b Effect of media type on the growth and cultural characteristics of <u>Mycosphaerella ligulicola</u> isolate M <sub>2</sub> at 25 C.	71
TABLE 10c Effect of media type on the growth and cultural characteristics of <u>Mycosphaerella ligulicola</u> isolate M <sub>3</sub> at 25 C.	72
TABLE 11 Effect of incubation temperature on pycnidial production by <u>Mycosphaerella ligulicola</u> on V-8 juice agar after 21 days.	76

TABLE 12	Pycnidial production by <u>Mycosphaerella ligulicola</u> on 20% V-8 juice agar after 12 days incubation under different light regimes.	78
TABLE 13	Effect of duration of near-ultraviolet light on pseudothecial production by <u>Mycosphaerella ligulicola</u> on V-8 juice agar.	80
TABLE 14	Characteristics of pycnidia and pseudothecia of <u>Mycosphaerella ligulicola</u> on culture media.	86
TABLE 15	Fungicides tested by the poison food technique against five fungi causing chrysanthemum flower blight.	109 & 110
TABLE 16	Grouping according to ED <sub>50</sub> values of fifteen fungicides, based on effectiveness against five fungi causing flower blight of chrysanthemums.	111 & 112
TABLE 17	Total rating of fifteen fungicides for effectiveness against five fungi causing flower blight of chrysanthemums based on ED <sub>50</sub> group score.	113
TABLE 18	Fungicides which were totally fungicidal or fungistatic at 1, 10, 50 or 100 µg/ml active ingredient against five fungi causing flower blight of chrysanthemums.	114
TABLE 19	Effect of four fungicides on germination of the conidia of four fungi causing flower blight of chrysanthemums.	133
TABLE 20	Fungicides tested in the field for control of flower blight of chrysanthemums.	139
TABLE 21	Performance of seventeen fungicide treatments for control of chrysanthemum flower blight.	140
TABLE 22	Chrysanthemum flower blight fungi present in fungicide treatments and control.	141
TABLE 23	Fungi isolated from diseased chrysanthemum flowers in the unsprayed plots (controls).	142

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# LIST OF FIGURES

	Page
FIGURE 1-4 Culture plates of PDA <sub>L</sub> showing colonies of fungi and bacteria originating from diseased tissue pieces taken from chrysanthemum ray florets.	7 & 8
FIGURE 5 Spore drop (spore suspension) inoculation method.	19
FIGURE 6 Chrysanthemum flower showing petal flecking (field infection).	21
FIGURE 7 Individual ray florets showing petal flecking (taken from flower in Figure 6).	21
FIGURE 8 Chrysanthemum bud 'showing colour' with petal flecking.	22
FIGURE 9 Chrysanthemum flower buds infected with <u>Mycosphaerella ligulicola</u> .	23
FIGURE 10 One-sided necrosis of a chrysanthemum flower caused by <u>Mycosphaerella ligulicola</u> (field infection).	24
FIGURE 11 Distortion of chrysanthemum flower caused by <u>Mycosphaerella ligulicola</u> (field infection).	24
FIGURE 12 Pycnidia of <u>Mycosphaerella ligulicola</u> on a ray floret of chrysanthemum.	25
FIGURE 13 Pseudothecia of <u>Mycosphaerella ligulicola</u> on a stem of chrysanthemum.	25
FIGURE 14 Pseudothecia of <u>Mycosphaerella ligulicola</u> on a ray floret of chrysanthemum	25
FIGURE 15 Flecking on chrysanthemum ray florets artificially inoculated with <u>Itersonilia perplexans</u> .	27
FIGURE 16 Ray floret scorch of chrysanthemum flower inoculated with <u>Itersonilia perplexans</u> .	27
FIGURE 17 Symptoms on chrysanthemum ray florets caused by <u>Pleospora</u> sp. ( <u>Stemphylium vesicarium</u> ) (artificially inoculated).	28
FIGURE 18 Flecking and tip necrosis on chrysanthemum ray florets artificially inoculated with <u>Alternaria alternata</u> .	28

FIGURE 19	Production of pseudothecia by <u>Pleospora</u> sp. ( <u>Stemphylium vesicarium</u> ) on PDA <sub>L</sub> following different exposures to near-ultraviolet light.	46
FIGURE 20	Effect of incubation temperature on conidial morphology of <u>Pleospora</u> sp. ( <u>Stemphylium vesicarium</u> ).	51
FIGURE 21	Technique for preparation of slide cultures.	55
FIGURE 22	Conidium ontogeny of <u>Pleospora</u> sp. ( <u>Stemphylium vesicarium</u> ).	57
FIGURE 23	Production of a secondary conidium by <u>Pleospora</u> sp. ( <u>Stemphylium vesicarium</u> ) on PDA <sub>L</sub> .	59
FIGURE 24	Conidia of <u>Pleospora</u> sp. ( <u>Stemphylium vesicarium</u> ) produced on V-8 juice agar cultures incubated for 11 days in the dark at 26 C. <u>Insert.</u> Enlargement of a conidium showing 3 distinct transverse septal constrictions.	59
FIGURE 25	Protopseudothecia of <u>Pleospora</u> sp. ( <u>Stemphylium vesicarium</u> ) produced on PDA <sub>L</sub> cultures incubated for 14 days under near-ultraviolet light.	61
FIGURE 26	Asci and ascospores of <u>Pleospora</u> sp. ( <u>Stemphylium vesicarium</u> ) produced on PDA <sub>L</sub> cultures incubated for 10 weeks in the dark at 12 C.	61
FIGURE 27	Bitunicate ascus containing ascospores of <u>Pleospora</u> sp. ( <u>Stemphylium vesicarium</u> ). Produced on PDA <sub>L</sub> cultures incubated for 10 weeks in the dark at 12 C.	62
FIGURE 28	The effect of media on the growth of <u>Mycosphaerella ligulicola</u> after 7 days incubation at 24 C.	66
FIGURE 29	The effect of media type on the growth rate of <u>Mycosphaerella ligulicola</u> at 25 C.	67
FIGURE 30	Growth rate of <u>Mycosphaerella ligulicola</u> on laboratory potato dextrose agar at 25 C.	68
FIGURE 31	Colony of <u>Mycosphaerella ligulicola</u> on PDA <sub>L</sub> after 12 days incubation in the dark at 24°C.	83
FIGURE 32	Pycnidiospores of <u>Mycosphaerella ligulicola</u> in Shears mounting fluid (ex naturally infected chrysanthemum flower).	84

FIGURE 33	Pycnidiospores of <u>Mycosphaerella ligulicola</u> in lactophenol acid fuchsin (ex PDA <sub>L</sub> cultures after 21 days incubation in the dark at 25 C). Note the illusion of a septum in each pycnidiospore.	84
FIGURE 34	Asci and ascospores of <u>Mycosphaerella ligulicola</u> on 20% V-8 juice agar.	85
FIGURE 35	Asci and ascospores of <u>Mycosphaerella ligulicola</u> from pseudothecia on chrysanthemum stem.	85
FIGURE 36	Culture of <u>Itersonilia perplexans</u> on PDA <sub>L</sub> after 21 days at 24 C.	90
FIGURE 37	Clamp connection of <u>Itersonilia perplexans</u> .	92
FIGURE 38	Sporogenous cell of <u>Itersonilia perplexans</u> on PDA <sub>L</sub> culture.	92
FIGURE 39	Ballistospores of <u>Itersonilia perplexans</u> produced on PDA <sub>L</sub> after 10 days incubation at 20 C.	93
FIGURE 40	The production and liberation of a ballistospore of <u>Itersonilia perplexans</u> .	94
FIGURE 41(a)	Production of a secondary ballistospore by <u>Itersonilia perplexans</u> on PDA <sub>L</sub> .	95
FIGURE 41(b)	Germination of secondary ballistospore while still attached to the primary ballistospore.	95
FIGURE 42	Conidia of <u>Itersonilia perplexans</u> from 7 day old potato yeast marmite culture.	95
FIGURE 43	Stages in the formation of a clamp connection by <u>Itersonilia perplexans</u> .	97
FIGURE 44	Effect of different concentrations of captafol incorporated in PDA <sub>L</sub> on the radial growth of <u>Alternaria alternata</u> .	115
FIGURE 45	Effect of benomyl, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums.	116
FIGURE 46	Effect of captafol, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums.	117

FIGURE 47	Effect of chlorothalonil, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums.	118
FIGURE 48	Effect of captan, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums.	119
FIGURE 49	Effect of zineb, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums.	120
FIGURE 50	Effect of mancozeb, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums.	121
FIGURE 51	Effect of dicloran, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums.	122
FIGURE 52	Effect of fuberidazole, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums.	123
FIGURE 53	Effect of thiabendazole, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums.	124
FIGURE 54	Effect of carboxin, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums.	125
FIGURE 55	Effect of oxycarboxin, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums.	126
FIGURE 56	Effect of thiram, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums.	127
FIGURE 57	Effect of bavistin, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums.	128

- FIGURE 58    Effect of thiophanate-methyl, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums. 129
- FIGURE 59    Effect of chloroneb, incorporated in laboratory potato dextrose agar, on the radial growth of five fungi causing flower blight of chrysanthemums. 130
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## SUMMARY

Five fungi, namely Alternaria alternata, Botrytis cinerea, Mycosphaerella ligulicola, Itersonilia perplexans, and Pleospora sp. (imperfect state Stemphylium vesicarium) were found to cause flower blight of chrysanthemums in the Manawatu district. This is the first record of a Pleospora sp. with a S. vesicarium imperfect state being associated with chrysanthemum flower blight. It is also the first report of pseudothecia of M. ligulicola occurring in New Zealand. The symptoms induced by all five fungi were very similar making specific identification on this basis difficult. Surface treatment of infected tissue pieces with 'Janola' 1:7 for 1 min followed by plating to antibiotic agar was the most satisfactory method of isolating the fungi and this in turn facilitated identification.

Both the sexual and asexual sporulation of Pleospora sp. on culture media was increased by light, although some sporulation did occur in the dark. In the laboratory protopseudothecia matured when exposed to constant low temperatures (8 - 16 C) for approximately 10 weeks, depending on the isolate and the temperature. Incubation temperature also had a considerable influence on conidial morphology, with the length/width ratio increasing as temperature was increased.

Pycnidiospores of M. ligulicola produced in culture were predominantly aseptate whereas the majority from the host were uniseptate. The percentage septate pycnidiospores produced in culture were not significantly affected by growth medium, light or



incubation temperature (20-32 C). Near-ultraviolet light was essential for the production of pseudothecia in the laboratory and 3 days was the minimum exposure required for their induction on 20% V-8 juice agar.

Captafol, chloroneb, mancozeb, thiram and carboxin were the most effective of fifteen fungicides tested against the five fungi by the laboratory poison food technique. Using the spore germination technique chlorothalonil appeared very promising. This was confirmed in a trial on chrysanthemums grown in field plots where chlorothalonil was outstanding against all five fungi in the complex, with mancozeb, captafol, and zineb also giving good control.

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