FLOWER BLIGHT OF CHRYSANTHEMUMS : THE CAUSAL FUNGI AND THEIR CONTROL

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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 floriculturalists 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^2

(ii) Area for plant sale = 741 m^2

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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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.