

QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES
DIVISION OF PLANT INDUSTRY BULLETIN No. 666

**FUNGICIDAL CONTROL OF BLACK SPOT (COLLETO-
TRICHUM ACUTATUM) AND GREY MOULD
(BOTRYTIS CINEREA) ON STRAWBERRY FRUIT
IN SOUTH-EASTERN QUEENSLAND**

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SUMMARY

In a strawberry fruit rot control trial, dichlofluanid satisfactorily controlled both black spot (*Colletotrichum acutatum*) and grey mould (*Botrytis cinerea*). Black spot was also effectively controlled by captafol, captan, mezineb and "Daconil 2787", while benomyl and methyl topsin controlled grey mould. Infections of black spot apparently latent in nature were not controlled by any of the fungicides tested. "Daconil 2787" and dichloran were phytotoxic.

I. INTRODUCTION

In south-eastern Queensland, strawberries are harvested from May to November. Severe fruit losses are caused by black spot (*Colletotrichum acutatum* Simmonds) and grey mould (*Botrytis cinerea* Pers. ex Fr.). Black spot is favoured by relatively warm conditions (Sturgess 1957) and commonly occurs early in the season and from August till the end of picking. In 1960, Winks and Oxenham reported that captan gave satisfactory control of black spot. Grey mould is favoured by cool, moist conditions which commonly occur in south-eastern Queensland from June to September. Although Winks and Oxenham (1960) showed that captan also gave good control of grey mould, it has been found only partially effective during conditions very favourable for disease development.

Recent experimental work in other strawberry-growing countries has demonstrated that some of the newer fungicides are better than captan for the control of grey mould (Freeman and Pepin 1967; Paulus *et al.* 1969; Maas 1970).

In 1971 a field trial was conducted to evaluate a number of fungicides for the control of both black spot and grey mould under Queensland conditions.

II. MATERIALS AND METHODS

The field trial was conducted on a commercial strawberry farm at Nambour in south-eastern Queensland. Severe losses of fruit from both black spot and grey mould had occurred on this farm in previous seasons. Runners of the

strawberry cultivar Redlands Crimson were taken on March 13 from a 12-month-old ratoon area and planted in single rows on elevated beds. A randomized block design was used with four replications of nine treatments, with plots consisting of 12 plants in 4.6 m of bed. The beds were mulched with black polythene 3 weeks after planting.

The following fungicides were tested: 80% captan (N-(trichloromethylthio) cyclohex-4-ene-1,2-dicarboximide) as "Captan A"; 70% mezinzeb (zinc propylene-bisdithio-carbamate) as "Antracol"; 80% captafol (N-(1,1,2,2-tetrachloroethylthio) cyclohex-4-ene-1,2-dicarboximide) as "Difolatan"; 50% dichloran (2, 6-dichloro-4-nitroaniline) as "Allisan"; 50% dichlofluanid (NN-dimethyl-N'-phenyl-N'-(flurodichloromethylthio) sulphamide) as "Euparen"; 75% tetracholoisophthalonitrile as "Daconil 2787"; 50% benomyl (methyl 1-(butylcarbamoil)-2-benzimidazolecarbamate) as "Benlate"; and 70% thiophenate methyl (1,2 bis(3-methoxycarbonyl-2-thioureido) benzene) as "Topsin M".

Sprays were applied at 7-day intervals with a knapsack sprayer at approximately 1 350l/ha. Spraying commenced on May 24 (4-5 weeks after first flowering) and continued until November 19. Harvesting commenced on May 31 and continued at weekly intervals until November 26. At each harvest the numbers of fruit infected with black spot and grey mould were recorded.

III. RESULTS AND DISCUSSION

Weather conditions favoured the development of both black spot and grey mould. The incidence of black spot was high during June and from early August to the end of harvesting. Grey mould rot was severe from mid July to the end of September.

Results are shown in Table 1. Captafol, captan, dichlofluanid, mezinzeb and Daconil 2787 gave satisfactory control of black spot. Benomyl and thiophenate methyl gave outstanding control of grey mould but failed to control black spot. Dichlofluanid provided good control of grey mould, while captan, captafol and Daconil 2787 were reasonably effective. Daconil 2787 was slightly phytotoxic, causing a dark discoloration of the older foliage particularly during the warmer weather towards the end of the season. Dichloran was also phytotoxic, causing a hardening and bronzing of green fruit and a surface cracking of ripe fruit.

A number of fungicides were shown to give satisfactory control of black spot, but at the commencement of the season four weekly sprays were required before this control was obtained. Production during this period was, however, a relatively small proportion of the total yield. The poor control during this early period may well indicate that these chemicals cannot control latent infections of *C. acutatum*. Sturgess (1957) showed by artificial inoculations that *C. acutatum* could infect and apparently form latent infections in fully developed green strawberry fruit. The author (unpublished data) using a similar technique demonstrated that infections could occur in immature fruit at any time after petal fall and remain dormant until the fruit ripened. The period from petal fall to fruit maturity for Redlands Crimson is 3-6 weeks, depending on seasonal conditions. In this trial the first treatments were not applied until the early-set fruit were ripe. Infection of the diseased fruit recorded in the first 4 weeks could, therefore, have occurred before the fungicides were applied.

TABLE 1

EFFECT OF A NUMBER OF FUNGICIDES ON THE INCIDENCE OF BLACK SPOT AND GREY MOULD OF STRAWBERRIES

Treatment	Rate g a.i./l.	Disease Incidences*				
		Black Spot		Grey Mould		
		Trans. Mean†	Equiv. Mean‡	Trans. Mean	Equiv. Mean	
1. Captafol	1.2	1.952	3.31	4.323	18.19	
2. Captan	1.6	2.367	5.10	5.454	29.25	
3. Dichlofluanid	1.0	2.913	7.99	1.666	2.28	
4. Mezinéb	1.4	3.811	14.02	12.237	149.24	
5. Daconil 2787	1.3	4.126	16.52	3.260	10.13	
6. Dichloran	0.75	9.717	93.92	10.339	106.39	
7. Benomyl	0.5	13.776	189.28	1.274	1.12	
8. Thiophenate methyl	1.4	14.808	218.78	1.563	1.94	
9. Unsprayed .. ..	..	11.629	134.73	16.370	267.48
Standard error .. ..	..	1.020	..	0.626	..
Necessary differences for significance	$\left\{ \begin{array}{l} 5\% \\ 1\% \end{array} \right.$..	2.978	..	1.826	..
		..	4.036	..	2.475	..
Significant differences .. ..	..	9, 8, 7, 6 \geq 5, 4, 3, 2, 1, 8, 7 \geq 6 8 > 9		9, 6, 4, 2, 1, \geq 8, 7, 3 9, 6, 4 \geq 5, 2, 1,; 9 \geq 6, 4 4 > 6; 2 > 5; 5 > 7	

* Disease incidences are the total number of diseased fruit harvested during the season.

† $\sqrt{(x + \frac{1}{2})}$ transformation used in analysis.

‡ Equivalent means are in original units.

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(Received for publication June 13, 1973)

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