PEACH BROWN ROT INVESTIGATIONS IN QUEENSLAND

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SUMMARY

Blossom blighting is of no practical importance in Queensland. Most fruit infections appear to occur during a period of about a month before harvest.

Control of brown rot in dessert peaches was obtained with three sprays of captan at intervals of two weeks, the last being immediately before harvest.

I. INTRODUCTION

Brown rot (*Sclerotinia fructicola* (Wint.) Rehm) is, in seasons favourable to it, the most destructive disease of stone fruits in Queensland. Over the past decade a number of experiments have been carried out with a view to minimizing losses, and more recently the period during which infection takes place in Queensland has also been investigated. The present paper summarizes the results of this work.

Considerable variability in experiments with brown rot has been reported by Angell (1950) and Pont (1950) and is to be found in the work reported here. Pont in an unpublished report of the Queensland Department of Agriculture and Stock (1950) suggested that latent infection might account for some of the variable results obtained in field experiments. Wade (1951) also considered some latent infection to be involved and later (Wade 1956) developed this hypothesis further.

Jerome (1958) showed that peaches can carry large numbers of viable conidia on the surface and postulated latent contamination rather than latent infection.

II. MATERIALS AND METHODS

(a) Spraying Experiments

Blocks of peach trees were used, randomized as single-tree plots. At harvest time, fruit samples, normally of 25 fruit per tree, were collected and stored at room temperature for some days. During this period diseased fruit were counted and removed.

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The materials used were: lime sulphur (20·0% w/v sulphur as polysulphides); thiram (80% w/w, used at 0·12% active ingredient); ziram (80% w/w, used at 0·12% active ingredient); captan (50% w/w, used at 0·1% active ingredient); "zinc omadine" (50% w/w of the zinc salt of pyridinethione 1 oxide, used at 0·1% active ingredient).

(b) Bagging Experiments

A series of trials aimed at determining the infection periods and their relative importance was commenced in 1954 and has continued to date.

Fruit were enclosed in individual bags of 0·0015 in. clear polythene ("Visqueen") held closed by rubber bands. When field inoculations were carried out, similar sleeves, open at both ends, were used and closed by rubber bands. Inoculations were made with a "Rega" Junior hand pneumatic spray using a water suspension of conidia from fresh sporing cultures.

These experiments fall into two groups, those without artificial inoculation and those with it.

Without artificial inoculation, the fruits were bagged in the field before probable infection times (empirically determined) and left until harvest. Then, still in their individual bags, they were harvested and stored at room temperature for a few days before being examined for brown rot.

Artifically inoculated fruit were inoculated at periods considered to be important for natural infection. Thereafter they were, in their individual sleeves, treated similarly to the uninoculated bagged fruit.

In all instances a final sample of 100 was sought and so a substantial allowance was made initially for storm and other losses. Nevertheless, high winds and other causes commonly removed most bags and sleeves applied early in the season.

III. EXPERIMENTAL RESULTS

(a) Spraying Experiments

When work in Queensland was reported by Pont (1950), the only suitable fungicides available were based on sulphur, and lime sulphur had been recommended for some time. Experimental work at that time was aimed at establishing spray concentrations and length of spraying period. A typical schedule at this time involved spray applications at fortnightly intervals for two to three months.

Other fungicides have since become available and it was found in 1952-53 that thiram was superior to ziram and to lime-sulphur (McKnight, unpublished report, Queensland Department of Agriculture and Stock, 1953). In the following season, captan proved significantly superior to both thiram and ziram.

One outcome of this work was the apparent value of a preharvest spray. In 1954-55 captan and thiram with and without a preharvest spray were included in a 13 x 3 randomized trial in a block of Golden Queen peaches. The preharvest spray was applied approximately 24 hr before harvest on February 26, 1955 and 11 days after the previous application, which was the end of either a 3-spray or a 6-spray schedule. The data relative to the preharvest spray are given in Table 1. Subsequent work has supported this result and the preharvest spray is now a standard recommendation in Queensland.

TABLE 1

EFFECT OF PREHARVEST SPRAY ON BROWN ROT DEVELOPMENT. GOLDEN QUEEN PEACHES, 1954–55

Treatment	Percentage of Brown Rot	
	Mean	Equiv.
Captan with preharvest spray	16·4	8·0
Captan without preharvest spray	21·3	13·2
Thiram with preharvest spray	17·3	8·8
Thiram without preharvest spray	34·0	31·2
Untreated	43·0	46·5
Necessary difference for significance (5%)	17·9	

In view of the constant trend of evidence that most infection in Queensland occurs during the ripening of the fruit, work in the later years has been directed to checking whether spraying with captan during the ripening period of about one month would give satisfactory control. Results of two of these trials are shown in Tables 2 and 3. In each case the last spray was applied a day before harvest. Under this condition no worthwhile advantage was obtained by spraying once a week instead of once every two weeks.

TABLE 2

EFFECT OF LATE SPRAYING ON BROWN ROT DEVELOPMENT. GOLDEN QUEEN PEACHES, 1958–59

Treatment	Percentage of Brown Rot	
	Mean	Equiv.
5 captan sprays, weekly	21·8	13·8
3 captan sprays, fortnightly	28·5	22·8
Untreated	60·3	75·5
Necessary differences for significance { 5%	17·9	
1%	24·8	

TABLE 3

EFFECT OF LATE SPRAYING ON BROWN ROT DEVELOPMENT. WIGGINS PEACHES, 1959–60

Treatment	Percentage of Brown Rot	
	Mean	Equiv.
5 captan sprays, weekly	29·1	23·6
3 captan sprays, fortnightly	22·5	14·6
2 Zn omadine sprays, fortnightly	25·5	18·6
Untreated	52·4	62·7
Necessary differences for significance 5%	19·2	
Necessary differences for significance 1%	26·2	

In 1959-60 the effect of dipping fruit in a fungicide prior to packing was tried. Captan and "Mycostatin" gave similar results, which were comparable with field spraying. Suitable equipment for dipping is not, however, at present found in Stanthorpe orchards.

(b) Bagging Experiments

Without Artificial Inoculation.—Table 4 shows the incidence of brown rot developing after harvest on fruit bagged in 1956-57. The differences are not statistically significant but there is some evidence of the similar trend noticed in spraying experiments of most infection occurring during ripening of the fruit.

TABLE 4

DEVELOPMENT OF BROWN ROT IN BAGGED UNINOCULATED WIGGINS PEACHES, 1956–57

Time Fruit Bagged	No. of Fruit	Percentage of Brown Rot
Flowering	29	13·3
End of fruit set	122	14·7
Start of ripening	107	29·9
Harvest	100	57·0

With Artificial Inoculation.—Table 5 shows the percentage of brown rot developing after harvest on fruit inoculated in 1956-57 and 1957-58 on two blocks of peaches, one of the variety Wiggins and the other of Golden Queen. As it is necessary to delay bagging flowers until fertilization has occurred, the "flowering" and "fruit set" times were combined in later years and the inoculation carried out at approximately petal fall. Results for 1958-59 and 1959-60 are given in Table 6.

TABLE 5

DEVELOPMENT OF BROWN ROT IN INOCULATED PEACHES

Time of Inoculation	1956–57				1957–58			
	Wiggins		Golden Queen		Wiggins		Golden Queen	
	No. of Fruit	Brown Rot (%)	No. of Fruit	Brown Rot (%)	No. of Fruit	Brown Rot (%)	No. of Fruit	Brown Rot (%)
Flowering	40	5·0	1	0	6	0	0	0
End of fruit set ..	62	0·0	36	11·1	30	13·3	65	3
Start of ripening ..	70	45·7	73	17·8	74	2·7	80	31·7
Harvest	73	86·3	75	82·7	47	59·6	77	85·7

TABLE 6

DEVELOPMENT OF BROWN ROT IN INOCULATED PEACHES

Time of Inoculation	1958–59				1959–60			
	Wiggins		Golden Queen		Wiggins		Golden Queen	
	No. of Fruit	Brown Rot (%)	No. of Fruit	Brown Rot (%)	No. of Fruit	Brown Rot (%)	No. of Fruit	Brown Rot (%)
Fruit set	66	0	10	20	17	59	7	14
Start of ripening ..	52	6	80	1	106	63	118	28
Harvest	28	71	38	79	100	100	100	98

These trials met with many vicissitudes and in no one year were the figures suitable for analysis. However, every year there has been the definite trend indicating most infection during the ripening period.

IV. GENERAL OBSERVATIONS

During the period 1951-1960 several detailed searches were carried out for apothecia of *S. fructicola.* None has been found. *S. fructicola* has, however, been obtained readily from surface washings off mummified peach fruit during the winter. Apothecia appear to be of little, if any, importance in the perpetuation of the disease in Queensland.

Blossom blighting has been seen once only (1954-55) in this decade and then it was of little importance. It would seem that this source of infection can safely be left out of consideration in Queensland control recommendations.

McKnight (unpublished report, Queensland Department of Agriculture and Stock, 1953) sampled leaves from a block of peach trees in which variations in incidence of brown rot were observed. Leaf analyses for potassium

were made in the Department's Chemical Laboratory. The results ranged from 51·5 to 77·9 m-equiv. per cent. (composite sample 62·1) for low brown rot and from 60·4 to 73·5 (composite sample 70·0) for high brown rot incidence. The differences were not significant.

V. DISCUSSION

Virtually the entire Queensland production of stone fruit is sold for table consumption. Most is sold in Brisbane and nearly all of the remainder in other east coast towns. There, in summer, the climate is normally warm and humid. Under such conditions brown rot can quickly cause serious loss in consignments. (Optimum temperature for growth of *S. fructicola* is 24°-26°C (Pont, unpublished report, Queensland Department of Agriculture and Stock, 1950)). It is therefore necessary that control measures continue to act during transport and marketing and also in the consumer's home. As the fungus spores profusely and the ripe fruit are so susceptible, it is necessary to market the fruit with a prophylactic coating of fungicide. Any such material, to be suitable, must leave no objectionable visible residue and must not be a health hazard.

Captan has given the best fungicidal control of the materials tried. Its effect has been consistent for several years. It satisfies the other requirements. A preharvest spray ensuring a fungicidal cover on the harvested fruit has given improved control on fruit that are stored for several days at summer temperatures.

To sum up—the most satisfactory commercial control under Queensland conditions has been obtained from captan used in the month before harvest, with the last spray a day before picking. Control measures against blossom blighting are not warranted.

No definite proof for or against a latent infection hypothesis has emerged but most of the results here reported show a constant trend indicating that most infection in Queensland occurs late in the life of the fruit, possibly during ripening.

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