EFFECT OF FUNGICIDE FIELD SPRAYS ON POSTHARVEST FRUIT ROT OF RASPBERRIES

Jack A. Freeman[2]

Abstract

Sixty-four to 93% rot developed in raspberries 40 to 60 hours after harvest, even though the incidence of fruit rot in the field was 1% or less. Field sprays of captan 1½ lb/acre were most effective in increasing the holding quality of the fruit. DAC 2787 used at the same dosage was considerably less effective, while sprays of dichloran 1 lb/acre were ineffective. Neither marketable yield nor fruit size was affected by treatment. The results suggest that even in a season of low rot incidence a minimum of at least 2 sprays of captan should be applied: first, when blossoms open, and again 10 days later. In a wet year a more extensive schedule may be justified.

Introduction

In raspberry plantings in coastal British Columbia, Botrytis cinerea Pers. frequently causes loss of fruit by rotting and reduces quality by general softening and discoloration of the druplets. Once raspberries are picked they are extremely perishable because of the rapid development of postharvest rots. Jarvis (2) reported that mycelium infecting floral parts may subsequently invade the proximal end of both strawberry and raspberry receptacles. This mycelium may remain quiescent until the fruit ripens; consequently infected fruit may escape notice during picking and marketing. In the field, Botrytis is not as prevalent on raspberries as it is on strawberries. This, apparently, is because the fruits of raspberries are borne singly or in small open clusters and not close to or on the ground. Thus, growers are often reluctant, especially in dry seasons, to apply fungicide sprays to raspberries. The author, in a previous study with strawberries (1), found that a spray schedule consisting of four sprays of captan, folpet or thiram at approximately 10-day intervals beginning at first bloom gave effective control of fruit rot in the field. The holding quality of the fruit was improved by the field sprays. There has been no local investigation on the control of this fungus in raspberries. Thus, an experiment was conducted in 1965 to obtain information on the effectiveness of various spray schedules with captan, DAC 2787 and dichloran for the control of field and postharvest fruit rot of raspberries.

Methods

A mature commercial 7-year-old planting of 'Puyallup' raspberries located on a Lynden silt loam at Abbotsford, British Columbia, was used in this trial. The experiment was laid out in a randomized block design with six replications. Each plot consisted of a single 25-foot row. Because the 1965 season was unusually dry, the planting was sprinkler-irrigated on July 12 and July 27. The treatments and spray schedules were applied as outlined in Table 1.

Control of preharvest infection was determined by weighing all infected berries from each plot at each picking. The crop was picked 9 times between July 12 and August 10. In addition to weighing the infected fruit, the weights of marketable and cull fruit were also recorded. The size index of sound berries from each plot was determined at each picking. The effect of treatment on postharvest fruit rot was determined from a random sample of at least two pounds of sound berries picked on July 15, 23, 29, and August 5 from each plot in each replicate. The berries were transported in shipping crates to Agassiz, 40 miles distant, and were placed in common storage. The percentage of sound berries was determined 40 and 60 hours after harvest.

Results and discussion

The incidence of fruit rot in the field was 1% or less, apparently due to the unusually dry season. Neither marketable yield nor fruit size was affected by treatment. The data on fruit size was not in accord with the recent findings with strawberries. The author (1), working with 'Siletz' strawberries, found that the trend was for fruit to be larger from plots treated with captan, folpet or thiram. Powell (3) reported that strawberry plants had benefited nutritionally from captan and that fruit size was increased.

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[1] Small Fruits Research, Canada Department of Agriculture, Experimental Farm, Agassiz, B. C.

Table 1. Fungicides and field spray schedules tested for control of raspberry fruit rot - 1965

Treatment lb a.i./acre (in 100 gal water)	When applied	Dates of application
Captan 1½	Before flower buds opened through picking (8 sprays)	May 28; June 7, 14, 22, 30; July 12, 22, 29.
Captan 1½	When blossoms opened through picking (7 sprays)	June 7, 14, 22, 30; July 12, 22, 29.
Captan 1½	Before flower buds opened to picking (6 sprays)	May 28; June 7, 14, 22, 30; July 12.
Captan 1½	When blossoms opened to picking (5 sprays)	June 7, 14, 22, 30; July 12.
Dichloran* 1½ t captan 1½	When blossoms opened to picking (5 sprays)	June 7, 14, 22, 30; July 12.
Captan 1½	Before flower buds opened, repeated when blossoms opened and again 10 days later (3 sprays)	May 28; June 7, 17,
Captan 1½	When blossoms opened and repeated once 10 days later (2 sprays)	June 7, 17.
DAC 2787** 1½	When blossoms opened to picking (5 sprays)	June 8, 14, 22, 30; July 12.
DAC 2787 1½	Before flower buds opened, repeated when blossoms opened and again 10 days later (3 sprays)	May 28; June 8, 17.
DAC 2787 1½	When blossoms opened and repeated once 0 days later (2 sprays)	June 9, 17
Dichloran ½ t captan ¾	When blossoms opened and repeated once 0 days later (2 sprays)	June 7, 17.
Dichloran 1	When blossoms opened to picking (5 sprays)	June 7, 14, 22, 30; July 12.
Dichloran 1	Before flower buds opened repeated when blossoms opened and again 10 days later (3 sprays)	May 28; June 7, 17.
Dichloran 1	When blossoms opened repeated once 10 days later (2 sprays)	June 7, 17.
Unsprayed control.		

* Dichloran (Botran) = 2,6-dichloro-4-nitroanile.

** DAC 2787 = tetrachloroisophthalonit rile

Table 2. Effect of field fungicide treatments on the holding quality of raspberries 40 and 60 hours after harvest - 1965

Treatment lb a.i./A with times sprayed	Percent sound fruit after 40 hours					Percent sound fruit after 60 hours				
	Picking dates					Picking dates				
	Jul 15	Jul 23	Jul 29	Aug 5	Mean	Jul 15	Jul 23	Jul 29	Aug 5	Mean
Captan 1½ (8x)	86.5*	74.2	45.3	76.2	70.6 a	70.6	20.9	5.4	56.3	38.3 ab
Captan 1½ (7x)	88.9	83.1	40.8	72.7	71.4 a	73.3	42.7	11.1	43.7	42.7 a
Captan 1½ (6x)	87.6	68.6	34.1	67.4	64.4 abc	73.8	24.2	7.6	29.3	33.7 ab
Captan 1½ (5x)	89.2	71.8	38.9	68.7	67.2 a	74.1	26.5	4.6	27.6	33.2 ab
Dichloran 1 + captan 1½ (5x)	82.9	65.3	37.6	76.8	65.7 ab	69.1	38.6	5.3	30.1	35.8 ab
Captan 1½ (3x)	91.8	72.6	29.7	53.9	62.0 abc	63.7	31.5	2.0	20.1	29.3 abc
Captan 1½ (2x)	89.6	73.1	35.7	46.5	61.2 abc	72.6	24.4	14.4	15.0	31.6 abc
Dichloran ½ + captan ¾ (2x)	85.9	65.6	29.0	46.5	56.8 bcd	41.7	14.2	3.9	14.7	18.6 bcd
DAC 2787 1½ (5x)	78.1	64.9	27.4	50.6	55.3 cd	50.4	30.3	9.6	26.9	29.3 abc
DAC 2787 1½ (3x)	79.3	46.1	26.4	39.2	47.8 de	50.0	13.9	2.9	10.0	19.2 bcd
DAC 2787 1½ (2x)	78.7	76.4	24.3	38.9	54.6 cd	51.3	15.6	9.2	17.5	23.4 abcd
Dichloran 1 (5x)	63.8	55.2	15.9	32.8	41.9 ef	28.1	11.0	1.1	9.8	12.5 cd
Dichloran 1 (3x)	65.8	39.2	12.0	28.8	36.5 f	10.3	5.3	1.5	7.4	6.1 d
Dichloran 1 (2x)	70.0	50.4	20.5	19.9	40.2 ef	16.7	4.4	1.6	3.1	6.5 d
Unsprayed	65.1	31.2	23.2	26.8	36.6 f	13.9	6.1	2.0	6.3	7.1 d
Mean	80.2	62.5	29.4	49.7	55.5	50.6	20.6	5.5	21.2	24.5
S. E. Mean					3.15					6.05

* Mean of 6 replications.

Means not followed by the same letter are significantly different at the 5% level (Duncan's Multiple Range Test).

Table 3. Effect of mean air temperatures on the percentage sound fruit of raspberries 40 and 60 hours after harvest.

	Picking and Storage Periods			
Temperatures	July 15-18	July 23-26	July 29-Aug 1	Aug 5-8
	Degrees F.			
Mean Max.	75.0	86.5	94.8	79.8
Mean Min.	52.0	54.0	61.7	55.7
Mean	63.5	70.3	78.3	67.8
	Percent sound fruit			
Postharvest Period				
40 hours	80.2*	62.5	29.4	49.7
60 hours	50.6	20.6	5.5	21.2

* Mean of 15 treatments x 6 replications = 90 samples.

The data on postharvest control of fruit rot show that captan was the most effective of the field sprays tested, while DAC 2787 was intermediate and dichloran was ineffective (Table 2). Captan gave very effective protection against spoilage in the first 40 hours after harvest. With the July 15 picking approximately 70% of the captan-treated berries were still sound after 60 hours. The efficacy of captan on the July 29 picking was considerably poorer than with the other pickings. In fact, the amount of spoilage was extremely high for this entire picking. The holding quality of the raspberries appeared to be directly correlated with the air temperature during picking and storage (Table 3). The July 29 picking occurred during a particularly hot period with temperatures rising to 97°F. However, even under such adverse conditions the beneficial effect of captan was still evident 40 hours after harvest with up to 45.3% sound berries as compared to 23.2% for the unsprayed fruit. After 60 hours very few sound berries remained, regardless of treatment.

On the basis of this experiment, even in a season of low rot incidence, a minimum of at least 2 sprays of captan 1½ lb/acre should be applied: first, when blossoms open, and again 10 days later. There was a tendency for the percentage of sound fruit to increase with the number of captan applications. In a wet year a more extensive schedule may be justified. This will warrant further study.

Literature cited

1. Freeman, J. A. 1964. The control of strawberry fruit rot in coastal British Columbia. Can. Plant Dis. **Surv.** 44: 96-104.
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