

APPLE (*Malus domestica* 'Braeburn')
Scab; *Venturia inaequalis*
Powdery Mildew; *Podosphaera leucotricha*

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Fungicides for control of apple scab and powdery mildew, 2003.

Fungicide treatments were arranged in a randomized complete block design in a block of 'Braeburn' apples on ELMA-111 rootstock planted in 1995 on 20 x 20 ft spacing. Each treatment consisted of 5 single tree replicates. Fungicide treatments were applied using a hydraulic handgun sprayer at 150 psi at a rate of 109 to 200 gal water/A. Approximately 5 to 9 gal of a spray suspension were applied per 5 trees depending on the time of year. Treatments were applied on 28-29 Mar (half inch green to tight cluster), 14 Apr (20% king bloom), 28 Apr (80% full bloom), 12 May (90% petal fall), 27-28 May (1st cover), and 10 Jun (2nd cover). No fertilizer was spread within tree rows. Insecticides were applied to the entire block using a Rear's air blast speed sprayer on 11 Jun (Diazinon 50W 4 lb/A), 1 and 30 Jul (Assail 13.5 oz/A) for codling moth management. Weeds were controlled in the tree row floor by using Glyphos X-TRA (2.8 qt/A) tank mixed with Surflan AS (2.8 qt/A) on 15 Apr. All herbicide rates are based on in the tree row area. Apple scab infection periods were monitored using an Adcon A730 weather station equipped with standard sensors. Using a modified primary infection model (wet periods start with rain and end with 8 hr drying time), a total of 7 infection periods were detected from bud break in late Mar through Jun: 0 high infection periods; 2 moderate infection periods (23 Apr and 11 May); and 5 light infection periods (2, 5, 10, 11 and 15 Apr). The incidence of leaf scab and powdery mildew was determined on 26 Jul by examining all leaves from 20 vegetative shoots (419-585 leaves) randomly selected from each tree. Plant growth regulation (PGR) effects were evaluated using whole tree rating and shoot length measurements. Whole trees were rated for PGR effects on 22 May using a 0 to 5 scale where 0 = trees with no PGR effect and 5 = trees with severe leaf and shoot stunting along with leaf necrosis. Shoot length was measured on 25 Aug by measuring 50 vegetative shoots per tree. Incidence of fruit scab and russet was evaluated on 6 Oct by picking and examining up to 100 fruit/tree. Due to poor fruit set many trees did not have 100 fruit. Harvest data were analyzed only for trees with greater than 30 fruit per tree which resulted in some treatments with only 3 replicates. The Yates missing plot estimate of ARM was used to analyze all fruit information.

Spring weather conditions in Western Oregon were considered normal to wet with above normal rainfall in March and April, however, May and June had below normal rainfall. All fungicide treated trees had significantly less apple scab on leaves or fruit than nontreated trees (Table 1). No leaf scab was found on trees treated with Pristine plus Superior Spray Oil however the number of leaves with scab on trees treated with many other fungicides were not significantly different. A slight increase in necrotic leaf spots was observed on trees treated with oil (data not shown). Trees treated with V-10114, Captan alone or Rally alone had significantly more leaf scab than trees treated with Pristine plus oil. Trees treated with V-10116 plus Induce had the lowest amount of fruit scab however the fruit scab on trees treated with many other fungicides were not significantly different. Trees treated with Captan or Rally alone tended to have increased levels of fruit scab. All fungicide treated trees had significantly less powdery mildew than nontreated trees. Trees treated with Captan alone had significantly more powdery mildew than trees treated with other fungicides. Trees treated with Rally alone had the lowest amount powdery mildew however the powdery mildew on trees treated with many other fungicides were not significantly different. Trees treated with V-10116 plus Induce had the most apples with russet symptoms and was significantly higher than nontreated trees. Trees treated with the high rate of V-10116 or Captan alone had fruit russet symptoms that were not significantly different than nontreated trees. Growth regulation effects were obvious on trees treated with V-10116 plus Induce. Whole tree ratings of this effect showed that these trees received significantly higher ratings than trees treated with any other material (Table 2). Vegetative shoot length can be affected by chemicals and diseases such as powdery mildew. Trees with high powdery mildew ratings also tended to have shorter average shoot lengths. Trees treated with V-10116 plus Induce had the lowest average shoot length. Although trees treated with the low rate of V-10116 without Induce had shoot lengths similar to those treated with Induce, we still believe the addition of Induce was responsible for the increased PGR effect. This result could be traced back to one replicate where both treatments occurred on adjacent trees and the possibility of chemical drift from the Induce treated tree could not be eliminated.

Table 1. – Disease ratings for Braeburn apple trial.

Treatment & Rate/A	Time of Application*	Apple Scab**		Powdery Mildew	Fruit Russet
		Leaves (%)	Fruit (%)	Leaves (%)**	(%)**
Nontreated	none	32.2 a	84.7 a	39.8 a	25.4 b
Procure 50 WS 12 oz +					
Dithane 75 DF 3 lb.....	All.....	1.4 cdef	3.6 cde	3.7 cd	5.9 cd
Flint 50 WG 2.5 oz alternate TC, FB, 1C					
Procure 50 WS 12 oz	KB, PF, 2C.	0.7 def	8.8 bcd	5.3 cd	6.7 cd
Flint 50 WG 2.5 oz					
	All.....	0.2 ef	4.4 cde	4.6 cd	6.3 cd
Pristine at 0.92 lb.....					
	All.....	0.3 ef	2.9 de	9.7 c	9.1 cd
Pristine at 0.92 lb plus					
Supreme Oil 1-2 gal.....	All.....	0.0 f	----	3.8 cd	----
V-10116 at 0.08 lb A/A.....					
	All.....	0.6 def	7.1 cde	5.9 cd	7.3 cd
V-10116 at 0.107 lb A/A.....					
	All.....	0.2 ef	3.2 de	3.7 cd	16.5 bc
V-10116 at 0.08 lb A/A plus					
Induce at 14 to 26 oz.....	All.....	0.2 ef	1.1 e	4.1 cd	57.6 a
V-10114 at 0.15 lb A/A.....					
	All.....	2.3 cd	5.1 cde	5.0 cd	9.8 cd
V-10116 at 0.08 lb A/A alternate TC, FB, 1C					
Captan 50 WP 6 lb.....	KB, PF, 2C.	1.3 cdef	5.9 cde	8.4 cd	7.8 cd
V-10116 at 0.09 lb A/A alternate TC, FB, 1C					
V-10114 at 0.15 lb A/A	KB, PF, 2C.	2.0 cde	7.9 bcde	4.1 cd	5.1 d
Captan 50 WP 6 lb					
	All.....	3.0 bc	10.7 bd	19.6 b	14.9 bcd
Rally 40 W 5 oz					
	All.....	4.5 b	14.4 b	2.9 d	10.5 cd

* Treatments were applied on 28-29 Mar (half inch green to tight cluster, TC), 14 Apr (20% king bloom, KB), 28 Apr (80% full bloom, FB), 12 May (90% petal fall, PF), 27-28 May (1st cover, 1C), and 10 Jun (2nd cover, 2C).

** Means followed by the same letter do not differ significantly based on Fisher's protected LSD (P=0.05).

--- Not enough fruit in at least 3 replicates to make measurement.

Table 2. Growth regulation effects on Braeburn apples.

Treatment & Rate/A	Time of Application	Plant Growth Regulation Effect	
		Whole Tree Rating 0 to 5 scale*	Average Shoot length (cm)**
Nontreated	none	1.7 bc	31.7 cd
Procure 50 WS 12 oz +			
Dithane 75 DF 3 lb.....	All.....	0.5 d	37.7 ab
Flint 50 WG 2.5 oz alternate TC, FB, 1C			
Procure 50 WS 12 oz	KB, PF, 2C.	1.0 cd	37.5 ab
Flint 50 WG 2.5 oz	All.....	1.2 bcd	40.8 a
Pristine at 0.92 lb.....	All.....	1.1 bcd	37.1 ab
Pristine at 0.92 lb plus			
Supreme Oil 1-2 gal	All.....	1.1 bcd	37.0 abc
V-10116 at 0.08 lb A/A.....	All.....	1.9 b	32.8 bcd
V-10116 at 0.107 lb A/A.....	All.....	1.6 bc	37.2 ab
V-10116 at 0.08 lb A/A plus			
Induce at 14 to 26 oz.....	All.....	2.9 a	30.6 d
V-10114 at 0.15 lb A/A.....	All.....	1.3 bcd	36.6 abc
V-10116 at 0.08 lb A/A alternate TC, FB, 1C			
Captan 50 WP 6 lb.....	KB, PF, 2C.	1.0 cd	39.5 a
V-10116 at 0.09 lb A/A alternate TC, FB, 1C			
V-10114 at 0.15 lb A/A	KB, PF, 2C.	1.2 bcd	39.4 a
Captan 50 WP 6 lb	All.....	1.6 bc	35.4 abcd
Rally 40 W 5 oz	All.....	0.9 cd	38.4 a

* 0 to 5 scale where 0 = trees with no PGR effect and 5 = trees with severe leaf and shoot stunting along with leaf necrosis.

** Means followed by the same letter do not differ significantly based on Fisher's protected LSD (P=0.05).