APPLE (*Malus* ×*domestica* 'Golden Delicious', 'Jerseymac', 'Redcort')
Apple scab; *Venturia inaequalis*
Cedar apple rust; *Gymnosporangium juniperi-virginianae*
Quince rust; *Gymnosporangium clavipes*
Powdery mildew; *Podosphaera leucotricha*
✓Flyspeck; *Zygophiala jamaicensis*
✓Sooty blotch; species complex

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Apple disease control with Tanos, Pristine, and older fungicides, 2003.

Treatments were replicated four times using three-tree plots containing one tree of each cultivar on M.9 rootstocks. Plots within rows were separated by cedar trees that provided inoculum for rust diseases and minimized drift between plots. Populations of *V. inaequalis* in the test orchard were near baseline for sensitivity to dodine, sterol demethylation inhibitor (DMI) fungicides and strobilurin fungicides when tested by Dr. Wolfram Koeller in 2003. Fungicide treatments were sprayed to drip using a handgun at 200 psi. Few if any primary scab infections developed from the first potential infection period on 11 Apr (26 hr wetting, 43 °F) when trees were at green tip. A moderate infection period on 26 Apr (24 hr wetting, 52 °F) when trees were at tight cluster resulted in infections that became visible on 13 May (late bloom). Additional primary infection periods occurred 1-2 May (18 hr, 60 °F), 5-9 May (49 hr, 52 °F), 11-12 May (19 hr, 56 °F), 21 May (12 hr, 59 °F), 22-23 May (35 hr, 55 °F), and 26-31 May (100 hr, 59 °F). Infection periods were calculated by combining wetting periods separated by less than 24 hr of drying, but mean temperatures for split wetting periods were calculated using only the hours when foliage was actually wet. A total of 147 hr wetting occurred between 19 May (petal fall) and 31 May. June weather included five secondary scab infection periods, 102 hr of wetting, and 5.2 in. of rain. July had six scab infection periods, 139 hr wetting, 4.2 in. rain; August had five infection periods, 259 hr wetting, 8.1 in. rain; and September had 277 hr wetting and 9.1 in. rain. Control trees were heavily scabbed, but scab did not cause significant defoliation during summer, and cedar apple rust infections on terminal leaves were less extensive than in several previous years.

Treatments involving DMI or strobilurin fungicides provided good control of mildew and scab. Pristine controlled rust diseases as well as the DMI fungicides, but Sovran applied alone throughout the season did not. The combination of Dithane + Captan provided better control of early-season scab on Jerseymac than did Dithane applied alone. Tanos applied alone was ineffective for most diseases. Where Tanos was applied in combination with contact fungicides (treatments 9-11), disease control was never better than the comparable contact fungicide applied alone (treatment 2). The wet summer provided ideal conditions for development of sooty blotch and flyspeck, and 4.16 inches of rain on 1-4 Sep removed any fungicide residues remaining from the last application in Aug. In treatments 4 and 5, alternating rates of Captan were applied as a comparison for the Tanos treatments 9, 10 and 11. Tanos treatments 10 and 11 provided better control of flyspeck on Redcort than was achieved with treatments 4 and 5. All three Tanos alternation treatments provided better control of both sooty blotch and flyspeck on Golden Delicious than was achieved with treatment 5, but they were never better than the standard summer program that utilized Topsin M in the last two applications (Treatments 2 and 3). Treatments 6, 7 and 8 included a strobilurin fungicide in the last two sprays of the season and provided the best control of flyspeck on Redcort. Weather conditions immediately after bloom favored development of severe russetting on Golden Delicious.

Material and rate of formulated product per 100 gal	Spray application dates: 21 Apr	30 Apr	09 May	19 May	30 May	12 Jun	03 Jul	26 Jul	11 Aug	% JM terminal lvs with mildew 10 Jun [x]
1. Control										35.6 c[y]
2. Dithane RSNT 75DF 1 lb	X	X	X	X	X					
Captan 50W 1 lb + Topsin M 70W 3 oz						*[z]	*	X	X	30.9 bc
3. Dithane RSNT 75DF 8 oz										
+ Captan 50W 8 oz	X	X	X	X	X					
Captan 50W 1 lb + Topsin M 70W 3 oz						*	*	X	X	21.4 b
4. Dithane 75 RSNT 75DF 1 lb										
+ Rubigan 1EC 3 fl oz	X	X	X	X	X					
Captan 50W 2 lb (**) or 1 lb (*)						** [z]	*	**	*	0.8 a
5. Dithane RSNT 75DF 1 lb										
+ Nova 40W 1.5 oz	X	X	X	X	X					
Captan 50W 2 lb(**) or 1 lb (*)						**	*	**	*	0.2 a
6. Pristine 38WG 4.8 oz	X	X	X	X	X	X	X	X	X	0.5 a
7. Sovran 50WG 1.33 oz	X	X	X	X	X	X	X	X	X	0.9 a

(continued) Material and rate of formulated product per 100 gal	Spray application dates 21 Apr	30 Apr	09 May	19 May	30 May	12 Jun	03 Jul	26 Jul	11 Aug	% JM terminal lvs with mildew 10 Jun [x]
8. Polyram 80DF 1 lb + Sovran 50WG 1.33 oz	X	X								
Polyram 1 lb + Rubigan 1 EC 3 fl oz			X	X	X					
Captan 1 50W lb + Sovran 50WG 1.1 oz						* [z]	*	X	X	1.4 a
9. Tanos 50WP 2.67 oz + Dithane RSNT 75DF 10.67 oz	X		X		X					
Dithane RSNT 75DF 1 lb		X		X						
Tanos 50WP 2.67 oz +Captan 50W 1 lb						** [z]	X	**	X	36.7 c
10. Tanos 50WP 3.3 oz + Dithane RSNT 75DF 10.67 oz	X		X		X					
Dithane RSNT 75DF 1 lb		X		X						
Tanos 50WP 2.67 oz +Captan 50W 1 lb						** [z]	X	**	X	34.7 bc
11. Tanos 50WP 2.67 oz + Dithane RSNT 75DF 1 lb	X		X		X					
Dithane RSNT 75DF 1 lb		X		X						
Tanos 50WP 2.67 oz +Captan 50W 1 lb						** [z]	X	**	X	29.8 bc
12. Tanos 50WP 3.3 oz	X	X	X	X	X					
Tanos 50WP 2.67 oz						X	X	X	X	35.3 bc

[x] Data taken from the eight youngest leaves on 20 terminals per tree.
[y] Numbers within columns followed by the same letter do not differ significantly (Fisher's Protected LSD, $P \leq 0.05$). The arcsine transformation was used for statistical analyses, but arithmetic means are shown.
[z] Asterisks are dates when Captan 50W was applied alone at 1 lb (single asterisk) or at 2 lb (double asterisk).

Material and rate of formulated product per 100 gal [t]	% scab infection on Jerseymac [y] cluster lvs 10 Jun	fruitlets 16 Jun	terminal leaves 30 Jun	terminal leaves 26 Aug	fruit 6 Aug	Redcort fruit with scab 11 Sep [y]
1. Control	41.7 d [z]	98.4 e	80.1 f	97.8 f	98.6 e	89.1 d
2. Dithane RSNT 1 lb [u]	0.6 ab	3.7 bc	7.6 de	12.4 cd	11.8 d	4.0 ab
3. Dithane 8 oz + Captan 8 oz [u]	0.7 ab	0.0 a	2.7 bc	6.2 bc	3.0 abc	2.9 ab
4. Dithane 1 lb + Rubigan 3 fl oz [v]	1.5 ab	0.7 ab	0.7 ab	2.6 ab	5.8 bcd	0.0 a
5. Dithane 1 lb + Nova 1.5 oz [v]	1.7 ab	0.3 a	0.3 a	2.0 ab	0.0 a	0.9 a
6. Pristine 4.8 oz	0.5 ab	0.0 a	0.2 a	1.2 a	1.6 ab	0.0 a
7. Sovran 1.33 oz	0.3 a	0.5 ab	0.2 a	1.2 a	0.0 a	0.0 a
8. Polyram 1 lb + Sovran 1.33 oz Polyram 1 lb + Rubigan 3 fl oz Captan 1 lb (+ Sovran 1.1 oz)	0.2 a	0.3 a	0.6 ab	3.0 ab	0.7 ab	0.3 a
9. Tanos 2.67 oz + Dithane 10.67 oz [w] Tanos 2.67 oz + Captan 1 lb [x]	2.1 b	6.8 c	13.6 e	18.4 d	8.6 cd	16.7 b
10. Tanos 3.3 oz + Dithane 10.67 oz [w] Tanos 2.67 oz + Captan 1 lb [x]	1.8 ab	2.1 abc	5.7 cd	11.2 cd	10.1 cd	2.0 ab
11. Tanos 2.67 oz + Dithane 1 lb [w] Tanos 2.67 oz + Captan 1 lb [x]	1.4 ab	1.0 ab	7.4 d	11.2 cd	3.9 bc	1.8 ab
12. Tanos 3.3 oz // Tanos 2.67 oz	24.8 c	78.5 d	75.7 f	92.0 e	97.2 e	66.3 c

[t] See first table for treatment details.
[u] Summer sprays: Captan 50W 1 lb (+ Topsin M 70W 3 oz in the last two applications).
[v] Summer sprays: Captan 50W 2 lb alternating with Captan 50W 1 lb.
[w] Alternating with Dithane 1 lb alone.
[x] Alternating with Captan 50W 2 lb alone.
[y] Data from all leaves on 20 clusters/tree (10 Jun), all fruitlets on 20 clusters (16 Jun), all leaves on 20 terminals/tree on 30 Jun or 15 terminals/tree on 26 Aug, and an average of 101 Jerseymac fruit/tree on 6 Aug (range of 51 to 110 fruit/tree), and 75 Redcort fruit/tree on 11 Sep.
[z] Numbers within columns followed by the same letter do not differ significantly (Fisher's Protected LSD, $P \leq 0.05$). The arcsine transformation was used for statistical analyses, but arithmetic means are shown.

Material and rate of formulated product per 100 gal [t]	% Golden Del. term lvs with rust 30 Jun [y]	% fruit with quince rust [y] Jerseymac 16 Jun	Golden Delicious 24 Sep	Russetting on Golden Delicious (1-5 scale) [y]
1. Control	32.1 e [z]	11.0 e	15.7 c	3.29 cde
2. Dithane RSNT 1 lb [u]	3.2 bc	0.4 ab	6.5 b	2.91 abc
3. Dithane 8 oz + Captan 8 oz [u]	2.8 bc	0.5 ab	3.0 b	2.79 ab
4. Dithane 1 lb + Rubigan 3 fl oz [v]	0.7 ab	0.0 a	0.0 a	3.07 bcd
5. Dithane 1 lb + Nova 1.5 oz [v]	0.0 a	0.0 a	0.5 ab	3.22 cd
6. Pristine 4.8 oz	1.0 ab	0.8 ab	1.5 ab	2.75 ab
7. Sovran 1.33 oz	6.4 cd	4.5 de	3.5 b	3.68 e
8. Polyram 1 lb + Sovran 1.33 oz Polyram 1 lb + Rubigan 3 fl oz Captan 1 lb (+ Sovran 1.1 oz)	3.3 bcd	0.0 a	0.5 ab	2.81 ab
9. Tanos 2.67 oz + Dithane 10.67 oz [w] Tanos 2.67 oz + Captan 1 lb [x]	1.7 bc	1.0 abc	3.0 ab	3.00 bcd
10. Tanos 3.3 oz + Dithane 10.67 oz [w] Tanos 2.67 oz + Captan 1 lb [x]	2.9 bcd	0.4 ab	3.5 ab	2.76 ab
11. Tanos 2.67 oz + Dithane 1 lb [w] Tanos 2.67 oz + Captan 1 lb [x]	1.0 abc	2.5 bcd	1.5 ab	2.56 a
12. Tanos 3.3 oz // Tanos 2.67 oz	11.0 d	4.6 cd	20.0 c	3.33 de

See bottom of page for footnotes.

Material and rate of formulated product per 100 gal [t]	% fruit with flyspeck [y] Redcort 11 Sep	Golden Delicious 24 Sep	% fruit with sooty blotch [y] Redcort 11 Sep	Golden Delicious 24 Sep
1. Control	85.8 e [z]	99.5 e	20.7 b	99.5 d
2. Dithane RSNT 1 lb [u]	41.6 b	34.0 abc	0.0 a	29.0 ab
3. Dithane 8 oz + Captan 8 oz [u]	50.2 b	51.3 c	0.0 a	43.4 b
4. Dithane 1 lb + Rubigan 3 fl oz [v]	70.5 cd	39.1 bc	0.3 a	29.9 ab
5. Dithane 1 lb + Nova 1.5 oz [v]	69.2 cd	74.6 d	0.0 a	73.2 c
6. Pristine 4.8 oz	17.7 a	17.0 a	0.0 a	16.0 a
7. Sovran 1.33 oz	16.4 a	17.5 a	0.0 a	17.5 a
8. Polyram 1 lb + Sovran 1.33 o z Polyram 1 lb + Rubigan 3 fl oz Captan 1 lb (+ Sovran 1.1 oz)	15.0 a	27.9 ab	0.0 a	26.0 ab
9. Tanos 2.67 oz + Dithane 10.67 oz [w] Tanos 2.67 oz + Captan 1 lb [x]	56.5 bc	32.0 abc	0.9 a	26.0 ab
10. Tanos 3.3 oz + Dithane 10.67 oz [w] Tanos 2.67 oz + Captan 1 lb [x]	51.0 b	38.4 bc	0.0 a	28.4 ab
11. Tanos 2.67 oz + Dithane 1 lb [w] Tanos 2.67 oz + Captan 1 lb [x]	41.9 b	22.0 ab	0.0 a	18.0 a
12. Tanos 3.3 oz // Tanos 2.67 oz	79.1 de	98.0 e	1.8 a	97.5 d

[t] See first table for treatment details.
[u] Summer sprays: Captan 50W 1 lb (+ Topsin M 70W 3 oz in the last two applications).
[v] Summer sprays: Captan 50W 2 lb alternating with Captan 50W 1 lb.
[w] Alternating with Dithane 1 lb alone.
[x] Alternating with Captan 50W 2 lb alone.
[y] Data from all fruit on 20 clusters (16 Jun), all leaves on 20 terminals/tree on 30 Jun, 75 Redcort fruit/tree on 24 Sep and 50 Golden Delicious fruit/tree on 24 Sep. Fruit russetting was rated on a scale of 1-5 wherein 1 = smooth fruit, 2= roughened lenticels, 3 = slight russetting extending from lenticels, 4 = patches of russetting skin evident on fruit, 5 = very severe russetting.
[z] Numbers within columns followed by the same letter do not differ significantly (Fisher's Protected LSD, $P \leq 0.05$). The arcsine transformation was used for statistical analyses, but arithmetic means are shown.