

APPLE (*Malus domestica* ‘Golden Delicious’, ‘Idared’)
Scab; *Venturia inaequalis*
Powdery mildew; *Podosphaera leucotricha*
Cedar-apple rust; *Gymnosporangium juniperi-virginianae*
Quince rust; *Gymnosporangium clavipes*
Sooty blotch; disease complex
Flayspeck; *Zygophiala jamaicensis*
Brooks spot; *Mycosphaerella pomi*
Rots (unspecified)
Bitter rot; *Colletotrichum* spp.
White rot; *Botryosphaeria dothidea*
Alternaria rot; *Alternaria* spp.
Fruit finish

K. S. Yoder, A. E. Cochran II, W. S. Royston, Jr.,
S. W. Kilmer, and A. L. Kowalski
Virginia Tech Ag. Res. & Ext. Center
595 Laurel Grove Road
Winchester, VA 22602

Disease control by experimental and registered fungicides and mixed schedules on Golden Delicious and Idared apples, 2017.

Seventeen experimental or registered combination treatment schedules were compared on two-tree sets of 17-yr-old trees. The test was conducted in a randomized block design with four replicates separated by non-treated border rows. Test rows had been non-treated border rows in 2016, which allowed mildew inoculum pressure to stabilize on 2017 test trees. Fungicide treatments were applied to both sides of the tree on each indicated application date with a Swanson Model DA-400 airblast sprayer at 100 gal/A as follows: Treatments applied at 100 gpa to both sides of the tree row on each application date: 5 Apr (App. # 1, open cluster); 13 Apr (App. # 2, bloom); 26 Apr (App. # 3, PF, petal fall); Apps. #4-11, 1C-8C (1st-8th covers): 9 May, 23 May, 8 Jun, 22 Jun, 10 Jul, 27 Jul, 4 Aug, 16 Aug. Treatments #10-15 were parallel, with the test fungicide applied only in two applications, at open cluster and petal fall, and these were alternated with Inspire Super at bloom and first cover. No fungicide was applied to these treatments at second cover, then they were all covered with Captan + Ziram through 8th cover. Treatments #16 and 17 did not receive the two applications at open cluster and petal fall, only Inspire Super (#16) or Inspire Super + Manzate (#17) at bloom and first cover. Inoculum placed over each Golden Delicious test tree included wild blackberry canes with the sooty blotch and flayspeck fungi, and bitter rot mummies 6 Jun. Other diseases developed from inoculum naturally present in the test area, including cedar-apple rust inoculum from red cedars in the vicinity. Maintenance sprays, applied to the entire test block included Altacor, Assail, Beleaf, Damoil, Danitol, Delegate, Imidan, Lannate LV, Sivanto and Voliam Flexi. Foliar data are from counts of ten shoots per replicate tree: 13 Jun (Golden Delicious) and 21 Jul (Idared), and fruit data represent postharvest counts of 25 fruit per replicate tree. Idared fruit were sampled 19 Sep, placed in cold storage until 21 Sep, moved to ambient temperatures (55-84°F, mean 70.4°F) and rated 25 Sep and 11 Oct. Golden Delicious fruit were sampled 19 Sep, held in cold storage until 25 Sep, then moved to ambient temperatures (55-83°F, mean 71.0°F) and rated 28 Sep and 16 Oct. Percentage data were converted by the square root arcsin transformation for statistical analysis.

Conidia of the mildew pathogen were present 27 Mar, and there were 39 dry weather “mildew infection days” from 27 Mar until 21 Jun, resulting in heavy infection of non-treated trees (Table 1). Treatments with strong suppressive effect on primary mildew symptoms included Trt #9 (Torino alternated with Luna Sensation, Merivon, and Rhyme), Luna Sensation/Inspire Super (Trt #1), Merivon (Trt #2), Fontelis/Inspire Super (#13) and Sercadis/Inspire Super (#15). This strong suppressive effect extended to excellent control of mildew on foliage and fruit by treatments #2 (Merivon) and #9 (Torino alternated with Luna Sensation, Merivon, and Rhyme). Primary and secondary mildew control were weaker for Aprovia and experimental VA-1. A significant Syl-Coat rate effect was noted on mildew control by VA-1. Scab pressure was relatively light on foliage, but moderately heavy on fruit (Table 2). Strong scab treatments included Luna Sensation + Manzate/Inspire Super + Manzate (Trt #1), GWN-10411 (Trts #3 and 4), VA-1 (Trts #10 and 11), Fontelis/Inspire Super (#13) and Aprovia/Inspire Super (#14). Under heavy cedar-apple rust pressure, the most effective schedules were Aprovia/Inspire Super (#14) and VA-1/Inspire Super (Table 3). General “leaf spot” symptoms were likely related to partially inhibited rust lesions. Under light quince rust pressure, all treatments gave significant suppression. The 250-hr wetting threshold for sooty blotch and flayspeck (SBFS) activity was reached by 5 Jul, and under heavy disease pressure, all treatments gave significant control on both cultivars (Table 4), with Luna Sensation + Manzate/ Inspire Super + Manzate (Trt #1) being superior overall for SBFS and bitter rot control on Idared. All treatment schedules ended with four to six applications of Captan + Ziram, and there were differences related to the treatment before 3rd cover. There were also relative cultivar differences in performance. All treatments controlled Brooks spot. Luna Sensation + Manzate/ Inspire Super + Manzate (Trt #1) also gave excellent control of bitter rot control on Golden Delicious (Table 5). Increasing the rate of Syl-Coat significantly improved rot control by VA-1, but there was significantly more rot with VA-1 with the low rate of Syl-Coat (Trt #11) than where it was not alternated with Inspire Super (Trt #16). There were also inconsistent rate responses by GWN-10411 and GWN-10250 for rot control on Golden Delicious. On Idared there was no significant difference in rot control among treatments applied on the same schedule (Table 6). There were no significant deleterious effects on Idared fruit finish and most treatments significantly improved opalescence of Idared compared to non-treated fruit (Table 7). On Golden Delicious, there were some significant differences in russet among treatments, but only treatment #9 significantly increased russet compared to non-treated fruit, and USDA grade was not significantly affected.

Table 1. Mildew control.

Treatment and rate/acre	Appli- cation number	Primary mildew rating, Idared*	Mildew, % leaves, leaf area or fruit infected				
			Idared			Golden Delicious	
			leaves Inf.	leaf area	fruit	leaves Inf.	leaf area
0 Non-treated control	---	1.3 h	65 j	40 f	60 f	50 f	18 f
1 Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Inspire Super 12 fl oz + Manzate 75 DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2,4,6 5C-8C	4.8 a-c	12 ab	2 a	8 ab	13 bc	2 bc
2 Merivon 4.18SC 5.5 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	4.6 a-c	11 a	2 a	8 ab	5 a	1 a
3 GWN-10411 20SC 3 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	3.4 d-f	26 c-e	4 ab	5 a	26 de	4 c
4 GWN-10411 20SC 4 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	3.4 d-f	21 a-d	3 ab	6 ab	20 cd	2 bc
5 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	3.3 ef	22 b-d	3 ab	13 a-d	14 bc	2 a-c
6 GWN-10250 28 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	3.9 c-e	37 e-g	8 b-d	6 ab	19 cd	3 bc
7 GWN-10250 32 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	3.5 d-f	25 c-e	4 ab	11 a-c	24 de	3 bc
8 GWN-10250 36 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	4.6 a-c	26 c-e	4 ab	7 ab	15 bc	2 a-c
9 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Merivon 4.18SC 5.5 fl oz + Manzate 75DF 3 lb Rhyme 2.08SC 6.5 fl oz + Manzate 75DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2 #4 #6 5C-8C	5.5 a	17 a-c	3 ab	5 a	12 b	2 ab
10 VA-1 2.01 fl oz + Syl-Coat 235 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	2.5 fg	43 f-h	10 cd	14 b-d	30 e	3 bc
11 VA-1 2.01 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	2.8 fg	43 f-h	10 cd	12 a-c	42 f	7 d
12 Luna Sensation 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	4.3 b-d	28 de	5 a-c	11 a-c	19 cd	3 bc
13 Fontelis 1.67SC 1pt + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	4.8 ab	31 d-f	5 a-c	18 c-e	28 e	3 c
14 Aprovia 0.83EC 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	3.0 e-g	45 gh	11 d	9 a-c	44 f	7 d
15 Sercadis 2.47SC 3.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	4.8 a-c	27 c-e	4 ab	12 a-c	16 bc	2 bc
16 Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	BI, 1C 3C-8C	2.3 g	59 ij	23 e	26 de	49 f	10 e
17 Inspire Super 12 fl oz + Manzate Pro-Stick 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	BI, 1C 3C-8C	2.9 e-g	51 hi	12 d	30 e	46 f	9 de

Mean separation by Waller-Duncan K-ratio t-test (p=0.05). Four reps, 10 shoots/tree 13 Jun (G. Delicious) or 21 Jul (Idared), or harvest counts of 25 fruit per tree picked 19 Sep (Idared).

* Suppressive effect rated on six primary mildew shoots/tree 2 Jun, scale: 1-10 (1= none; 10= excellent effect).

Treatments applied at 100 gpa to both sides of the tree row on each application date: 5 Apr (App. # 1, open cluster); 13 Apr (App. # 2, bloom); 26 Apr (App. # 3, PF, petal fall); Apps. #4-11, 1C-8C (1st-8th covers): 9 May, 23 May, 8 Jun, 22 Jun, 10 Jul, 27 Jul, 4 Aug, 16 Aug.

Table 2. Scab control.

Treatment and rate/acre	Application number	Scab infection, % leaves or fruit infected			
		Idared		Golden Delicious	
		leaves	fruit	leaves	fruit
0 Non-treated control	---	7 e	60f	9f	23 b
1 Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Inspire Super 12 fl oz + Manzate 75 DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2,4,6 5C-8C	2 b-e	1 a	3 b-e	3 a
2 Merivon 4.18SC 5.5 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	3 c-e	8 a-d	4 d-f	2 a
3 GWN-10411 20SC 3 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	2 b-e	5 a-c	2 c-e	3 a
4 GWN-10411 20SC 4 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	<1 a	3 a-c	0a	4 a
5 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	3 b-e	7 a-d	2 b-e	4 a
6 GWN-10250 28 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	4 c-e	7 a-d	5ef	9 ab
7 GWN-10250 32 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	2 a-d	7 a-d	4 d-f	4 a
8 GWN-10250 36 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	6 c-e	12 b-e	6ef	6 ab
9 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Merivon 4.18SC 5.5 fl oz + Manzate 75DF 3 lb Rhyme 2.08SC 6.5 fl oz + Manzate 75DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2 #4 #6 5C-8C	3 b-e	9 a-d	4 d-f	5 a
10 VA-1 2.01 fl oz + Syl-Coat 235 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	3 a-d	7 a-d	<1 ab	2 a
11 VA-1 2.01 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	1 a-c	9 b-e	1 a-c	6 ab
12 Luna Sensation 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	6 de	24e	2 b-e	11 ab
13 Fontelis 1.67SC 1pt + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	3 b-e	3 a-c	1 a-c	2 a
14 Aprovia 0.83EC 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	1 ab	3 ab	1 a-c	4 a
15 Sercadis 2.47SC 3.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	3 b-e	11 c-e	2 b-e	2 a
16 Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	BI, 1C 3C-8C	4 c-e	16 de	1 a-d	10 ab
17 Inspire Super 12 fl oz + Manzate Pro-Stick 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	BI, 1C 3C-8C	4 c-e	18 de	2 b-e	4 a

Mean separation by Waller-Duncan K-ratio t-test ($p=0.05$). Four replications, 10 shoots/tree 13 Jun (G. Delicious) or 21 Jul (Idared), or harvest counts of 25 fruit per tree picked 19 Sep (Idared and Golden Delicious).

Treatments applied at 100 gpa to both sides of the tree row on each application date: 5 Apr (App. # 1, open cluster); 13 Apr (App. # 2, bloom); 26 Apr (App. # 3, PF); Apps. #4-11, 1C-8C (1st-8th covers): 9 May, 23 May, 8 Jun, 22 Jun, 10 Jul, 27 Jul, 4 Aug, 16 Aug.

Table 3. Control of cedar-apple rust, quince rust, and “leaf spots”.

Treatment and rate/acre	Appli- cation number	Cedar-apple rust, % leaves infected		“Leaf spots”** % leaves affected		Quince rust, % fruit infected	
		Idared	G. Del.	Idared	G. Del.	Idared	G. Del.
0 Non-treated control	---	39 g	58h	10 ab	8 a-d	8 d	6 b
1 Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Inspire Super 12 fl oz + Manzate 75 DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2,4,6 5C-8C	14 c-e	30 ef	12 ab	20f	0 a	0 a
2 Merivon 4.18SC 5.5 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	21 e	17 d	11 ab	12 b-e	0 a	1 a
3 GWN-10411 20SC 3 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	30 f	46 g	10 ab	16ef	1 ab	2 a
4 GWN-10411 20SC 4 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	37 fg	44 g	7 ab	12 c-f	4 c	0 a
5 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	32 fg	44 g	8 ab	12 b-e	0 a	0 a
6 GWN-10250 28 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	34 fg	49 gh	6 ab	9 b-e	2 ab	2 a
7 GWN-10250 32 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	36 fg	46 g	5 ab	8 b-d	1 ab	0 a
8 GWN-10250 36 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	36 fg	48 g	4 a	6 a-c	0 a	0 a
9 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Merivon 4.18SC 5.5 fl oz + Manzate 75DF 3 lb Rhyme 2.08SC 6.5 fl oz + Manzate 75DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2 #4 #6 5C-8C	30 fg	46 g	9 ab	6 ab	0 a	0 a
10 VA-1 2.01 fl oz + Syl-Coat 235 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	5 ab	1 a	11 ab	3 a	0 a	0 a
11 VA-1 2.01 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	3 a	5 b	12 ab	7 a-c	0 a	0 a
12 Luna Sensation 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	16 de	23 de	15 b	21 f	0 a	0 a
13 Fontelis 1.67SC 1pt + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	9 bc	7 bc	7 ab	11 b-e	0 a	0 a
14 Aprovia 0.83EC 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	2 a	4 b	10 ab	7 a-c	0 a	0 a
15 Sercadis 2.47SC 3.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	12 cd	9 c	11 ab	18 ef	0 a	0 a
16 Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	Bl, 1C 3C-8C	14 cd	31 f	10 ab	17 ef	2 bc	0 a
17 Inspire Super 12 fl oz + Manzate Pro-Stick 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	Bl, 1C 3C-8C	15 c-e	29 ef	13 ab	14 d-f	0 a	0 a

Mean separation by Waller-Duncan K-ratio t-test (p=0.05). Four paired-tree replications, 10 shoots/tree rated 13 Jun (G. Delicious) or 21 Jul (Idared), or harvest counts of 25 fruit per tree picked 19 Sep (Idared and Golden Delicious).

* “Leaf spots” refers to an unidentified, generic leafspot symptom, not a specific disease.

Treatments applied at 100 gpa to both sides of the tree row on each application date: 5 Apr (App. # 1, open cluster); 13 Apr (App. # 2, bloom); 26 Apr (App. # 3, PF); Apps. #4-11, 1C-8C (1st-8th covers): 9 May, 23 May, 8 Jun, 22 Jun, 10 Jul, 27 Jul, 4 Aug, 16 Aug.

Table 4. Control of sooty blotch, flyspeck, and Brooks spot.

Treatment and rate/acre	Applica- tion number	% fruit infected				
		Sooty blotch		Flyspeck		Brooks spot Idared
		Idared	G. Del.	Idared	G. Del.	
0 Non-treated control	---	100 g	94 f	99 f	98 i	24 c
1 Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Inspire Super 12 fl oz + Manzate 75 DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2,4,6 5C-8C	2 a	0 a	0 a	0 a	0 a
2 Merivon 4.18SC 5.5 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	8 ab	15 e	19 bc	40 h	1 ab
3 GWN-10411 20SC 3 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	15 b-e	5 a-d	39 de	31 f-h	0 a
4 GWN-10411 20SC 4 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	29 ef	9 c-e	37 c-e	21 e-h	1 ab
5 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	18 b-e	5 a-d	32 b-d	12 b-e	0 a
6 GWN-10250 28 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	39 f	10 c-e	59 e	18 d-g	0 a
7 GWN-10250 32 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	23 c-f	13 c-e	41 de	31 f-h	0 a
8 GWN-10250 36 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	24 d-f	4 a-d	29 b-d	16 c-f	0 a
9 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Merivon 4.18SC 5.5 fl oz + Manzate 75DF 3 lb Rhyme 2.08SC 6.5 fl oz + Manzate 75DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2 #4 #6 5C-8C	11 a-c	4 a-c	25 b-d	12 c-e	0 a
10 VA-1 2.01 fl oz + Syl-Coat 235 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	20 b-f	0 a	17 bc	3 ab	2 b
11 VA-1 2.01 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	20 b-f	11 c-e	26 b-d	31 gh	0 a
12 Luna Sensation 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	18 b-e	1 ab	25 b-d	8 b-d	0 a
13 Fontelis 1.67SC 1pt + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	22 b-f	7 b-e	23 b-d	16 d-g	0 a
14 Aprovia 0.83EC 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	26 c-f	12 de	22 b-d	16 c-g	0 a
15 Sercadis 2.47SC 3.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	14 b-d	12 c-e	22 b-d	19 d-g	1 ab
16 Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	Bl, 1C 3C-8C	19 b-e	7 b-e	17 b	13 c-e	2 b
17 Inspire Super 12 fl oz + Manzate Pro-Stick 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	Bl, 1C 3C-8C	14 b-e	7 b-e	26 b-d	5 a-c	1 ab

Mean separation by Waller-Duncan K-ratio t-test (p=0.05). Four paired-tree replications. Harvest counts of 25 fruit per tree picked 19 Sep (Idared and Golden Delicious).

Treatments applied at 100 gpa to both sides of the tree row on each application date: 5 Apr (App. # 1, open cluster); 13 Apr (App. # 2, bloom); 26 Apr (App. # 3, PF); Apps. #4-11, 1C-8C (1st-8th covers): 9 May, 23 May, 8 Jun, 22 Jun, 10 Jul, 27 Jul, 4 Aug, 16 Aug.

Table 5. Control of post-storage rots on Golden Delicious apple.

Treatment and rate/acre	Applica- tion number	% fruit infected				
		Harvest counts 28 Sep		Rot incidence after 21 days incubation.		
		Bitter Rot	“Rot spots”	Any rot	Bitter Rot	White rot
0 Non-treated control	---	16b	44c	67f	59e	15bc
1 Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Inspire Super 12 fl oz + Manzate 75 DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2,4,6 5C-8C	2a	0a	6a	3a	3a
2 Merivon 4.18SC 5.5 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	0a	5ab	14a-d	10a-d	6a-c
3 GWN-10411 20SC 3 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	0a	2ab	11ab	8a-c	2ab
4 GWN-10411 20SC 4 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	14b	8b	38de	34d	3a
5 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	1a	1a	23b-e	15b-d	8a-c
6 GWN-10250 28 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	1a	1a	28c-e	21cd	8a-c
7 GWN-10250 32 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	1a	1a	8ab	5ab	2ab
8 GWN-10250 36 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	2ab	3ab	14a-c	13a-c	3a
9 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Merivon 4.18SC 5.5 fl oz + Manzate 75DF 3 lb Rhyme 2.08SC 6.5 fl oz + Manzate 75DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2 #4 #6 5C-8C	1a	0a	19b-e	16b-d	5a-c
10 VA-1 2.01 fl oz + Syl-Coat 235 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	1a	1a	17a-e	7a-c	9a-c
11 VA-1 2.01 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	2ab	8b	41ef	29d	17c
12 Luna Sensation 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	0a	1a	26b-e	7a-c	19c
13 Fontelis 1.67SC 1pt + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	1a	8b	37de	15a-d	15a-c
14 Aprovia 0.83EC 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	1a	5ab	29c-e	19cd	10a-c
15 Sercadis 2.47SC 3.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF Bl, 1C 3C-8C	0a	4ab	21b-e	8a-c	16a-c
16 Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	Bl, 1C 3C-8C	2ab	2ab	14a-d	11a-d	2a
17 Inspire Super 12 fl oz + Manzate Pro-Stick 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	Bl, 1C 3C-8C	2a	2ab	13a-c	8a-c	5a-c

Mean separation by Waller-Duncan K-ratio t-test (p=0.05). Four paired-tree replications, 25 fruit per tree picked 19 Sep and placed in cold storage; moved 25 Sep to ambient temperatures (55-83°F, mean 71.0°F) and rated 28 Sep and 16 Oct.

Treatments applied at 100 gpa to both sides of the tree row on each application date: 5 Apr (App. # 1, open cluster); 13 Apr (App. # 2, bloom); 26 Apr (App. # 3, PF); Apps. #4-11, 1C-8C (1st-8th covers): 9 May, 23 May, 8 Jun, 22 Jun, 10 Jul, 27 Jul, 4 Aug, 16 Aug.

Table 6. Control of post-storage rots on Idared apple.

Treatment and rate/acre	Appli- cation number	% fruit infected			
		Bitter rot, harvest counts, 25 Sep	Rot incidence after 16 days warm temp. incubation		
			Any rot	Bitter Rot	White rot
0 Non-treated control	---	58 c	80 e	80 e	3 a
1 Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Inspire Super 12 fl oz + Manzate 75 DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2,4,6 5C-8C	3 ab	8 ab	8 a-c	0 a
2 Merivon 4.18SC 5.5 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	3 ab	9 a-c	9 a-d	0 a
3 GWN-10411 20SC 3 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	3 ab	9 a-c	9 a-d	0 a
4 GWN-10411 20SC 4 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	2 ab	7 a	7 ab	1 a
5 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	3 ab	14 a-d	14 a-d	0 a
6 GWN-10250 28 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	7 ab	19 a-d	19 a-d	0 a
7 GWN-10250 32 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	2 ab	22 a-d	21 a-d	0 a
8 GWN-10250 36 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	9 ab	12 a-c	12 a-d	0 a
9 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Merivon 4.18SC 5.5 fl oz + Manzate 75DF 3 lb Rhyme 2.08SC 6.5 fl oz + Manzate 75DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2 #4 #6 5C-8C	1 a	8 a	7 a	1 a
10 VA-1 2.01 fl oz + Syl-Coat 235 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	3 ab	20 a-d	18 a-d	2 a
11 VA-1 2.01 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	9 ab	26 cd	25 cd	1 a
12 Luna Sensation 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	4 ab	21 a-d	19 a-d	2 a
13 Fontelis 1.67SC 1pt + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	12 b	23 b-d	23 b-d	0 a
14 Aprovia 0.83EC 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	11 ab	30 d	29 d	1 a
15 Sercadis 2.47SC 3.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	4 ab	28 d	25 cd	3 a
16 Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	BI, 1C 3C-8C	10 ab	21 a-d	21 a-d	0 a
17 Inspire Super 12 fl oz + Manzate Pro-Stick 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	BI, 1C 3C-8C	1 a	15 a-d	14 a-d	1 a

Mean separation by Waller-Duncan K-ratio t-test (p=0.05). Four paired-tree replications, 25 fruit per tree picked 19 Sep, placed in cold storage; moved 21 Sep to ambient temperatures (55-84°F, mean 70.4°F) and rated 25 Sep and 11 Oct.

Treatments applied at 100 gpa to both sides of the tree row on each application date: 5 Apr (App. # 1, open cluster); 13 Apr (App. # 2, bloom); 26 Apr (App. # 3, PF); Apps. #4-11, 1C-8C (1st-8th covers): 9 May, 23 May, 8 Jun, 22 Jun, 10 Jul, 27 Jul, 4 Aug, 16 Aug.

Table 7. Fruit finish.

Treatment and rate/acre	Appli- cation number	Fruit finish rating (0-5) or USDA grade for russet*			
		Russet		G. Del. %	Opalescence
		Idared	G. Del.	X-Fcy/Fancy	Idared
0 Non-treated control	---	1.7 a	1.5 a-c	84 a	1.7 c
1 Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Inspire Super 12 fl oz + Manzate 75 DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2,4,6 5C-8C	1.5 a	1.6 a-d	91 a	1.2 b
2 Merivon 4.18SC 5.5 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	1.1 a	1.3 ab	91 a	0.6 a
3 GWN-10411 20SC 3 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	1.4 a	1.6 b-d	93 a	0.9 ab
4 GWN-10411 20SC 4 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-2C 3C-8C	1.5 a	1.5 a-c	84 a	1.1 ab
5 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	1.4 a	1.7 b-d	85 a	1.1 b
6 GWN-10250 28 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	1.6 a	1.4 a-c	87 a	1.2 b
7 GWN-10250 32 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	1.5 a	1.0 a	97 a	1.1 b
8 GWN-10250 36 fl oz + Manzate 75DF 3 lb + Silwet 114 ml/100 gal Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC-3C 4C-8C	1.3 a	1.4 ab	90 a	1.2 b
9 Torino 0.85SC 6.8 fl oz + Manzate 75DF 3 lb + Induce 8 fl oz /100 gal Luna Sensation 500SC 5.5 fl oz + Manzate 3 lb Merivon 4.18SC 5.5 fl oz + Manzate 75DF 3 lb Rhyme 2.08SC 6.5 fl oz + Manzate 75DF 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	#1,3,5,7 #2 #4 #6 5C-8C	1.6 a	2.1 d	78 a	1.1 b
10 VA-1 2.01 fl oz + Syl-Coat 235 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	1.2 a	1.4 a-c	87 a	1.1 ab
11 VA-1 2.01 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	1.5 a	2.0 cd	77 a	1.2 b
12 Luna Sensation 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	1.3 a	2.0 cd	87 a	0.9 ab
13 Fontelis 1.67SC 1pt + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	1.3 a	1.7 b-d	84 a	1.0 ab
14 Aprovia 0.83EC 5.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	1.4 a	2.0 cd	85 a	1.0 ab
15 Sercadis 2.47SC 3.5 fl oz + Syl-Coat 114 ml/100 gal Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	OC, PF BI, 1C 3C-8C	1.5 a	1.4 ab	91 a	1.0 ab
16 Inspire Super 2.82EW 12 fl oz Captan 80WDG 30 oz + Ziram 76DF 3 lb	BI, 1C 3C-8C	1.4 a	1.7 b-d	87 a	1.3 bc
17 Inspire Super 12 fl oz + Manzate Pro-Stick 3 lb Captan 80WDG 30 oz + Ziram 76DF 3 lb	BI, 1C 3C-8C	1.6 a	1.8 b-d	83 a	1.1 b

Mean separation by Waller-Duncan K-ratio t-test (p=0.05). Four paired-tree replications, Harvest counts of 25 fruit per tree picked 19 Sep (Idared and Golden Delicious).

* Fruit finish rated on a scale of 0-5 (0=perfect finish; 5=severe russet or opalescence). USDA Extra-fancy and fancy grades after downgrading by russet presumed not to be caused by mildew.

Treatments applied at 100 gpa to both sides of the tree row on each application date: 5 Apr (App. # 1, open cluster); 13 Apr (App. # 2, bloom); 26 Apr (App. # 3, PF); Apps. #4-11, 1C-8C (1st-8th covers): 9 May, 23 May, 8 Jun, 22 Jun, 10 Jul, 27 Jul, 4 Aug, 16 Aug.