GRAPE (*Vitis vinifera* 'Chardonnay')
Powdery Mildew; *Erysiphe necator*

J. W. Pscheidt and D. R. Kroese
Dept. of Botany and Plant Pathology
Oregon State University
Corvallis, OR 97333

Organic materials for grape powdery mildew management, 2021.

Fungicide treatments were arranged in a randomized complete block design in a block of 'Chardonnay' planted in 1985 on a 7x11 ft spacing. Chardonnay vines were trained to a bilateral cordon with spur pruning and pruned from 11 to 14 Jan. Shoot thinning by hand occurred on 28 to 29 Apr and sucker removal occurred periodically during the growing season. Canes were cut above the top wire on 6 Jul and maintained at this height throughout the growing season. Each treatment was replicated on four sets of five vines. Treatments were applied using a hooded boom sprayer at 150 psi at a rate of 80 to 128 gal water/A depending on canopy growth such that 2.8 to 4.5 gal of spray suspension was used per 20 vines. Fungicide treatments were applied on 18 May (BBCH 19), 26 May (BBCH 53), 3 Jun (BBCH 59), 10 Jun (start of bloom, BBCH 63), 17 Jun (BBCH 67), 24 Jun (BBCH 71), 2 Jul (BBCH 73), 9 Jul (BBCH 75), 16 Jul (BBCH 76), 23 Jul (BBCH 78), 30 Jul (BBCH 79) and 6 Aug (just before verasion, BBCH 81). Leaves were removed from the fruiting zone on the east side of all vines on 30 Jun. Movento (6 fl oz/A) was applied on 24 May for erineum mite management. Makaze (64 fl oz/A) plus GoalTender (40 fl oz/A) plus Mission (2.5 fl oz/A) were tank mixed and applied to all rows on 22 Jan, while Makaze (3 fl oz/gal) was applied on 30 Apr and Forfeit 280 (3 fl oz/gal) was applied on 22 Jun for spot management of weeds. Fertilizer (16-16-16 at 30 lb/A) was applied 22 Apr but little rain occurred to move it into the soil. According to the Gubler-Thomas powdery mildew forecasting model, there were 7 rain events between bud break and end of bloom that were favorable for ascospore release and infection: 3 severe infection periods (24 May, 11 and 12 Jun), 2 moderate infection periods (24 and 30 Apr) and 2 low infection periods (7 and 19 May). The powdery mildew risk index shot up to high (0 to past 60) for a short period then declined twice around mid-May and again early June before remaining high (above 60) from 19 June until the end of Sep. Incidence and severity of powdery mildew on fruit was evaluated on 7, 13, and 22 July while incidence and severity of powdery mildew on leaves was evaluated on 29 Jun, 19 Jul and 12 Aug. Powdery mildew disease data were collected by arbitrarily examining 50 clusters or leaves from the middle three vines of each replicate. Treatments were also evaluated by calculating the area under disease progress curve (AUDPC) which was calculated by multiplying the mean incidence or severity from two observation dates by the number of days between observations ($\Sigma[Y_{i+1} + Y_i)/2][X_{i+1}-X_i]$ where Y_i is incidence or severity of mildew in percent at i*th* observation and X_i is the day of the i*th* observations). Values calculated between each pair of observations are added together to obtain a total AUDPC.

Spring rainfall was well below average and an unusual climate change related heat dome (heat wave) occurred for 3 days in late June with temperatures at or above 100°F. This resulted in the second driest and second hottest growing season ever recorded. Symptoms of powdery mildew were first found on 17 May as a few individual colonies on scattered vines and flag shoots. Incidence of powdery mildew on clusters was high and not significantly different among treatments. Highest severity of powdery mildew on clusters was found on non-treated vines and was significantly higher than the powdery mildew found on fungicide treated vines. There was no significant difference in cluster powdery mildew among fungicide treated vines. Incidence of powdery mildew on leaves was also high and not significantly different among treatments. Highest severity of powdery mildew on leaves was found on non-treated vines and was significantly higher than the powdery mildew found on fungicide treated vines. Lowest 12 Aug powdery mildew severity on leaves was found on vines treated with EcoSwing, however, the severity found on vines treated with Regalia was not significantly different. There was no significant difference in leaf severity AUDPC among fungicide treated vines. There was no significant difference in soluble solids among treatments when evaluated on 13 Sep for an average of 21.9 brix (data not shown).

Minor phytotoxicity in the form of very small necrotic leaf and cane spots was observed on vines treated with the high rate of AgriCell a few days after the first application. Youngest tissues at application seem most susceptible. The rate was lowered to prevent further damage. Phytotoxicity in the form of berry russeting on the east side was observed on vines treated with Regalia plus Cohere on 7 June. Regalia alone has not caused any issues in previous trials and the manufacturer indicated that surfactant is not needed. No phytotoxicity was observed on vines treated with EcoSwing plus Cohere. Conclusion - never mix Cohere with Regalia.

Table 1. Incidence and severity of grape powdery mildew on Chardonnay clusters.

Treatment & Rate/A or /100 gal water as indicated	Time of Application*	Clusters with Powdery Mildew**			
		Incidence (22 July)	Incidence AUDPC	Severity (22 July)	Severity AUDPC
Non-treated…….……..	None……	100	1440	73.0 a	1177 a
EcoSwing at 1 qt plus Cohere at 1 pt/100 gal……..…	All……..	93.5	1369	49.6 b	884 b
Regalia at 3 qt plus Cohere at 1 pt/100 gal……..…	All……..	93.0	1323	51.4 b	878 b
AgriCell at 128 fl oz/100 gal plus Dyne-Amic at 12 fl oz/100 gal	All……..	97.0	1371	58.2 ab	989 b
AgriCell at 256 fl oz/100 gal plus Dyne-Amic at 12 fl oz/100 gal AgriCell at 64 fl oz/100 gal plus Dyne-Amic at 12 fl oz/100 gal	A, B, C D-L…….	97.5	1378	57.3 b	981 b

* Pesticides were applied on A = 18 May (BBCH 19), B = 26 May (BBCH 53), C = 3 Jun (BBCH 59), D = 10 Jun (start of bloom, BBCH 63), E = 17 Jun (BBCH 67), F = 24 Jun (BBCH 71), G = 2 Jul (BBCH 73), H = 9 Jul (BBCH 75), I = 16 Jul (BBCH 76), J = 23 Jul (BBCH 78), K = 30 Jul (BBCH 79) and L = 6 Aug (just before verasion, BBCH 81).

** Means followed by the same letter do not differ significantly based on Fisher's protected LSD (*P=0.05*). Means without letters are not significantly different.

Table 2. Incidence and severity of grape powdery mildew on Chardonnay leaves.

Treatment & Rate/A or /100 gal water as indicated	Time of Application*	Leaves with Powdery Mildew**			
		Incidence (12 Aug)	Incidence AUDPC	Severity (12 Aug)	Severity AUDPC
Non-treated…….……..	None……	100	4325	99.7 a	2936 a
EcoSwing at 1 qt plus Cohere at 1 pt/100 gal……..…	All……	100	4121	68.7 c	1591 b
Regalia at 3 qt plus Cohere at 1 pt/100 gal……..…	All…….	100	4033	74.0 c	1662 b
AgriCell at 128 fl oz/100 gal plus Dyne-Amic at 12 fl oz/100 gal	All…….	100	4101	83.7 b	1863 b
AgriCell at 256 fl oz/100 gal plus Dyne-Amic at 12 fl oz/100 gal AgriCell at 64 fl oz/100 gal plus Dyne-Amic at 12 fl oz/100 gal	A, B, C D-L…….	100	4157	86.3 b	1821 b

* Pesticides were applied on A = 18 May (BBCH 19), B = 26 May (BBCH 53), C = 3 Jun (BBCH 59), D = 10 Jun (start of bloom, BBCH 63), E = 17 Jun (BBCH 67), F = 24 Jun (BBCH 71), G = 2 Jul (BBCH 73), H = 9 Jul (BBCH 75), I = 16 Jul (BBCH 76), J = 23 Jul (BBCH 78), K = 30 Jul (BBCH 79) and L = 6 Aug (just before verasion, BBCH 81).

** Means followed by the same letter do not differ significantly based on Fisher's protected LSD (*P=0.05*). Means without letters are not significantly different.