# Field Susceptibility of Apple Cultivars to Scab, *Venturia inaequalis* and Powdery Mildew, *Podosphaera lencotricha* in a Cool, Humid, Climate[1]

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Since 1963 approximately one hundred apple cultivars and advanced breeding selections have been evaluated at Northwestern Washington Research and Extension Unit, located 65 miles north of Seattle adjacent to the Pacific Ocean. A 1972 report (3) describes disease susceptibility and general horticultural characteristics of 68 cultivars. Many of these cultivars have been discarded and others added. This report presents subjective disease ratings, based on annual observations of natural infection in the field from 1972-1979.

Climatically this area is typified by an annual precipitation of from 381-2032 mm (15-80 inches) depending on proximity to the Cascade and Olympic Mountains. Cool summer temperatures, rarely exceeding 26.7°C (80°F), and frequent light showers, fog, and dew furnish ideal conditions for scab and mildew development. The Research Unit, the locale of the described trials, has an annual rainfall of 813 mm (32 inches) and average temperature of 10.2°C (50.3°F) distributed as shown:

| | Rainfall | Temperature °C | | | |
|---|---|---|---|---|---|
| Month | (mm) | Mean | Max. | Min. | Highest | Lowest |
| Jan. | 96 | 3.8 | 7.4 | 0.2 | 18.3 | −20.0 |
| Feb. | 79 | 5.6 | 9.5 | 1.7 | 21.1 | −13.3 |
| Mar. | 69 | 6.7 | 11.0 | 2.3 | 19.4 | − 5.0 |
| Apr. | 62 | 9.4 | 14.6 | 4.1 | 24.4 | − 2.2 |
| May | 45 | 12.5 | 18.6 | 6.4 | 31.7 | 0 |
| June | 41 | 15.0 | 20.6 | 9.2 | 32.2 | 3.9 |
| July | 21 | 16.7 | 23.9 | 9.6 | 33.8 | 3.3 |
| Aug. | 41 | 16.5 | 23.4 | 9.6 | 36.7 | 2.8 |
| Sept. | 53 | 14.1 | 20.6 | 7.7 | 29.4 | − 1.1 |
| Oct. | 93 | 10.6 | 15.6 | 5.7 | 24.4 | − 2.2 |
| Nov. | 105 | 6.2 | 10.1 | 2.2 | 16.7 | − 6.7 |
| Dec. | 109 | 5.0 | 8.3 | 1.6 | 14.4 | −16.1 |

The trees upon which the disease ratings were taken are located in three small blocks, all within a radius of one quarter mile. One block is seeded to perennial turfgrass with soil residual chemical weed control in the tree row. The other two are presently clean cultivated. All trees are growing on size controlling rootstocks, EM 26, VII, IX and 106. From 1-11 single tree replications of each cultivar have been established in different years since 1963. Thus, there are a variable number of disease observations recorded in the study and no attempt was made to analyze the observations statistically.

The ratings were made annually on each tree in the orchard blocks between mid-July and mid-August. Since June drop and hand thinning were completed prior to rating, the data do not represent the maximum percent of infected fruit, but simply an estimate of the degree of disease carrying through to harvest. Scab ratings represent the approximate percent of fruit with scab lesions. Number and size of lesions was not considered. Mildew infection was estimated as the percentage of shoots showing symptoms of the disease.

A "minimal" spray program was applied annually. This usually consisted of a pre-pink or pink application of benomyl, oil, polysulfide or dodine (Cyprex), alone or in combinations;

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a petal fall application of dodine, dinocap (Karathane), Captan or wettable sulfur alone or in combination, and an occasional summer spray of dodine and dinocap following an extended rainy period. Insecticides were added as needed for aphids, leaf roller and mites. Codling moth is not a major problem in tihs area.

The data in Table 1 presents both the maximum disease incidence recorded in any single observation and the overall mean. The scab and mildew ratings varied greatly from season to season and from tree to tree because of weather conditions, effectiveness of the spray program and location in the orchard. Thus, both the maximum and the mean are helpful in evaluating field resistance.

**Table 1. Susceptibility of 78 Cultivars to Field Infection of Scab and Mildew.**

| Cultivar | No. of Trees[1] | No. of Observations[2] | % Mildew | | % Fruit Scab | |
|---|---|---|---|---|---|---|
| | | | Maximum[3] | Mean[4] | Maximum | Mean |
| Ashmead's Kernel | 2 | 8 | 20 | 8.1 | 60 | 21.2 |
| Blushing Golden | 1 | 7 | 20 | 8.0 | 80 | 33.6 |
| Bramley's Seedling | 2 | 8 | 30 | 3.8 | 10 | 3.6 |
| Brown Russet | 1 | 6 | 20 | 3.3 | 15 | 5.0 |
| Buckley Giant | 1 | 6 | 20 | 7.5 | 1 | 0.2 |
| Burgundy | 1 | 7 | 80 | 43.6 | 90 | 42.9 |
| Chehalis | 3 | 22 | 80 | 13.2 | 30 | 4.5 |
| Coop 1 | 1 | 5 | 10 | 3.0 | 0 | 0 |
| Delicious (Gardner) | 1 | 8 | 15 | 2.9 | 90 | 51.0 |
| Discovery | 4 | 15 | 10 | 0.7 | 75 | 13.7 |
| Early McIntosh | 1 | 7 | 10 | 3.6 | 90 | 27.1 |
| Empire | 1 | 8 | 25 | 11.3 | 90 | 48.8 |
| Fuji | 4 | 15 | 25 | 2.9 | 95 | 35.3 |
| Gala | 4 | 14 | 30 | 3.6 | 95 | 28.2 |
| Golden Delicious | 1 | 4 | 20 | 6.3 | 30 | 11.3 |
| Gravenstein | 6 | 25 | 20 | 5.4 | 90 | 9.0 |
| Grove | 1 | 5 | 25 | 9.0 | 90 | 47.0 |
| Hawaii (Early Golden) | 3 | 22 | 35 | 10.2 | 90 | 23.6 |
| Holiday | 1 | 6 | 50 | 18.3 | 90 | 41.7 |
| Holly | 2 | 8 | 5 | 0.6 | 80 | 27.5 |
| Honeygold | 2 | 6 | 15 | 4.2 | 95 | 46.7 |
| Hudson's Golden Gem | 2 | 8 | 40 | 7.5 | 15 | 3.1 |
| Idared | 2 | 15 | 90 | 29.7 | 90 | 24.3 |
| Jefferis | 1 | 6 | 60 | 23.5 | 30 | 10.8 |
| Jerseymac | 3 | 5 | 90 | 35.0 | 100 | 67.8 |
| Jonagold | 4 | 16 | 50 | 16.3 | 50 | 17.5 |
| Jonalicious | 1 | 8 | 60 | 10.6 | 14 | 6.0 |
| Jonamac | 4 | 16 | 90 | 25.3 | 80 | 22.0 |
| Jonnee | 1 | 6 | 90 | 62.5 | 80 | 30.0 |
| Julyred | 1 | 4 | 90 | 62.5 | 100 | 86.2 |
| Laking | 3 | 9 | 35 | 11.7 | 90 | 41.1 |
| Lodi | 2 | 11 | 30 | 10.6 | 80 | 27.7 |
| Lyman's Large Summer | 1 | 6 | 15 | 2.5 | 90 | 44.2 |
| Macoun | 3 | 25 | 90 | 32.3 | 70 | 16.2 |
| Magnolia Gold | 2 | 8 | 70 | 30.6 | 85 | 31.9 |

## Table 1. (Continued)

| Cultivar | No. of Trees[1] | No. of Observations[2] | % Mildew | | % Fruit Scab | |
|---|---|---|---|---|---|---|
| | | | Maximum[3] | Mean[4] | Maximum | Mean |
| Maigold | 2 | 7 | 15 | 3.6 | 85 | 12.9 |
| Melba, Red | 1 | 7 | 15 | 3.6 | 60 | 38.6 |
| Melrose | 2 | 16 | 80 | 24.4 | 60 | 20.0 |
| Minn 1039 | 3 | 4 | 75 | 42.5 | 60 | 41.3 |
| Mother | 1 | 7 | 30 | 9.3 | 10 | 2.9 |
| Mutsu | 2 | 14 | 5 | 0.4 | 25 | 11.8 |
| NJ 49 | 3 | 9 | 10 | 3.9 | 100 | 61.7 |
| NJ 50 | 3 | 9 | 20 | 5.0 | 80 | 50.6 |
| NJ 52 | 3 | 9 | 5 | 0.6 | 90 | 63.9 |
| Newtosh | 1 | 5 | 50 | 18.0 | 90 | 27.0 |
| NY E-18 | 2 | 7 | 18 | 3.4 | 25 | 5.0 |
| NY 381 | 2 | 6 | 5 | 0.8 | 50 | 25.8 |
| NY 18491 | 1 | 6 | 25 | 15.8 | 10 | 4.2 |
| NY 44410-2 | 1 | 6 | 40 | 13.3 | 40 | 19.2 |
| NY 55140-9 | 1 | 6 | 40 | 18.3 | 0 | 0 |
| NY 58553-1 | 1 | 6 | 25 | 13.3 | 0 | 0 |
| Orenco | 1 | 4 | 40 | 13.8 | 40 | 17.5 |
| Oriole | 2 | 9 | 95 | 48.9 | 20 | 11.7 |
| Ozark Gold | 2 | 8 | 10 | 1.3 | 30 | 8.9 |
| Paulared | 2 | 12 | 70 | 20.8 | 30 | 5.5 |
| Prima | 3 | 16 | 60 | 9.9 | 20 | 1.3 |
| Prime Red (Akane) | 4 | 18 | 60 | 12.8 | 60 | 8.1 |
| Priscilla | 2 | 5 | 10 | 2.2 | 0 | 0 |
| Quinte | 1 | 4 | 8 | 2.0 | 80 | 63.8 |
| Raritan | 1 | 8 | 40 | 16.9 | 10 | 4.9 |
| Red Baron | 2 | 6 | 75 | 16.7 | 15 | 4.2 |
| Signe Tillisch | 1 | 6 | 80 | 48.3 | 25 | 9.2 |
| Sinta | 5 | 12 | 30 | 6.2 | 95 | 33.3 |
| Sir Prize | 3 | 5 | 80 | 46.0 | 0 | 0 |
| Spartan | 11 | 72 | 30 | 2.2 | 90 | 6.0 |
| Spigold | 1 | 5 | 75 | 24.0 | 25 | 5.2 |
| Stark Splendor | 1 | 6 | 0 | 0 | 80 | 25.0 |
| Starkspur Earliblaze | 2 | 5 | 25 | 7.0 | 30 | 11.0 |
| Stirling | 3 | 7 | 0 | 0 | 10 | 1.4 |
| Summerglo | 1 | 8 | 20 | 3.1 | 100 | 18.1 |
| Summerred | 3 | 19 | 70 | 12.5 | 90 | 36.1 |
| Tohoku 4 | 1 | 7 | 5 | 0.7 | 5 | 0.7 |
| Tompkins King | 1 | 5 | 80 | 23.0 | 10 | 2.0 |
| Tydeman Early | 3 | 13 | 20 | 3.1 | 10 | 1.7 |
| US-Ga 6132 | 4 | 9 | 30 | 8.1 | 75 | 33.9 |
| Viking | 4 | 21 | 50 | 6.7 | 95 | 21.4 |
| Vista Bella | 1 | 5 | 20 | 16.0 | 100 | 81.0 |
| Wolf River | 1 | 6 | 10 | 1.7 | 5 | 1.7 |

[1]Number of bearing trees rated.
[2]Total number of observations = number of times each tree was rated (mildew and fruit scab). No cultivar rated less than 4 years.
[3]Highest rating recorded for a given cultivar.
[4]Mean of all ratings.

## Conclusions

Cultivars with high *resistance* to both scab and mildew: Bramley's Seedling, Brown Russet, Coop #1, Priscilla, Stirling, Tohoku 4, Tydeman's Early and Wolf River.

Cultivars with high *susceptibility* to both scab and mildew: Burgundy, Idared, Jerseymac, Jonamac, Jonnee, Julyred, Melrose and Magnolia Gold.

Cultivars with high *resistance* to scab *only*: Buckley Giant, Chehalis, Hudson's Golden Gem, Mother, NY 55140-9, NY 58553-1, NY 18491, Prima, Raritan, Red Baron, Sir Prize and Tompkins King.

Cultivars with high *resistance* to mildew *only*: Discovery, Early McIntosh, Holly, Mutsu, NJ 52, NY 381, Ozark Gold, Quinte and Stark Splendor.

These data are helpful in developing recommendations for various types of clientele, whether they be commercial growers committed to a thorough chemical disease control program or those with an equal commitment to avoiding pesticides. Publications providing general cultivar descriptions (2, 7), with one notable exception (1), do not provide sufficient data specifically on disease resistance. Therefore, we have been providing applied publications to our clientele to inform them of our special regional requirements. (4, 5, 6)

## Literature Cited

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# Book Review

**Growing Your Own Fruits and Nuts in the Sub-Tropics.** Henry Louis Ullman, PIC O MAUI, Publishers, Box 635, Makawao, HI 96768. $1.75.

A handbook guide for growing your own fruits and nuts in the sub-tropics is presented in such a manner that one might grow these plants with expertise in Hawaii.

The following crops were discussed: banana, papaya, lilikoe, mango, avocado, orange, lemon, lime, tangerine, lychee, guava, breadfruit, annona, fig, macadamia nut, coconut, strawberry and deciduous fruit trees.

The author failed to meniton the Horticulture Department of the University of Hawaii for further detailed information concerning the growth and production of these crops. The grower should obtain as much information as possible concerning the specific planting before time and expense are involved.

—*R. K. Simons*