

Broccoli resistance to downy mildew

Franklin F. Laemmlen □ Keith S. Mayberry

Several available varieties are more resistant than those now grown in the Imperial Valley

Broccoli has become an important winter vegetable crop in the Imperial Valley, where acreage has steadily increased from 2,700 acres in 1978-79, to more than 5,000 in 1983-84. New varieties adapted to desert growing conditions are under continual development by seed companies.

Downy mildew of broccoli, caused by *Peronospora parasitica*, poses a threat to the crop each season. One or more fungicide applications are necessary to produce a quality product at harvest in most years. To obtain information on the disease resistance as well as horticultural characteristics of currently available broccoli cultivars in the Imperial Valley, we conducted a trial during the 1983-84 growing season at the University of California Imperial Valley Agricultural Center near Holtville.

Seeds of 14 commercially available cultivars were planted in a randomized complete block design, with each block replicated four times. The cultivars were planted in double rows on 42-inch beds, and each plot was 30 feet long. An additional 28 experimental or recently released cultivars were planted in a single plot for observation. All plantings were thinned to 8 inches in row.

The trial began on October 5, 1983, and downy mildew was rated on January 16, 1984. Downy mildew of broccoli in the Imperial Valley normally does not appear until plants have grown to cover the bed tops and furrows with foliage. Humidity within the plant canopy then provides the microenvironment in which the downy mildew fungus can infect and cause disease. Oldest leaves usually show symptoms of infection first.

The cultivars Emperor and Green Duke now compose most of the commercial broccoli acreage in the Imperial Valley. Those cultivars, plus Apollo, Green Knight, Surfer, and Green Valiant are among the most susceptible to downy mildew under Imperial Valley conditions (table 1). The cultivars Cindy, Citation,

TABLE 1. Reaction of broccoli cultivars to downy mildew, Imperial Valley, 1983-84

Cultivar	Disease index*
Cindy (QualiSel)	1.00 a
Citation (Moran)	1.12 ab
Excalibur (Moran)	1.75 b
Nancy (QualiSel)	1.75 b
Nu-Green (Neuman)	3.00 c
Commander (Northrup King)	3.00 c
Prominence (Takii)	3.25 c
Premium Crop (Takii)	3.50 cd
Apollo (Asgrow)	4.00 de
Green Duke (Northrup King)	4.25 e
Green Knight (Northrup King)	4.37 e
Surfer (Royal Sluis)	4.50 e
Green Valiant (Northrup King)	4.50 e
Emperor (Northrup King)	4.50 e

*Disease index (average of four replications): 1 = no disease; 5 = infection of 100% of foliage and some of inflorescence. Means with different letters are significantly different at the 5% level. Duncan's Multiple Range Test.

TABLE 2. Reaction of experimental broccoli varieties to downy mildew, Imperial Valley, observation trial, 1983-84

Cultivar	Disease index*
Hyb. 1230 (Moran)	1.0
Green Surf (Moran)	1.0
Hyb. 2804 (QualiSel)	1.0
Hyb. 2806 (QualiSel)	1.0
Hyb. 2803 (QualiSel)	2.0
GSV 82-4310 (Goldsmith)	2.0
XPH 1117 (Asgrow)	2.0
Hyb. 288 (Moran)	2.5
AVX 7631 (Sun Seeds)	2.5
Bonanza (Burpee)	3.0
Hyb. 90 (Northrup King)	3.0
Shogun (Northrup King)	3.0
Laser (Royal Sluis)	3.0
Cruiser (Royal Sluis)	3.0
Exp. 3481 (Peto)	3.0
Exp. 21881 (Peto)	3.0
AVX 7901 (Sun Seeds)	3.0
Exp. 286 (Scattini)	3.5
Exp. 2431 (Royal Sluis)	3.5
AVX 8002 (Sun Seeds)	4.0
AVX 8001 (Sun Seeds)	4.0
AVX 8000 (Sun Seeds)	4.0
XPH 5166 (Asgrow)	4.0
Hyb. 43 (Sakata)	4.0
Southern Comet (Takii)	4.5
Hi Grown (Takii)	4.5
Exp. 22081 (Peto)	4.5
Exp. 290 (Scattini)	4.5

*Disease index: 1 = no disease; 5 = infection of 100% of foliage and some of inflorescence. One 30-foot plot rated at harvest time; no statistical analysis performed.



Examples of broccoli cultivars with varying degrees of resistance to downy mildew: at top, very resistant; middle, moderately susceptible; and bottom, susceptible.

Excalibur, and Nancy showed high degrees of resistance to the disease and, if grown, would eliminate the need for fungicidal control of downy mildew.

Several of the highly resistant varieties showed good to excellent horticultural characteristics, such as head size and color, head shape and compactness, and stalk diameter, and should receive further evaluation in commercial plantings.

Among the experimental varieties planted for observation, only Hybrid 1230, Green Surf, Hybrid 2804, Hybrid 2806, and Hybrid 2803, GSV 82-4310, XPH 1117, Hybrid 288, and AVX 7631 showed a high degree of resistance to downy mildew. These lines or their parents should be useful as potential breeding material to develop cultivars for areas with heavy downy mildew pressure.

Franklin F. Laemmlen and Keith S. Mayberry are Farm Advisors, University of California Cooperative Extension, Imperial County.