

Grape Variety Performance Under Drought Conditions*

J. N. MOORE, W. A. SISTRUNK, and J. E. VAILE†

The 1964 season in Arkansas provided an excellent opportunity to observe the performance of grape varieties under extremes of heat and drought. Figure 1 shows the mean weekly maximum and minimum temperatures and rainfall at the Clarksville Fruit Substation, Clarksville, Arkansas, where the grape variety trials are located. From May 1 to September 1, maximum temperatures were above 95°F. on 65 days, and exceeded 100°F. on 42 days. July was the hottest month, with 22 days in which maximum temperatures exceeded 100°F. A maximum temperature of 110°F. was recorded during the season.

During the period May 12 to August 8 only 1.86 inches of rainfall were recorded. The months of June and July were very dry, with total rainfall of only 0.83 inches and 0.53 inches, respectively. No irrigation was applied to the vineyard during the season.

The performance of 44 grape varieties was evaluated in 1964. Twenty-six of these were planted in 1961, and the remainder were set in 1962 in a Linker loamy fine-sand soil. One year old, No. 1 own-rooted plants were spaced 8 feet apart in rows 10 feet wide. Four single plant replicates were used for each variety. Both American bunch grape varieties and French hybrids were included in the planting. The American varieties were pruned to the four-cane Kniffen system, and the French Hybrids were pruned to spurs or short canes.

Data on yield, soluble solids (by refractometer), titratable acidity as percent tartaric, juice pH, optical density of juice, and a drought resistance rating of the vine are given in Table 1. Yields ranged from 0.82 tons/acre for Barnes (a rootstock selection of *Vitis champini*) to 10.15 tons/acre for USDA Meridian 17, with a mean for all varieties of 4.32 tons/acre. Among the higher yielding varieties were Seibel 5-279, Schuyler, Seibel 9110, Seibel 7053, Seyve-Villard 15-403, Niagara, Golden Muscat, and Fcche.

Soluble solids in excess of 20% were recorded for Seibel 13053, Delaware, and Seibel 1000. Other varieties having high soluble solids were Seibel 5-279, Ontario, Seyve-Villard 12-375, Baco #1, Seyve-Villard 5-276, and Dr. Collier. The mean soluble solids content of all varieties was 16.5%. The soluble solids content of Fredonia, Sheridan, Bath, Niagara, Concord, and McCampbell were quite low and seemed to be associated with scorching of the foliage of these varieties as a result of the hot, dry conditions.

Titratable acidity ranged from 1.80% for Seyve-Villard 23-657 to 0.49% for Seibel 10868, with a mean of all varieties of 0.89%. A combination of relatively high soluble solids and high acidity, desirable in processed juice and in the manufacture of certain wines, was attained by Seyve-Villard 23-657, Seibel 8357, Baco #1, Yates, and Barnes.

Optical density was measured by diluting 1 part of expressed juice with

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Table 1. Yield, fruit quality, and drought resistance of 44 grape varieties at Clarksville, Arkansas, 1964.¹

Variety	Harvest Date	Yield (T/A)	Soluble Solids (%)	Titratable Acidity (% tartaric)	Juice pH	Optical Density (500 μ)	Drought Resistance Index ³
Planted 1961							
Seibel 5-279	7/21	6.14	19.4	0.84	3.7	0.155	0.8
Schuyler	7/21	6.26	17.0	0.59	3.6	0.375	2.0
Ontario	7/21	4.92	19.0	0.79	3.5	0.510	2.3
Fredonia	7/28	2.58	13.0	1.15	3.3	0.850	4.0
Seibel 5898	7/28	3.13	14.5	0.83	3.8	1.220 ²	0.3
Portland	7/28	4.15	13.3	0.70	3.5	0.190	2.8
Seibel 9110	8/4	6.29	15.4	1.07	3.7	0.154	1.5
Seibel 7053	8/4	6.02	15.6	0.92	4.0	0.405	1.5
Seibel 1000	8/4	1.70	20.9	0.65	3.8	0.280	1.8
SV 23-657	8/4	5.37	18.4	1.80	3.3	0.525	1.0
SV 12-327	8/4	4.96	13.1	1.52	3.5	0.166	0.0
SV 18-315	8/4	5.64	15.9	1.15	3.3	0.355	1.3
Dix	8/4	3.33	16.1	0.58	3.8	1.530 ²	2.0
Steuben	8/4	5.03	15.8	0.90	3.3	0.920	3.8
Seibel 11803	8/11	5.92	18.5	0.79	3.3	0.315	1.0
Seibel 8357	8/11	3.13	17.5	1.31	3.4	4.720 ²	0.8
Seibel 5409	8/11	2.76	17.4	0.58	3.7	0.180	2.5
SV 15-403	8/11	8.09	13.7	0.71	3.4	0.285	1.0
SV 12-375	8/11	5.64	19.4	0.77	3.7	0.140	1.3
Wine King	8/11	2.74	17.4	0.99	3.5	1.380 ²	1.8
Delaware	8/11	3.94	20.6	0.58	3.9	0.530	3.0
Van Buren	8/11	2.53	15.6	0.75	3.6	0.710	2.0
Niagara	8/11	6.71	14.2	0.81	3.4	0.285	3.8
Concord	8/11	3.44	14.4	0.82	3.5	0.710	3.5
Golden Muscat	8/11	6.05	17.0	0.72	3.5	0.245	2.0
USDA Meridian 17	8/11	10.15	14.0	0.77	3.3	0.315	0.0
Catawba	8/25	2.45	16.3	0.86	3.5	0.535	2.8
Planted 1962							
Seibel 13047	7/21	2.82	17.5	0.74	3.7	0.155	0.5
Baco #1	7/21	5.02	19.4	1.31	3.4	0.890	2.3
Cimarron	7/28	3.26	14.2	0.63	3.6	0.900	1.0
Foche	7/28	6.26	18.1	0.85	3.5	1.100 ²	1.8
Bath	7/28	4.39	13.4	0.86	3.5	0.390	3.3
Sheridan	7/28	2.65	13.1	1.04	3.2	0.620	4.0
Seibel 13053	7/28	1.81	22.4	0.60	4.0	0.540	1.0
SV 5-247	7/28	3.82	15.3	0.59	3.7	0.420	0.3
McC Campbell	7/28	3.88	11.6	1.14	3.1	0.670	3.3
Yates	8/4	5.58	16.6	1.04	3.2	0.560	2.5
Seibel 10878	8/4	2.43	18.9	0.68	3.6	0.870	1.8
SV 5-276	8/4	4.15	19.4	0.93	3.7	0.290	1.5
America	8/4	5.44	15.2	0.93	3.6	0.950	0.0
Barnes	8/4	0.82	17.0	1.66	3.3	0.700	0.0
Seibel 10868	8/11	5.19	18.1	0.49	3.9	0.185	1.3
Loretto	8/11	2.04	13.0	0.83	3.4	0.775	1.0
Dr. Collier	8/11	1.43	19.0	0.94	3.6	0.330	1.0
Mean		4.32	16.5	0.89	3.5	0.644	1.8

¹ Means of 4 replications.² Juice so dark that 1:39 dilution was required to get readings on Seibel 8357 and 1:9 dilution was used for Seibel 5898, Dix, Wine King, and Foche. Values in table are calculated for 1:4 dilution to compare with other varieties.³ 0 = no damage; 1 = some yellowing of foliage; 2 = considerable chlorosis, occasional scorched leaf margin; 3 = considerable burning of foliage; 4 = severe burning and defoliation.

4 parts of water and reading the optical density at 500 μ . Dark colored juices result in higher optical density readings. Several varieties were found to produce a darker colored juice than Concord. Seibel 8357 produced a very dark juice, which should be of value for adding color in blends with lighter colored juices. Other varieties having juice appreciably darker than Concord were Seibel 5898, Dix, Wine King, and Foche.

A visual drought resistance rating was made for each plant in the vineyard on September 1. Seyve-Villard 12-327, USDA Meridian #17, America, and Barnes showed no detrimental effects from the prolonged drought and high temperature. Each of these produced abundant new growth of good color during the season, and all except Barnes produced good yields of fruit. Other varieties tolerating the adverse conditions well were Cimarron, Dr. Collier, Loretto, Seibel nos. 5-279, 5898, 11803, 8357, 13047, 13053, and Seyve-Villard nos. 23-657, 15-403 and 5-247. Among the varieties most

severely damaged by the hot, dry conditions were Fredonia, Steuben, Niagara, Concord, Bath, Sheridan, and McCampbell. Many of the vines of these varieties were so completely defoliated during the season that they are likely to sustain considerable winter injury as a result of their weakened condition.

Although the exact parentages of all of the varieties showing tolerance to the hot, dry conditions of 1964 are not known, it is probable that most were derived from crosses involving *Vitis lincecumii* or *V. rupestris*. America, Dr. Collier, and Loretto were all derived from *V. lincecumii* breeding, and most of the French Hybrid selections have genes of *V. lincecumii* and *V. rupestris*. Cimarron resulted from a cross of *V. cinerea* x Seneca. Barnes is a rootstock selection of *V. champini*, and USDA Meridian 17 is from a cross of a *V. champini* selection x Lucile. It is obvious that these native southern species transmit considerable tolerance to heat and drought.

Although many of the varieties that

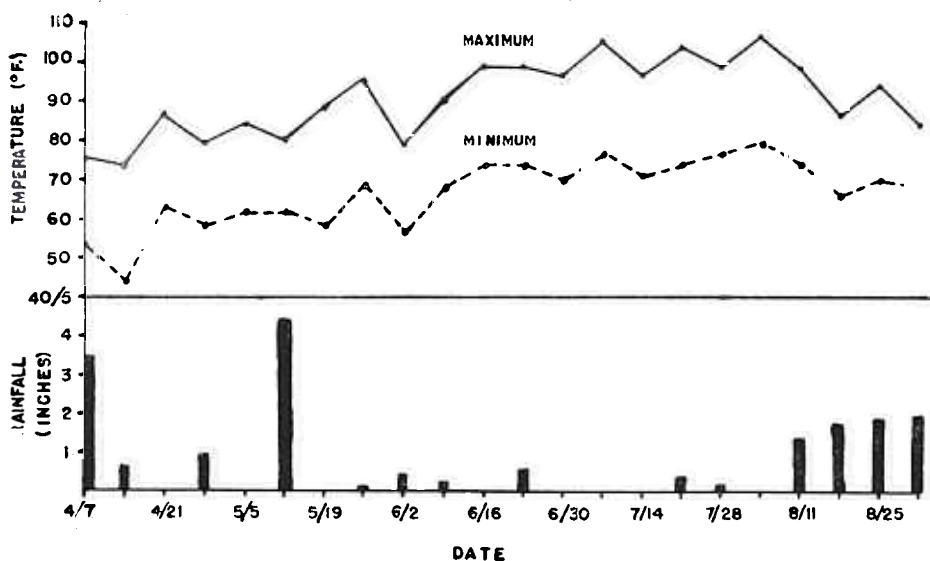


Fig. 1. Mean weekly maximum and minimum temperature and rainfall at the Clarksville Fruit Substation during the summer of 1964.

performed well under the conditions of this test have shown promise as wine grapes, none are now being recommended as table grapes or for processing of unfermented juice. However, Seibel 5898 and Seibel 8357 may have potential in blends of processed juice, and Seibel 11803 and Meridian 17 show promise as table grape varieties. Many of the French Hybrid grapes are reported to be very susceptible to diseases, although no particular disease problems have appeared in the Clarksville vineyard under a routine spray program. Perhaps the greatest value of these varieties would be in their use as parents in a breeding program. Many of the northern varieties which are not adapted to hot, dry conditions have desirable fruit qualities. It should be possible, through controlled breeding, to develop adapted varieties having good fruit quality.

Glenn Thomas, of Stark Bros., Passes Away

When Glenn Thomas died this past summer, we lost a highly regarded horticulturist and highly respected member of the church and community.

He graduated from Michigan State College in 1917 with a degree in Landscape Architecture. He joined the Stark Bros. organization that year, and remained with them until his death, 47 years later. He was in charge of the Mail Order Department at the time of his passing.

Glenn was a life member of APS and the Masons, active in his church, the Boy Scout movement, the Red Cross, United Fund, and other worthy activities.

G. M. Kessler

Sundar and Nuevo Peaches

The 'Sundar' peach is being commercially released in 1965 by the California Citrus Research Center and Agricultural Experiment Station at Riverside. It is a large, juicy, white-fleshed freestone which ripens in mid-September in southern California. Its winter-chilling requirement is moderately short, and is therefore suitable for warm-winter climates. Dr. J. W. Lesley, Professor Emeritus, developed it from crosses involving Prenda, Late Champion, Elberta, and Peento.

In 1961 Dr. Lesley introduced his 'Nuevo.' However, this is a large, yellow-fleshed, clingstone for canning, ripening in late August to early September. It, too, has a low winter-chilling requirement, being similar to Rubidoux in this respect.

—R. M. Brooks

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