Effects of Vine Spacing on Yield and Juice Quality of 'Concord' Grapes

By J.R. MORRIS and D.L. CAWTHON

CONVENTIONAL spacing for 'Concord' grapevines in Arkansas is 3.05 m (10 ft) between rows and 2.44 m (8 ft) between vines within the row. This between-row spacing has been determined largely by accessibility requirements of vineyard equipment. However, the optimum in-row vine spacing and resulting plant density for 'Concord' could vary, depending on inherent vine vigor and the numerous interacting environmental factors that influence vine canopy development and the complete utilization of allocated trellis space.

Many vineyards in Northwest Arkansas are established on Captina silt loam soils formed from weathering of cherty limestone or siltstone, with the major difference between sites being the depth of the plow layer and upper subsoil. The objective of this study was to determine the effect of in-row vine spacing on yield and quality of 'Concord' grapes grown on different depths of soil at the same site location.

The study was conducted for 4 years (1975 thru 1978) in a mature Geneva Double Curtain trained vineyard established at the Main Station in Fayetteville. Before the vineyard was planted, two distinctly different soil depths were created in adjacent blocks by land leveling operations to represent the extremes in soil depth found in commercial vineyards. The shallow soil area was reduced to approximately 25 cm of soil above the subsoil layer, while the deep area had 50 to 55 cm of top soil.

All rows were spaced 3.05 m (10 ft) apart and vines were spaced 1.52 m (5 ft), 1.83 m (6 ft), 2.13 m (7 ft), 2.44 m (8 ft), and 3.05 m (10 ft) apart within the row. These spacings resulted in 2,152, 1,792, 1,537, 1,345, and 1,076 vines/ha or 871, 726, 622, 545, and 436 vines/acre, respectively. All vines were balanced-pruned to a 30+10 severity on 5-node canes and were shoot positioned 2 or 3 times each year. At harvest each year, yields were recorded and fruit samples were collected for quality analysis.

Vines at a given in-row spacing on the deeper soil produced more grapes than vines at that same spacing on the shallow soil, although these values were not compared statistically (see table). As the in-row spacing increased on deeper soil, the per plant yield tended to increase. However, on the shallow soil, an increase in yield per vine did not continue after the 2.13 m (7 ft) spacing.

Shown above is a portion of the vineyard in which this study was conducted.

The pruning weights per vine responded to the soil depths and in-row vine spacings in the same manner as vine yield, with wider spacings and the deeper soil generally producing larger pruning weights. Vines on the deeper soil produced more fruit per retained node than vines on the shallow soil and there was a tendency for the wider vine spacings to produce more fruitful nodes on deep soils. The treatments resulting in increased node fruitfulness produced a larger number of berries per cluster and larger berries (data not shown).

There was no significant difference between the percent soluble solids content of the fruit from either of the soil depths or at the vine spacings used. Soil depth and vine spacing had little effect on percent tartaric acid, juice color, and percent green fruit. However, there was a tendency for grapes at the wider spacing to have slightly lower titratable acidity and a lower percentage of green fruit.

The yields obtained in this study indicate that 'Concord' grapes can be spaced within the row at least 3.05 m (10 ft) apart on good soils without experiencing a total yield reduction, provided the cordons and fruiting canes are maintained. However, when vineyards are planted on the shallow soils of this region, the in-row vine spacing should not exceed 2.44 m (8 ft) for maximum yields. Soil depth or in-row vine spacing had little effect on the attributes of juice quality determined.

Dr. Morris is horticultural food scientist; Mr. Cawthon is research assistant

Effect of Soil Depth and In-row Vine Spacing on Yield Components, Pruning Weights, and Juice Quality of `Concord' Grapes (mean of 4 years)'

Soil depth and vine spacing (m)	Vines/ ha	Yield kg/vine	Yield MT/ha	Pruning weights, kg/vine	Node fruitfulness, g	Soluble solids, %	Tartaric acid, %	Color, abs. 520 nm	Green fruit, %
Shallow soil									
1.52	2152	6.2b	13.5a	0.68c	188a	15.1 a	0.85a	.198a	2.6a
1.83	1793	7.2b	12.8a	0.72c	198a	15.4a	0.80b	.224a	0.8a
2.13	1537	9.1 a	14.0a	0.94b	209a	14.8a	0.82b	.234a	2.3a
2.44	1345	8.9a	12.1 a	1.01b	191a	15.5a	0.81b	.229a	1.7a
3.05	1076	9.2a	9.9b	1.12a	218a	15.4a	0.80b	.208a	2.2a
Deep soil									
1.52	2152	8.7d	18.8a	0.84c	247b	15.2a	0.88a	.182a	6.9b
1.83	1793	11.4c	20.2a	1.09b	264ab	15.2a	0.86ab	.198a	4.9ab
2.13	1537	11.9c	18.3a	1.21b	258ab	15.Sa	0.84ab	.216a	2.5a
2.44	1345	13.8b	18.6a	1.22b	264ab	15.7a	0.83b	.221a	2.1a
3.05	1076	16.9a	18.4a	1.55a	286a	15.7a	0.821d	.201a	3.0a

'Means separation within columns and soil depths by Duncan's multiple range test at 5 percent.