

Influence of Drip Irrigation on 'Concord' Grapes

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Using drip irrigation to prevent periods of water stress to 'Concord' grapes, and improved training and trellising techniques may allow less severe pruning than currently recommended to increase yield while maintaining fruit quality. A four-year study was conducted to determine the influence of irrigation, pruning severity and nitrogen level on yield, vine size and juice quality. The study was in a Geneva Double Curtain trained 'Concord' vineyard established in 1966 at the Main Agricultural Experiment Station, Fayetteville. Soil was a Taloka Mounded series (land-leveled) having a field capacity of 17.1 % and a wilting percentage of 5.2.

Vines were either not irrigated or supplemental irrigation was applied as needed from bloom until 1 week prior to veraison to maintain soil moisture tension between 100-200 mb at a depth of 60 cm.

Pruning schedules were the recommended 30+10 level (30 nodes retained for the first 454 g (1 lb) of dormant prunings and 10 additional nodes retained for each additional 454 g removed) and a 60+10 level. The fruiting nodes were retained on 6-node canes.

Two nitrogen levels were established using NH_4NO_3 . High N plots received 152 and 228 kg/ha actual N in single applications in 1975 and 1976 prior to bloom. In 1977 and 1978, split applications of 114 kg/ha each were applied at bloom and approximately 3 weeks later. Low N plots received 0 kg/ha for the 4-year period.

Yield and pruning weight. During 1975, pruning severity was the only experimental variable that had an influence on yield, with vines pruned to 60+10 yielding more fruit than vines pruned to 30+10 (See table). This was due to more clusters of fruit per vine (data not shown). Vine size of irrigated 30+10 vines tended to be larger and nonirrigated 60+10 vines tended to be smaller than vines in the other treatments (data not shown).

In 1976, yield tended to follow patterns similar to those of 1975, but irrigated vines produced higher yields than nonirrigated vines for a given pruning severity and nitrogen level (See table).

In 1977 and 1978, irrigation had a greater influence on yield than pruning severity. This resulted from greater node fruitfulness for irrigated 30+10 and lower node fruitfulness for nonirrigated 60+10 vines (data not shown). However, in 1977 all irrigated 30+10 and the irrigated, high nitrogen, 60+ 10 vines tended to have higher pruning weights than vines of any other treatments (data not shown). This allowed for more buds to be left during balance-pruning and illustrates the advantages of irrigation to indirectly increase yields by increasing vine vigor.

Juice Quality. In 1975, 1976 and 1978 the percent soluble solids of juice was inversely related to yield with vines from the lowest yielding treatments (nonirrigated, 30+10) having the highest percent soluble solids (See table).

Under the high-yield conditions of 1977, irrigation and high nitrogen were necessary to obtain an adequate level of soluble solids (15% or greater) to be acceptable for processing at the 60+10 pruning severity. Although there were no yield differences between high- and low-nitrogen fertilized vines in 1977, percent soluble solids of juice from low nitrogen fertilized vines was considerably lower.

In 1978, irrigated 30+10 vines at the low-nitrogen level produced the only juice that did not make 15% soluble solids. This treatment also resulted in juice with poor color (data not shown).

In summary, supplemental irrigation increased yields and was beneficial in attaining acceptable quality levels and maintaining vine size when vines were less severely pruned. In order to assure maximum vine performance and highest yields of fruit with 15% or more soluble solids while maintaining vine size, irrigated vines should be pruned more severely than 60+10. In general, higher yields resulted in lower juice quality. Nitrogen requirements would vary from vineyard to vineyard since fruiting response to nitrogen can vary considerably and is often dependant an other cultural practices and soil fertility. However, results indicated that a higher rate of nitrogen fertilizer may be needed for irrigated vines as compared to nonirrigated vines in order to ensure proper fruit maturity at the time of conventional harvest in Arkansas.

Effects of Irrigation, Pruning Severity, and Nitrogen Fertilization on Yield and % Soluble Solids of 'Concord' Grapes. Fayetteville, Arkansas.

Year	Irrig. Txl.	Pruning Severity			
		High Nitrogen		Low Nitrogen	
		60+10	30+10	60+10	30+10
Yield (MT/ha)					
1975	I	15.3 a	10.0 b	15.8 a	9.4 b
	NI	14.8 a	8.1 b	14.0 a	7.0 b
1976	I	13.8 a	10.0 abc	12.3 ab	8.5 bcd
	NI	11.0 abc	7.5 cd	9.1 bcd	5.5 d
1977	I	24.8 a	18.1 bc	25.8 a	24.0 ab
	NI	15.2 cd	13.1 d	18.0 cd	15.1 cd
1978	I	15.8 ab	17.8 a	12.1 bc	16.5 ab
	NI	7.0 bc	7.8 cd	5.9 d	9.3 cd
Soluble Solids (%)					
1975	I	17.8 bc	17.9 abc	17.2 c	17.8 bc
	NI	17.6 c	19.4 a	17.5 c	19.2 ab
1976	I	19.0 ab	18.5 ab	18.0 b	18.6 ab
	NI	18.7 ab	19.7 a	19.2 ab	19.6 a
1977	I	17.0 ab	18.9 a	13.8 de	16.2 bc
	NI	14.5 cd	16.5 bc	12.4 e	16.1 bc
1978	I	15.8 ab	15.5 ab	16.3 ab	14.7 b
	NI	17.5 a	16.6 ab	16.9 a	16.2 ab