

# Effect of Trellis Height with and without Crossarms on Yield of Thompson Seedless Grapes<sup>1</sup>

Robert J. Weaver and A. N. Kasimatis<sup>2</sup>  
University of California, Davis, California

**Abstract.** 'Thompson Seedless' grapes (*Vitis vinifera* L.) were trained to heights of 1.4, 1.7, and 2.0 m with and without an 0.6-m crossarm. Data were collected from 4 seasons beginning in 1969. Within treatments variability was usually too great to reveal significant differences among treatment means for most parameters measured within a single year. Analysis of the 3-year combined results revealed that the highest trellis resulted in most yield, most clusters, and most berry sugar per vine. Vines on the lowest trellis had the least pruning brush wt. Vines with crossarms had higher wt per berry, soluble solids, sugar, and wt brush per vine than did vines without crossarms.

Higher training systems for grape vines should support longer shoots which are more exposed to the sun than are those on lower systems. Crossarms tend to spread shoots so that the leaves are not as likely to shade each other. For these reasons, we might expect larger crop yields on high-trained vines, especially when crossarms are used. The results of an experiment designed to provide information on the effect of trellis height, with and without crossarms, on yield and vigor of the vines are presented in this paper.

## Materials and Methods

In spring, 1966, own-rooted 'Thompson Seedless' vines were planted in an irrigated vineyard at the Kearney Horticultural Field Station near Parlier, CA. A planting of 6 rows of 38 vines per row was used. The rows were 3.7 m apart, and vines were spaced 2.4 m within the rows. In January 1967, trellises were erected and the vines pruned. One set of vines had no crossarms, and another set had 0.6 m crossarms. Wider crossarms were not used so as to avoid the shading of plots in adjacent rows. The treatments were 1.4, 1.7, and 2.0 m trellises with and without a 0.6 m crossarm.

Treatments 1(1.4 m), 2(1.7 m), and 3(2.0 m) each had a single support wire for canes and shoots and treatment 4(1.4 m), 5(1.7 m), and 6(2.0 m) each had 3 support wires (Fig. 1).

There were 9 vines per treatment, each replicated 4 times in randomized blocks. Each contained 4 replications. However, data were obtained from only 3 adjacent vines, selected for uniformity at beginning of the experiment in each plot; the others acted as buffer vines between treatments.

All vines were head-trained and cane-pruned. In 1969 there were usually 2–4 canes per vine. Thereafter there were 4–6 canes depending on individual vine capacity, and each cane was pruned to 15 nodes. In 1970, for treatments 1 and 2 an average of 54 nodes were retained, treatments 4 and 5 – 58, and treatments 3 and 6 – 60. In 1972, treatment 2 had an average of 70 nodes, treatment 1 – 72, treatment 6 – 76, treatments 3 and 4 – 78, and treatment 5 – 80. The numbers of nodes retained in 1973 were similar to those for 1972.

The first crop was harvested in August 1969, at which time crop wt and soluble solids were determined. In all years, a 0.91 kg sample of berries was taken from each 3-vine plot for analysis. In 1970, 1971, and 1972, crop wt, cluster wt, berry wt, soluble solids, and total acid were recorded. Soluble solids content was determined using a hand refractometer, and total acid by titrating 10 ml of juice with 0.133 N NaOH, using phenolphthalein as an indicator. Pruning brush wts were obtained in the dormant season. All data were subjected to analysis of variance.

## Results

**General observations.** More of the shoots on vines without crossarms touched the ground than did vines with crossarms. As a result,

even vines with the highest trellises, but without a crossarm, had a few more shoot tips cut off by cultivation than did vines with crossarms. Also, vines on the trellises with a crossarm produced longer canes and, at pruning, they were mature for a longer length.

**1969 harvest.** In the first crop harvested on August 28, the soluble solids in the juice was about 20% for all vines. Crop wt per vine ranged from 3.0 to 3.4 kg but when treatments were averaged, there was no significant effect of crossarm or height of trellis on amount of crop.

**1970 harvest.** The crop was harvested on August 20. There were no differences among treatments for most measured characters (Table 1). There was a significant linear increase in wt of crop per vine and total sugar in the berries per vine from the lowest to the highest trellis. Soluble solids were higher on vines with crossarms; and pruning brush wt, taken January 28, 1971, were also greater for such vines.

**1971 harvest.** Fruits were harvested on September 10. The highest trellis produced the most brush, and there was a linear significance from the least crop on the lowest trellis to the highest crop on the high trellis (data not shown). Weight of crop per vines, wt per berry, and pruning brush wt (obtained February 14, 1972) were higher on vines with crossarms than on those with no crossarms.

**1972 harvest.** Low temperatures during the period March 26–28 caused some shoot injury, but the extent of injury did not seem to differ with trellis height. Vines were harvested on September 7. The heaviest wt per berry was attained with the medium height trellis, and the highest percent total acid with the highest trellis (data not shown). A significant linear trend for increased values of total acidity with increased trellis height was noted. Vines with crossarms had greater wt per cluster, wt per berry, soluble solids, and berry sugar per vine than did those without crossarms.

**Combined analysis for the 1970–72 period.** This analysis revealed that the highest trellis yielded the greatest total crop wt, most clusters, and most berry sugar per vine, and greatest brush wt (Table 1). Vines with crossarms had higher wt per berry and more soluble solids, berry sugar, and wt of brush per vine than did vines without crossarms. There was no significant interaction between trellis height, presence of

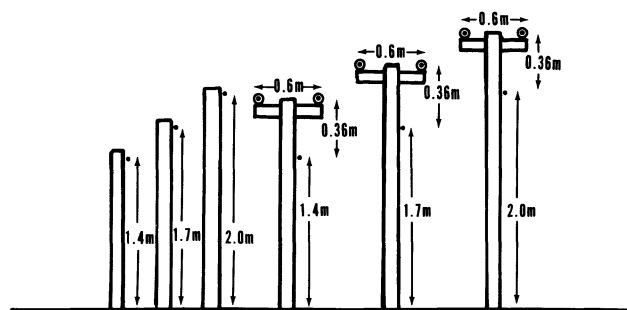


Fig. 1. Diagrammatic illustration of the types of trellises used. Solid dots indicate location of cane-supporting wires, and circled dots indicate foliage-supporting wires.

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<sup>2</sup> Professor of Viticulture and Extension Viticulturist, respectively.

Table 1. The effect of trellis height and construction on yield, quality, and wt of cane prunings of 'Thompson Seedless' grapes (av. data for 1970, 1971, and 1972).

Measurement	Trellis height (m)			LSD 5%	LSD 1%	Linear signifi- cance	Crossarm		LSD 5%	LSD 1%
	1.4	1.7	2.0				Yes	No		
Wt. of crop/vine (kg)	23.2	24.9	26.0*	2.3	NS	1.65	25.6	23.8	NS	NS
No. clusters/vine	48.4	51.0	53.8**	—	5.45	0.95	51.6	50.5	NS	NS
Wt./cluster (kg)	0.48	0.51	0.50	NS	NS	NS	0.51	0.48	NS	NS
Wt./berry (g)	2.13	2.17	2.16	NS	NS	NS	2.21	2.09**	.06	.08
Soluble solids (%)	19.7	20.0	20.1	NS	NS	NS	20.2	19.6**	0.4	0.5
Total acid (%)	0.58	0.58	0.58	NS	NS	NS	0.58	0.58	NS	NS
Sugar in berries/ vine (kg)	4.56	4.98	5.21**	—	0.60	0.58	5.17	4.65**	0.37	0.49
Wt. of cane prunings/ vine (kg)	4.16	4.73*	4.98**	0.49	0.68	NS	5.13	4.12**	0.68	0.93

\*\* Denotes a significant difference between 2 means at the 1% level.

\* Denotes a significant difference between 2 means at the 5% level.

crossarm, or year. In 1970, there was a significant interaction between height and crossarm for soluble solids, and in 1972 for total acid.

### Discussion

Variability within treatments were too great to produce consistent and striking differences among treatment means for most characters within a single year. However, analysis of the combined data from 3 years revealed that the highest trellis produced the highest crop wt, greatest number of clusters per vine, most sugar in berries per vine, and highest pruning brush wt. High pruning brush wt indicates high vine vigor and size, and resultant high yield. Similarly, vines with crossarms had high pruning brush wt, which was reflected in high crop and soluble solids. The results indicate that crossarms are of value, and suggest that wider crossarms should be tried.

In studies with 'Concord' vines as affected by Keuka, 4-arm Kniffin, and Umbrella training in conjunction with 1.4 and 1.8 m trellises, Shaulis et al. (1953) found that the higher training systems usually produced more pruning wood over a 4-year period. Our results revealed the same tendency, although within year differences were significant only in 1971.

Shaulis and May (1971) concluded that, in 'Thompson Seedless', yield increases could be obtained by vine training which reduced shoot crowding. Our use of crossarms is a way to prevent shoot crowding, but wider crossarms than those we used are needed.

Lynn (1965) found that raisin yields of 'Thompson Seedless' were significantly increased by use of a 0.6-m horizontal trellis about 1.2 m above the ground, as compared to a standard 1-wire trellis at the same height. His increases were about 15%, similar to those obtained with the 1.4-m trellis we used. Lynn stated that the horizontal trellis is beneficial mainly because it spreads and supports the shoots, providing better leaf exposure.

### Literature Cited

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## Effect of Peach/Plum Graft Incompatibility on Seasonal Carbohydrate Changes<sup>1</sup>

Patrick J. Breen<sup>2, 3</sup>

Department of Pomology, University of California, Davis

**Abstract.** Spring-budded trees of peach/plum (*Prunus persica* Batsch. cv. Fay Elberta on the plum *P. cerasifera* Ehrh. × *P. munsoniana* Wight & Hedr. cv. Marianna 2624) showed foliar symptoms of incompatibility in early August, whereas a reciprocal combination, plum/peach, remained healthy. Within 2 weeks leaves and scion bark of the incompatible combination contained several times the concentration of starch found in comparable tissues of peach/peach trees. The level of polyols were similar in the peach scions of both combinations until end of summer. In the plum rootstock starch in the bark of the incompatible trees reached a maximum concentration at the beginning of August but was essentially depleted within the next 3 weeks, while the level of sorbitol decreased by half. In relation to compatible combinations, free sugars increased in the bark above the incompatible union and declined below. Presumably, failure of the phloem to function across the peach/plum union in mid-summer resulted in the markedly dissimilar carbohydrate levels in the graft components.

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<sup>3</sup> Present address: Department of Horticulture, Oregon State University, Corvallis, OR.