

Research has refined pruning concepts

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In the wild, the grapevine is often supported at great heights by adjacent trees; the shoots cling to branches by means of tendrils and trail for considerable lengths. A favorable light environment is essential for annual growth, so lower or interior areas are characterized by rope-like "trunks," devoid of leaves, extending from the ground upward to the canopies of trees. Not only is the fruit difficult to locate and harvest, it consists of a myriad of small straggly clusters. Productivity is erratic from year to year.

Vine pruning became an established art as man learned to cultivate the grapevine. Early Egyptian mosaics depict pruned and trellised vines. By the Christian era, the Greeks and Romans had developed instructions for pruning and training vines, but viticulture lacked a scientific background until the twentieth century.

California had developed an important grape industry by the late nineteenth century, but none of a large number of books published on vine pruning was suitable for the needs of the California vine grower. This deficiency was remedied in 1897 when the University of California College of Agriculture published a bulletin on vine pruning by Frederic T. Bioletti.

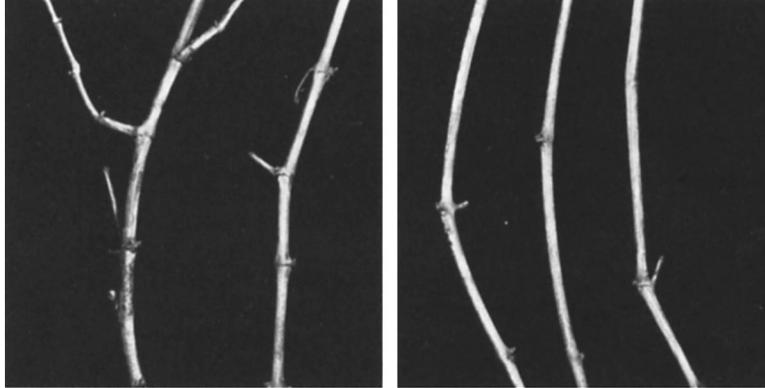
Professors Bioletti and A. J. Winkler were the most active of the University researchers to study California pruning practice over the past 80 years. In addition to considering the commercial aspects of pruning, they investigated the physiological responses of the grapevine and laid a solid foundation of understanding, which has markedly influenced California viticulture.

In 1907 Bioletti outlined practical suggestions on the treatment of young vines for growers, who planted "thousands of acres of new vineyard during the last two years." He stressed the importance of the first three years' culture in the life of the vineyard and pointed out that irregular bearing of Sultanina (Thompson Seedless) in many California vineyards was largely due to defective pruning. Thompson Seedless was destined to become by far the state's most important variety, and this early recognition of a special pruning requirement was fundamental to its success.

The harmful effects of summer pruning by topping or pinching were reported in 1918 following research on Carignane and Tokay vines grown on the University Farm, Davis.

The development of unilateral and bilateral horizontal cordon vines for vigorous varieties supplied with irrigation water was demonstrated in the early twenties. Emphasis was given to the use of head pruning for nonirrigated vineyards because of economy, and because it was best understood by most grape growers. Cordon pruning was recommended only for vigorous large-fruited table grapes, and cane pruning for Sultanina (Thompson Seedless), *Black Corinth*, and most eastern varieties. Thus, a foundation of vine pruning practice was established; refinements and clearer understanding of principles came with later research efforts.

By the 1920s plant physiologists were developing a fundamental concept that the leaf area of a plant determined the amount, composition, and quality of the crop. Knowledge of this relationship led Winkler to question traditional methods. He initiated studies to determine the effects of pruning on vine growth, on the crop, and on capacity for production. After a series of classic experiments, he concluded that dormant pruning reduced vine capacity, that fruit production also reduced capacity but less so than pruning, that



Above: Well-matured canes grown in full sun have closely spaced internodes and good lateral development. Poorly matured "shade" canes have long internodes and lack lateral development.

Opposite page, top: Continuing research and refinement of vine pruning practices by specialists like U. C. Cooperative Extension viticulturist Amand Kasimatis have led to more economical vineyard production and improved fruit quality.

nonpruned vines could produce more but lower quality fruit than those pruned in a normal manner, and that nonpruned, crop-reduced vines produced the best fruit. Winkler found that increasing leaf surface by less severe pruning, but restricting crop level to normal, improved the floral parts through better nutrition and resulted in better fruit. He continued this line of research and showed that the benefits of nonpruning might be obtained with Muscat of Alexandria (a variety subject to poor set and shot-berry production) by half-long or cane pruning followed by removal of some of the flower clusters.

The effect of dormant pruning on the carbohydrate metabolism of the vine was described in 1929. Less severe pruning was reflected in the storage of greater amounts of total carbohydrates in the vine, acceleration of early shoot growth, increased percentages of reducing sugars in the mature flowers, and an accompanying increase in pollen germinability. A decrease in leaf numbers resulted in decreased productivity and fruit quality. Winkler recommended longer pruning plus thinning to improve the quality and yield of such table grape varieties as Red Malaga, Malaga, Emperor, Almeria, and Tokay. The table grape industry followed the recommendations, which resulted in the production of more attractive, higher quality fruit.

Increasing demand for wine grapes with desirable levels of sugars and acids led to pruning severity trials in the late 1960s in the Napa Valley. Cane pruning was tested on Chardonnay and Pinot noir vines at three levels of pruning severity related to the extent of vine growth the previous season. This relationship, termed balanced pruning, had been recognized earlier but the practice lacked definition. The research clearly showed that severe pruning enhanced vine growth but restricted crop yields; the least severe resulted in an overabundance of crop with delayed maturity.

In the early seventies similar responses were shown with Thompson Seedless vines under test in the San Joaquin Valley. These recent experiments verified the work of earlier researchers and emphasized to the industry the value of careful pruning. The advantages of careful selection of fruiting canes of Thompson Seedless were demonstrated in the mid-seventies. Canes that had been exposed to maximum sunlight during the previous growing season produced more clusters and shoots than canes grown in the shade.

This further refinement of pruning practice resulted from a better understanding of vine physiology and how its application could enhance production and economic returns. Continuing research in this area of viticulture has led to more economical vineyard production and improved fruit quality.

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