

## Fumigation Makes California the #1 Producer of Strawberries in the World

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The United States is the world's leading producer and consumer of strawberries. The U.S. accounts for 28% of the world supply of strawberries. California is the top strawberry growing state, accounting for more than 90% of U.S. production and 20% of world production.

Soil fumigation has been an integral part of strawberry cultivation in California since about 1960 [1]. Starting in 1950, strawberries in California were produced almost entirely from cultivars developed by the University of California and Driscoll Strawberry Associates. Although the yields of these cultivars occasionally reached 40,000 or even 60,000 lbs/acre, the state average for the period from 1950 to 1960 ranged from 10,000 to 12,000 lbs/acre [1]. The yield potential of the new cultivars was far from being realized.

One source of strawberry yield losses was verticillium wilt, a disease caused by the fungal pathogen *Verticillium dahliae*, which attacks the water-conducting tissue of the plant called the xylem. The infections extend into the plant's xylem from where they spread throughout the plant. Infected plants wilt and outer leaves dry and turn brown. Infected plants often collapse during the peak of the first year's growth [2]. Eventually the entire plant wilts and dies. The fungus has been known to remain in the soil for 25 years [3]. In the period before fumigation became a common practice, growers constantly searched for new land in order to avoid plant diseases.

Since about 1965, approximately 90% of strawberry acres in California have been fumigated before each crop is planted [1]. Statewide average strawberry yields tripled following the adoption of fumigation and now average about 50,000 lbs/acre (Figure 1). In addition, soil fumigation made available lands that had previously been avoided for strawberry cultivation. These were the rich, fertile, alluvial lands with long crop histories and fungal infestations [4]. Generally, the increase in strawberry yield is credited to effective control of verticillium wilt with fumigation [1].

USDA has estimated that without the use of soil fumigants in California, strawberry yield would decline by 70% [5].

### References

1. Wilhelm, S. and A.O. Paulus. 1980. How soil fumigation benefits the California strawberry industry. *Plant Disease*. March.
2. Paulus, A.O. 1990. Fungal diseases of strawberry. *HortScience*. August.
3. Welch, N.C. 1989. *Strawberry Production in California*. University of California Cooperative Extension, Leaflet 2959.
4. Wilhelm, S., et al. 1974. Preplant soil fumigation with methyl bromide-chloropicrin mixtures for control of soil-borne diseases of strawberries – a summary of fifteen years of development. *Agriculture and Environment*. 1(3):227-236.
5. Sorensen, K.A., et al. 1997. *The Importance of Pesticides and Other Pest Management Practices in U.S. Strawberry Production*. USDA, NAPIAP Document 1-CA-97.



Applying fumigants on California strawberries



Fumigant effect on strawberry roots

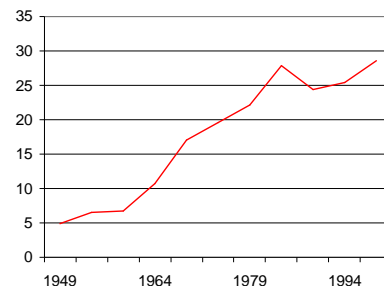


Figure 1: California Strawberry Yields (Tons/Acre)