



Frank Zink, UC Plant Breeder Emeritus, cross-pollinates one melon variety with another at left. Above, a first-generation hybrid (top) combines fusarium-resistant 'Doublon' and susceptible but highly marketable 'Top Mark'; six generations of backcross-pollinating that hybrid and 'Top Mark' yielded a new, resistant form of 'Top Mark' (bottom).

# Resistant germplasm controls Fusarium wilt in cantaloupes

F. W. Zink □ W. D. Gubler

***Fusarium wilt is widespread, and has caused severe losses to cantaloupe fields in the San Joaquin Valley. Researchers have bred resistant germplasm into orange-fleshed western shipping-type cantaloupes, and resistant F<sub>1</sub> hybrids are now available for commercial growers.***

Fusarium wilt of cantaloupe, caused by *Fusarium oxysporum* Schlecht f. sp. *melonis* Leach and Currence emend. Snyd. and Hans., is relatively new to California, having first been found in 1974 in a market garden field in western Riverside County. In 1976, one planting of the PMR 45 variety was severely affected in Fresno County's major production area. Since that time, Fusarium wilt has become progressively more widespread, causing losses in Fresno, Merced, Stanislaus, Kings, and Kern counties. Today it is the most important soilborne disease affecting muskmelon in the San Joaquin Valley.

Fusarium wilt is a vascular wilt disease caused by a soil-inhabiting fungus. The pathogen can survive in the soil for years, and can also be seedborne. Fusarium enters the plant by infecting the roots at any stage of growth.

A heavy soil infestation may result in seedling death before emergence or cause young plants to develop rot and wilt with little external evidence of stem injury. On very young plants, Fusarium can be confused with forms of damping-off caused by other fungi. On older plants, the first visible symptom is a wilting or yellowing of leaves on one or more lateral runners. Wilting occurs rapidly — at first, only a single lateral may be affected, but the entire plant eventually dies. Necrotic lesions appear on one side of the affected stem near the ground line and extend for some distance as long, narrow brown streaks. Plants generally are stunted.

The only practical control now available for Fusarium wilt comes in the form of varieties that are inherently resistant to the pathogen. Though several resistant varieties

have been developed for the midwestern and eastern states where the disease has occurred since the 1930s, none of these is acceptable as a western shipping-type cantaloupe, and all are poorly adapted to California production areas.

## Methods

Our survey of muskmelon germplasm showed that a number of plant introductions and varieties are highly resistant to the Fusarium races that are present in California (*F. oxysporum* f. sp. *melonis* races 0 and 2). We selected two varieties as sources of resistance (the donor parents): 'Doublon,' a French orange-fleshed dessert melon; and 'Perlita,' an orange-fleshed, netted cantaloupe from Texas. Genetic studies revealed a simple mechanism for inheritance of the disease reaction, with resistance controlled by a dominant gene in 'Doublon' and by a second dominant gene in 'Perlita.'

We initiated four parallel breeding programs to incorporate the donor parents' resistance into two netted, salmon-orange-

fleshed western shipping cantaloupe varieties, Top Mark and Gusto 45, which served as the recurrent parents. Controlled crosses were made between the donor parents and the recurrent parents. We screened the first generation for resistance to *Fusarium* wilt in seedling tests, and crossed selected resistant progenies back to their respective recurrent parents.

We went through six successive backcross generations, selecting for the donor parents' resistance and the recurrent parents' desirable horticultural traits. Progenies from the sixth backcross generation that showed resistance to *Fusarium* wilt were identified by seedling tests and transplanted into fruit-to-row isolation plots at the West Side Field Station in the San Joaquin Valley. We selected open-pollinated fruit for fruit type and quality and for plant vigor. Seeds from those fruits were saved.

Resistant seedlings grown from seed produced at the West Side Field Station were used to grow an additional generation, using the same breeding procedures at the University Experiment Station in Davis. Selections were made for fruit quality, freedom from crown-blight symptoms, and sulfur resistance in breeding lines with Top Mark as the recurrent parent. A seed sample from each selected fruit was assayed for *Fusarium* resistance (seedling test).

Resistant seedlings from the second open-pollinated generation of the sixth backcross were transplanted into the Melon Industry Greenhouse at UC Davis and self-pollinated. A seed sample from the fruit of each plant was tested to identify which plants were breeding true for resistance. Seed from these resistant plants was released to the California seed industry.

Through the combined efforts of a plant breeder and a plant pathologist using traditional methods, and with the support of the California Melon Research Board, four resistant western shipping-type cantaloupe lines have been released to date. The first of these advanced breeding lines was made available to seed companies in 1984, just 8 years after the first report of the disease in the San Joaquin Valley. In 1987 and 1988, several resistant commercial F<sub>1</sub> hybrids that were developed from UC breeding lines were grown on infested soil and gave excellent protection against the disease. Additional hybrids and resistant open-pollinated varieties resembling Top Mark and PMR 45 will be available to the melon industry for the 1991 growing season.

---

*F. W. Zink is a Distinguished Plant Breeder Emeritus, Department of Vegetable Crops, and W. D. Gubler is an Extension Plant Pathologist, Department of Plant Pathology, both with the University of California, Davis. This research was funded in part by the California Melon Research Board.*



Jack Kelly Clark

## Unions: their effect on California farm wages

Philip L. Martin □ J. R. Abele

***Six unions today cover 12,400 farmworker jobs on 258 California farms, a sharp decrease from the numbers of the early 1980s.***

***Though they are the workers' certified bargaining representatives on 725 farms, unions are finding it harder to turn their election victories into contracts that will raise member wages.***

In 1966, the United Farm Workers' (UFW) first contract with the Schenley Industries grape farm raised the hourly minimum wage for farmworkers from \$1.25 to \$1.75. Ever since, there has been a great deal of speculation among media, researchers, and legislators about the effects of unions on California farm wages. According to the USDA, the average hourly wage paid to a California fieldworker rose from \$1.41 in 1965 to \$5.84 in 1989. Some commentators credit the UFW for this increase, while others believe rising minimum wages and other factors account for the overall 314% increase over 24 years. Over the same period, the Consumer Price Index rose 270%.

This article looks at union activities and their effects on farm wages since 1975. In

1975, California enacted the Agricultural Labor Relations Act (ALRA) and created the Agricultural Labor Relations Board (ALRB) to administer it. The ALRA granted farmworkers the right to organize into unions and to bargain collectively with farm employers. As a consequence, the ALRA was expected to encourage union activities and help increase wages. A review of wage data indicates that unions had a statewide influence on farm wages during the late 1970s, but since then their effects have been more local.

### Farmworker unions

At least 15 unions have been certified as bargaining representatives for farmworkers in ALRB-supervised elections since ALRA enactment in 1975. Of the 1,125 supervised elections, 726 (65%) resulted in union certification. Almost two-thirds of those elections were held between 1975 and 1978. ALRB election and certification data indicate (1) that many unions were certified in only one election; (2) that two unions — the UFW and the Christian Labor Association (CLA) — account for 79% of all certifications; and (3) that 54% of all certifications were in two geographical areas, around Salinas and San Diego. Several unions were certified but no longer exist (e.g., the International Union of Agricultural Workers), and several new