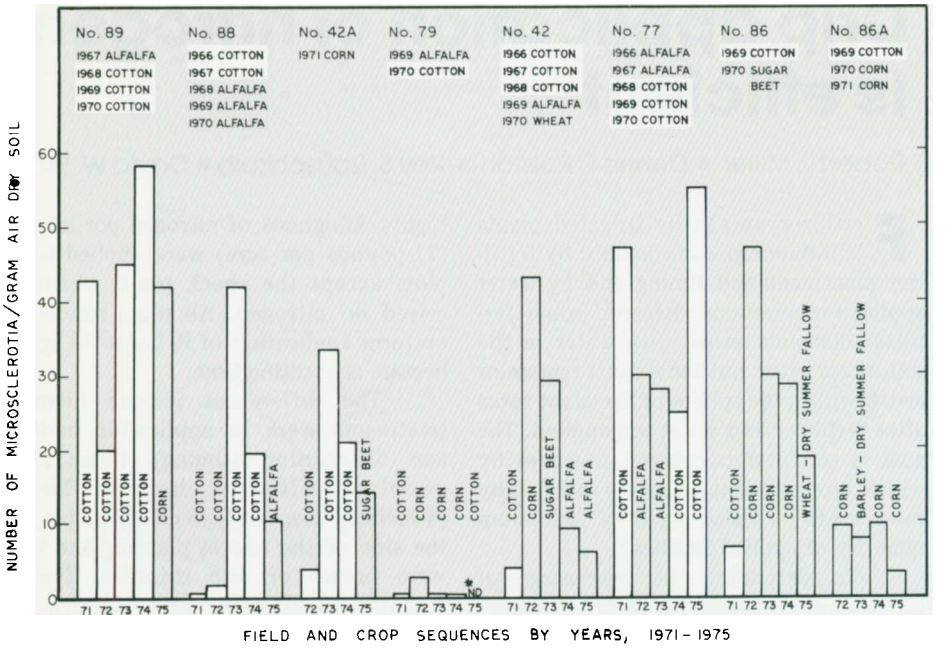

Maximum annual inoculum densities of the Verticillium wilt fungus determined in July-September in eight fields.

in controlling *Verticillium*, for, depending on the inoculum level of an experimental field when a rotation regime was initiated, the attrition rate may or may not be sufficient to reduce disease incidence. The occasional large decreases in inoculum level observed in most fields (see graph) may also be a factor in the conflicting reports, because the unpredictable and short-term nature of such decreases would necessarily lead to inconsistent results.

It is not surprising that wilt incidence is often higher, or yield is lower, or both, in continuous host plots than in rotation plots. Inoculum buildup progresses steadily in continuous host culture but is disrupted during the nonhost cycle in rotation plots. Therefore, a direct comparison of rotation plots at the end of the rotation sequence would be misleading. Our ability to measure the pathogen directly has enabled us to avoid this complication. In most reports in which lower disease incidence has been observed in rotation plots than in continuous cotton plots, the incidence of disease has rarely decreased in any given plot over the years of the study. This, along with the findings of our study, suggests that rotations stretch out the time involved in inoculum buildup but are unable to prevent it.

Conclusion

We conclude that rotations have little effect on *Verticillium* survival in soils, and that they are ineffective in the long run as control measures for this pathogen. Rotations have a number of agronomic benefits, and thus we would not want to discourage their use. However, rotations of cotton with such crops as corn, alfalfa, or grain should not be undertaken to combat Verticillium wilt.

In California, where crop rotations have been reported in relation to Verticillium wilt in cotton, yield increases in the rotation plots have averaged 10 percent (our own calculations of reported data). Our results suggest that these yield increases are probably the result of beneficial effects of crop rotation and are unrelated to *Verticillium*. Crop rotation can influence soil structure and porosity, the soil moisture regime, soil fertility, and other variables, each of which could affect yields.

Although significant attrition of microsclerotia does occur in field soils, such attrition occurs independently of the crop grown. Because inoculum reductions in continuous susceptible culture were equal to any in immune-crop culture, such reductions cannot be attributed to the presence of sugar beets, alfalfa, or corn. Apparently, factors independent of the crop grown govern reductions in inoculum density. It will be important to identify these factors both for understanding the biology of this pathogen in the soil and for developing control measures.

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Research brief

Maintaining quality of fruits and vegetables

A major portion of the estimated $200 million annual losses of fruits and vegetables during shipment and marketing can be attributed to diseases caused by less than a dozen fungi and bacteria. Significant progress has been made in controlling these diseases.

Fifteen years ago two University plant pathologists, after testing hundreds of compounds, discovered that an ammonia-related chemical, 2-aminobutane, effectively controlled rotting of oranges, lemons, grapefruit, and tangerines, and was nontoxic to humans. Today over 50 packing houses (about 40 percent of the total in California) use this compound to control decay during storage and marketing. Mold loss, which cost the citrus industry several million dollars a year, is now almost nonexistent.

The treatment is highly effective for control of penicillium decay in oranges during the degreening operation and during short-term storage before packing; previous treatment materials had become ineffective because resistant strains of penicillium had developed. Two-aminobutane has also become a profitable patent of the University of California, making funds available for research by graduate students at all campuses. (PPA 2763)