

Introduction: The Importance of Research on the Control of Postharvest Diseases of Perishable Food Crops

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The reduction of losses in perishable food crops because of postharvest diseases has become a major objective of efforts by international organizations to increase the food supplies of the world (1-3). Accurate data are not available on the magnitude of economic losses resulting from diseases affecting susceptible fruit, vegetable, and root crops during storage and in transit to market. However, there is general agreement that heaviest postharvest losses occur in developing countries where storage facilities are inadequate and refrigerated storages and vehicles are lacking (4-6). Worldwide losses in the postharvest period are probably in the range of 10-30% on most crops. In some perishable crops, such as tomatoes, losses as high as 30-50% are not unusual. Based on relatively conservative estimates, the amount of food lost annually during the postharvest period could feed between 200 and 300 million people for one year.

Although losses in developing countries are often at unacceptable levels, the evidence is strong that the adverse economic impact of postharvest disease is much greater in developed countries than has been recognized. The mechanization of most phases of harvesting, storing, grading, washing, and moving perishable food crops has increased the prospects for bruising and enhanced opportunities for infection by fungal and bacterial pathogens (7-10).

The need to increase emphasis on research on control of postharvest diseases is based on the fact that it will be difficult to increase world food supplies by traditional approaches designed to increase crop yields and expand the areas devoted to crop production. Most of the land best suited for crop production is already under cultivation, and large acreages of highly productive land are being lost every year because of urbanization. In addition the losses resulting from water and wind erosion of good agricultural land are at a staggering level. There is a bright prospect that crops with improved disease and insect-resistance and higher yields will be available in the near future; even with these added inputs plus increased use of herbicides, insecticides, fungicides, and fertilizers, it will be difficult to reach the desired objective of doubling total world food production in the next two to three decades. Such an increase is needed if we are to meet the pressure of continuing population growth. It should be recognized that the least cost intensive effort to increase food supplies would be in protection of food after harvest. Because of the increased value of the harvested crop, relatively small percentage losses in shipments may result in a total loss in profit since profit margins are so small in this industry.

In view of the fact that most pathologists will agree that estimates of postharvest losses of 10-30% in perishable food crops are not unreasonable, the question may be raised as to why so little effort is directed in control of postharvest disease problems. In the volumes of the *Annual Review of Phytopathology* published from 1962 through 1988, approximately 500 review articles were published covering all phases of the field of plant pathology. Of these only six can be considered to be mainly concerned with postharvest problems. This does not reflect a lack of interest by the editors in the area, but simply the paucity of research in

progress and lack of funding on postharvest problems. Furthermore, few departments of plant pathology have courses concerned with postharvest diseases, most basic texts devote little or no space to this topic area, and only a relatively small number of plant pathologists have been involved in postharvest disease research. Unlike other disease problems, little or no attention has been given by plant breeders to the possibility that breeding for postharvest resistance to diseases should be an integral part of their breeding programs. In part this gap reflects a lack of recognition of the potential payoff of such breeding efforts and it also can be attributed to a lack of the availability of standardized inoculation tests that would facilitate screening for disease resistance to diseases causing most of the losses after harvest. Inasmuch as the prospects are good that many of the fungicides now on the market for control of postharvest diseases may be restricted or banned, it is essential that increased attention needs to be given to alternative approaches to disease control.

The papers that follow consider one of the major avenues of research that warrants increased attention—increasing resistance to postharvest pathogens and the potential use of biocontrol agents as substitutes for fungicides. It is obvious that present losses justify a substantial increase in the investment of intellectual and financial resources to gain an improved understanding of the causal factors and to improve the current methods of control. This will have a beneficial impact not only in the United States, but also in countries desperately needing to find ways to meet ever-increasing demands for an adequate supply of food.

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