Disease Damage in Clonal and Self-Pollinated Crops

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The purpose of this article is to summarize evidence drawn from two quite different and wholly independent sources as to the extent to which vegetative propagation and genetic uniformity in a crop contribute to disease hazard. That such basic factors have been but rarely mentioned in discussions of plant disease problems is perhaps evidence of the preoccupation of plant pathologists with pathogens rather than crop plants. In 1939, Hartley (1) pointed out the disease hazards involved in planting clonal varieties of trees, as well as roses, potatoes, bananas, sugar cane, and the creeping bent golf-green grasses. Later Stevens (3,4) published certain figures which he felt gave some indication of the greater importance of disease in “grain” crops which are self-pollinated as compared with those which are cross-pollinated. The material compiled by McCallan (2) and summarized below bears on both these points.

McCallan’s study is confined to the United States. Available information regarding the value of various crops is combined with estimates of crop losses to give a single “disease importance index”. The figures as to farm value and acreage are of course taken from “Agricultural Statistics” published by the U. S. Dept. of Agriculture. The estimates of crop losses are those compiled by the Plant Disease Survey for the years 1930-39 and published in the “Plant Disease Reporter”. It is well known that these are only estimates, but they constitute our best available information and represent the combined judgement of recognized authorities.

From the material available it was possible for McCallan to select 36 outstanding diseases of agricultural crops. These are found on 17 different crops. Of these 17 crops, 7 are vegetatively propagated (Table 1). There were six crops produced from seed and self-pollinated. Cotton alone falls in the class of crops produced from seed and largely self-pollinated. Finally, three of the crops naturally cross-pollinated are recognized as suffering from outstanding diseases. The importance of these 17 crops in our national economy will be evident from column 2 of Table 1, which gives by groups the average farm value for 1937-41. Their total farm value at that time ($4,342,000,000) was nearly three-fourths of the total of the 50 major agricultural crops. The most important single group is that of crops produced from seed and which are naturally self-pollinated. A very large part of this is, of course, represented by corn—the basis of our national economy.

Of the 36 outstanding diseases listed by McCallan, 14 occur on crops which are vegetatively propagated, 13 on self-pollinated crops, 4 on a crop produced from seed which is mostly self-pollinated, and 5 on naturally cross-pollinated crops which are produced from seed. For each disease there is presented an “index” based on the impor-

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3Figures in parenthesis refer to “Literature Cited” p. 844.