

特別講演要旨

EPIDEMIOLOGICAL CONCEPTS AND STRATEGIES IN BREEDING SOYBEANS FOR DISEASE RESISTANCE.

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Abstract

The epidemiology of plant disease deals with the dynamic processes of host-pathogen interactions, which determine the prevalence and severity of the disease. Epidemic processes for most foliar diseases of plants follow a series of steps : arrival of pathogens on plant surfaces, initial infection, incubation period, latent period, sporulation, dissemination of secondary inoculum, and infectious period. These complex biological processes are influenced by the environment. Man also often interferes with these processes by altering the host and pathogen populations and the environment. Slowing or halting any of the epidemic processes can delay the development of the epidemic, so that serious losses in yield due to disease do not occur. It is generally recognized that the most effective and efficient method of minimizing damages due to disease is through the use of resistant cultivars, particularly when other methods such as fungicide applications are not economically feasible. Populations of plant pathogens are not genetically uniform nor are they necessarily stable. Cultivars bred for resistance to current populations of a pathogen may not be resistant in the future due to selection pressures placed on the pathogen populations. Understanding of the population development and genetic

variability in the pathogene, and knowledge of the genetics of resistance in the plant should help in developing breeding strategies that will provide effective and stable disease control through genetic resistance.

In the United States, soybeans have ranked first in value of crops sold off the farm in recent years. Soybeans have been the leading U. S. agricultural export in dollars since 1962. The five north central States of Illinois, Indiana, Minnesota and Ohio produced 58% of the soybeans harvested in 1970. Currently, Illinois is the largest soybean-producing state based on the acreage of harvested soybeans. A large number of foliar pathogens occur in this region. The diseases caused by these pathogens vary greatly in importance. Most foliar diseases have not caused severe epidemics over large areas, although severe disease damage has occurred in isolated areas. Nonetheless, the virulence of pathogens of soybeans is dynamic and thus the pathogens have the genetic potential to cause severe epidemics.

The objective of this presentation is to discuss my research program at the University of Illinois on the epidemiology of foliar diseases of soybean and the genetics of disease resistance in soybeans. This program is being developed to maximize the potential use of genetic resistance to control serious soybean diseases based upon epidemiological concepts and strategies. Also, applications of plant tissue culture in soybean improvement for disease resistance and molecular genetic techniques in characterizing pathogenicity genes in pathogen populations are included in the research program.