

Withering Plant Disease Epidemiology?

The editorial by L. V. Madden and P. S. Teng, "Whither Plant Disease Epidemiology" (*PLANT DISEASE* 73:279, 1989) should be taken seriously. The authors are leaders in the field of botanical epidemiology. They do not complain about the lack of funding of their specialism, but about the apparent lack of interest shown by young scientists. They also express their dissatisfaction with the lack of interest shown by administrators at the national level. The authors correctly point out that their specialism, theirs and mine, has to compete with others within phytopathology, among which is the one I call "molecular phytopathology." Epidemiology seems to be a poor competitor.

Competition is not an evil to be feared. The present situation is analogous to another of about 30 years ago. At the time, field-oriented phytopathology was completely out of favor, and "biochemical phytopathology" was in. Indeed, the biochemical wave in phytopathology was impressive in depth and explanatory power. Its number of publications was overwhelming, but its contribution to actual plant disease management was slight. The majority of fungicidal principles were found by the traditional hit-or-miss approach. The "ecology drive" succeeded the "biochemistry wave" and contributed to the enthusiasm for epidemiology, which became trendy in phytopathology.

The recent wave of molecular biology has struck the imagination of the public even more than the past one of biochemistry. Many administrators are overimpressed by the popularity of molecular biology and the promises it offers. As the era of chemical disease control is waning, investments must be made in other directions. Big money is involved. We have seen this before and

we can explain it to our students with some complacency.

Real as these phenomena may be, they are not the essence of the problem as I see it. Biochemistry and molecular biology are reductionist branches of science. Through the method of reduction, they dig deeper and thus solve problems hitherto unsolved. The fate of reductionist solutions is, unfortunately, that they often create or lead to discovery of new and sometimes worse problems. Epidemiology follows a radically different avenue. Epidemiology offers a holistic approach; it emphasizes complexity rather than simplicity. The muddled complexity of real life is the problem area of the epidemiologist.

Let us consider the brief history of botanical epidemiology. Vanderplank's rightly famous 1963 book, *Plant Diseases: Epidemics and Control*, was and is the cornerstone of botanical epidemiology. It emphasized the numerical development of pathogen populations in time. When simulation techniques came to our aid, we could incorporate the numerical development of the host in our weather-driven models. Fundamental consideration of spatial distribution is a recent acquisition. Qualitative aspects of host-pathogen-environment interaction were neglected and the effect of man ignored. I disagree with Madden and Teng when they write ". . . we feel it is important to consolidate this specialism . . ." (i.e., epidemiology). Consolidation is as deadly as a dagger. Development and expansion are necessary for progress. Students now are bored by numerics alone; they dislike the emphasis on gadgetry, unless it enhances the ability of humans to perceive and implement solutions to real problems.

In comprehensiveness, botanical epidemiology relates to general ecology as an off-road village to a metropolis. Unlike the development of general ecology, however, that of epidemiology was linked at an early stage to a set of

practical problems, i.e., plant disease management. Thus epidemiology became effective in real life at an early date. The instrumental aspects of epidemiology, the tools, have been overemphasized. Of course, physics, mathematics, statistics, and computer science (rather than biochemistry or molecular biology) come to the support of epidemiology, but they do not form its essence. The essence is, in my opinion, the truly holistic character of epidemiology leading to a problem-solving mood, a policy-oriented attitude.

Let us be realistic. In medicine, less than 1% of the practitioners are epidemiologists. In the Netherlands, attempts are now made to step up medical prevention, a policy that demands more input from epidemiologists. In phytopathology, perhaps 10% of the practitioners should be allocated to epidemiology to develop pollution-poor disease control strategies and to perform the risk analyses of the solutions offered by molecular phytopathology. Again, prevention will be the key word.

Plant disease epidemiology does not wither away. It grows, and it may grow into something new and great for which the label "epidemiology" is no longer adequate. As long as we have no new label, I feel content with my notion of epidemiology as representing the ecological side of modern phytopathology, taking a holistic attitude, being innovative and decision-oriented, and happily facing the challenges of the future. The frontiers of knowledge also expand in the holistic direction. Tell your brilliant students and young scientists about epidemiology and some will want to participate, to contribute.

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