

Maintaining a Balance in Plant Pathology

ABRAHAM H. EPSTEIN

Chairman, Department of Plant Pathology, Seed and Weed Sciences, Iowa State University, Ames



Dr. Luis Sequeira's excellent editorial, "Drifting in the Sea of Biotechnology," in the July 1986 issue of *PLANT DISEASE* (page 612) struck a highly sensitized chord in many plant pathologists, especially those associated with departments of moderate to small size.

The term "biotechnology" works wonders for the reputation and prestige of any institution fortunate enough to be able to add molecular expertise to its research and teaching spectrum. Conversely, woe unto any institution that has lagged in this area. The promise of potential utilization of genetic material from unusual sources for the improvement of plants has generated a rush to capitalize on the new technology. Unprecedented amounts of venture capital have been poured into academic research institutions and industrial research ventures, many of which did not exist just a few years ago. Bringing on research programs in molecular biology is extremely costly in terms of both salaries and start-up and current expenses. A commitment of \$150,000 to \$200,000 as a start-up support package for each new position in molecular biology is not uncommon.

In view of this, should every department attempt to build a molecular biology program? Further, what will be the future of departments that fail to do so? While resources for research on the molecular aspects of plant biology have increased dramatically, the opposite appears to be occurring in traditional plant pathology. Of equally grave concern is the fact that we could soon be faced with severe staffing problems in the agricultural disciplines. Institutions that traditionally biased their selection process toward students with agricultural backgrounds now find themselves recruiting from a pool that represents less than 3% of the U.S. population. We are seeing fewer of the best students available to agriculture, at both the undergraduate and the graduate level. This is, no doubt, attributable to the bad press resulting from the financial crisis in agriculture. The downturn in student enrollments in agriculture coincides with an increasing number of retirements from the ranks of traditional plant pathology. Where will we find the replacements, and what will these replacements be like?

Plant pathology is in a position not much different from the other life sciences. We find ourselves marveling at the success of the "new kid on the block." We are intrigued by the promises that have been made for biotechnology but at the same time are anxious about where and how it all fits, and we recall previous "technological revolutions" that delivered somewhat less than was promised. My inclination is to view biotechnology for what it is—"a new set of tools" to be applied to our discipline. Much of this technology has been developed outside of plant pathology, primarily because far larger resources have been available in areas related to human and animal health.

Fortunately, plant pathology is in a comparatively advantageous position. The organisms we deal with are of the right size for manipulation and possess a number of heritable traits (markers), the genetics of which are fairly well known. Hence, the prospects for progress and relatively early payoffs as a result of application of molecular biology in plant pathology are very good. A major benefit has been the quickening of progress in elucidating the biochemical mechanisms underlying the plant-pathogen interaction. As a result of utilizing a

common molecular technology, there is greatly increased communication between plant pathologists and our colleagues in other disciplines, such as biochemistry, genetics, and physiology, as well as between plant scientists and animal scientists. I see enormous benefit from this increased emphasis on interdisciplinary dialogue and cooperative research.

The challenges to plant pathology, it seems to me, boil down to several main issues:

1. How do we incorporate biotechnology into plant pathology and still maintain an identity and our traditional knowledge base? If the molecular basis of the plant-pathogen interaction is to be elucidated in an orderly fashion, close working relationships need to be established between traditional plant pathologists and molecular biologists whose interests lie in plant pathology. A coordinated development in the various disciplines that results in the assemblage of a critical mass of biotechnologists working in a cooperative interactive mode will be most powerful and productive. Some of this can be accomplished by retooling existent faculty, but retooling, for a variety of reasons, is not for everyone. However, no one expecting to stay competent in plant pathology in the future is exempt from retooling enough to understand what the various aspects of biotechnology are and where they might fit.

2. We must be careful to maintain the traditional knowledge base and our ability to relate to production agriculture. Molecular biologists are not going to be highly desirous of applied or field development research or extension responsibilities. Speaking of extension, agriculture, it seems to me, is entering an era when more, not less, unbiased information will be needed. Biotechnology will not obviate the need for good plant pathology extension.

3. Integrating these molecularly oriented individuals into our traditional departments may pose a few problems because of the remuneration expected and the unprecedented space and expense requirements. Because the knowledge base for biotechnology was developed outside of traditional plant pathology in departments often associated with colleges of medicine, this is where we will find most of the talents we need. To recruit from these areas, we must cope with the effects of the "marketplace" on entry salaries.

4. The problem of low enrollments is a more vexing one and less subject to immediate solution. It is due in very large part to the economic crisis in agriculture and the public perception that well-trained scientists are no longer needed in production agriculture or in agriculture-related industries. At the same time, we at the university level have lost contact with the science and biology teaching staff in our secondary school systems and in nonagricultural colleges. These contacts with biology teachers must be reestablished. It is during the last two years of high school that many of the brightest students make their college and professional choices. These students must be made aware of plant pathology as a career option. We could make this happen by providing teaching modules involving some of the more interesting and spectacular plant pathological laboratory phenomena to biology teachers and bringing these teachers into our laboratories for some concentrated hands-on familiarization with plant pathology exercises. While we are on the subject of teaching, it may be high time for us to seriously consider further redesigning our curricula. Is plant pathology currently a viable option at the undergraduate level? Plant pathology may be more attractive and practical combined with more plant science as a plant science option or offered in a pest management mode.

We have some very significant adjustments to make over the next few years. We must identify some new resources if we expect to address the molecular aspects of plant pathology. The same holds true for the traditional knowledge base, since the customary sources of support appear to be waning. Finally, the message that plant pathology is an important, viable discipline must be delivered to the public and legislative sectors.