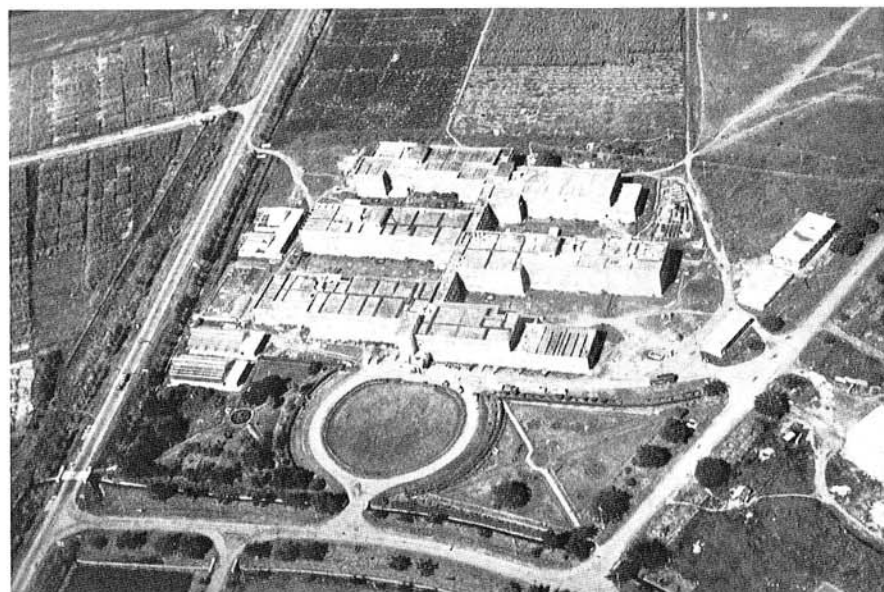


# Teaching Plant Pathology in India



Aerial view of the College of Agriculture at the G. B. Pant University of Agriculture and Technology in Pantnagar, the first agricultural university in India based on the land-grant pattern of the United States.

Plant pathology teaching in India began 75 years ago when the Imperial Agricultural Research Institute (IARI) was established at Pusa, a small town in the state of Bihar in northern India. A British mycologist, E. J. Butler, was appointed the first Imperial mycologist and is rightly remembered as the "father of Indian plant pathology." IARI offered in-service training to graduates (B.S. degree or equivalent), who were awarded an "associateship" after submitting theses. The first batch probably consisted of three mycology students who received their associateships in 1907. The science of plant pathology in India would not have grown to its present respectable level without this pioneering effort by the British scientists.

At about the same time, agricultural colleges were established at Lyallpur (now in Pakistan), Kanpur in the United Provinces (now Uttar Pradesh) in northern India, Nagpur in central India, Poona (now Pune) in western India, and Coimbatore in southern India. Although separate diplomas in plant pathology were not offered by these institutes, some mycology and pathology were taught to the undergraduates. A little mycology and plant pathology were also taught to students working for a degree in botany

in some of the old traditional, or British-patterned, universities, including those at Allahabad, Bombay, Calcutta, and Madras. One highlight of this period that deserves special mention was the publication of the book "Fungi and Disease in Plants" by Butler in 1918.

IARI was shifted to Delhi in 1936 after a large earthquake damaged the buildings at Pusa in 1934. The major effort in teaching plant pathology continued to be through research experience and submission of theses until 1946.

## Changes with Independence

When India became independent of British rule in 1947, "Indian" was substituted for "Imperial" in the institute's name, and the acronym was not changed. That year, IARI introduced formal teaching of mycology and plant pathology as part of the associateship course. Over the next 10 years, many of the traditional universities introduced a plant pathology course in their undergraduate curricula and some started postgraduate M.Sc. or M.Sc. (Ag.) degree programs in mycology and plant pathology. A few other agricultural colleges, including those at Kanpur, Pune, Nagpur, and Coimbatore, were also awarding M.Sc. (Ag.) and Ph.D. degrees in plant pathology by this time, and a number of students graduated.

Before independence, most Indian

scholars went to England to receive higher education. After independence, however, many American universities liberally extended admission and financial support to bright students from India. Beginning in 1955, American universities extended additional help by sending experts to advise on agricultural education in India. All this had a great impact on agricultural education in India, including, of course, the teaching of plant pathology. Between 1907 and 1958, a total of 120 graduates were awarded associateships in mycology and plant pathology by IARI. In 1958 the Rockefeller Foundation helped establish a postgraduate school at IARI, and master's and doctorate degree programs based on the course-credit system and research approach of American universities were started in several fields, including plant pathology. By the late 1950s, many young scientists had returned to India with doctorate degrees from American universities, and the stage was set for a big change in agricultural teaching and research.

A milestone in the history of teaching plant pathology in India was erected in 1960 when the first agricultural university, the Uttar Pradesh Agricultural University (now the G. B. Pant University of Agriculture and Technology), based on the land-grant pattern of American universities was established at Pantnagar with technical and material help from the University of Illinois. I had just finished my own doctorate work in plant pathology at the University of Illinois and was fortunate enough to be invited to be the first assistant professor to join the College of Agriculture at Pantnagar. Starting with one teacher and one undergraduate course in plant pathology, the department of plant pathology developed into one of the best-known departments, with over 30 staff members offering 22 undergraduate and postgraduate courses. Subsequently, 21 agricultural universities, many aided by American universities, have been established on the same pattern and cover almost the whole of India. There are now 75 colleges of agriculture, about 50 of which are constituents of agricultural universities. Almost all the 21 agricultural universities have at least one campus where M.Sc. (Ag.) and Ph.D. degrees in plant pathology are offered. Most offer 2-9 undergraduate courses, including electives, and 12-30 postgraduate courses. Currently, more than 400

students are working for M.Sc. (Ag.) and Ph.D. degrees in plant pathology.

### Special Problems

Before evaluating the teaching of plant pathology, I must comment on the general conditions prevailing in India that have a pronounced influence on the teaching not only of plant pathology but of all subjects. India is a country still struggling to stand on its feet economically after centuries of political instability. Bureaucracy and red tape exist as in any country, and these and economic limitations ensure that the import of equipment and supplies is very much restricted. Although tremendous progress has been made in the indigenous production of scientific requirements, India is not yet self-sufficient. Many countries have donated equipment manufactured by them, but repairs and unavailability of spare parts cause problems.

Because of industrial expansion, India's electrical power supply is under pressure. Power cuts to laboratories are common, and fuel costs are restricting the mobility of staff. Such limitations have directed pathologists toward aspects of science that can be taught more easily in laboratories with a minimum of complicated equipment. Thus, emphasis has been on mycology rather than on virology, which generally requires more sophisticated equipment and facilities. There are other significant problems, but these are sufficient to highlight the difficulties under which agricultural universities in India must work. Hence, the progress made or not made should be looked at with objectivity and with some sympathy.

### Undergraduate Teaching

On the whole, teaching of plant pathology at the undergraduate level has been commendable. Most universities offer two or three compulsory (core) courses and up to six elective courses. The compulsory courses expose all agricultural undergraduate students to basic knowledge of plant pathogens, the important diseases they cause, and the general principles of disease control. Comparing undergraduate teaching in India with the best in the world, I would say this job is well done. There are weaknesses, of course, and I wish to elaborate on these.

For historical reasons, mycology still dominates pathology. The mycology

content of courses outbalances the contents on other pathogens. The trend now is to correct this imbalance, and a balanced blend of course content on different pathogens will be achieved in the foreseeable future.

Laboratory sessions still prevail, and there is a need to take students to the fields more often. In the laboratory, students are often shown old permanent slides of fungi and bacteria instead of being given fresh specimens to examine. Several teachers, because of their own training background, insist that students memorize details rather than letting them interpret facts. Library assignments are given in only a few colleges. In several universities, unfortunately, young, inexperienced teachers are in charge of undergraduate courses.

After 1960, all agricultural universities adopted the semester/trimester system with courses and credits, and evaluation by teachers replaced the annual external examinations of the traditional British system. Both teachers and students found themselves in an entirely new situation that created quite a few problems. The problem of adjustment was more acute among undergraduates, and even today, 20 years later, the internal evaluation system is under strain. Teachers often are pressured to be liberal in grading students. In some universities, including that at Pantnagar, where special orientation seminars are held for students

and teachers and administration is vigilant, the internal evaluation system is working satisfactorily.

A weakness existing in many countries is the reluctance of administrators to recognize good teachers, mainly out of fear that this will make the other teachers unhappy. I very definitely do not



Many plant pathology departments have sophisticated equipment, such as the electron microscope, but maintenance is often difficult.



An undergraduate laboratory session in progress.

subscribe to that view. The success of any commercial product in the market is judged by consumer acceptance. On the same basis, administrators should encourage student bodies to recognize good teachers annually. This is done in a few universities in the United States and could be beneficial in India.

Indian plant pathologists have published several good books for undergraduate teaching both in English and in regional languages. This has certainly helped the overall teaching effort.

### **Postgraduate Teaching**

In contrast to undergraduate teaching, postgraduate teaching in India has been generally weak, and much needs to be done to raise the overall standard. Reasons for this situation are several and not difficult to see. My major criticism concerns the number of courses offered by most plant pathology departments. Because of the unfortunate concept that everything about plant pathology that exists under the sky has to be presented to students through lectures, many departments offer an excessive number of courses. I was amused to hear that one department offers its postgraduate students two courses in seed pathology—one to M.Sc. (Ag.) students and one to Ph.D. students.

I consider about 12–14 courses for M.Sc. (Ag.) and Ph.D. students to be optimum, but many departments offer around 20 courses. There is substantial duplication of content in several courses. I place most of the blame for this tendency on the administrators in these universities, who insist, under the pretext of maintaining high academic standards, on excessive credit requirement for these degrees. For example, many universities require more than 45 trimester credit hours of courses for an M.Sc. (Ag.) degree and a similar number for a Ph.D. degree. This forces the departments not only to increase the number of courses but also to inflate the credit hours of each. The situation is serious and must be critically reviewed. The fewer the courses, the better they will be taught, and students will be encouraged to learn more by themselves. Some universities offer a high number of courses but do not have enough teachers to teach them. This results not only in excessive teaching loads but also in unsatisfactory situations where, for example, a mycologist ends up teaching virology.

Although things have changed to some extent, many advisors still tend to suggest laboratory-oriented problems for theses, despite very exciting possibilities and opportunities to tackle field problems. Indian plant pathology should become more field-oriented. With all the difficulties in obtaining equipment and supplies, field-oriented research should be more welcome.

On the whole, the standard of



postgraduate research in plant pathology can be rated average, and serious efforts are required to raise this level. Very often theses problems suggested to students lack challenge, and students are not forced to be innovative. I have met many students who never felt very proud of the theses research they did. Teachers need to think seriously about improving the situation. They must ask one question: Is the research going to ultimately help farmers? Relevant research topics are suggested by farmers when they visit universities in their states during the annual farmers' fairs and ask questions during the question-and-answer sessions. All teachers and students need to do is listen to the farmers carefully and note down the questions that cannot be satisfactorily answered.

A feature of the American system that did not exist in the previous Indian system is the seminar course for students. I consider this a very positive feature that is helping students immensely. The seminar gives them an opportunity to look for information, prepare a topic, present it before an audience, and defend the presentation. As a teacher, I saw big differences between the first and the fourth seminar of any student. I have some criticism of the way some departments handle the seminar, however. Quite often the student is "pounced on" by his teachers; his errors are emphasized in front of colleagues and he is ridiculed for his mistakes. Because most Indians are brought up to be respectful to their elders, students meekly listen to the "words of wisdom" from their teachers. This is misplaced "respect." Teachers must change their attitude and students must not keep quiet under the false notion of "paying respect." I do not advocate student revolt, but teachers must help students develop self-

confidence by encouraging them to formulate new ideas and to question dogma.

Because of a shortage of jobs and several other socioeconomic reasons, students are quite often absorbed in the department where they worked for their doctorates. Non-Ph.D. staff members are permitted to work for a Ph.D. degree in their own departments and credit the courses offered by their own colleagues. All this is undesirable. Departments do not gain from a policy of "inbreeding"; new blood is required to keep a department healthy.

Another feature of the land-grant system is the integration of teaching, research, and extension. This provides agricultural universities in India an opportunity to interact with farmers and improve teaching through research findings. The universities following this feature are doing well, but some keep the three functions separate, which leads to considerable waste of resources. Integration of these functions is vital to the good teaching of agricultural science, including plant pathology.

It is sometimes said in English-speaking countries that Indians do not write good English, and this is true of many agricultural students. Undergraduate courses are often taught in one of India's several other official languages. Then, at the postgraduate level the student suddenly must switch to English; he has no option. Moreover, the English spoken in India is divergent from Oxford English, as is American English. In defense of Indian students, I would say they do well with English compared with students from most other non-English-speaking countries. Lack of capability to communicate in English, however, does affect the performance of students as evaluated by international standards. At

least one department of plant pathology in India insists that students take a course in technical writing in English.

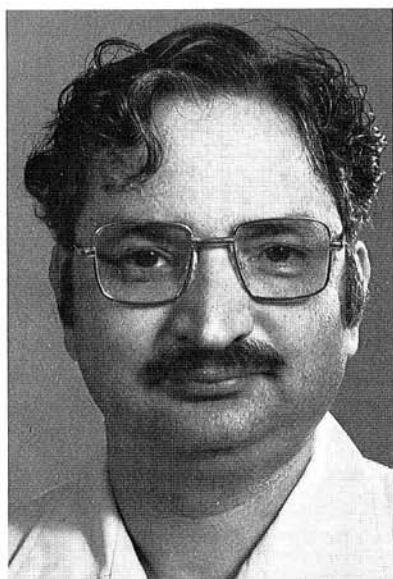
### Looking Ahead

There is a need to further improve undergraduate teaching of plant pathology by 1) strengthening the laboratory and field exercises, 2) using more audiovisual aids, 3) giving at least one library or practical assignment in a term, and 4) asking senior and experienced teachers to offer the courses. Student bodies should be encouraged to identify good teachers of plant pathology. The Indian Phytopathological Society, with more than 1,000 members, should take the initiative in preparing audiovisual aids and publishing illustrated monographs relevant to the Indian situation, just as the American Phytopathological Society has done.

Postgraduate teaching needs to be evaluated very critically, and radical changes in attitudes and in organization of some departments are required. The number of courses should be reduced by merging those with overlapping content. I have no doubts that most departments could cover the broad subject of plant pathology in about 12-14 courses, including those offered by specialists; eg, biochemical plant pathology could be taught only in departments with the



A postgraduate class in a field of pigeon pea (*Cajanus cajan*). More field sessions are needed at both the undergraduate and the postgraduate levels.



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expertise. Students should be encouraged to study on their own through more library, laboratory, and field assignments and should be helped in preparing their seminars. They should be helped to work on problems of the farmers. They should be encouraged to attend the annual meetings of the Indian Phytopathological Society. The appointment of staff from

among those who have studied for their Ph.D. degrees in the same department should be discouraged. Non-Ph.D. staff members must be encouraged to work for that degree in a university other than their own. Every university must make a serious effort to integrate teaching, research, and extension activities at the department level.

Despite all these criticisms I consider that the plant pathology departments of some of the agricultural universities of India have earned a good reputation in producing well-trained scientists. Among those deserving special credit are the G. B. Pant University of Agriculture and Technology at Pantnagar, the Punjab Agricultural University at Ludhiana, and the Haryana Agricultural University at Hissar in northern India and the University of Agricultural Sciences at Bangalore in southern India. Similarly, the Indian Agricultural Research Institute in New Delhi and the Botany Laboratory at the University of Madras are doing a very commendable job. If other universities and institutes would pattern themselves on these models, I am sure the teaching of plant pathology would improve overall.

The teaching of plant pathology in India is not yet at the level found in some of the most advanced countries, but it is not far below. With a little more effort, India should be able to play an increasing international role in the many countries in Africa and Asia where plant pathology is still in an early stage of development.

#### **Acknowledgment**

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