Editorial

The Importance of Taxonomy to Nematode Control Strategies

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Correct species identification is basic to efficient nematode control. Nematologists need these identifications to carry out research, teaching, extension, and other activities. Unfortunately, the contributions made by taxonomists too frequently are unrecognized. Some specialists apparently show little concern or interest in taxonomy. A few taxonomists, on the other hand, have been unaware of the needs of biologists working in other areas. In fact, a few taxonomists have cut themselves off from wider fields of research and control. These extreme positions are detrimental to the advancement of nematology. Greater cooperation, understanding, and teamwork between taxonomists and other nematologists could result in inestimable benefit.

Great strides have been made in nematode taxonomy during the past 30–40 years. For example, until 1923, when the potato cyst nematode was named *Heterodera rostochiensis*, all cyst-forming nematodes were classified as *H. schachtii*. Now there are approximately 50 species divided among three genera.

From 1884 to 1932 all root-knot nematodes were known as *Heterodera radicicola* and from 1932 to 1949, as *H. marioni*. In 1949 Chitwood transferred root-knot nematodes to the genus *Meloidogyne* and described five species and one subspecies. Now there are more than 40 species. Although species identification is sometimes difficult, routine identifications of economically important species are made in laboratories throughout the world. These identifications have aided nematologists regardless of their specialized areas of activity. It would be unthinkable to work with these nematodes today if they were assigned to a single species.

On the other hand, a number of the morphological characters used to separate some of the recently described *Meloidogyne* species from closely related species are difficult to recognize, particularly by students and others using unsophisticated microscopes and light sources. Many recently described species occur in limited geographic areas, and usually the species description includes little or no information concerning the influence of environment on morphological characters. If the environment significantly influences the characters used to separate a new species from closely related species, it is difficult or impossible to identify the new species in a location other than the one in which it was described. Environmental factors do induce variation in morphometric and morphological characters of some species.

For most genera, study of the range of variation of the characters of each species is needed. The range of species variation can be determined only by extensive studies of many populations, collected and examined from a range of environments. A problem encountered in this kind of study is that for some species with limited distribution, it would be difficult or impossible to obtain collections from a number of environments. In fact, it is often impossible to obtain a preserved specimen of the type species.

Species identification is still based mainly on morphological criteria. Preliminary studies have been made with such alternate criteria as molecular taxonomy and biochemical systematics. Many of the plant-parasitic species have a limited number of morphological variations suitable for species separation, and we have traditionally depended on morphological characters of mature females. For some species, it is necessary to use such information as nematode biology, host range, and host pathogenicity to supplement morphology.

The need for accurate identification increases as progress is made in all areas of nematology. For example, evidence for specificity in the transmission of viruses by nematodes increased the need for accurate identification of the vectors. Recently, plant resistance and crop rotation have assumed more importance as control measures for managing nematode populations. Correct species identification is essential for the successful use of these control measures.

As world travel and transportation of plant materials increase, the need to regulate the movement of destructive nematodes increases. Because economically important and minor plant pathogens often are closely related morphologically, successful plant quarantine operations depend on correct species identification.

Changing names of nematodes, particularly of economically important species, often causes inconvenience to nematologists and others. Many nematologists complain that taxonomists make too many name changes. All too often the name of a nematode is changed several times during a relatively short period. Species names should be changed only on the basis of sound taxonomic research. Then when research indicates a change is justified, the change should be made.

Although the need for nematode taxonomy is increasing, the emphasis on taxonomy is decreasing. Taxonomy can be studied properly only at universities and other centers with adequate equipment, nematode collections, literature, and technical assistance. Taxonomists should have the opportunity to share common facilities, including media preparation, growth chambers, glasshouses, and plot areas. Such centers deserve better support than they now receive.

Providing nematode identifications for nematologists should not be the major function of a taxonomist. Conditions and time conducive to taxonomic research should be provided.

High-level taxonomy cannot be carried out with intermittent support. Funds are needed for long-range taxonomic research and for care of collections and literature.

Nematode taxonomy should receive more emphasis in plant nematology courses. Taxonomic methods, the importance of taxonomy in practical nematology, and the need for preservation of specimens should be taught.

Taxonomists should be familiar with the role of taxonomy in other areas of nematology. Including a taxonomist as an advisor or co-worker in appropriate nematological investigations should be encouraged.

The results of taxonomic research should be more readily available. Computers are promising for data storage and retrieval, for rapid communication, and as an aid to accurate identification. The benefits of data management techniques depend on maintenance of high-quality taxonomic research.