

Introduction: Recent Advances in *Fusarium* Systematics

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 New Mexico Agricultural Experiment Station Journal Article 1586.  
 Accepted for publication 1 March 1991 (submitted for electronic processing).

The hyphomycete genus *Fusarium* has attracted more attention from a broader range of scientists than possibly any other group of fungi. The Fusaria are a diverse, cosmopolitan group responsible for numerous plant diseases, storage rots, and human and animal toxicoses and mycoses (2,3,6,8,11). They are even being used as a novel source of food protein (1). *Fusarium* species frequently are encountered by plant pathologists on isolation plates. Indeed, the ease with which these fungi are isolated and the frequency of their association with plant material often lead to the presumptive diagnosis of *Fusarium* species as pathogens. In reality, while *Fusarium* species are clearly successful plant pathogens, they are equally successful as saprophytes and parasites. Plant pathologists, therefore, must determine the ecological roles of the *Fusarium* species they isolate in order to make accurate diagnoses.

Good technique and the application of Koch's postulates are necessary to untangle these issues, but equally important is the need for correct identification of the *Fusarium* isolate under consideration. Unfortunately, this is not always an easy task. Volatility in *Fusarium* systematics over the past 100 years has made identification of these fungi difficult for the nonspecialist. The volatility itself is evidence of the diversity within the genus and the significance of these fungi to food production and storage throughout the world (11). The Fusaria have been found from the tropics to the Arctic Circle and throughout most biomes on earth (5,7,16). It is no surprise, therefore, that almost as many taxonomic systems have been proposed for this genus as major laboratories that work on the systematics.

The past ten years have brought a degree of uniformity to the systematics of the Fusaria, although some disagreement still exists between systems used in different countries (3). Scientists in the United States readily adopted the nine species system of Snyder and Hansen (13-15) when it was published, primarily because of its simplicity. Despite acceptance of this system in Japan (9) and France (10), it proved to be an oversimplification and was not widely adopted in other countries. Since publication of the Snyder and Hansen system, a plethora of monographs have been published on the genus.

The monograph by Booth (2) was the first of these and remains widely used throughout Commonwealth countries. The monograph by Gerlach and Nirenberg (4) is commonly cited in European literature, while the book by Joffe (6) has received little attention outside the mycotoxin research community and Israel. Nelson, Toussoun, and Marasas (12) finally provided a unifying basis for the United States and Anglo-European systems of *Fusarium* taxonomy, based in large part on the seminal work by Wollenweber and Reinking (16). Nevertheless, the manual by Nelson et al (12) was not widely accepted as a definitive work on the subject by many outside the United States.

The difficulty in obtaining international agreement on the systematics of a genus such as *Fusarium* is not unusual in systematic mycology. Difficulties arise because *Fusarium* species are of interest to a wide range of scientists and technologists, many of whom receive little training in mycology. Hence, these workers require a practical and reliable key to the Fusaria that can be used under most laboratory circumstances. Such a key has not been forthcoming, although a number of laboratory manuals are

now available (2,4,12). Because routine identification of *Fusarium* species is not easy, it is likely serious workers always will require the services of an authority to identify important, unusual isolates of the fungus.

New approaches to the systematics of the Fusaria promise to make identification easier for the nonspecialist. This discussion session provides plant pathologists with a view of the current research into *Fusarium* systematics and demonstrates the current state of thinking. It is hoped these proceedings also will provide a glimpse of the forthcoming improvements. For example, the use of molecular tools to help untangle the phylogeny of these fungi is still in its infancy, but provides new criteria by which Fusaria can be separated. The following papers provide an overview of the current status of *Fusarium* taxonomy in the United States. They provide insight into some of the current problems and, in places, provide answers to some old questions. *F. oxysporum*, a truly impressive hyphomycete by its ubiquity in soil and success as a pathogen and saprophyte, is discussed in detail. The complexity of the relationships within this species is addressed, along with some valuable ideas on the significance of the numerous subspecific groups within *F. oxysporum*.

There are still many exciting possibilities in *Fusarium* research. It is hoped that the papers presented here will inspire further work on this challenging genus.

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