

THE GENUS FUSARIUM LINK

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(Received March 3, 1969)

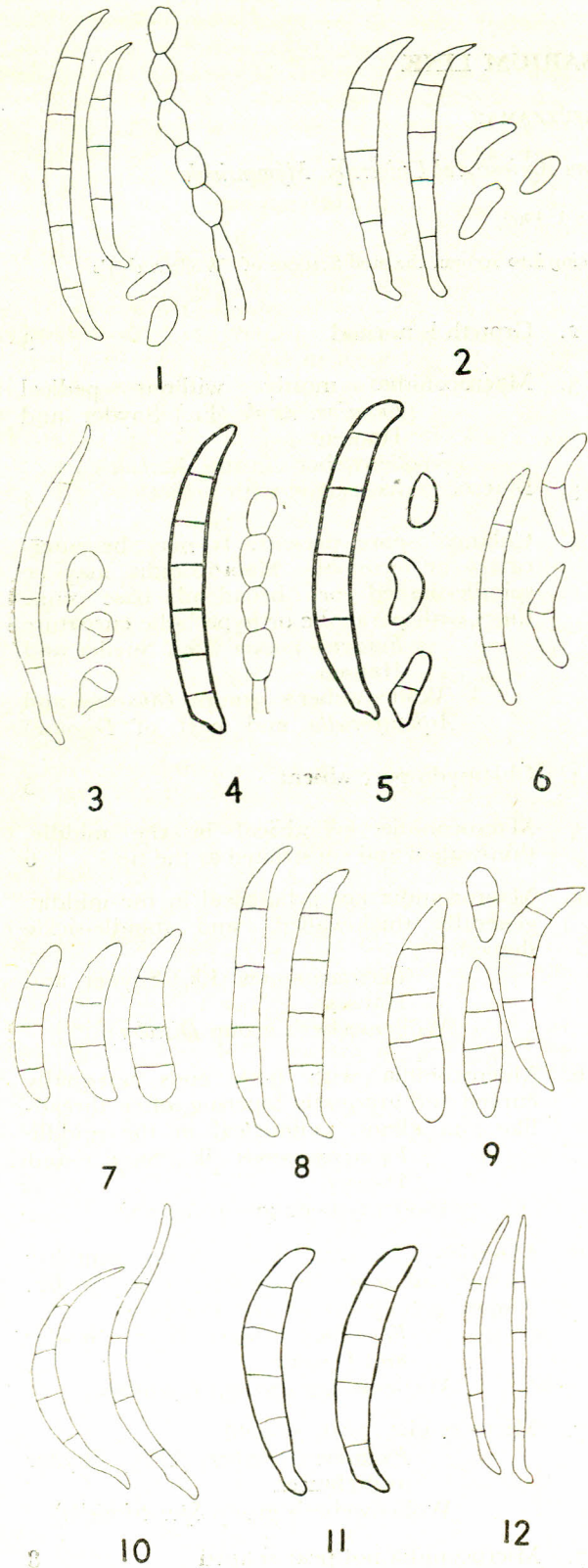
A key is proposed to identify the species of *Fusarium* taking into account the modifications of Wollenweber's classification made by Snyder and Hansen.

Introduction

The species of the genus *Fusarium* are difficult to classify because the members show a large number of forms. Wollenweber developed a classification,¹⁻² and placed as many as 65 species into 16 different sections. Some of these species were further divided into varieties and forms. Later on, Snyder and Hansen³⁻⁵ demonstrated that the characters used by Wollenweber for separating the species of *Fusarium* are unreliable, because many of the characters, (such as, size of conidia, number of septa, presence or absence of sporodochium and sclerotia, and colour of stroma) used by him were extremely variable even for the same monospore isolate. Snyder and Hansen observed that the most constant character is the shape of macroconidium, especially, the appearance of the mid-section and the ends of the conidia. In view of these, Snyder and Hansen proposed a simple classification but they never published any modified key of the old classification. Therefore, a new key is presented here for separating the species of *Fusarium* taking into account the modifications of Wollenweber's classification made by Snyder and Hansen.

Key

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|---|---|
| <p>1. Microconidia generally aseptate and different from macroconidia 7</p> | <p>2. Growth is normal 3</p> |
| <p>1. Microconidia mostly septate. They may be either absent or not different in shape from small macroconidia 2</p> | <p>3. Macroconidia mostly without pedicel
<i>Fusarium nivale</i> (Fr.) Snyder and Hansen
(Wollenweber's group <i>Arachnites</i>)</p> |
| <p>2. Growth is slow (with feeble aerial mycelial growth). Many of them grow on other fungi and insects
<i>Fusarium ciliatum</i> (L.K.) Snyder and Hansen
(Wollenweber's group <i>Pseudomicrocera</i> and <i>Submicrocera</i>)
or
<i>Fusarium episphaeria</i> (Tode)
Snyder and Hansen
(Wollenweber's group <i>Eupionnotes</i> and <i>Macroconia</i>)</p> | <p>3. Macroconidia usually with pedicel 4</p> |
| | <p>4. Chlamyospore present. It may be intercalary or terminal. Macroconidia may be spindle-shaped or broadend base some times with parabolic or hyperbolic curvature
<i>Fusarium roseum</i> (Lk.) Snyder and Hansen
(Wollenweber's groups <i>Gibossum</i> and <i>Arthrosporiella</i> and part of <i>Discolor</i>)</p> |
| | <p>4. Chlamyospore absent 5</p> |
| | <p>5. Macroconidia cylindrical in the middle, thin-walled and constricted at the tip 6</p> |
| | <p>5. Macroconidia not cylindrical in the middle, generally thick-walled and spindle-sickle shaped.
<i>Fusarium roseum</i> (Lk.) Snyder and Hansen
(Wollenweber's group <i>Discolor</i>)</p> |
| | <p>6. Macroconidia with both ends unequally curved and gradually tapering, often thread-like and almost cylindrical in the middle
<i>Fusarium roseum</i> (Lk.) Snyder and Hansen
(Wollenweber's group <i>Roseum</i>)</p> |
| | <p>6. Macroconidia with both ends similarly curved and generally constricted at the tip. Almost cylindrical at the middle
<i>Fusarium lateritium</i> (Nees.) Snyder and Hansen
(Wollenweber's group <i>Lateritium</i>)</p> |
| | <p>7. Microconidia pear shaped
<i>Fusarium tricinctum</i> (Cda.) Snyder and Hansen
(Wollenweber's group <i>Sporotrichiella</i>)</p> |
| | <p>7. Microconidia not pear shaped 8</p> |



8. Chlamyospore present 9
 8. Chlamyospore absent 10
 9. Relatively thick-walled macroconidia with truncate or rounded tip. Basal cell more or less pedicellate
Fusarium solani (Mart.) Snyder and Hansen
 (Wollenweber's group *Martiella*)
 9. Relatively thin-walled macroconidia with tapering or constricted tip. Pedicel is prominent
Fusarium oxysporum (Schl.) Snyder and Hansen
 (Wollenweber's group *Elegans*)
 10. Macroconidia many septate (more than 5), thick-walled. Microconidia in chains
Fusarium regidiusculum (Brick.) Snyder and Hansen
 (Wollenweber's group *Spicarioides*)
 10. Macroconidia few septate (3-5), thin-walled. Microconidia in chains
Fusarium moniliforme (Sheld.) Snyder and Hansen
 (Wollenweber's group *Liseola*)

Some Comments Relevant to the Present Classification:

Separation between Snyder and Hansen's species based partly upon the presence or absence of chlamyospores. However, the chlamyospore formation is often a rare event. It may even be absent altogether. Thus it becomes difficult to separate the species. It is always advisable to wait for few weeks after inoculation so as to allow the mycelia to mature. The chlamyospores can be observed only in old cultures. In addition to mycelial chlamyospores, one must also consider those appearing on macroconidia. Furthermore, *Fusarium* changes its character frequently when a few transfers of the culture are made on agar media, especially on Potato Dextrose Agar medium, and very often the shape of macroconidia becomes distorted during this process. So, it is advisable to determine an isolate as soon as possible even if

Figs. 1-12.—1, *Fusarium moniliforme*; 2, *Fusarium oxysporum*; 3, *Fusarium tricinctum*; 4, *Fusarium regidiusculum*; 5, *Fusarium solani*; 6, *Fusarium episphaeria*; 7, *Fusarium nivale*; 8, *Fusarium lateritium*; 9, *Fusarium roseum* (*Arthrosporiella*); 10, *Fusarium roseum* (*Gibbosum*); 11, *Fusarium roseum* (*Discolor*); 12, *Fusarium roseum* (*Roseum*).

it is not in pure culture. Natural media like oat meal agar, steamed rice or stem, where sugar concentration is low are very useful to determine the macroconidial character. Transfer of small agar block from an agar culture to a plane agar media is an easy method to obtain normal spores. However, a media with a high sugar concentration is useful for observation of the mycelial colour and separation of species from a mixed culture. In fact, a good determination of *Fusarium* species cannot be done with only a single culture media. Even with best conditions it is often impossible to separate a new isolate with accuracy.

It may be mentioned here that only few species, such as, *F. moniliforme*, *F. solani*, *F. roseum*, *F. oxysporum*, *F. nivale* are common and pathogenic and others are uncommon and nonpathogenic. *F. ciliatum* and *F. episphaeria* are very specialized *Fusaria* and do not occur commonly. *F. tricinctum*

is rarely found in cereals. *F. rigidiusculum* is a secondary invader on trunks and branches of trees and is mainly found in tropical countries. The line drawings of the conidia of different species of *Fusarium*, as per present classification, are given on p. 258.

References

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