VARIATIONS IN PLEURAGE CURVICOLLA (WINT.) KUNTZE

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INTRODUCTION

The fact that one strain of a fungus may differ considerably from another strain within the same species coming from a different source, growing on a different substratum, or subject to other stimuli, has long been known. Yet the knowledge of the extent of such variations found recorded in literature is scattered and comparatively meager. This lack of exact data on the amount of variation, both morphological and physiological, within the species has led to considerable confusion and often makes it practically impossible to decide whether or not the fungus at hand belongs to a previously described species. It is only by the careful observation and study of a fungus species under the influence of different environmental conditions that its limitations can be determined. Too often fungi are described from specimens from a single source and on but one host or substratum, with the result that some of their characteristics may be overlooked. Later another worker obtains a strain of the same species from another source or under different conditions, notes rather striking differences not mentioned in the original description, and gives it a new name. As a result an organism may receive many names, and only when the group is carefully monographed is it found that these are but variations of one and the same species. The chaotic condition produced by the indiscriminate production of new species was discussed at length at a meeting of the Botanical Society of America in 1908 and the discussion was published in the American Naturalist[1] of the same year.

The purpose of this paper is to record certain variations noted in a strain of *Pleurage curvicolla* with the hope that these may add something to the present knowledge of the extent to which individuals of a single species may vary and yet not afford sufficiently different morphological characters to justify the making of a new species.

SOURCE OF THE ORGANISM

The strain under discussion first appeared in 1918 as a contamination in a culture of *Sphaeronema fimbriatum* which had been isolated by Dr. L. L. Harter in 1912 from a sweet potato affected with black rot, and which had been in the laboratory continuously since that time. Single ascospore isolations were made, and the organism thus obtained was used in the work here recorded.

[1] Amer. Nat. 42: 217–281. 1908.

Variation in the Number of Spores

Perhaps the first and most striking thing observed when a crushed perithecium of this organism is examined microscopically is the large number of spores in the asci. This species as originally described by Winter[2] contains 128 spores in an ascus. Griffiths[3] in his monograph of the North American Sordariaceae states that all but one of his strains, which had 128, had 256 spores in the ascus. He says that he did not count all the spores but counted enough to convince him that there were more than 128, and since another nuclear division would make 256, he assumed that there probably were that number in an ascus. Owing to the great number of spores and to the tenacity with which they cling together, it is impossible to see all the spores, but in the strain under discussion the writer has been able to count 375 in one ascus and 350 in another and in several other instances 300 or more. Counts were made by mounting a single mature ascus on a microscopic slide in a drop of water under a cover slip, and crushing the spores out by pressing on the cover. Nevertheless, it has never been possible to obtain a distribution of the spores which would permit an exact count. In many cases a portion of the spores were counted and the remainder estimated. It was decided finally that there must be in the neighborhood of 500 spores in each ascus and probably 512, which would be the number resulting from another nuclear division after that suggested by Griffiths, or from nine mitotic divisions in all.

It would seem then that *Pleurage curvicolla* may have 128, 256, or 512 spores in the ascus. The number seems to be constant for the strain under all conditions so far as present observations extend.

Spore Size

Perhaps the most reliable characters used in the determination of a species are the spore size, shape, markings, etc. A large number of spores taken from mature perithecia growing on various media have been measured, and the results are tabulated below. Only the dark, opaque spores were considered mature and were measured.

Table 1

Medium	Age of Culture	Receptacle in which Grown	Spore Size Max. and Min. Limits.
Irish potato agar.....	30 days	Petri dish	11–13 x 15–19 μ
Irish potato agar.....	16 days	Petri dish	10–13 x 13–15 μ
String bean agar.....	14 days	Petri dish	10–13 x 13–15 μ
Corn meal agar.....	15 days	Petri dish	9.5–11.25 x 13–17 μ
Corn meal.....	41 days	Erlenmeyer flask	9–11 x 13–15 μ
Melilotus stem.....	33 days	Test tube	9–13 x 13–19 μ
			9–13 x 13–19 μ, max. and min. limits.

[2] Winter, G. Hedwigia 10: 161. 1871.

[3] Griffiths, D. Mem. Torrey Club 11: 1–134. 1901.

It will be seen from the above table that the spore size is rather constant regardless of the medium upon which the fungus grows. The maximum and minimum limits for all the measurements are 9–13 x 13–19 μ compared with 10–11 x 13.5–16 μ as given for *P. curvicolla* by Griffiths, and with 14 μ as given by Winter.

Secondary Appendages

The presence of secondary spore appendages has not been satisfactorily demonstrated in this strain. The primary appendage is usually clearly evident on young and recently matured spores, but the examination of thousands of spores in all stages of development has failed to convince the writer of the presence of secondary appendages. However, in the cases of a half dozen spores a small fragment of something which resembled a secondary appendage was noticed at the end of the primary appendage, although none has ever been seen at the opposite end. This may have been the remnant of the secondary appendage, or it may have been some foreign matter or protoplasm from the ascus which had assumed a shape resembling a short appendage. In the instances noted the projections observed were not long and whip-like as described for the appendages of *P. curvicolla*, but it is entirely possible that they had been broken or had deliquesced, since they are said to be "very fugacious."

It seems possible that the presence or absence of these secondary appendages may also depend upon the environmental conditions under which the fungus developed. However, this could be determined with certainty only by long and careful study of many strains of the organism grown under various conditions and subject to different stimuli.

Size of Perithecia and Asci

It has been seen that the spore size compared very closely with the measurements given for *P. curvicolla*, the maximum and minimum limits including those of the latter. A somewhat greater variation in the size of

Table 2

Medium	Age of Culture	Receptacle in which Grown	Perithecial Size Max. and Min. Limits.
Melilotus stems.....	15 days	Test tube	400–572 x 614–786 μ
Corn meal agar.....	15 days	Test tube	529–572 x 815–929 μ
String bean agar.....	14 days	Petri dish	343.2–513 x 472–629 μ
Irish potato agar.....	56 days	Petri dish	472–686 x 858–1001 μ
Irish potato agar.....	11 days	Petri dish	430–458 x 595–644 μ
Irish potato agar.....	30 days	Petri dish	429–543 x 544–829 μ
Corn meal.....	41 days	Erlenmeyer flask	200–429 x 743–1101 μ
Melilotus stems.....	33 days	Test tube	400–600 x 715–1004 μ
			200–686 x 472–1101 μ, max. and min. limits
			400–547 x 669–868 μ averages

the perithecia has been found. Perithecia containing mature asci, namely, asci containing dark-colored spores, and growing on different media, were measured. These measurements are given in table 2.

The measurements given for *P. curvicolla* by Griffiths are 350–450 x 550–600 μ, and by Winter, 697 μ high. The measurements tabulated above simply show how great a variation may occur in the size of perithecia. The greatest variation occurred on corn meal on which perithecia as small as 200 μ in diameter were found and some as high as 1101 μ. This is probably due to the quantity of the medium rather than to its quality, since whenever a thick layer of substratum is provided many of the perithecia are submerged and send up long beaks to, or toward, the surface, while when growing on a thinner layer, as in a petri dish, they are usually superficial. Cultures growing in test tubes on Irish potato agar about 3 cm. deep formed perithecia as far as 5 mm. beneath the surface of the medium whose beaks were entirely absent or were short and never reached the surface.

Less attention has been given to the study of the asci, since these enlarge so rapidly when placed in water that the measurements are less reliable. However, measurements of asci taken from a 30-day-old culture on an Irish potato agar plate gave the limits 83–91 x 210–252 μ, as compared with 70–120 x 225–280 μ as given by Griffiths, and 113 μ broad by 257 μ long as given by Winter.

Summary

1. Observations made on a strain of *Pleurage curvicolla* together with records found in literature seem to indicate that this species may have 128, 256, or 512 spores in the ascus, and hence it is assumed that 7, 8, or 9 mitotic divisions probably occur within the ascus.

2. The spores of this strain compare closely with those given for other strains of this species, but there is a somewhat greater variation in the size of the perithecia.

3. Careful study of spores of all ages, both within and outside the ascus, have failed to demonstrate definitely the presence of the secondary appendages which are supposed to be a constant taxonomic character in this species.

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