Nuclear behavior in the vegetative hyphae of Neurospora crassa

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Abstract
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Mitchell, M.B. A round-spore character in N. crassa.

Tests of ad+ descendants of this cross have indicated that the round-spore character is non-autonomous. Random single-spore isolates, when crossed as fertilizing parents to wild-type testers, were found to be of two types, one giving only, or predominantly, round spores and the other, only normal. When strains arising from the spore pairs (the members of each pair were isolated and cultured together) of 22 round-spored ascus were tested in the same way, two of each type per ascus were regularly found. Attempts to obtain crosses of which both parents were round spore producers, or in which such a strain functioned as prospore parent, were unsuccessful. However, the indicated segregation, in round-spored ascus, of the ability to transmit the round-spore character suggested the behavior of an ascus dominant, hence the designation, R, was applied. Another sort of change in the character of the ascus, from 4-spored to 8-spored, transmitted by only half the segregants of an ascus, has already been reported in N. tetrasperma by Dodge, Singleton, and Rolnick (1950 Proc. Am. Phil. Soc. 94:38).

The finding of occasional normal spores from crosses of two of the R isolates tested is of interest in connection with dominance. Analyses, in the manner described above, of three ascus from one of these crosses, two normal- and one round-spored, all gave the result expected from round-spored ascus, that is, two round, and two normal spore producers per ascus. One of the normal-spored ascus was further tested by the crossing of its R and + segregants. The segregation of mating type allowed + x R crosses, both of which gave spores. One of the ascus crosses 14 of 22, of those tested and found to give 2:2 segregation of R and +. This result suggests that in + x R crosses involving ascus of the 35408 strain, reversals of dominance sometimes occur but are not necessarily inherited. On this basis, other ascus which have been observed to give exceptional round-spored ascus among normals could be interpreted as + x R which also exhibit infrequent reversals of dominance. An example of a recessive ascus character in N. crassa has been reported by Sib (1962 Neurospora News. 1:6). -- Division of Biology, California Institute of Technology, Pasadena. California 91109.

Wilson, C.L. Nuclear behavior in the vegetative hyphae of Neurospora crassa. We have recently described some new aspects to nuclear division and motility in the vegetative mycelium of Neurospora crassa. The details of these findings are being reported in two papers (Wilson et al. 1966 Ark. Acad. of Sci. 20: in press); and Wilson and Aist 1967 (in manuscript), but it would seem desirable to outline our findings for this newsletter.

We have found that the asexual nucleus of N. crassa divides in the manner we have described for Ceratocystis fagacearum (Aist and Wilson 1967 Amer. J. Botan. (in press). Nuclear division occurs within an expanded nuclear envelope. Chromatin separation differs from classical mitosis in that 1) division occurs perpendicular to the longitudinal axis of the cell, 2) anaphase movement is unilaterial and unsynchronized and 3) a spindle occurs only between separating chromatids.

The mechanisms of division proposed by Bakerspigel, Weijer et al., and Dowding and Weijer have features which are consistent with certain of our findings. We believe that the constricting and dividing nuclei reported by Bakerspigel may have resulted from a staining of the nuclear matrix within the envelope as well as the chromatin. When we overstain, we get similar figures. As the daughter nuclei migrate out of the old nuclear envelope, the envelope is stretched and figures are produced comparable to those illustrated by Bakerspigel as divisional stages.

Weijer et al., Dowding and Weijer have shown the chromosomes to be associated lineally into a filament of chromatin. They interpret division as the splitting of this filament into two strands of lineally associated chromosomes which then separate. We find the chromosomes associated into a filament of double-stranded chromatin prior to division. A spindle then develops between separating chromatids and appears to push them apart.

We have also found that the centriole of N. crassa is involved in nuclear motility as well as division. When nuclei move in the cell, they are preceded by the centriole. Migrating nuclei become attenuated and can be seen to have a head (centriole) and a tail (nucleolus). -- Department of Plant Pathology, University of Arkansas, Fayetteville, Arkansas 72701.