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Abstract
Spore and ascus mutants in *N. tetrasperma*
Also, in asc us eases the first mithosis has been completed but nuclear migration has not. Examples of prematurely forming spore walls have been observed. At least in the case of the largest giant spores, which are approximately whole ascus size and include the total of the nuclear complement, the system that designates the outline of spores seems either to be at the cell membrane or is being substituted for by the membrane or something associated with it. This hypothesis is based on observations of asc us that are double mutants for giant spore and for peak (also called biscuit). Typical peak asc us are balloon or pew-shaped structures that include 8 normal ascospores. In the double mutants, the giant spores are pear or balloon-shaped, the wall lowering essentially the outline of the ascus itself.

Initial data from experiments designed to study the effects of different environmental conditions on spore production in gsp/gsp crosses indicate that the mutant is much more sensitive both to elevated temperature (31°C) and to sorbose supplementation of the medium than is the +/- cross. In addition, gsp/gsp crosses on Wertaagord-Mitchell crossing medium produce a significantly greater number of giant spores than is produced by similar crosses on corn meal agar. (VL is on NIH Postdoctoral Fellow and previously has been supported as a postdoctoral trainee by Grant T1 GM 1035; the research program is supported by Grant GM 12953, National Institutes of Health, USPHS) - - Section of Genetics, Development and Physiology, Cornell University, Ithaca, New York 14850.


A dominant round spore mutant and both dominant and recessive ascus mutants have been isolated following dimethyl sulfate mutagenesis of N. tetrasperma conidia. The characteristics of the dominant round spore mutant are similar to those of the round spore mutant of N. crosa described by M. Mitchell (1966 Nutrpospor Newsl. 10:6). Crosses in which both parents carry the round spore mutation are illegitimate. Each spore from a four-spored ascus germinates from two germ pores. In the infrequent case of a three-spored ascus, the exceptionally large round spore has four germ pores and presumably can germinate from all four pores. Germination from more than two pores has been observed in multi-porate spores derived from single-spored" tetrasperma ascus and also in the "giant" spore (gsp) mutant of N. crosa described in the note above by Leary and Srb.

Unlike the N. crosa round spore which Cameron has mapped as one of the outermost mutants in 1R, segregating independently of mating type (1967 Neurospora Newsl. 11:6), N. tetrasperma round spore is in linkage group 1 and shows close linkage to the mating type locus (approx. 12 mop units). However, the linkage of round spore to mating type in N. tetrasperma need not be taken to mean that round spore is located closer to mating type in N. tetrasperma than in N. crosa, nor can it be assumed that more than one gene on linkage group 1, when mutated, is capable of producing round ascospores. These reservations are based on evidence that in N. tetrasperma, crossing over is greatly reduced, at least in linkage group 1. Adenine and several other N. tetrasperma linkage group markers obtained in our lab, have never shown recombination with the mating type locus.

Normal N. tetrasperma spores average 16μ x 31μ while "round" spore dimensions average 18μ x 21μ. Round spores show a slight elongation near the germ pores and the 21μ is meowed along a line drawn between the two germ pores. Unlike normal spores, round spores usually do not fill the length of the ascus, yet the volume of a round spore is calculated to be about 85-90% that of a wild type spore.

An occasional non-genetic reversal of dominance occurs; that is, in a cross heterozygous for round spores, one or two ascus in a given perithecium may contain four phenotypically normal spores. However, given the absence of second division segregation in such exceptional ascus, each of the normal heterocaryotic spores upon germination give rise to a self-fertile mycelium which produces perithecic containing round-spored ascus. Ascus have never been observed to contain mixtures of round and normal spores. The dominance effects are observed for the ascus as a whole and not for individual spores.

Ascus mutants: The vegetative mycelium of both the dominant and the recessive abnormal ascus mutants is colonial. The dominant ascus mutant has the effect of producing abnormal ascus when crossed to a wild type parent, whereas with the recessive, only mutant x mutant crosses have an effect on the ascus. The type of ascus produced by these mutants is similar to that produced by the peak-2 (pk-2, also called bis) mutant isolated in N. crosa (Pincheira and Srb 1969 Am. J. Botany 56: 846).

The dominant N. tetrasperma ascus mutant is allelic to the pk-2 N. crosa ascus mutant. Allelism could be tested for directly since the pk-2 gene has been transferred from N. crosa into N. tetrasperma. The recessive N. tetrasperma ascus mutant is not allelic with pk-2 but this is not surprising since recessive mutants affecting ascus morphology in N. crosa have been found for at least seven different loci (Srb and Srb 1969 Genet. Res. 13: 303). It is interesting to note that at present all dominant ascus mutants so far obtained in N. crosa, map at the pk-2 locus.

The transfer of genes between two evolutionarily distinct species of Neurospora is a valuable tool and has led to interesting observations. One cannot accurately predict that these morphological mutants particularly those affecting the sexual reproductive apparatus of a heterothallic species of Neurospora such as N. crosa will have on identical expression in a pseudohomothallic species (N. tetrasperma). The pk-2 N. crosa ascus mutant has undergone five backcrosses to the N. tetrasperma wild type parent. Although in N. crosa pk-2 has an effect on the ascus only when homozygous, in N. tetrasperma the mutant has a partial dominant effect; that is, although the ascus produced in a pk-2 x wild (N. tetrasperma) cross are linear, a high frequency of them contain more than four spores. Only 1-2% of the asci in the corresponding wild type N. tetrasperma cross contain more than four spores. (DRN is supported by Grant GM 12953, National Institutes of Health, USPHS) - - Section of Genetics, Development and Physiology, Cornell University, Ithaca, New York 14850.