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Mutations blocking development of perithecium

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Abstract

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Ho C.C. Mutations blocking development of the protoperithecium in Neurospora.

The development of the protoperithecium or the female sexual organ in Neurospora, though essential for sexual development, is nevertheless dispensable for completion of the life cycle, due to alternative vegetative reproduction by conidia and vegetative hyphae. Mutants defective in the formotion of protoperithecio ore therefore valuable non-lethal developmental mutants in efforts to discover those genes that are responsible for the initiation of a developmental pathway. For genetical studies, these female-sterile mutants con be used or male parents to fertilize the protoperithecia from strains of opposite mating type.

Three classes of mutations blocking the different stages of the development of protoperithecio have now been obtained. All of them ore spontaneous mutations. In most cores (except ty-1 and ty-2) only mutants with normal vegatative morphology and good growth rate were chosen, so that it con be certain that the mutation specifically affects the development of protoperithecia. It is already known that several morphological mutants, such as the modifiers of the colonial temperature-sensitive mutant (Terenzi and Reissig 1967 Genetics 56:321),have defective protoperithecio ond ore female sterile.

The mutations of the first group (ff-1, ff-2 ond others) specifically prevent the formation of protoperithecia and have no effect on vegetative morphology or nutritional requirements. The ff-1 mutation was mopped on the right arm of linkage group II between org-5 and try-3 (Tan and Ho 1970 Molec. Gen. Genet. 107: 158). Another pmtoperithecio-less mutant also mops on linkage group II, but its precise location is not known. The location of ff-2 is uncertain.

The second class of mutants (ty-I, ty-2) was first discovered by Westergaard, and the regulation of their tyrosinase synthesis was studied intensively (Horowitz et al. 1960 J. Mol. Biol.2: 96). They form a few small protoperithecia, which ore generally defective in function. Rarely, a few of their protoperithecio con be mated to form perithecia The mutant ty-1 hos on abnormal vegetative morphology called "velvet", in that the aerial hyphoe ore short and bear few conidio. Velvet is inseparable from female sterility. Most ascospores of ty-1 ore also probably lethal, as indicated by a large deficiency of ty-1 in the progeny of all crosses as determined by random ascospore analysis. The aerial hyphae of ty-2 ore also shorter than those of the wild type. The mutant ty-1 was tentatively mopped by Walker (1963 Neurospora Newsl. 3: 15) near tyrosine-1 on the for right on of linkage group III. The present work confirms his result. The genesis located to the right of albino-2 on the right arm of linkage group 1. It is not allelic to the T locus (Horowitz and Fling 1956 Proc. Natl Acad. Sci. U. S. 42:498), the structural gene of tyrosinase, which is proximal to al-2.

The last class of mutants (f&6) produces many large and black protoperithecia which cannot be mated to form perithecia. They also excrete large amounts of black pigments, presumably melanin, into the medium. This excretion of pigments may not be the cause of the functional defect, for there are similar excretor mutants which are female fertile. The gene ff-6 is located close to ty-1.

The protoperithecia-less mutants (ff-1, ff-2) are strong candidates for the regulatory gene or genes that switch on the development of protoperithecia. If this is true, it is expected that these mutants may show a deficiency of the various enzymes and proteins involved in the development of this organelle. The nature of the ff-6 mutation is unknown. - - - Division of Genetics, School of Biological Sciences, University of Malaya, Kuala Lumpur, Malaysia.