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A temperature-sensitive morphological mutant present in Beadle-Tatum and Rockefeller-Lindegren "wild-type" stocks and their derivatives

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Abstract

A temperature-sensitive morphological mutant present in Beadle-Tatum and Rockefeller-Lindegren “wild-type” stocks and their derivatives

Perkins, D.D. and M. Bjorkman. A temperature-sensitive morphological mutant present in Beadle-Tatum and Rockefeller-Lindegren "wild-type" stocks and their derivatives.

A gene located in linkage group "that results in a spreading colonial phenotype at 39° C has been found in a wide variety of strains derived from Lindegren ancestry. The trait is erratic and difficult to score at 34°, and is not apparent at 25°. Expression is more marked on glycerol-complete medium than on Vogel's minimal medium N. The gene will be designated scot: spreading colonial temperature-sensitive.

The abnormality was noticed in two strains obtained from J.F. Wilson for studies of heterokayron compatibility. Since the strains were derived from Rockefeller-Lindegren (RL) background, wild type strains RL21a (FGSC #2219) and RL3-8a (FGSC #2218) were subsequently tested, as were a sample of Wilson-Garnjobst het-testers from FGSC. Presence of scot in all there strains raked the question whether it might also be present in the ancestral Beadle-Tatum (strains ,A and 25 derived from Lindegren) and Lindegren wild types. Strains 1A and 250 proved to be morphologically abnormal at 39° and phenotypically identical to scot from RL strains. Commonly used relatives and derivatives of there wild types were also tested, with the results shown in Figure 1.

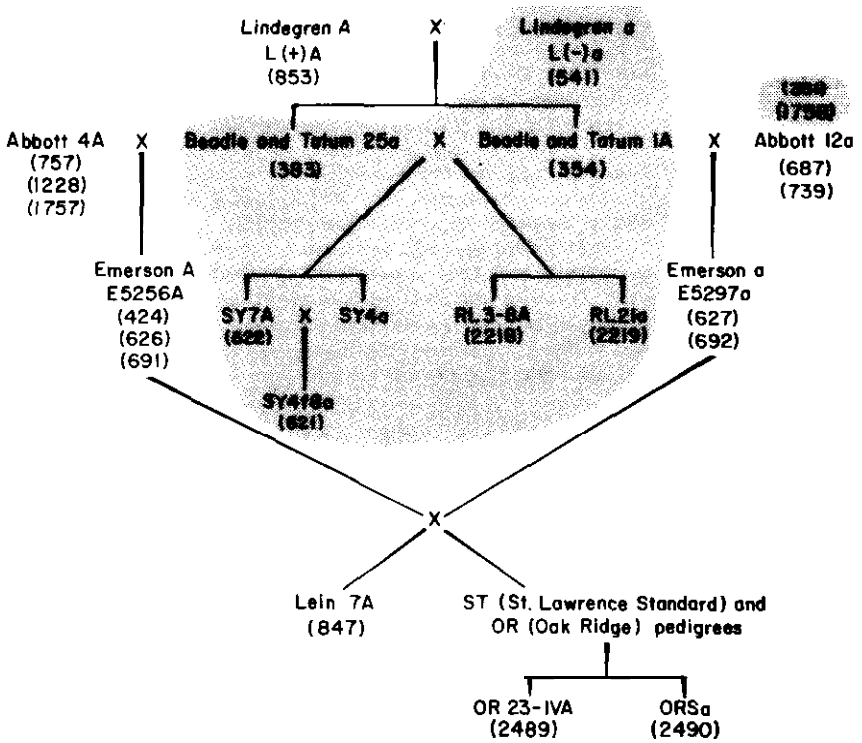

Figure 1 Pedigree of commonly used N. crassa stocks, indicating those whore phenotype is scot (shaded portion) and scot+ (no, shaded). FGSC numbers ore given in parentheses. All stocks were tested for scot at 39° vs. 25° except SY4a, which is not extant. Only rtockr 351 and 1758 have phenotypes inconsistent with those of presumed progeny. Compare pedigrees in Barratt (Neurospora News,. 2: 24, ,962, and Catcheside (Austr. J. Biol. Sci. 28: 213, 1975).

There observations are consistent with the scot gene having been introduced from a Lindegren strain that was ancestral to 25a and IA, while the scot+ allele, characteristic of Emerson, Lein, St. Lawrence and Oak Ridge wild types, came from the Abbott ancestors.

The only stocks that are clearly inconsistent with this interpretation are FGSC 351 and 1758, which score as scot although they ore ostensibly Abbott 12a. Both there stocks originated from Beadle's laboratory, either directly from M. B. Mitchell a, Caltech or through ATCC. Two other rtockr designated Abbott 12a by FGSC ore of the expected scot+ genotype--FGSC 687 and 739. These both came from the laboratory of D. G. Catcheside, either directly to FGSC, or through M.J. Mayo.

D. G. Catcheside has shown that stocks supposed to be Lindegren a (-) (FGSC 541 , withdrawn from the collection in 1971) and Emerson 5256 (FGSC 69,) ore suspect of being interlopers. This is bared on their possession rec genotype inconsistent with their claimed ancestry o r progeny (Austr. J. Biol. Sci. 28: 213-225, 1975). The L(-) stock (FGSC 541) is further suspect because it is albino. However, FGSC 541 is scot, consistent with its position in the pedigree. L(+) and L(-) stocks were deposited by Car, Lindegren in Centralbureau voor Schimmelcultures, Baarn, in 1937, where they survived the war and were carried for many years before acquisition by FGSC.

Intercrosses between two scot strains result in progeny all of which are scot. When a scot strain such as RL is crossed with a scot+ strain such as OR, the trait segregates 1:1. A 3-point cross showed scot is located in the right arm of V in the order al-3 scot his-6.

-RL strains were adopted as standards in the Tatum laboratory at Rockefeller University. Presumably scot was not recognized because cultures were not ordinarily grown above 34°. A,, microscopic tests of compatibility employing het-testers of RL background were carried out by Wilson and Garnjobst (1966)in microcultures grown at 20° to 30° C. scot would thus not have been recognized by these workers.

We were not the first to observe a temperature-dependent morphological effect in strains of Lindegren background. Stuart Brody reported in ,970 (J. Bact. 101: 802) that RL3-8a grew with abnormal morphology at 34° in liquid shake-culture with 2% acetate as carbon source. Morphology was normal at 34° with 2% glucose, and at 23" with either carbon source. Dorothy Newmeyer (1972, unpublished) observed that the Beadle-Tatum strain ,A (FGSC 354) showed pelleted growth at 34° C when grown submerged in liquid medium with sucrose, where it resembled cot-1 The strain did not resemble cot-, in tests on minimal agar slants at 34°, however More recently, James F. Wilson (personal communication) observed independently that RL differed from OR in growth at 37°, and showed that the trait segregated , ;1 in reciprocal crosses.

The take-home lesson is: be prepared for anomalous behavior when scot wild types and any strains derived from them are grown at elevated temperatures. This potentially implicates many strains containing markers derived from Beadle and Tatum strains at Stanford

(no prefix), Caltech (C prefix), Yale (Y), and Rockefeller (R). In contrast, strains whose background is Emerson, St. Lawrence or Oak Ridge are probably free of scot. Markers can readily be freed of scot by crossing a strain that contains it to OR or EM, and selecting a normal f_1 isolate.

Caution must be taken to avoid attributing the scot phenotype to another locus. We once fell into that trap when stocks of two independently originating ser-1 mutants, H605 and C127, were both observed to grow colonially at high temperature (Genetica 40: 253, 1969). We now know that the colonial trait was not a pleiotropic manifestation of ser-1. Instead, it can simply be attributed to the fact that both ser-1 mutants probably originated in strains that already contained the scot gene, from which they are easily separated. H605 is known to have been induced in a Lindegren strain (Hungate 1946). The exact ancestry of C127 is not known (G.R. Dubes, personal communication); it may have been Lindegren.

The scot A and a strains used in our linkage tests will be deposited in FGSC, for reference. ---Deportment of Biological Sciences, Stanford University, Stanford, CA 94305.