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## Abstract
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The method of measuring linear growth rate on agar medium in long tubes devised by Francis Ryan in 1941-1942 is simple, precise, and reproducible. These "race tubes" have been widely used for many purposes, such as to define optimal conditions for growth (Ryan *et al*. 1943 Am. J. Bot. 30:784-799), to measure complementation and assay the effect of varying nuclear ratios in heterokaryons (Davis 1966, in Ainsworth/Sussman (eds.), The Fungi, an Advanced Treatise 2:567-588), to study circadian rhythms (Sargent *et al*. 1966 Plant Physiol 41:1343-1349, Feldman *et al*. 1983 Photochem. Photobiol. Rev. 7:319-368), and to determine changes in growth rate that accompany decreases or increases in the number of genes specifying ribosomal RNA (Rodland *et al*. 1983 Curr. Genet. 7:379-384). Race tubes have also been used to detect and study senescence and mitochondrion-based stopper mutations in laboratory strains, and the stop-start growth shown by classes of mutagen-sensitive and DNA-repair deficient mutants (e.g. Sheng 1951 Genetics 36:199-212; Bertrand *et al*. 1976 Can. J. Genet. Cytol. 18:397-409; Newmeyer 1984 Curr. Genet. 9:65-74). In a survey of wild-collected strains, race tubes led to the discovery in one wild population of senescence due to mitochondrial defects (Rieck *et al*. 1982. Can. J. Genet. Cytol. 24:741-759.

Ryan *et al*. determined growth rates of representative strains of *N. crassa* and *N. sitophila*. Rieck *et al*. have measured the rate for *N. intermedia*. To our knowledge, linear growth rates have not been reported for *N. tetrasperma* or for the five homothallic species.

We were prompted to compare linear growth rates by the discovery of a fourth heterothallic species, which is being described and named *N. discreta*. Sexually compatible strains of *N. discreta* are highly fertile among themselves, but are genetically isolated from all the other species by sterility barriers. In preparing a species description it seemed of interest to compare growth rates of *N. discreta* with the other species. The results are summarized in Table 1, where rates are also shown graphically.

TABLE I

Linear growth of strains representing all the known Neurospora species. Rate is mm/h at 25°C on minimal medium N in 30 cm long growth tubes. Each value is based on the linear phase of growth in a single tube.

| SPECIES | STOCK NO. | NAME OF STRAIN | RATE | GRAPH OF LINEAR RATES |
|---|---|---|---|---|
| N. crassa | | | | |
| | 8203 | ORS-SL6 a | 3.7 | |
| | 2149 | fl-P A | 3.8 | |
| | P538 | Mauriceville-1c A | 3.7 | |
| | 8063 | Adiopodoume A | 3.9 | |
| | 9359 | Adiopodoume V7 A | 4.0 | |
| N. intermedia | | | | |
| | P420 | Clewiston-1h A | 4.0 | |
| | P405 | LaBelle-1b a | 4.0 | |
| | 8136 | Shp-1 a | 4.1 | |
| | 8135 | Shp-1 A | 4.2 | |
| | P60 | Kao-shong-1 a (ylo ecotype) | 3.3 | |
| | P201 | Kelungkung-1 a (ylo ecotype) | 3.4 | |
| N. sitophila | | | | |
| | P8085 | Arlington A (Sk-1k) | 3.8 | |
| | P8086 | Arlington a (Sk-1k) | 3.8 | |
| | 8112 | Sk-1s A | 3.9 | |
| | 8111 | Sk-1s a | 3.9 | |
| | 8222 | fl Sk-1k A | 4.0 | |
| N. tetrasperma | | | | |
| | 8055 | 85 A | 3.3 | |
| | 8056 | 85 a | 3.5 | |
| | 8219 | 85 A+a | 3.6 | |
| | P2300 | Waitakere, N.Z. A+a | 4.0 | |
| | P202 | Gianjor-1 A+a | 4.0 | |
| N. discreta | | | | |
| | P851 | Kirbyville-6 A | 1.5 | |
| | P846 | Kirbyville-1 a | 1.4 | |
| | P390 | Homestead-1k a | 2.8 | |
| | P755 | Santa Maria a | 2.8 | |
| homothallics | | | | |
| | 8058 | N. africana | 1.7 | |
| | 8059 | N. dodgei | 2.1 | |
| | 8060 | N. galapagosensis | 1.5 | |
| | D301 | " ", var. dominicana | 1.8 | |
| | FGSC 1889 | N. terricola | 0.8 | |
| | FGSC 1910 | N. lineolata | 1.7 | |

Rather than prepare tubes in duplicate or triplicate for individual tests, only a single race tube was used for each strain, and rates were determined using several different strains to represent each species. This could not be done for the homothallic species where only a single isolate was available.

*N. crassa*, *N. intermedia*, *N. sitophila*, and *N. tetrasperma* differ little in rate of linear growth. An apparent exception is the yellow ecotype of *N. intermedia* (represented by P60, P201) which is found characteristically on nonburned substrates in the Eastern hemisphere.

In contrast, the five homothallic species grow at only half the speed of the heterothallics, or less. The slowest species, *N. terricola*, from soil in Wisconsin, is also set off from the others morphologically by having rounded ascospores with a single germ pore. Strain D301 from Dominica, West Indies, has been diagnosed as a variety of *N. galapagosensis* (H.L. Huang, personal communication). All the homothallic strains are devoid of conidia.

Representative strains of the new species *N. discreta* are also distinctly slower than the other heterothallic species. The Kirbyville isolates from Texas are slowest. P390 (Florida) and P755 (Guatamala) are somewhat faster.

Our growth-rate determinations based on single tubes are certainly not definitive. However, these results agree well with the more extensive data of other workers for species tested previously. Our 25° C rates compare with those of Ryan *et al*. (1943) as follows: 3.7-4.0 vs 3.7-4.2 mm/h for *N. crassa*; 3.8-4.0 vs 4.1-4.2 mm/h for *N. sitophila*. For *N. intermedia*, our 4.0-4.2 mm/h compares with about 4.2 mm/h of Griffiths *et al*. (personal communication). Ryan *et al*. calculated that a difference of less than 0.4 mm/h between two single race tubes is probably not significant. - - - Department of Biological Sciences, Stanford University, Stanford, California 94305