How to obtain and recognize partial-diploid strains that are duplicated for known chromosome segments.

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Background

Segmental duplications (partial diploids) of known content can be obtained as progeny from crosses of insertional or terminal chromosome rearrangements (Perkins 1974). These have been put to use in numerous ways:

- To identify and score genes that confer vegetative (heterokaryon) incompatibility (e.g., Mylyk 1975, Perkins 1975).
- To identify suppressors of vegetative incompatibility (e.g., Newmeyer 1970).
- To map genes relative to breakpoints (e.g., Perkins 1972, 1986).
- To determine the mode of breakdown of duplications (Newmeyer and Taylor 1967, Smith *et al.* 1996) and the effect of defects in DNA repair on chromosome stability (e.g., Schroeder 1986).
- To determine dominance and recessiveness when the alleles being tested are in a fixed 1:1 ratio (e.g., Metzenberg *et al.* 1974, Turner 1976).
- To investigate RIP and MSUD (e.g., Perkins *et al.* 1997, Bhat and Kasbekar 2001, Vyas *et al.* 2006, Shiu *et al.* 2001).

See *How to identify and score genes that confer vegetative (heterokaryon) incompatibility*. See *How to use duplication-generating rearrangements in mapping.*

Procedure

To determine what segments can be obtained as partial diploids, see Fig. 2 in Perkins (1997) (reproduced on page 68 of Perkins *et al.* 2001). For a diagram of duplicated segments that contain known vegetative incompatibility genes, see Fig. 1 in Perkins *et al.* (1993) or Fig. 1 in *How to identify and score genes that confer vegetative (heterokaryon) incompatibility*. To obtain information on individual duplication-generating rearrangements, see Perkins (1997). For a listing of rearrangement strains that generate duplications, see Part V E in the FGSC Catalog.

Because segmental duplications are unstable, duplication strains are usually not carried in stock, but are obtained anew by crossing the duplication-generating rearrangement with a normal-sequence strain. (Instability varies for the duplications produced by different rearrangements. Those from translocations that involve the nucleolus organizer region are especially unstable.) If the duplication-generating rearrangement is a translocation, one third of viable progeny are expected to carry the duplication.

Most duplications cannot readily be distinguished on the basis of their vegetative phenotype. They can be recognized unambiguously, however, because when a duplication is crossed, barren perithecia are produced. Tests for barren vs. fertile are carried out routinely on lawns of *fluffy* testers, using synthetic cross medium either in petri plates or in 10 × 75 mm slants.

Experiments can be designed to allow recognition of duplication progeny by marker phenotype. (This is especially useful with unstable duplications that break down to give fertile heterokaryons). If a duplication-generating strain that carries a recessive marker located in the translocated segment is crossed with a normal-sequence strain carrying a different recessive marker in the corresponding segment, duplication progeny can be recognized because they are double heterozygotes and are dominant for both marker phenotypes. Several of the duplication generating rearrangements listed by FGSC are marked in this way.

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