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## Abstract

This note gives a comprehensive list of stocks useful for working with Spore killer elements, including reference strains for use as testers, genetically marked derivatives, and strains sensitive and resistant to killing by *Sk-1K, Sk-2K*, and . Geographical site of origin is indicted for the various killer alleles. Many of the strains are newly deposited in FGSC. Some are listed also under other categories. Updated versions of the list will appear in future FGSC Stock Lists (Part IV, Special Purpose Stocks).

# Strains for studying Spore killer elements in four Neurospora species

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This note gives a comprehensive list of stocks useful for working with Spore killer elements, including reference strains for use as testers, genetically marked derivatives, and strains sensitive and resistant to killing by *Sk-1K*, *Sk-2K*, and *Sk-3K*. Geographical site of origin is indicted for the various killer alleles. Many of the strains are newly deposited in FGSC. Some are listed also under other categories. Updated versions of the list will appear in future FGSC Stock Lists (Part IV, Special Purpose Stocks).

Characteristics of chromosomally located Spore killer elements have been summarized by Turner et al. (Am. Nat. 137:416-429, 1991; Fungal Genet. Newsl. 34:59-62, 1987) and will only be summarized briefly here. In crosses heterozygous for killer and sensitive (*SkK* x *SkS*), four ascospores are usually killed in each 8-spored ascus and the survivors are *SkK*. All eight ascospores survive in crosses homozygous for the same killer element. Killer elements have been found in natural populations of *N. intermedia* (*Sk-2K* and *Sk-3K*, both rare) and *N. sitophila* (*Sk-1K*, common). *Sk-2K* and *Sk-3K* have been introgressed from *N. intermedia* into *N. crassa* for convenience of genetic analysis. Both are haplotypes-presumed gene complexes in a centromere-spanning segment of linkage group III within which meiotic recombination is repressed in the killer/sensitive heterozygotes. *Sk-2K* and *Sk-3K* are similar in behavior except that each is sensitive to killing by the other. The two also differ in their reaction to genes conferring resistance to killing. Genes conferring resistance to *Sk-2K* or to *Sk-3K* are present in some populations of *N. intermedia*. Resistance to *Sk-2K* is found at low frequency throughout the range of *N. crassa*. The resistance genes, symbolized *r(Sk)-2* and *r(Sk)-3*, have been mapped in wild type sequence in *N. crassa*. They are linked to loci within the killer complex. Map relations in *N. crassa* are shown in Figure 1. Linkage relations of *Sk-1K* are not known, nor is it known whether this killer element is associated with a complex.

*Sk-2K* strains have been found only in *N. intermedia*, and only in four localities: Brunei (B), Java (J), Papua New Guinea (P), and Sabah (SA). *Sk-3*K is known solely from Papua New Guinea. All commonly used *N. crassa* laboratory wild-type strains and their derivatives are sensitive to killing both by *Sk-2K* and by *Sk-3K*.

Strains containing the aconidiate mutation fluffy (*fl*) are conveniently used a female parents in test crosses for scoring killer vs. sensitive. The *fl* testers are highly fertile, and because conidia are absent, ascospores ejected to the sides of the tube can be seen clearly. With *N. crassa*, tests are made by fertilizing the testers on 10 x 75 mm slants of synthetic cross medium with 1% sucrose and examining shot ascospores after 10 days at 25 C. With *N. intermedia*, *N. sitophila*, and *N. discreta*, tests are best made on 13 x 100 mm slants using synthetic cross medium with filter paper as sole carbon source. If this medium is employed, stocks without the fluffy mutation

can be used, because few conidia are produced. Standard stocks of *N. tetrasperma* are also satisfactory as testers because they make few conidia at 25 C, even on sucrose medium.

Table 1. Strains for identification and study of Spore-killers in Neurospora

| Species and genotype | Origin of allele* | FGSC No. A | FGSC No. a | Comment |
|---|---|---|---|---|
| *Neurospora crassa* | | | | |
| Sk-2K | B | 6648 | 6647 | 10th backcross to N. crassa, mixed background |
| Sk-2K | B | 3114 | 3115 | 10th backcross to N. crassa, inbred to OR wild type |
| cum Sk-2K acr-7 | B | - | 7432 | |
| Sk-2K acr-7 | B | 6930 | - | 10th backcross to N. crassa |
| Sk-2K acr-7 leu-1 his-7 | B | - | 7373 | |
| Sk-2K acr-2 leu-1 his-7 | B | 7387 | 7388 | |
| Sk-2K acr-2 leu-1 | B | 7375 | 7374 | |
| Sk-2K acr-2 his-7 | B | 7376 | 7377 | |
| Sk-2K leu-1 | B | 7371 | | |
| Sk-2K his-7 | B | 7378 | | |
| Sk-2K phe-2 dow | B | 4538 | 4539 | |
| Sk-2K dow | B | 4260 | 4261 | |
| Sk-2K; fl | B | 3297 | 3298 | 9th backcross to N. crassa |
| Sk-2K | P | 7368 | 7367 | 12th backcross to N. crassa |
| Sk-2K acr-2 | P | 7385 | 7386 | |
| Sk-2K | J | 7369 | 7370 | 12th backcross to N. crassa |
| cum Sk-2K acr-2 | J | 7383 | 7384 | |
| Sk-2K acr-2 | J | 6928 | 6929 | 15th backcross to N. crassa |
| Sk-2K | J | 7392 | 7393 | Used for testing N. crassa from India |
| Sk-2S Sk-3S fl@ | | 6682 | 6683 | flP (RL) testers |
| r(Sk-2)-1 | - | 2222 | - | Iowa-1, LA (P527) |
| r(Sk-2)-1 cum | - | 7379 | 7380 | |
| cum r(Sk-2)-1 acr-7 | | - | 7389 | |
| r(Sk-2)-2 | - | | 7398 | Derived from N. crassa P2604, Georgetown, Malaya |
| Sk-3K | P | 3577 | 3578 | 10th backcross to N. crassa |
| cum Sk-3K | P | 7382 | 7381 | |
| cum Sk-3K his-7 | P | 7390 | 7391 | |
| Sk-3K acr-2 | P | - | 7077 | |
| Sk-3K acr-7 | P | 6931 | 6932 | 15th backcross to N. crassa |
| Sk-3K fl | P | 3579 | 3580 | 10th backcross to N. crassa |
| Sk-2K Sk-3S fl@ | | 6682 | 6683 | flP (RL) testers |
| r(Sk-3) | | 7395 | - | 6th backcross to N. crassa |
| cum r(Sk-3) | | - | 7396 | 6th backcross to N. crassa |
| cum r(Sk-3) leu-1 | | - | 7394 | 9th backcross to N. crassa |
| r(Sk-3) acr-7 ser-1 | | 7397 | - | 6th backcross to N. crassa |
| *Neurospora intermedia* | | | | |
| Sk-2K | B | 7401 | 7402 | 3rd and 4th backcross to Taipei background |
| Sk-2K | P | 7429 | - | 3rd backcross to Taipei background |
| Sk-2K | J | 7399 | 7400 | f1 of Tjiawi-2d (P162) x Taipei-1c (P13) |

| | | | | |
|---|---|---|---|---|
| Sk-2K | SA | 7426 | - | Menggatal, Sabah (P3126) |
| r(Sk-2) | | 1832 | 1833 | Townsville-1b (P113), Townsville-1 (P112) |
| Sk-3K | P | 3193 | 3194 | Derived from Rouna-1 (P32) |
| r(Sk-3) | | 6595 | 5123 | Tahiti (P2427, P2421) |
| Sk-2S Sk-3S@ | | 3416 | 3417 | Shew wild types (Taipei background) |
| Sk-2S Sk-3S fl@ | | 5798 | 5799 | 7th backcross of flP from N. crassa to Shew wild types |

| Species and genotype | Origin of allele* | FGSC No. A | a | Comment |
|---|---|---|---|---|
| *Neurospora sitophila* | | | | |
| Sk-1K | | 2216 | 2217 | Derived from Dodge's Arlington stocks |
| Sk-1K; fl | | 4762 | 4763 | fl P(1012) from Whitehouse N. sitophila, 3rd backcross to Dodge stocks |
| Sk-1S | | 5940 | 5941 | Tahiti (P2443, P2444) |
| Sk-1S; fl | | 4887 | 4888 | 5th backcross of flP from N. crassa to Panama VP203 or derivative |
| *Neurospora tetrasperma* | | | | |
| (See Raju and Perkins 1991 Genetics 129: 25-37. E: 8-spored ascus.) | | | | |
| Sk-2K acr-2 | J | 6934 | 6935 | 8th-9th backcross to N. tetrasperma |
| Sk-2K acr-2; E | J | 6936 | 6937 | 4th backcross to N. tetrasperma |
| Sk-3K acr-7 | P | 6938 | 6939 | 7th-8th backcross to N. tetrasperma |
| Sk-3K acr-7; E | P | 6940 | 6941 | 8th backcross to N. tetrasperma |
| Sk-2S | | 1270 | 1271 | Wild types 85A, 85a (also Sk-3S) |
| Sk-2S; E | | 5897 | 5901 | 85A, 85a background (also Sk-3S) |

* B: Brunei (Borneo); J: Java; P: Papua New Guinea; SA: Sabah (Borneo).
"nth backcross" Indicates progeny from the nth backcross of *SkK* into the alien genetic background. Introgressed killer strains with markers, for which there is no comment, are all from well backcrossed parents. Stock numbers prefixed with P are given for strains that originated from nature. For origins of stocks designated by place names, see FGSC Neurospora Stock List, Part V.
@ These strains are sensitive to killing both by Sk-2K and by Sk-3K. The double symbol is used to specify phenotype, and does not imply that Sk-2K and Sk-3K necessarily represent two genes at separate loci. It has not been determined how many loci are involved in determining sensitivity vs. resistance to either or both Spore killers.

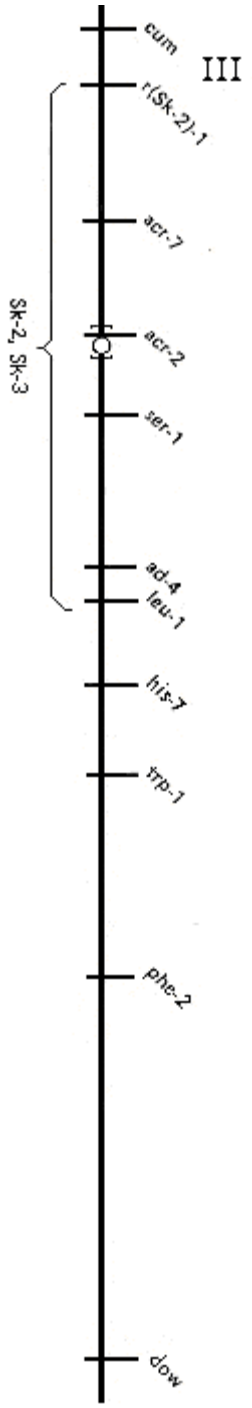


Figure 1. Loci of linkage group III that are relevant to *Sk-2* and *Sk-3*. Meiotic crossing over in the region between *acr-7* and *leu-1* is normally about 30%. Crossing over in the *acr-7 - leu-1* interval is effectively abolished in crosses where one parent contains *Sk-2K* or *Sk-3K* and the other is sensitive or contains a gene conferring resistance. *r(Sk-3)-1* is located near *r(Sk-2)-1*. *r(Sk-2)-2* has been mapped close to *leu-1*.