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Geographical distribution of resistance to spore killer in *N. crassa* and *N. intermedia*

Abstract

Spore killer-2 (*Sk-2K*) is a rare meiotic drive factor found only in four (among about 2,500) collected cultures of *N. intermedia*, two from Borneo, and one each from Java and Papua New Guinea (Turner et al 1987 Fungal Genet. Newsl. 34:59-62). When strains carrying *Sk-2K* are crossed to other *N. intermedia* strains, each ascus contains four viable ascospores, which carry *Sk-2K*, and four aborted ascospores. In some populations of *N. intermedia*, one third to one half of the strains collected carry a gene, tightly linked or allelic to *Sk-2K*, which confers full or partial resistance to killing. In crosses between *Sk-2K* and a resistant (*r(Sk-2)*) strain, each ascus contains four viable *Sk-2K* progeny and four (sometimes fewer) viable *r(Sk-2)* progeny. *N. intermedia* is found around the world at all longitudes sampled, but resistance to *Sk-2K* is found only in approximately half the globe, roughly centered in the region where *Sk-2K* was found.

Geographical distribution of resistance to spore killer in *N. crassa* and *N. intermedia*

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Spore killer-2 (*Sk-2K*) is a rare meiotic drive factor found only in four (among about 2,500) collected cultures of *N. intermedia*, two from Borneo, and one each from Java and Papua New Guinea (Turner et al 1987 Fungal Genet. Newsl. 34:59-62). When strains carrying *Sk-2K* are crossed to other *N. intermedia* strains, each ascus contains four viable ascospores, which carry *Sk-2K*, and four aborted ascospores. In some populations of *N. intermedia*, one third to one half of the strains collected carry a gene, tightly linked or allelic to *Sk-2K*, which confers full or partial resistance to killing. In crosses between *Sk-2K* and a resistant (*r(Sk-2)*) strain, each ascus contains four viable *Sk-2K* progeny and four (sometimes fewer) viable *r(Sk-2)* progeny. *N. intermedia* is found around the world at all longitudes sampled, but resistance to *Sk-2K* is found only in approximately half the globe, roughly centered in the region where *Sk-2K* was found. It extends from India on the west, across the Pacific (including Japan and Australia) to Ponape. The collections that do not contain resistance include Hawaii (123 strains tested), southern Brazil (64), southeastern U.S.A. (153), Puerto Rico (84), and western Africa (48).

Sk-2K has never been found in *N. crassa* (among 450 tested), but fertile hybrid progeny can be produced between the two species in the laboratory. *Sk-2K* was introgressed into *N. crassa* for study because of the lack of genetic knowledge about *N. intermedia*. Resistance to killing by *Sk-2K* occurs as a minority phenotype in populations of *N. crassa*. Three points were addressed in studying the resistant *N. crassa* strains:

(1) Allelism. One *N. crassa* strain from Malaya carries a gene for resistance that recombines at a low frequency with the previously reported *r(Sk-2)*-1 from Southeastern U.S. (Turner and Perkins 1979 Genetics 93:587-606). Other resistance factors from widely separated locations have not recombined when crossed to each other.

(2) Distribution. The range of *N. crassa* extends from Yucatan and Southeastern United States, eastward through the Caribbean, northern South America, Africa and India to Thailand. Except for equatorial Africa, it has not been found in the Southern Hemisphere. Resistance has been found in every region where *N. crassa* is found. The lowest incidence was 5/107 tested from southern U.S.A. Even looking at countries where just a few samples were collected from a limited area, resistance has been found in every country with 10 or more *N. crassa* samples, and in some with fewer.

(3) Hybridization. Resistance to *Sk-2K* gives no indication of hybridization between *N. crassa* and *N. intermedia* in nature. There is no geographical correlation between resistant populations. Resistance was absent from a number of collections of *N. intermedia* in regions where resistant *N. crassa* was found (southeastern U.S.A., Puerto Rico, and western Africa). In *N. intermedia*, *r(Sk-2)* is found in a large region from Thailand eastward to Ponape where no *N. crassa* has been found. The only overlap in resistant *N. crassa* and *N. intermedia* populations includes the eastern part of the *N. crassa* range: India, Malaya, and Thailand.

The distribution of resistance and of *Sk-2K* in *N. intermedia* suggests the (actual or recent) selective pressure of *Sk-2K* in the populations where resistance is found. The distribution in *N. crassa* could mean (1) that *Sk-2K* is or was widespread (though rare) in *N. crassa*, (2) that *r(Sk-2)* genes have some selectable function that keeps them segregating in populations independent of the presence of *Sk-2K*, or (3) that introgression took place in the area of overlap, probably with the interaction of (1) or (2).