normal and expectable fluctuations due to astronomical and meteorological causes.

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SEGREGATIONS OBSERVED IN BREEDING THE MONILIA BREAD MOLDS

IN the heterothallic species of Neurospora, two nuclei bearing factors of inheritance from both parents come together in an ascus and fuse. After a short resting period the fusion nucleus undergoes three successive divisions. Each of the resulting nuclei is then included in a spore. Eight uninucleate unisexual ascospores are thus formed from a single mother cell. The asci are long and slender and the nuclear spindles are very definitely oriented so that the relationship of the different spores is readily determined. The results obtained in crossing different strains as well as species of the Monilia bread molds have been such as to suggest the desirability of knowing in each case just where segregation of the various factors of inheritance takes place.

Neurospora crassa is a species commonly found on sugar-cane bagasse and elsewhere in the south. The eight spores from each of several asci have been isolated one by one and germinated. The eight haplonts, each from a single spore and all from a single mother cell in each case, were grown in pairs in all possible combinations. The results prove conclusively that segregation of the sex factors occurs in the first nuclear division in the ascus. The four spores in one end of the ascus are all alike as to sex, and the four in the other end of the ascus are of the opposite sex.

Neurospora sitophila, the common pink mold of the bakery, resembles *N. crassa* in many respects, but it has been reported[1] that in this species segregation of the sex factors must occur in the second division because the spores alternate in pairs as to sex. That this is not always the case is evident from results recently obtained by the writer. The strains mated were originally obtained at the Arlington Experimental Farm in Virginia. Eight haplonts were obtained by germinating the spores from one ascus. After the cultures had developed a few days very striking differences could be seen. The cultures had been numbered 1 to 8 corresponding to the location of the spores in the ascus. There was a very definite alternation in pairs as to the color of the aerial hyphae and the amounts of the salmon-pink conidia produced. Mycelia Nos. 1, 2 and 5, 6 produce pale or albinistic aerial hyphae with few, if any, conidia. Mycelia Nos. 3, 4 and 7, 8 produce masses of brightly colored salmon-pink to orange conidia. By growing the eight haplonts in pairs in all possible combinations, however, it was proved that this alternation in pairs was independent of sex. The haplonts alternate four and four as to their sex, so that as in *N. crassa* segregation of the sex factors must occur in the first division, even though the factors for conidia segregate in the second division. By mating haplonts Nos. 2 and 7 a new generation of perithecia was obtained. The same alternation in pairs as to production of conidia, and alternation four and four as to sex, was proved to obtain in asci of these perithecia also.

Quite otherwise is the situation when two albinistic races such as Nos. 2 and 6 are mated, or when two strains such as Nos. 4 and 8, which produce an abundance of conidia, are grown together. For example, when haplonts Nos. 2 and 6 are mated a new albinistic race is established which produces few, if any, conidia even when grown on bread, its natural medium. Such a race would be less obnoxious to the baker, since it must rely on sexual reproduction for its perpetuation. The spores from the different asci were tested out as to their sexuality. While the eight haplonts from an ascus are all alike in being albinistic, and practically sterile as to production of conidia, it was found that as to sex the spores alternate in pairs. When haplonts Nos. 4 and 8 referred to above were mated, asci were developed in which all eight spores were alike as to production of conidia by their mycelia, but again the spores alternate in pairs as to their sex.

Neurospora tetrasperma is a homothallic species. The mechanism by which a spore is provided with a nucleus of each sex is rather remarkable. Segregation of the sex factors could occur in any one of the three divisions, yet each ascospore would ordinarily be bisexual.

The three species of Neurospora furnish very desirable material for studies on inheritance in the fungi. Perhaps in no other place in the plant or animal kingdoms so far known can the progeny from a single mother cell be studied so readily and to such an advantage. Just why, in a mating of strains of *Neurospora crassa* which appear to be homozygous as to factors for production of conidia, segregation of the sex factors should occur in the first division in the ascus, while in similar races of *N. sitophila* these factors are segregated in the second division, is not altogether clear. Further study proves that segregation of various factors of inheritance in *N. sitophila* may occur at different points, depending on certain conditions not yet clearly understood.

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[1] Marguerite S. Wilcox, "The Sexuality and Arrangement of the Spores in the Ascus of *Neurospora sitophila*," *Mycologia*, 20: 3–17. 1928.