susceptibility tests made in Nigeria itself a mixed population of susceptible and resistant mosquitoes was used. This is borne out by the fact that significant kills were produced by an exposure of only 1 hr. to dosages of dieldrin considerably less than 4 per cent, even as low as 0·5 per cent. The eggs sent on three separate occasions to London may also have been mixed susceptible and resistant strains; but only a small percentage survived the journey. It is suggested that these were the highly resistant individuals; in other words, the journey by air has resulted in a selection of only the most vigorous mosquitoes, which are at the same time the ones highly resistant to insecticides.

Cross-resistance to the related chlorinated hydrocarbons, aldrin, alpha- and beta-chlordane, isodrin, endrin and gamma-BHC, has previously been commented on by Busvine[5] and Metcalf[6]. Busvine places these insecticides in the following order from the degrees of resistance shown by houseflies: alpha-chlordane (highest), beta-chlordane, aldrin, dieldrin, gamma-BHC, isodrin and endrin (lowest). With the resistant *A. gambiae* the order would appear to be: alpha-chlordane (highest), beta-chlordane, dieldrin, aldrin, isodrin, endrin and gamma-BHC (lowest).

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[1] Elliott, R., and Ramakrishna, V., *Nature*, **177**, 532 (1956).
[2] Busvine, J. R., *Nature*, **177**, 534 (1956).
[3] Wall, W. J., *Trans. Roy. Soc. Trop. Med. Hyg.*, **47**, 268 (1953).
[4] World Health Organization Tech. Series Report No. 80 (1954).
[5] Busvine, J. R., *Nature*, **174**, 783 (1954).
[6] Metcalf, R. L., *Physiol. Rev.*, **35**, 197 (1955).

A High Frequency of Heterozygous Diploids and Somatic Recombination produced by Ultra-violet Light in Imperfect Fungi

Pontecorvo and his co-workers[1] have demonstrated that, by the use of appropriate selection techniques, heterozygous diploids can be secured from heterocaryons of *Aspergillus nidulans*. Further, these diploids produced, on cultivation, recombinants by both somatic crossing-over[2] and somatic reduction. Later, similar results were obtained with the asexual strains, *Aspergillus niger*[3] and *Penicillium chrysogenum*[4]. I have succeeded in producing heterozygous diploids in the asexual fungi *A. sojae* and *A. oryzae* by the use of similar methods. These diploids also showed somatic segregation and yielded recombinations of the original genotypes. First-order segregations showed further segregation upon cultivation. Only a few segregants have been analysed and all proved to be still diploid in having double the haploid amount of deoxyribonucleic acid per nucleus. Their occurrence can be explained by the same type of somatic crossing-over as that discussed by Pontecorvo[5] and originally discovered by Stern[6].

The frequency of spontaneously arising somatic diploid nuclei in *A. sojae* is about 10^{-7}, or the same as that in *A. niger* and *A. nidulans*. In all three fungi, camphor increased this frequency to about 10^{-6}. It was further found that the frequency of heterozygous diploids in *A. sojae* could be raised to more than 10^{-2} by ultra-violet light.

When conidia of a heterocaryon between yellow-leucineless and albino-histidineless mutants of *A. sojae* were exposed to ultra-violet light until only about 1 per cent survived and were then plated on complete medium, 2–9 per cent of the survivors formed green colonies which were also prototrophic and diploid. Similar results were obtained with other heterocaryons and with one between yellow-methionineless and albino-leucineless mutants of *A. oryzae*. This great increase in diploidization was not simply due to the selective survival of diploid nuclei which were spontaneously present, as the relation between a survival of 10^{-2} and the increase from 10^{-7} to 10^{-2} in the frequency of diploids clearly shows; there was an absolute increase in the numbers of diploids.

Ultra-violet light was also active in stimulating somatic segregation in these diploids. When conidia from a green diploid colony were irradiated with different doses, there was a progressive decrease, from 9 to 75 per cent, in the green colonies formed upon plating. Correspondingly, there was an increase in the frequency of albino, yellow and sectored segregants. This phenomenon may be similar to that observed by James[7] with heterozygous diploid yeast.

The use of ultra-violet light to produce an extraordinarily high frequency of heterozygous diploids in asexual fungi should make feasible an analysis of their mode of origin and their subsequent behaviour, and should also greatly facilitate the production of new and improved strains for industrial use.

The results of this investigation will be published in detail and in English in the *Journal of General and Applied Microbiology*.

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[1] Pontecorvo, G., and Roper, J. A., "Advances in Genetics", **5**, 218 (1953).
[2] Roper, J. A., and Pritchard, R. H., *Nature*, **175**, 639 (1955).
[3] Pontecorvo, G., Roper, J. A., and Forbes, E., *J. Gen. Microbiol.*, **8**, 198 (1953).
[4] Pontecorvo, G., and Sermonti G., *J. Gen. Microbiol.*, **11**, 94 (1954). Sermonti, G., *Rend. Ist. Sup. Sanità*, **17**, 231 (1954).
[5] Pontecorvo, G., *Caryologia*, Vol. Supp. 1 (1954).
[6] Stern, C., *Genetics*, **21**, 624 (1936).
[7] James, A. P., *Genetics*, **40**, 204, 826 (1955).

"Polyploidy in Bluebells"

J. Yanney Wilson has recently given an account of polyploidy in bluebells (*Endymion non-scriptus* and *E. hispanicus*)[1]. There are some errors in this paper which it is desirable to correct. The "extraordinarily large forms" to which reference is made have not been determined by me as hybrids. Apparently the author has misunderstood the excellent coloured figures in the *Botanical Magazine*, N.S., **176** (1952). The central figure is of *Endymion hispanicus*, the left-hand one is of *E. non-scriptus*, and the right-hand one is of the putative hybrid. Further, the impression is given that Mr. Yanney Wilson examined my material cytologically; but he has not done so and I have not had the opportunity of studying his plants taxonomically.

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[1] *Nature*, **178**, 195 (1956).