GENETICS OF DIŒCY AND MONŒCY IN *ECBALLIUM*

DIŒCY, the separation of the sexes on to different diploid individuals, occurs irregularly throughout the higher plants. It must therefore have arisen a number of times during the evolution of this group. Thus the genetical control of diœcy is of considerable interest, particularly in regard to the differences between diœcious forms and their monœcious or hermaphroditic relatives. Little information has been available about such differences in the past; but two mimeographed papers[1,2] have now been circulated, in which Dr. F. Galán, of the University of Salamanca, describes the results of crosses between diœcious and monœcious forms of the cucurbitous plant *Ecballium elaterium*.

The monœcious form occurs in the northern half of Spain and the diœcious form in the southern half. The two appear to be readily crossed in both directions. The hybrids are fertile and various F_2 and back-cross progenies were raised. These indicated that monœcy is determined by a third allelomorph at the locus, the other two allelomorphs of which operate the normal sex mechanism in the diœcious form. Thus the monœcious form is (in Galán's notation) $a^+ a^+$, while in the diœcious types males and females are $a^D a^d$ and $a^d a^d$ respectively. The allelomorph a^+ seems to be recessive to a^D but dominant to a^d.

A few plants occur which are unexpected in this scheme. It seems that they are individuals which should be monœcious, carrying both types of flower; but actually bear flowers of only one sexual type. The experiments could not easily have revealed whether there occurred opposite types of aberration, genetically male or female plants bearing both sexual types of flower. No information is therefore available on this point.

About 1 per cent of the plants which presumably are genetically monœcious in Galán's scheme appear as females in the F_1. These must, however, be $a^+ a^d$, so that we may suppose the dominance of a^+ over a^d not to be unconditional. In F_2 and back-crosses, aberrant types appear which cannot be explained so simply. Thus monœcious F_1 plants, which must be $a^+ a^d$, give occasional males, as well as the monœcious and female plants expected, on selfing. We must suppose these males to be genetically $a^+ a^+$ or, less likely perhaps, $a^+ a^d$. In back-crosses, plants which must be $a^+ a^+$ sometimes appear as females. The frequencies of these aberrant phenotypes are about $\frac{1}{2}$ per cent in the back-crosses and nearly 7 per cent in F_2.

The author records that a plant which appears as male or female in its first year of flowering may carry both types of flower in later years, the chance of this occurring being itself genetically controlled. The F_1 was classified as second-year plants, but the F_2 as firsts. Thus the frequencies of aberrant phenotypes in these latter generations may be somewhat over-estimated. This over-estimation is, however, unlikely to be great, as only $\frac{1}{2}$ per cent of the back-cross plants seem to be aberrant.

It would thus appear that in addition to their allelomorphs at the main, *a*, locus, the two forms differ in their genetic backgrounds. The diœcious form contains genes, doubtless members of a polygenic system, which, when introduced by crossing into a plant monœcious in respect of the *a* locus, upset its development so that it digresses towards one sex or the other. It is not clear whether the background genotype of the F_1 would ever cause such an upset in $a^+ a^+$ plants; but it does seem clear that, even if it did, the upset would be rarer than is observed in F_2. In other words, the F_1 is heterozygous for the differences in genetic background, and these differences segregate in F_2. Some 7 per cent of the segregant backgrounds are unbalanced in the sense that they divert the normal monœcious development. The disturbing effect of segregation should be less in back-crosses, as indeed the lower frequency of aberration shows it to be.

Thus the evolutionary divergence of the monœcious and diœcious forms seems to have followed the genetic pattern familiar to us from other mechanisms controlling the breeding system. A difference has developed at a main locus, the segregation of which operates the diœcious system. But at the same time the genetic background of each form has been adjusted, in its own special way, to give just those types which the main gene immediately determines. On this basis we can further see how populations could show a gradual transition between monœcy and diœcy through a state consisting of a mixture of the two. It is to be hoped that the author will continue his experiments and establish the genetical interpretation more firmly by further investigation of aberrant individuals and mixed populations in later generations of selected lines.

Dr. Galán has also published an extensive review[3] of the various genetical theories of sex determination in animals and plants; but this is written in Spanish.

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[1] "Analysis of the Genetic Differences between the Monœcia and Diœcia Zygotes in *Ecballium elaterium*."

[2] "Analyse génétique de la monœcie et de la diœcie zygotiques et leur différence dans *Ecballium elaterium* (Cucurb)."

[3] "Exposision y critica de las Teorias de la Determinacion del Sexo" (Salamanca, 1942).

SOIL CONSERVATION IN BRITISH COLONIES

THE serious nature of the problem of soil erosion in many parts of the British Colonial Empire has been realized for some time, and in recent years much has been done to extend conservation measures. Considerable experience has accumulated since the position was last reviewed in 1944; but the more recent information has remained scattered, and in 1948, with the approval of the Secretary of State for the Colonies, a questionnaire was sent to the directors of agriculture in dependencies where soil conservation had made good progress. The information received, supplemented by data from published papers and reports, has been collected together by Sir Harold A. Tempany and issued by the Commonwealth Bureau of Soil Science, Harpenden, as Technical Communication No. 45, "The Practice of Soil Conservation in the British Colonial Empire" (Aberystwyth: Commonwealth Agricultural Bureaux, 1949. 10*s*.).

Factors affecting the incidence of erosion and its occurrence under different types of cultivation are discussed, and various forms of soil conservation described. Two main methods are recognized, one dependent on the use of earth structure, the other based on the use of cultural practices and living plant material. It is emphasized that soil conservation should not be regarded as a separate end, but rather