

GENETICAL SOCIETY OF GREAT BRITAIN

ABSTRACTS of Papers read at the HUNDRED AND EIGHTEENTH MEETING of the Society, held on 7th and 8th JULY 1955, in the DEPARTMENT OF AGRICULTURAL BOTANY, Institute of Rural Science, Aberystwyth

EXTRA-NUCLEAR INHERITANCE IN *DROSOPHILA MELANOGASTER*

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Sternopleural chaeta number and fecundity have been studied to determine the causes of variability normally remaining in inbred lines although these may have been sibmated for several hundreds of generations. In the two lines examined a large part has been found to be due to changes in the physiological activity of the female parent during egg laying, each individual receiving from the parent a physiological *rating* which determines its physiological activity, adult character and egg laying characteristics.

These effects can persist into the next generation or later, depending upon what appears to be a balancing effect of fecundity—*e.g.* excess egg laying (therefore high fecundity) results in eggs of low physiological activity which yield flies with low chaeta numbers; similarly, ignoring other factors, flies with high fecundity may be expected to produce flies with low fecundity.

Changes in parental environment, categorised as random, consistent, autonomic and periodic, affect the fecundity and general physiological activity of the flies. Hence it is not difficult to alter directionally the character of the offspring by changing the environment of the parents, although the parents tend to adapt themselves to the changed conditions to maintain as far as possible uniformity of offspring.

CORRELATION BETWEEN GRAFTING AND HYBRIDISATION IN THE GENUS *TRIFOLIUM*

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Previous workers have shown that *Trifolium* is a genus displaying very little interspecific compatibility; hence any new methods which would make possible species hybridisation are worthy of trial. Michurinist geneticists in the U.S.S.R. claim that "vegetative rapprochement" can be used for making distant crosses compatible. In consequence the present investigation was made into the possibility of applying such grafting methods in the genus *Trifolium*.

Reciprocal grafts were made between selected species and it was found that some scions developed normally, others were stunted, while others died very soon after grafting. Where the grafts succeeded, hybridisations between stock and scion were attempted and the success of these hybridisations was compared with that obtained by crossing ungrafted plants. It became evident that grafting prior to crossing did not increase the chances of successful hybridisation.

However, the data shows that there is a strong positive correlation between stock/scion compatibility on the one hand and sexual compatibility on the other. The significance of these results will be discussed and also the value of the grafting technique for determining which species are likely to hybridise.

SELECTION AND POPULATION STRUCTURE IN *LOLIUM*

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The outbreeding group, *Lolium rigidum*, *L. italicum* and *L. perenne*, contains a wide range of locally adapted populations. All are diploid ($2n = 14$) and interfertile, and the recent history of the agronomic strains is well documented.

The genetic structure of one such population, Irish Commercial ryegrass, is discussed here. This local strain has been grown for commercial seed production for over 60 generations, and plants have consequently been selected whose developmental responses result in a high seed yield in the first harvest year. Flowering behaviour is uniform under the range of environments usually encountered, and little variation is apparent between different stocks.

This phenotypic uniformity conceals considerable genetic variation. Not only do individuals differ in the developmental paths by which they attain uniformity of heading behaviour, but most plants are heterozygous for genes controlling flowering responses.

A similar genetic structure is revealed in the annual *Wimmera* ryegrass and in Kent Indigenous perennial ryegrass, which are quite distinct agronomically. These populations, also, have been stabilised phenotypically by selection, but still contain much potential genetic variation.

THE ROLE OF POPULATION CYTOLOGY IN
EVOLUTIONARY STUDIES

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The analysis of chromosome number, form and behaviour in natural populations is the most efficient method of assessing both the cytological constitution of the species and the type and evolution of its breeding system. Less intensive studies, involving few and often unrelated plants, may well overlook the cytological variation inherent in many species and its significance in the future development of the group.

A start has been made on the population cytology of *Holcus mollis* ($2n = 28$) *Dactylis glomerata* ($2n = 28$), and *Anthoxanthum odoratum* ($2n = 20$) and already it becomes clear that a reconsideration must be made of certain methods of cytotoxic investigation and of some evolutionary concepts.

In the main a distinction must be made between the cytology of artificially raised seedlings and that of population plants where the one shows the potential variability and the other the effect of natural selection. In *Holcus* the chromosome numbers of experimental seedlings are quite different from those of population plants whilst the good seed set and good seed germination give a false picture of the importance of sexual reproduction in the propagation of the species.

Studies in *Dactylis* and *Anthoxanthum* show differing degrees of hybridity selection in the two species whilst their high degree of quadrivalent formation despite the action of natural selection leads to the conclusion that they, along with other species of a similar type, do not evolve towards complete bivalent formation.

GENE FREQUENCIES IN THE CULTIVATED SWEET CHERRY

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The cultivated cherry population carries gene frequencies far in excess of what would be expected on the basis of chance. No apparent phenotypic expression, that might account for advantage under selection, can be attributed to the genes concerned. To account for these findings it is argued either that the sweet cherry in cultivation has originated from a narrow genetic pool, or that the chromosome regions involved, affect fruit quality in one of many ways, thereby conferring a selective advantage on the genotype. In either case it becomes clear that major genes showing such effects can be of direct assistance in predicting the value of parental combinations in a breeding programme.

PHENOTYPIC VARIATION IN THE "NOTCHED EARS" AND
"SINGED COAT" CHARACTERS IN CATTLE

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Cases of cattle showing notches in the ears at birth have been previously recorded, together with evidence that the condition is one of simple dominance. Supporting evidence to this has recently become available in other breeds and cases in the College herd of Ayrshire cattle will be available for inspection to illustrate the variation which occurs.

A condition involving disturbed development of the coat fibres over varying areas of the body has been encountered in a breed of beef cattle; there is presumptive evidence that it is attributable to recessive gene action, and from examination of a limited number of cases it may be postulated that its variable expression may involve time reaction effects.