

GENETICAL SOCIETY OF AUSTRALIA

3RD ANNUAL GENERAL MEETING

UNIVERSITY OF ADELAIDE

23-24 AUGUST 1954

PROGRAMME

ABSTRACTS

SCANNED FROM THE ORIGINAL

GENETICAL SOCIETY MEETING.August 23rd and 24th 1954.PROGRAMME: Monday

A.M. Chairman - Professor D. G. Catcheside.
 9.30 D. L. Hayman.
 10.00 J. B. Langridge.
 10.30 H. Daday.
 11.00 Morning Tea
 11.30 A. S. Fraser and T. Nay.
 11.50 P. J. Claringbold.
 12.10 W. R. Sobey.
 12.30 Lunch

Mr S. Smith-White
P.M. Chairman - ~~Dr. J. H. Rendel.~~
 2.00 G. C. Taneja.
 2.30 S. Smith-White.
 3.00 R. H. Hayman.
 3.30 Afternoon Tea
 4.00 B. L. Sheldon.
 4.30 F. Skaller.

Tuesday

Chairman - Dr. O. H. Frankel

A.M.
 9.30 D. E. Symon.
 10.00 ~~J. H. Rendel~~ ✓
 10.30 Morning Tea
 11.00 Discussion on Selection
 12.30 Lunch

P.M.

2.00 Continue Discussion on Selection as long
 as necessary.

3.30 Afternoon Tea.

Demonstrations.

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Demonstrations.

The Meeting will be held in the lecture theatre at the western end of the first floor of the Physics building, University of Adelaide.

A B S T R A C T S.

1. GENETICAL CONTROL OF INCOMPATIBILITY IN PHALARIS COERULESCENS.
D. L. Hayman.

Using the behaviour of the pollen-tube in the style as an index of compatibility, the number of intra sterile, inter-fertile groups present in progeny from cross pollinations has been determined. The results obtained cannot be explained on any previously demonstrated system of incompatibility. A new system of incompatibility involving two apparently unlinked loci has been applied. Each locus has a series of multiple alleles and no dominance differences between the alleles in the pollen or the style have been detected. This system fits the data obtained so far. Confirmatory tests remain to be done.

2. NUTRITIONAL MUTANTS IN THE FLOWERING PLANT, ARABIDOPSIS THALIANA.
J. L. Langridge.

Arabidopsis thaliana, a small crucifer with five haploid chromosomes, high fertility and brief life-cycle, has been adapted to the study of biochemical genetics in flowering plants. The wild type will grow in ordinary test-tubes containing five ml. of agar to give ripe seed twenty-three days after germination. Mutations are induced by X-raying the seeds, and metabolically-blocked mutants are selected on the inability of segregants of the X² generation to grow on sterile, chemically-defined medium. Five lethal mutations have been obtained, one mutant being unable to synthesize the vitamin, thiamin.

3. DISTRIBUTION OF GENE FREQUENCIES IN WORLD POPULATIONS OF TRIFOLIUM REPENS L.
H. Daday.

The cyanogenetic glucoside lotaustralin (Ac) and enzyme linamarase (Li) gene frequencies have been determined, using the modified picrate test in *Trifolium repens* populations collected from the five continents.

The European and Near Eastern *T. repens* populations disclosed a continuous change in genetical structure. A gradual decrease from 100 to 0 per cent was found in the frequencies of the dominant glucoside, and enzyme genes, as the locations of collection moved from southern to north-eastern Europe. The diminution in dominant gene frequencies was closely correlated with January isotherms. A decrease of 1°F (0.55°C) in January mean temperatures resulted in a reduction approximately of 4 per cent in the frequency of glucoside gene, and a reduction of 3 per cent in the dose of the enzyme gene.

Similar changes in genetical structure were evident in *T. repens* populations from the Central European Alps.

Population samples from America, Australia, New Zealand, the Far East and Africa, where this species was introduced in comparatively recent times, indicate that the formation of gene frequency gradients is in progress or is entirely absent. This depends on the winter temperature range prevailing, time of introduction, and origin.

4. EFFECTS OF THE NAKED GENE IN MICE.
A. S. Fraser and T. Nay.

The naked gene causes the coat hairs to be shed immediately after their growth has been completed. This allows relatively easy scoring of the patterns of hair bands, and therefore of the movement of growth waves over the body. Comparisons of + and N sibs have shown that these patterns are affected by the gene substitution. Another factor affecting the growth patterns in pregnancy, and from analysis of the pregnancy

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5. SOME PHYSIOLOGICAL ASPECTS OF THE SELECTION FOR OESTROGEN SENSITIVITY.

P. J. Claringbold.

A randomly bred line of albino mice has been selected into lines of increased and decreased sensitivity to oestrogens as determined by the intravaginal action of oestrone. Ovariectomized mice were used in the tests, successive generations being bred from the sibs of selected mice.

The relative sensitivity of the two lines was smaller when tested by the intravaginal administration of oestradiol. When tested subsequently by the subcutaneous administration of oestrone the lines were of equal sensitivity.

Owing to the quantal nature of the vaginal response to oestrogens little is known about individual sensitivity. A "staircase" method of estimating individual sensitivity has been developed recently and enables more information to be obtained about individuals.

6. INHERITANCE OF ANTIBODY RESPONSE TO A COMPLEX ANTIGEN.

W. R. Sobey.

The work to be discussed is part of a project to investigate the inheritance of antibody response using the techniques evolved from quantitative inheritance. Where a single antibody response can be measured it can be treated in the same way as any quantitative character: most antigens, however, are complex and elicit a number of different antibody responses. Available methods of measuring antibody response give a single measure of the complex of responses and it is contended that this will mask the heritability of any one of these. Evidence supporting this contention will be presented with an outline of the approach being made.

7. SELECTION OF CHAETA NUMBER IN DROSOPHILA.

G. C. Taneja.

Selection increased the mean values and decreased the phenotypic variance and the heritability. Absence of response to selection was found to be associated with very low estimates of heritability.

8. A POSSIBLE NEW TYPE OF PERMANENT HYBRIDITY IN THE STYPHELIEAE.

S. Smith-White.

SYNOPSIS. The Styphelieae is a tribe of the Australian Heaths (Epacridaceae) including about 200 species.

Different patterns of pollen development are found in the tribe. Most usual is the monad pattern, in which, following nuclear migration in early P.M.C., the four microspores are initially of unequal size and potentiality. A large microspore develops into a functional pollen grain, and three small microspores die.

Variants from this type of pollen occur in species of several genera. In some, the pollen is full tetrad, all four microspores being functional. In others, any P.M.C. may give 0 - 4 functional pollen grains, in statistically definable proportions.

In one species of Leucopogon, permanent hybridity is maintained by a peculiar system of complementary gametic selection, - the univalent chromosomes are transmitted only by the Embryo sac.

The assumption that the control of monad pollen development is determined by an extra-nuclear polarity, to which certain cytoplasmic and chromosomal components are sensitive leads to the conclusion that permanent hybridity for proximal and distal chromosome segments would be established. Loss of cell-polarity subsequently would provide the conditions for tetrad-

intravaginal action of oestrone. Ovariectomized mice were used in the tests, successive generations being bred from the sibs of selected mice.

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9. POSSIBLE ORIGINS OF THE MERINO.
R. H. Hayman.

Data from filial generations of a longwool x Merino cross do not suggest that the Merino developed as a single gene mutant.

10. HERITABILITY OF EGG PRODUCTION.

B. L. Sheldon.

In selecting for annual egg production two different criteria are possible -

- (a) the production of birds surviving at the end of the laying year.
- (b) production on hen-housed basis (Production Index) which takes into account mortality during the laying year.

Heritability of Survivors' production has been fairly consistently estimated as 30-35%.

Until recently few estimates of heritability of Production Index had been reported, and these were in the range 5-10%. Estimates, based on intra-sire regressions of offspring on dam and on intra-class correlations between full and half sisters, for 6 generations of White Leghorns and Australorps will be presented which indicate that heritability of this trait is considerably higher than 10%. This data is supported by recent published estimates from the United States. The results will be discussed with reference to mortality and production levels in the flocks concerned, and the value of Production Index as a criterion for selection.

11. HETEROSIS IN POULTRY.

F. Skaller.

The subject will be introduced by advancing reasons why poultry are most suitable farm animals for genetical studies on the effects of selection and systems of mating. Facilities at C.S.I.R.O. Poultry Research Centre, Werribee, provide good experimental conditions for such studies by allowing the maintenance of a population of about 5,000 pedigree-bred adult female fowls in a relatively constant and favourable environment. Measurements of the progress obtained by selection in 10 differently bred experimental flocks and of between-year variations of an environmental character are facilitated by the establishment of a Control flock with stable gene frequency and distribution.

Data from 7 generations of inter-breed crossing (single-, 3-way- and criss-crosses between White Leghorn, Black Australorps, and Red Rhode Islands) involving 2354 crossbred pullets will be presented showing significant heterosis effects in characters of a physiological nature, such as hatchability, chick mortality, sexual maturity, and egg production; the latter being superior by about 20 per cent to the best parent breed. Close inbreeding, on the other hand, depressed, despite of opposing selection pressure, the same characters during the first 4 generations when a coefficient of inbreeding of 40 per cent was reached. The 5th and 6th generations (60 per cent coefficient of inbreeding) showed evidence of recovery, some strains even producing excellent results.

Several theories to explain heterosis will be mentioned and an attempt made to interpret the presented data according to these theories.

12. CHLOROPHYLL DEFICIENT SUBTERRANEAN CLOVERS.

D. E. SYLION.

SUMMARY.

The common occurrence of chlorophyll deficient seedlings of Subterranean Clover is reported. Counts show that about 0.25% of the seedlings are affected to some extent.

The significance of this in regard to the environmental adaptation of the species and their maintenance in the population is discussed.

An unusual form of albinism preceded by green cotyledons is described.