GENETICAL SOCIETY OF AUSTRALIA

2ND ANNUAL GENERAL MEETING

CANBERRA

11-12 JANUARY 1954

ABSTRACTS

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PRE-ANZAAS GENETICAL SOCIETY MEETING

supplied by P. G. Martin

A very successful meeting was held in Canberra on the Monday and Tuesday preceding A.N.Z.A.A.S. (i.e. Jan. 11th and 12th). Abstracts of the 17 papers delivered are given below. In addition a short symposium was held on the "Teaching of Geneticists" and a preview of an instructional film on Meiosis, in course of preparation by the Animal Genetics Section of C.S.I.R.O., was witnessed.

Any reader who wishes to be notified of future meetings should inform the Secretary, Mr. P. G. Martin, Genetics Department, University of Adelaide.

ABSTRACTS

M. Blackwood. The effect of the A genotype on the inheritance of B chromosomes in Maize.

The analysis of eight progenies from crosses between plants with no B chromosomes and plants with 2 B chromosomes, giving the frequency distributions of plants with different number of Bs , and the mean number of Bs present, showed a significant difference between the first four, all with the same pollen parent, and the second four with different but interrelated pollen parents. Within each group, there was no significant difference between the means nor between the distribution. Both groups also differed significantly from Randolph's progeny data for the same cross.

These results suggested that the mechanisms causing the peculiar distribution of Bs to the progeny - namely, non disjunction and preferential fertilisation are effected by the A genotype.

R. D. Brock. Spontaneous chromosome breakage and endosperm failure

Many cases of seed failure, after crossing and in hybrids, is due to failure of the endosperm and abortion of the embryo. Characteristics of these cases are certain mitotic abnormalities, high polyploidy, bridges which persist through resting stage, spindle abnormalities. Investigations of these irregularities have been made in two plants, Lilium and Hyacinth, which are particularly suited to cytological examination of endosperm. The sequence of events which culminates in endosperm failure commences with spontaneous chromosome breakage. A special type of anaphase bridge, "pseudo-chiasma", is followed by mechanical breakage of chromatids. Breakage persists through the bridge-breakage fusion cycle and, owing to increased unbalance, accumulates. Abnormalities are genetically determined but are influenced by the chromosome number

of the endosperm. The spontaneous formation of "pseudo-chasmata" bridges seems to be associated with chromosome reproduction. This sequence of events, leading to endosperm failure in Lilium and Hyacinthus seems to be a general occurrence in other cases of endosperm failure.

D. G. Catcheside. Genetical map of the mating type chromosome of Neurospora crassa

About a dozen loci are situated in a short segment of the mating type chromosome between the locus of mating type and the centromere. Reasonably accurate mapping requires special methods to secure an optimum amount of information in relation to the technical work involved. This has been achieved to some extent by limiting the study to certain classes of recombinant and, for one locus, making use of a lethal interacting specifically with a mutant. It is still uncertain whether all the data can be completely reconciled.

A. M. Clark. Further observations on the biological activity of Pyronin and related dyes

Further data will be presented on the genetic and physiological effects of some xanthene dyes. At low dye concentrations, biological activity can be attributed to reactions with non-polymerized nucleic acids, but at higher concentrations a complex pattern of effects may be produced by inhibition of various enzyme systems.

C. I. Davern & J. S. F. Barker. Mutagenic effect of formalin on Drosophila melanogaster

The paper describes the results obtained from the comparison of the mutagenic effects of formalin on the frequency of sex linked lethals with its effect on the frequency of chromosome II lethals. The effect of the age of male on the mutagenic response is also studied in both the X and the II chromosomes. The effect of nutrition on the mutagenic effects of formalin as measured by the frequency of sex linked lethals, and the mutagenic effects of formalin medium fresh, and worked by larvae, are investigated.

A. H. Dunlop. Hereditary & Environmental interactions in Australian merino sheep

No abstract received

M. Hardy. The expression of the Tabby gene in the mouse coat

A semi-dominant, sex linked gene Tabby, recently discovered by Falconer, produces tabby markings in the coat of heterozygous females. Homozygous female and hemizygous males were of a different phenotype, lacking two of the three types of prelage hairs present in normal mice, and having a reduction in facial vibrissae and various other abnormalities. Closer study revealed that the expression of Tabby in heterozygotes differed in degree rather than in kind from its expression in homozygotes and hemizygotes. For example, there was in heterozygotes a reduction in the proportion of at least one of the types of prelage hairs, and the number of facial vibrissae (excluding those on the lips) was intermediate between that of normal and of homzygotes or hemizygotes. A study of development revealed striking similarities, in development as well as in final expression, between Tabby homozygotes or hemizygotes and crinkled homozygotes. (The gene crinkled is recessive, not sex-linked, and inherited independently from Tabby). The hypothesis of Falconer, Fraser and King that crinkled causes suppression of follicle formation during two separate periods in early development is applicable also to Tabby. Tissue culture studies of embryonic skin from Tabby mice support this view.

D. L. Hayman. Univalent behaviour at Meiosis in a Phalaris Hybrid

A hybrid, Phalaris coerulescens (2n=14) by Phalaris minor (2n=28), has 21 chromosomes and very regularly forms seven bivalents and seven univalents at metaphase I of meiosis, the univalents being larger than the other chromosomes. Other configurations are encountered occasionally. Subterminal neo-centric regions become active when the univalents move to the equatorial region of the spindle after the bivalents have disjoined at division I. This leads to chromosome breakage and apparent fusions.

B. W. Holloway. Heterocaryosis in Neurospora crassa

Heterocaryon formation between certain biochemical mutants of Neurospora crassa is controlled by a number of genes apart from the biochemical mutant genes concerned. A detailed investigation of the heterocaryon formed between a pantothenic acid requiring mutant and one requiring lysine has demonstrated four and possibly five genes to be concerned in the process of heterocaryon formation. These genes may not only prevent the formation of a heterocaryon but also modify the type of heterocaryotic growth. The characters so affected are the time at which heterocaryotic growth commences, the ability to maintain heterocaryotic growth and the vigour of the growth.

W. B. Mather. Chromosome morphology of some Australian species of Drosophila

The chromosome morphology, both larval brain and larval salivary gland of ten Australian Drosophila species (lativittata, enigma, serrata, and seven new species) is described and the possible modes of derivation are discussed in the light of known mechanisms of chromosome change.

M. J. Mathieson. The physiology of histidine - requiring mutants of Neurospora

Three different genes controlling histidine synthesis in Neurospora crassa have been studied. Two of these are very close to mating type and within 0.7 units of each other. The third is on chromosome D about 59 units from the centromere. The three strains differ from each other physiologically but are alike in being inhibited by certain constituents of "complete" medium. The inhibitors appear to prevent the uptake of histidine from the medium. The problem is how far such physiological properties are affected by the genetic background.

F. H. W. Morley. The importance and genetic control of undesirable recessive genes in livestock

The economic importance of undesirable recessive genes depends on their frequency and their type of expression. The frequency will generally be very small, but most individuals are probably heterozygous for at least one undesirable gene. The type of expression is variable. A large proportion of homozygotes are likely to die before birth, and therefore may not be noticed. Some genes, although important biologically, may be relatively unimportant economically.

Gene frequencies of undesirable recessives are normally kept at a low level by selection, heterozygote expression and inbreeding. If a gene happens to reach a high frequency, mass selection, especially if aided by progeny-tests, will soon reduce the frequency to an unimportant level. Special types of test mating, such as sire-daughter, are unlikely to be of much additional value.

J. M. Rendel. Use of one character as an index of environmental variation in another

Heritable variation of a character is often masked by environmental variation to an extent which makes it impossible to select effectively for the trait desired. It is often possible to allow for the effects of the environment. When these cannot be traced it may

be possible to use a second character as an index of environmental effects and correct the first for variation in the second, using the regression of one on the other as the correction factor. An example from mice is used to illustrate the method.

P. G. Schinckel. The trend of fleece weight in Australia

Examination of published statistics and of limited records from private properties shows that the average fleece weight of sheep in Australia has increased markedly since about 1870. The yearly averages are erratic due to changes in the method of collecting statistics and to seasonal variations. The period since 1870 is characterised by two general trends: between 1870 and 1908 the rate of advance in fleece weight was very substantial: since 1908 it has been at a much reduced rate. It seems likely that much of the early gains were of genetic origin: at least a moderate proportion of later gains are of environmental origin. Factors which might account for the change in the probable rate of genetic progress are:-

(1) Sheep may have reached a genetic limit for wool production.
(2) Selection may have shifted from selection for fleece weight to other characters. These may be negatively correlated genetically with fleece weight.

The current rate of progress is in reasonable agreement with expectation in a population of similar structure to that of the present Australian merino.

B. F. Short. The structure of the Australian Merino population

The 1921-1950 annual returns from flocks entered in the Australian Merino Stud Flock Register have been examined as an index of the structure of the Australian Merino population. Stud flocks mate approximately 2.3 per cent of the Merino ewe population and provide directly some 66 per cent of all rams used in the non-registered flocks of the industry. The stud population has a definite and continuing structure founded initially upon the several distinct strains of the Australian Merino sheep.

(a) the Fine wool
(b) the Non-Peppin Medium
(c) the Peppin Medium
(d) the South Australian

Within each of these broad groups a hierachy has developed wherein several well-established flocks compete: The Parent flocks - Total 24 flocks. Each Parent flock is patronised by an attendant group of Daughter flocks (Total 256 flocks) whose introduced breeding stock are wholly derived from the Parent flock or from a sister-member of the same group. The remaining group of registered flocks introduce breeding stock more or less promiscuously from various

Parent or Daughter flocks of a particular strain, from each other, and not infrequently from other strains. These are the General flocks: Total 687 flocks. This pattern is examined in detail and its significance to the industry discussed.

H. N. Turner. The effect of finite flock size on predictions of genetic advance in livestock improvement

No abstract received

M. J. D. White. Cytological Polymorphism in Grasshopper Populations and its Signficance

A review of the various types of cytological polymorphism (translocations, pericentric inversions, fusions, deletions and/or duplications of heterochromatin, supernumerary chromosomes) commonly met with in grasshopper populations. Relationship between the various types of structural heterozygosity and the different kinds of chiasma-localization. Evidence for heterosis. Distribution of structural heterozygosity in different populations of the species Trimerotropis sparsa and T. gracilis. Cytological polymorphism at the periphery of the distribution area. Heterozygosity in very small populations. Non-Mendelian inheritance of supernumeraries.

NOTES AND NEWS

New Zealand

Mr. I. A. M. Cruickshank, an officer of the Plant Diseases Division, Auckland, seconded to the Crop Research Division has been granted a Nuffield Fellowship. He is now at Cambridge.

Dr. H. C. Smith of Plant Diseases Division, who received his doctorate for work on root fungi, is now working with diseases in field crops.

Western Australia

Mr. A. W. Humphries has joined C.S.I.R.O. as a Research Officer in Division of Plant Industry. He has been located at the Institute of Agriculture, Nedlands.

Dr. K. W. Finlay of the Institute of Agriculture who has been awarded a Nuffield Travelling Fellowship left on 7th March for Cambridge where he will study genetical aspects of host-parasite relationships.