

GENETICS SOCIETY OF AUSTRALIA

9TH ANNUAL GENERAL MEETING

UNIVERSITY OF SYDNEY

18-19 AUGUST 1960

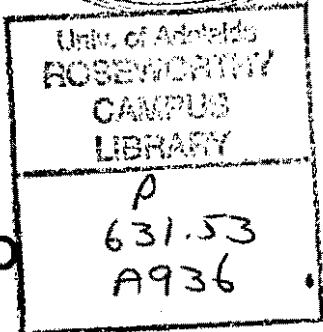
SELECTED ABSTRACTS

TITLES OF OTHER PAPERS

SCANNED FROM THE AUSTRALIAN

PLANT BREEDING AND GENETICS

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GENETICS SOCIETY MEETING, SYDNEY18-19th August, 1960.1. Abstracts of papers on plant breeding and genetics.H. T. CLIFFORD: Wild Hybrids in the Australian Flora.

The Australian Flora is rich in wild hybrids which have now been reported for about thirty genera. The importance of these for evaluating species relationships within the Australian flora will be discussed; the importance of wild hybrids between Australian and extra Australian species will also be considered.

SIR RONALD FISHER: Possible isolation in the wild population of Oenothera organensis.

Two explanations, by Sewall Wright respectively and the author, have been suggested for the high number of self-sterility alleles observed in a very small wild population of Oenothera organensis. Wright's explanations depend on the relative isolation of a number of small sub-populations. Emerson's original data, however, provide a means of putting this proposal to a test, and it appears that the different sub-populations are not in fact genetically isolated.

A. J. PRITCHARD: Tetrasomic Inheritance in Sorghum Aluum.

Material of Sorghum aluum was studied which segregated normal, light green and albino seedlings. In the S₂ generation, no family was produced which did not produce albino seedlings, although several were without light greens. The segregations found could be explained by tetradisomic inheritance of recessive factors. Cytological support of this theory and the implications of tetrasomic inheritance in breeding are briefly mentioned.

N. H. LUIG: Differential Transmission of Gametes in Wheat.

This paper deals with work undertaken at the Faculty of Agriculture, University of Sydney, in an attempt to determine the mode of inheritance of resistance to rust in certain wheat varieties.

The varieties Gabo, Yalta and Charter, among several others, carry the same resistance to wheat stem rust, Puccinia graminis var. tritici. Reports differ, however, as to the mode of inheritance of resistance. Workers in Canada and the U.S.A. using Chinese Spring as the susceptible parent concluded that two linked, dominant, complementary factors for resistance were involved. Monosomic analysis located the two genes on the X chromosome and linkage values of 20 - 29.5 percent were proposed. Australian workers, on the other hand, using crosses with Federation, concluded that a single factor is involved.

Most of the data for this study were obtained from crosses involving the stem rust resistant Gabo, Yalta and Charter with the susceptible Eureka and Mentana. Mentana is resistant to strain 68 Anz-3 of wheat leaf rust, Puccinia triticina. In their reaction to stem rust plants were clearly either resistant or susceptible, while in tests with leaf rust intermediate types were also obtained.

Data from F₁, F₂, F₃ and F₄ generations indicated the following:

1. Resistance to stem rust was inherited as a dominant character.
2. The same resistance operated in Gabo, Yalta and Charter.
3. Different ratios of resistant versus susceptible F₂ plants were obtained depending on whether Eureka or Mentana was used as the susceptible parent.
4. When Mentana was the susceptible parent the ratios did not fit a single-factor hypothesis.
5. Different F₂ ratios were obtained according to whether Gabo, Yalta or Charter was used as the resistant parent in crosses with Mentana.
6. Similarly in studies with leaf rust different F₂ ratios were obtained in crosses of the resistant Mentana with the susceptible Gabo, Yalta, Charter, Eureka, Kenya 117A, Spica and Federation.
7. The stem rust resistance of Gabo, Charter and Yalta was closely linked with the leaf rust resistance of Mentana.
8. Analysis of correlated stem rust and leaf rust F₃ data of crosses Gabo x Mentana and Yalta x Mentana indicated that the different ratios mentioned above were due to differential transmission of gametes.
9. Linkage data indicated that there is only one factor for stem rust resistance and only one major factor for leaf rust resistance.
10. Differential Transmission operated in the female as well as in the male gametes.
11. The phenomenon of Differential Transmission is inherited from generation to generation.
12. F₂ data from reciprocal crosses between Yalta and Mentana proved to be highly heterogeneous within each cross. The F₂ data was obtained from the progenies of 13 F₁ plants, and

varied according to the F_1 plant from which they came. No maternal (cytoplasmic) influences were involved.

It was possible to select from among segregating material, for certain ratios (0.5:1, 1:1, 1.5:1, 2:1, 2.5:1, 3:1, 4:1). These ratios possessed a high heritability.

F_1 plants of Mentana crosses showed no marked infertility; and the high germinability of the F_2 seeds did not indicate differential zygotic viability.

At present F_2 plants are being examined cytologically. Subsequently, their progeny will be tested with stem and leaf rust and the cytological observations correlated with the segregation ratios. It is proposed that in future in all wheat crosses where apparent single factors are inherited in a complex fashion such cytological observations on F_2 plants should be carried out.

MARILYN MONK and B. W. HOLLOWAY: The Nature of Transduction in Pseudomonas aeruginosa.

Four of the ten Pseudomonas phages tested have the ability to transduce a range of genetic markers. These phages are unrelated both biologically and serologically and it is concluded that transduction is a commonly occurring property of the phages active on this organism. The length of the segment of bacterial chromosome carried is obviously limited because in general only one marker is transduced at a time, but the joint transduction of two linked markers has been detected at low frequency. Both temperate and virulent phage types have been used successfully to transduce either sensitive or lysogenic receptor strains. Evidence of abortive transduction of auxotrophic markers has been obtained. Under conditions where superinfection of the recipient bacterial cell with non-transducing phage is prevented, the majority and possibly even all of the transduced clones are non-lysogenic. This indicates that the transducing phage particle must be defective in at least some of its phage functions.

C. I. DAVERN: The detection and significance of complementary base couplet orientation bias in DNA.

To date no information has been made available on the allocation of each of the 4 bases composing DNA between the complementary strands of this double helical structure. Evidence shall be given which shows that this question can be answered by a technique which amplifies base couplet orientation bias, and experimental examples of the detection of such bias in human DNA presented. The relevance of this bias to code efficiency shall be briefly and inexpertly commented upon.

BARRY O. LEE: The Inheritance of Ascospore Length in Neurospora Crassa.

Various types of selection for ascospore length have been practised in wild-type strains of Neurospora crassa. The results of eleven generations of selection will be discussed and a hypothesis to explain these results proposed.

Experimental results of various environmental treatments on both selected and unselected strains will be described.

J. A. SVED: Tetrad formation in tetrasomic organisms.

The genetical analysis of tetrad data for a digenic locus in tetraploid yeast is considered in terms of the basic concept of modes of tetrad formation and their associated frequencies of occurrence. The enumeration of the number of such modes and the estimation of their frequencies from some experimental data will be referred to.

D. E. BYTH: The breeding and selection of Soyabeans in Sub-Tropical Queensland.

A brief account of the early plant improvement work on soyabeans in Australia is given. The marked influence of photoperiod on soyabean development and the effect of this factor on the origin of the varieties to be introduced to Australia is discussed. Considerable plant to plant variation is shown to exist in soyabean introductions, and this can be exploited by simple selection techniques. A method of selection based on a selection index is suggested as the most effective means of obtaining genetic advance.

J. W. JAMES: Selection in Two Environments.

A study has been made of selection procedures aimed at improvement of animals in both of two environments when genotype-environment interactions are present.

"Overall gain" is defined in terms of the genetic variance, heritabilities, relative economic values, and genetic correlation of performance in the two environments.

Three selection procedures are discussed -

- (i) selection in one of the two environments
- (ii) selection of separate strains, one in each environment
- (iii) selection on an index combining performance in both environments.

The criterion for determining which environment should be used under (i) is worked out.

The optimum form of the index for (iii) is derived. The relative gains under the three procedures are compared.

It is found that over a considerable range of conditions, index selection produces greater overall gain than either of the other procedures.

2. Titles of other papers presented.

- J. Peacock Two Chromatids in Vicia
- R. Florence and J. Peacock Evidence of inbreeding in Eucalyptus pilularis.
- S. James Permanent interchange heterozygosity in Laurentia petraea.
- M. Blackwood Enhancement of R. pigmentation in translocations in Zea mays.
- J. S. Barker Interspecific competition and the estimation of relative fitness of *Drosophila* populations.
- W. B. Mather Chromosome evolution in two species of the immigrans group of *Drosophila*.
- G. McBride Assortative mating and selection in Drosophila melanogaster.
- J. W. James Selection in two environments.
- J. M. Rendel Canalisation of scutellar bristles in Drosophila melanogaster.
- A. S. Fraser Canalisation of a multi-dimensional character.
- O. H. Frankel Basal sterility in Triticum vulgare.
- Prof. Th. Dobzhansky Chromosomal polymorphism and adaptation in *Drosophila*.
- H. J. Hoffman A study of the rogue virus of the rabbit spleen.
- J. H. Bennett Family studies in the kuru region of New Guinea.
- H. Daday Combining ability for summer and winter production in Medicago sativa.

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| R. G. Beilharz | Is bodyweight sex-linked? |
| M. W. McDonald | Heterosis and non-allelic gene interaction. |
| S. K. Stephenson | Aspects of the Genetic Influence on growth and the development of carcass conformation in sheep. |

3. 1961 meeting of the Society.

The next meeting will be held in Brisbane at about the time of the ANZAAS meeting in May, 1961.