MASTER NEGATIVE NUMBER: 09296.54

Arunachalam, V. The Role of Recent Developments in Proc. 28th Ann. Conf. Indian Soc. Agril. Statistics, Hisar.

Journal of Indian Society of Agricultural Statistics, 27 (1975): 85-87.

Record no. E-8

Biometrical Genetics in Practical Plant Breeding.

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6. With several loci segregating independently and with no selection, if it is assumed that there are n loci each with two alleles and with identical effects as well as initial allele frequencies, then the average time taken for the fixation of a gamete having all the desirable alleles is found to be the same as that with single locus. With no crossing-over at all, the many-locus two allele situation is equivalent to a single locus with several alleles with the distribution of allelic effects / approaching normality as the number of loci increases indefinitely. In such a case with no selection, the mean time until fixation of a given gamete is the same, as that for twoallele The effect of linkage on the mean time until fixation can, system. therefore, bé described on the basis of a ratio between the mean time with no crossing over (M_o) and the mean time with free-recombination (M'_f) . In the absence of selection, the ratio (M_o/M_f) tends to unity. This result also holds true for small values of Nih. Linkage has therefore little effect on the mean time until fixation for small selective forces and identical effects as well as initial allele frequencies.

V. Arunachalam*

The role of recent developments in Biometrical Genetics in practical Plant Breeding

7. The paper was presented by Dr. Prem Narain as desired by the author who could not attend the symposium due to unavoidable reasons.

8. Diallel mating is one of the popular systems of hybridisation. A slightly varied form is that of line x tester mating (LT), wherein a number of females are mated each to a number of males. The design LT makes it possible to estimate the covariance of full

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and of half sibs and hence the variances of general and specific combining ability. The presence of high g. c. a. variance coupled with a non-significant s.c.a. variance, for example, would indicate the possibility of selection for high yielding derivatives in the hybrid population. Then with the testing of the g.c.a. effects of the parents, one can choose parents for effecting prospective hybrid combinations to obtain productive derivatives. Defining in a similar way, the covariances of g.c.a. and s.c.a. between pairs of characters, one can estimate the matrix of g.c.a. and s.c.a. effects. An inspection of this matrix could throw light on the feasibility of selecting parents in order to effect simultaneous improvement for more than one character in their hybrid populations.

9. To a limited extent, breeders use three-way and four-way crosses in their programmes. But if an experiment is conducted with single crosses as parents, say, as females and a line x tester mating system is adopted with improved varieties or productive single crosses as males, then one would have an opportunity to assess the productivity of three-way or doublecross hybrids from the angle of combining ability; in other words, one can assess the productivity of the double cross hybrid in terms of the combining ability effects of parents and grandparents. A comparison of different double crosses produced by a known mating system like LT should enable one to find ways of channelising the specific combining ability of single crosses into their double cross hybrids. Thus a breeder, in addition to formulating a hybrid release programme when the single cross hybrid is much superior to the parents, can now utilise such hydrids in higher hybrid combinations (multiple crosses) and look for getting variety derivatives from their progeny. For example, in double crosses in triticale, significant g.c.a. effects were noted for the grandparents for yield. The g.c.a. effects of the single cross parents, though not significant, were opposite in direction for yield. This High x Low cross revealed more heterosis for yield. In a similar way, the reasons for the presence or absence of heterosis in multiple crosses can be inferred once these crosses were the result of a proper mating system permitting inferences not only on the hybrid but on the parents as well as the grandparents.

10. Heritability and genetic correlation of quantitative traits cannot always be of use in practical plant breeding, since they are highly susceptible to environmental fluctuations. However, the inter-correlations should be assessed and utilised if one wishes to build a prediction criterion for yield. Such a problem presented itself in jute where the breeder would desire to use characters that could easily be measured (before the small pod stage) and predict the fibre yield. Based on this, the breeder would decide to leave the plant for seed if the predicted yield was high; otherwise, he would chop the plant at small pod stage for extracting its fibre. Similar problems do exist in plantation crops where a decision to allow the growth of the crop has to be made at an intermediate stage on the basis of predicted yield. It would be uneconomical to grow all the coconut trees in an experimental farm for example, for many years in order to assess their final yield potential. On the other hand, prediction of yield with fair accuracy at an early stage, would enable one to retain only the productive populations at the cost of the suboptimum ones.

11. In jute, a multiple regression analysis of about 20 important characters related to fibre yield revealed that plant height, base and middle diameters and fibre weights at these positions of a 5 sq. cm. sample bark, were adequate to predict the fibre yield. Using a hollow cone to describe the bark of a jute plant as a first approximation, the yields were derived using these characters. This yield formed the dependent variable y and the five characters mentioned above the independent variables x. A multiple regression was fitted using the measurements of the x's on the plants of the experimental population. This equation was utilised to predict the value of y, the fibre yield. The method thus allowed for the utilisation of the actual correlations between the characters important for prediction of fibre yield, in computing the predicted fibre yield. The predicted yield based on such a multiple regression was found to be superior to the geometric formulation of fibre yield. This technique would be a potent tool for selecting jute plants of populations based on a close estimate of their fibre yield.

R. K. Singh*

New developments in the simultaneous selection theory with special reference to the control on individual trait means

12. Before a genotype is released and attains the status of a variety or a breed, it has to be made perfect in many ways. The breeder has to see that the genotype in question is suitably modelled to respond to the new agronomic practices and thus leading to high yield, to adopt well to the changing environmental conditions and thus providing stability in yield, to resist against the various diseases and pests, and also to meet the modern consumers demand in respect

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