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KING'S BUILDINGS

WEST MAINS ROAD

TEL. 42827

22nd July, 1930.

Dear Dr. Fisher,

Miss Robison has now completed the correlations for butter fat of the Ayrshire cows. I think I have already sent you a summary of her results as regards milk yield in the same cows. Anyhow, I now enclose herewith the results of these investigations in the following papers -

- 1) Summary of milk yield of Ayrshire cows in different relationship groups
- 2) Correlations of milk yield of Ayrshire cows in different relationship groups
- 3) Summary of butter fat of Ayrshire cows in different relationship groups
- 4) Correlations of butter fat of Ayrshire cows in different relationship groups
- 5) Table showing the percentage of chromosomes in common between individuals in same relationship group. The first figure expressed in percentage gives those as regards the autosomes while the second figure, which is followed by x, gives the probability as regards the sex chromosomes held in common by cows in the same relationship group.

Taking tables 3 and 4 first, perhaps the most important matings to look to from the point of view of whether or not there is sex linkage, are these two; sire, paternal half brother, dam, not sister; and the reciprocal cross, sire not brother and dam paternal half sister. This gives correlation figures of .19 in the first case and .17 in the second. If there had been any indication of sex linkage it would most likely have been expressed in these figures which are both based on considerable numbers and since the figures are approximately the same, I think one can conclude that as regards butter fat inheritance, sex linked factors do not play any important part.

Coming now to tables 1 and 2 enclosed, which deal with milk yield, and taking the same matings, we find that where the sire is a paternal half brother and the dams are unrelated that the correlation is -.09, while the reciprocal cross, sires unrelated and dams paternal half sister, gives a high correlation of +.47. Turning to/

to table 5, we find that the theoretical autosomal distribution for both these types of mating is 6.25% chromosomes in common, but as regards the sex chromosomes the mating, sire paternal half brother, dam unrelated has no sex chromosomes in common while the mating, sire unrelated and dam paternal half sister has 12.5% sex chromosomes in common.

There is however one disturbing figure, the result of the mating, sire whole brother and dam unrelated. In the butter fat results this gives a correlation of .40. While this figure is all right as regards butter fat, since it is approximately twice sire paternal half brother and dam unrelated, I cannot understand why it should be so depressed in the case of milk yield because actually the sex chromosomes probability in this mating is 25%. It may be that this points out that there is some other factor involved which we have not yet been able to trace and this is perhaps confirmed by the fact that in the mating, sire paternal half brother, dam unrelated, we get only a very small positive correlation of .03, while in the reciprocal mating, sire not brother, dam maternal half sister, we get a higher correlation of .27 though this last figure is based on very small numbers. Theoretically these two figures should be approximately the same. The only point, and I think this may explain it, is that in calculating the probability of the sex chromosomes we have not allowed for the inevitability of the chromosome which goes to the cow from the sire. The sire has only one to give whereas the dam has two and therefore the variation on the dam's side in this respect should be greater.

This brings me to the second point on which we would like your further help, namely some method of estimating the probable error on these figures if such is in existence. For instance we would very much like to know what reliance we can place on the results obtained in the groups, sires full brothers, dam unrelated, where there are 415 cases.

Thirdly, I don't suppose we are strictly correct in expressing certain of these correlations as minus because they are not in the true sense negative correlations. I wonder what you would suggest to get us out of this difficulty?

I am sorry to bother you with such a long letter during the holiday season and I hope that you will forgive my being such a nuisance.

Yours sincerely,

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