Animal Breeding Research Department

DIRECTOR:
PROF. F. A. E. CREW, M.D., D.SC., PH.D.
ANIMAL HUSBANDRY
A. D. BUCHANAN SMITH, M.A., M.S.A., B.SC.
A. CALDER, PH.D., B.SC., N.D.A.
TEL. 45402

KING'S BUILDINGS
WEST MAINS ROAD

15th November, 1930.

Dear Dr. Fisher,

With my unmathematical brain I have managed to deal with the majority of the points that people interested in milk yield have raised in various parts of the world following upon the publication of our last paper (a copy of which I enclose herewith).

I have, however, received a second letter from Dr. Von Patow of the Institute fur Tierzucht, Landwirtschaftlichen Hochschule in Berlin. As he writes in German I have had his letter translated and send you a copy. I wonder how he should be answered? Perhaps a letter from you to him direct would be best. Personally, what I feel inclined to say is that we are no longer working on that method and I do not feel inclined to dispute with him about it!

We are busily engaged in collecting the figures from several Dairy Shorthorn herds. It is a slow business.

Yours sincerely,

A D Buchanan Smith

Dr. R.A. Fisher,
Rothamsted Experimental Station,
Harpenden.

Copy

Honoured Colleague,

Thank you very much for your kind letter of the 9th October.

We are now quite clear about the method upon which your calculations are based. Only, I have one objection to the actual basis of your calculations. Dr. R.A. Fisher mentions in his second edition of the Statistical Methods for Research Workers, page 147, III, that the variance of y within the array is $\sigma_2^2(1-\rho^2)$ and is the same within each array. Fisher mentions this formula but only in connection with "normal correlation" and when "the regression of x on y is linear".

In Davenport, Principles of Breeding, Appendix, Statistical Methods by H.L. Rietz, page 705, "Standard deviation of arrays. Suppose that the regression is truly linear, so that the means of the y-arrays fall on the line $y = r\frac{\sigma_y x}{\sigma_x}$, and furthermore that the standard deviations of all parallel arrays are equal, then the standard deviation of any array must be given by

$$\frac{\Sigma\left(y - r\frac{\sigma_y}{\sigma_x}x\right)^2}{n}$$

where the summation extends to the entire population.

$$\frac{\Sigma\left(y-r\frac{\sigma_y}{\sigma_x}x\right)^2}{n} = \frac{\Sigma y^2}{n} - \frac{2\sigma_y r}{\sigma_x}\frac{\Sigma xy}{n} + \frac{r^2\sigma_y^2}{\sigma_x^2}\frac{\Sigma x^2}{n}$$

$$= \sigma_y^2 - 2r^2\sigma_y^2 + r^2\sigma_y^2$$

$$= \sigma_y^2(1-r^2) \qquad (3)$$

Hence the standard deviation of a y-array is obtained from the standard deviation σ_y of the total population with respect to the y-character by multiplying σ_y by $\sqrt{1-r^2}$

Since the first number of (3) is a sum of squares divided by n, the second number must be positive. Hence

$$-1 < r < 1 \quad .$$

This shows that our correlation coefficient must take values between + 1 and - 1".

From the two passages quoted it appears to us that the formula is valid only on the assumption of a linear regression. This requirement can scarcely be regarded as fulfilled in/

$$\sigma_m = \sigma_y\sqrt{1-r^2}$$

in the form (chosen by you und earlier by Gowen) according to the various grandfathers.

Professor Kronacher requests me to thank you for your letter and for sending him your interesting reprints. You will excuse him not doing this personally. At the moment he is very busy. He will have pleasure in sending you the reprints you wish for during the next few days. Both questions contained in your letter to Professor Kronacher I can now answer straight away.

1. The Norische Pferd takes his name from the old Roman Province of Noricum and has no connection with Norway. It is an old indigenous draught breed which is native to the Bavarian and Austrian Alps and is becoming more widespread since the World War.

2. By Flotzmaul we understand that part of the nose in cattle which in English is called "the bridge of the nose". It is the portion of the nose and mouth devoid of ahair above the upper lip between the nostrils which, in cattle, has an individual characteristic pattern of gland stripe(s).

With compliments etc.,

(Sgd) C. von Patow.