A SIMPLE METHOD OF CALCULATING THE CROSSING OVER PERCENTAGE FROM THE F_2 DATA

THE study of linkage relations is of great significance in genetics. Backcross is the usual method of finding out the crossing over percentage but where the backcross fails, one has to depend upon the F_2 data for calculation. According to Riley[2] calculation of crossing over percentage from F_2 data is a tedious task and one of the best formulæ used for it is that of Immer, *viz.*,

$$\frac{ad}{bc} = \frac{2p^2 + p^4}{1-2p^2 + p^4}$$

or

$$p = \sqrt{\frac{-(bc+ad) + \sqrt{(bc+ad)^2 + ad\,(bc-ad)}}{(bc-ad)}}$$

where p is the percentage of crossing over in the repulsion phase, or $(1-p)$ is the percentage in the coupling phase, and a, b, c and d represent, respectively, the AB, Ab, aB and ab classes.

The author presents the following simple formulæ for the calculation of crossing over

percentage from the F_2 data :—

Coupling phase

$$p = \left(1 - \sqrt{\frac{ab}{T}} \times 2\right) \times 100 \qquad (1)$$

Repulsion phase

$$p = \left(\sqrt{\frac{ab}{T}} \times 2\right) \times 100 \qquad (2)$$

where p is the percentage of crossing over, T is the total population of F_2 and *ab* is the double recessive class.

The following examples will elucidate the formulæ more clearly :—

Example 1.—*Bateson* and Punnett made a cross between purple flowered and long pollen parent against red flowered, round pollen parent in sweet pea. The F_1 was purple long and the F_2 progeny was :—

Purple long	Purple round	Red long	Red round
177	15	15	49

In this cross the percentage of crossing over can be calculated by formula (1)

Thus

$$p = \left(1 - \sqrt{\frac{49}{256}} \times 2\right) \times 100 = 12.5\%$$

Example 2.—In the repulsion phase these workers obtained the following progeny :—

Purple long	Purple round	Red long	Red round
226	95	97	1

According to (2)

$$p = \left(\sqrt{\frac{1}{419}} \times 2\right) \times 100 = 9.8\%$$

The above results are in conformity with the results obtained by Immer's method.

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1. Hayes, H. K., Immer, F. R. and Smith, D. C., *Methods of Plant Breeding*, 1955.
2. Riley, H. P., *Introduction to Genetics and Cytogenetics*, 1945.