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SHORT COMMUNICATION

SOMATIC ASSOCIATION OF HOMOLOGOUS CHROMOSOMES IN RYE

HISASHI YOSHIDA, HIKOYUKI YAMAGUCHI
AND YASUSHI TAKANO[1)]

Laboratories of Radiation Genetics and Biometrics,[1)] Faculty of Agriculture,
University of Tokyo, Tokyo 113

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It has been recognized by some investigators that homologous chromosomes in somatic cells lie closer together than would be expected by random placement. This phenomenon, known as somatic association, has been observed in the root tip cells of wheat (Feldman *et al.* 1966), oats (Sadasivaiah *et al.* 1969; Dubuc and McGinnis 1970; Thomas 1973), and barley (Fedak and Helgason 1970). The present investigation was undertaken according to the method of Feldman *et al.* (1966) to determine whether homologues in rye also show somatic association.

The "double ditelosomic" line of *Secale cereale* cultivar Petkus was used in this study. The telocentric chromosomes (telos) derived from the short and long arm respectively of chromosome VII are readily distinguishable (t^S and t^L in Fig. 1). We are greatly indebted to Professor M. Kamanoi of Tokyo University of Agriculture for providing us seeds of this particular line.

The seeds were allowed to germinate for 2 days at 25°C in Petri dishes. Root-tips of the seedlings were cut off, pretreated in cold water (0-2°C) for 24 hours and fixed in acetic acid alcohol (1:3) solution. Squashed preparation was made after the Feulgen

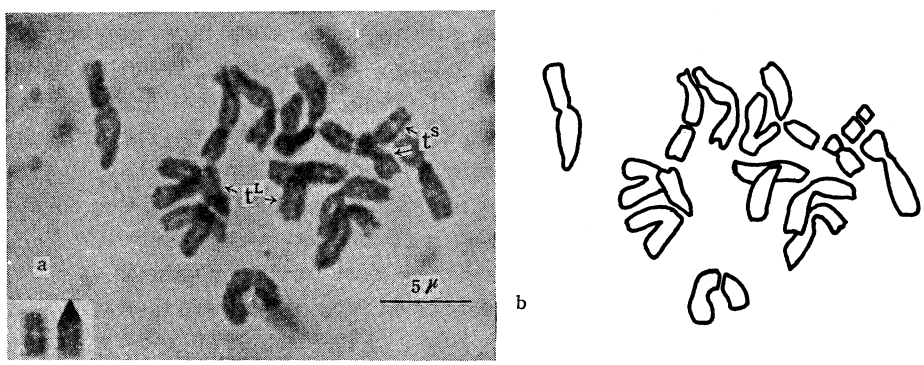

Fig. 1. (a) Cold treated metaphase plate of rye with the double ditelocentric chromosomes. The letters t^S and t^L represent the short and long arm telos, respectively (see, inset). (b) an interpretative drawing of (a).

procedure. Distances between the mid-points of the homologous telos in the well-spread metaphase plates were measured with an ocular micrometer. In order to remove variability in the degree of squashing, the distance between a pair of telos was divided by the distance between the two chromosomes farthest apart in the cell. The observed distribution of the relative distance between a pair of the telos was compared with the theoretical distribution expected from the randomness following to Hammersley's formula (1950). The difference between them was analyzed based on the Kolmogorov-Smirnov one sample test.

In contrast to the mean distance of 0.453 expected from the theoretical random distribution, the mean distances of the two pairs, t^S-t^S and t^L-t^L, were 0.299 and 0.325, respectively (Fig. 2). In both cases the observed distributions differed significantly at the 0.01 level from the random distribution (D_n=0.337 and 0.313>0.142). Both the homologous telos in rye, therefore, may lie in association, suggesting the orderly arrangement of homologues in somatic cells, as in the other *Gramineae* species.

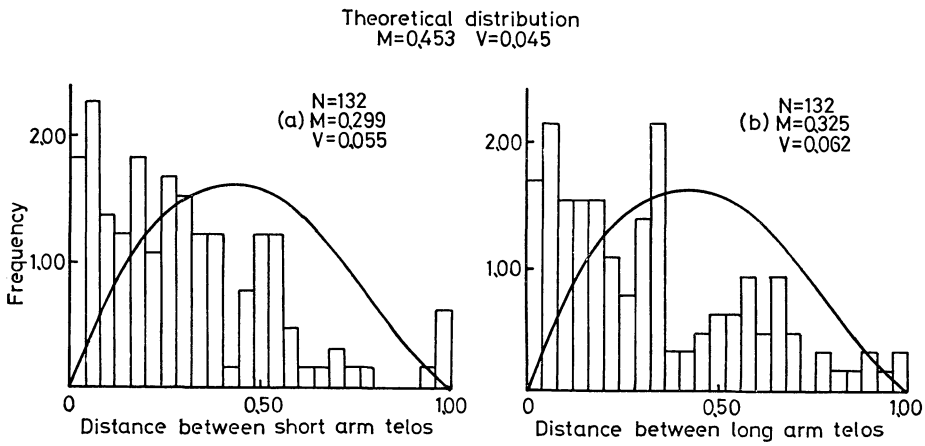

Fig. 2. Observed distribution of distance between the two homologous telos. (a) t^S-t^S, (b) t^L-t^L. N=Number of cells observed, M=Mean distance, V=Variance. A curve indicates the theoretical random distribution.

Kitani (1963) observed that association of the homologues in a number of plant species becomes looser as advances of chromosome condensation, loosest at metaphase, and tight again at anaphase and telophase. Thus he proposed that homologues in the higher plants may be arranged in association throughout cell cycle except during prophase and metaphase. In the preceding paper Yoshida and Yamaguchi (1973) presented the hypothesis that somatic association at metaphase can be found if the movement of chromosomes during prophase and metaphase is suppressed with chemicals. The result obtained in somatic cells of rye lends further support to the hypothesis.

The associated arrangement of homologous chromatin bodies is favorable to explain the occurrence of 'twin spots' in soybean (Vig and Paddock 1970) and 'somatic mutation' in *Tradescantia* (Mericle and Mericle 1967).

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