

given below. The conclusion seems justified that preferential segregation is reduced when crossing over is also decreased. The data offer some support to the hypothesis that the formation of heterozygous dyads via crossing over is an essential antecedent to preferential segregation.

$K^m Yg N/k^s yg Dp \times yg \longrightarrow 1634 Yg : 1353 yg \quad 54.7\% Yg$

$K^m Yg N/k^s yg N \times yg \longrightarrow 1331 Yg : 709 yg \quad 65.2\% Yg$

$K^s yg N/k \quad wd N \times yg \longrightarrow 1221 yg : 802 wd \quad 60.4\% yg$

The female parents in the above three crosses were all heterozygous for abnormal 10.

$K^s yg N/R \quad wd N \times wd \longrightarrow 499 yg : 494 wd \quad 50.2\% yg$

The female parent used above was homozygous for N10.

M. M. Rhoades

3. Preferential pairing in structurally heterozygous tetraploids.

Structurally heterozygous tetraploids were obtained by crossing diploids homozygous for asynaptic and either homozygous or heterozygous for inversion 3a by tetraploids homozygous for normal chromosome 3. The In 3a chromosomes carried the A_1 allele and the normal chromosomes carried the a_1 allele. Thus the tetraploid progeny of these crosses was either simplex (In A , N a , N a , N a) or duplex (In A , In A , N a , N a).

The simplex backcrosses gave a total of 4253 colored kernels and 4653 colorless or 1:1.09. Control data is not yet available but it is not believed that the presence of only one inverted chromosome would affect the ratio very much.

However, the backcrosses of the duplex heterozygotes as compared with those of the duplex normal give widely different ratios. When the duplex heterozygote is used as the seed parent the ratio is 2812 colored to 387 colorless or 7.26:1, and as the pollen parent 4700 colored to 670 colorless or 7.02:1. The control duplex as the seed parent gave a ratio of 1874:460 or 4.07:1 and the reciprocal crosses gave 2865 colored to 715 colorless or 4.01:1.

The above data clearly indicate that a considerable amount of preferential pairing takes place in the duplex heterozygote. The frequency (P) with which the structurally homologous segments pair with each other above the random amount (33.3%) can be determined by the use of the following formula which was obtained by modifying Mather's analysis of the gene segregation in normal tetraploids to include

factors to express the different frequencies of certain modes of pairing; thus $(1 - q)(1/3 + p)$ expresses the frequency that autosyndetic pairing occurs when two bivalents are formed. The details of the algebraic manipulations are too long to include here. The formula is as follows:

$$p = \frac{1/6 + 1/12 \text{ aeq} - R}{1/4 - 3/8 \text{ aq} + 1/8 \text{ aeq}}$$

where a = the frequency of adjacent disjunction of the quadrivalent, e = the frequency of equational orientation, q = the frequency of quadrivalent formation, and R = the frequency of the recessive class as found in a backcross.

The value aeq is equal to $2a$, a mathematical term as used by Mather to express the frequency of double reduction, a phenomenon partly responsible for deviations from a 5:1 ratio. The value of a here can be estimated from the control ratio $4.03:1 = 5 - 2a:1 + 2a$ ($a = .095$). However it seems inadvisable to substitute this value in the above formula since the value of q is probably lower in the structural heterozygote than in the control. Also the aq term causes some trouble. A rough estimate of the values of a and q can be made from cytological observations if we assume that all the groups of homologous chromosomes behave in about the same manner. The amount of equational separation (e) for the \underline{A} locus can be derived for diploids from the data of Rhoades on the frequency of second division segregation in diploid eggs of $\underline{e1} \underline{e1}$ plants. It is .74 (MGC News Letter 30, p. 40). If we assume that crossing over is the same frequency in the diploid and the tetraploid strains used, then this value may be taken as an estimate of " e ".

In view of the fact that this study is as yet in a preliminary stage, the value of p cannot be estimated with any degree of accuracy until various things are known - the effect of crossing over within the inversion loop, amount of numerical nondisjunction (3 - 1 split of quadrivalent), etc. It is impossible to draw any definite conclusions as to some of the problems this work is endeavoring to answer such as: what magnitude of structural rearrangement is required to produce the autosyndetic pairing found in allotetraploids? However, the data presented here are in general agreement with those reported on structurally heterozygous triploids by Rhoades in the last issue and indicate that a substantial amount of preferential pairing does take place.

G. G. Doyle

4. Occurrence of crossover strands in the diploid gametes of as plants.

Asynaptic plants produce both haploid and diploid eggs as well as non-functional spores with unbalanced chromosomal complements. Haploid and diploid sperm are also produced, but zygotes coming from the functioning of $2n$ pollen grains are rare because of competition with $1n$