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1. Nondisjunction of abnormal chromosome 10.

Relatively small populations involving different inbred W22 sublines homozygous for abnormal chromosome 10 have given numerous plants which combine the particular phenotypic characteristics of homozygous K-10 and trisomic-10 in this inbred. Plants showing the compound phenotype, however, are sterile. To obtain trisomic plants in a population not showing the abnormal chromosome 10 phenotype, $\underline{R}^{r}K/\underline{R}^{r}K$ plants were pollinated with $\underline{r}^{g}k/\underline{r}^{g}k$. Among 423 progeny, 77 were classified on the basis of plant type as trisomic-10. In reciprocal crosses with $\underline{r}^{g}\underline{r}^{g}$, each of the 16 presumed trisomics tested gave characteristic trisomic ratios. A similar test of the colored kernels from several of the $\underline{R}^{r}K/\underline{r}^{g}k$ progeny crossed to $\underline{r}^{g}k/\underline{r}^{g}k$ ♂♂, in contrast, gave 412 plants with none resembling trisomic-10. The observation of one trisomic among every five or six offspring of K-10/K-10 used as female prompted an investigation into the nature of the nondisjunction utilizing genetically marked chromosomes-10.

Matings of W22 $\frac{g\ R^{st}\ K}{+\ r^{r}\ K}$ ♀♀ X W22 $\frac{g\ r^{g}\ k}{g\ r^{g}\ k}$ ♂♂ gave 512 (21.97%) plants with phenotypic characteristics of trisomic-10 and 36 (1.5%) other atypical plants in a total population of 2,330. The frequency of chromosome 10 trisomics, about 22 per 100, is consistent with the previous experiment. Forty-five putative trisomic-10 plants, including somewhat more than the overall proportion of golden plants, were testcrossed as male parents on homozygous $\underline{g}\ \underline{r}^{g}\ k$. All gave segregation ratios characteristic of trisomy for 10. As tested by the markers used, 16 had one each of the maternal noncrossover chromosomes ($\underline{g}\ \underline{R}^{st}$ and $+\ \underline{r}^{r}$), 13 had both maternally derived chromosomes of one or the other parental type, 15 had one crossover chromosome, and one had two crossover chromosomes. Recombination between $\underline{g}$ and $\underline{R}$ was 22% in disomic plants and 19.7% for a random sample of trisomics.

A marked excess of stippled was observed among the initial kernel population, but 61.4% of the resulting plants produced red anthers indicating the presence of $\underline{r}^{r}$. The disturbed ratios are understandable in terms of the observed frequency of trisomics carrying both $\underline{R}^{st}$ and $\underline{r}^{r}$.

At what stage in the life cycle does the trisomic condition originate? Considering the known cytological properties of abnormal-10, nondisjunction is presumed to be meiotic. Clearly the stage is not postmeiotic, since the two maternally derived chromosomes need not be identical. The present experiment does not exclude the possibility of mitotic nondisjunction in the sporogenous tissues, and the data are not sufficiently extensive to establish whether a particular division of meiosis is involved. Further genetic studies involving a chromosome 10 marker close to the centromere are needed to clarify these points.

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