Twelve possible cases of duplications have been isolated on the basis of genetic evidence. Cytological examinations at pachynema for each of these cases have not revealed any observable buckles which would indicate the presence of a duplication. Either the duplications are too small to be seen or they are not there and the genetic data must be interpreted differently. The genetic data are too involved and incomplete (due to a hailstorm last summer) to be presented here. In general, however, the data conform to theoretical expectations. Gene markers which are on presumptive duplication chromosomes show reduced transmission rates through the pollen.

Theoretically, the frequency of translocations between homologous chromosomes should not be uncommon. Roughly, it should be (1/n-1) times the frequency of translocations between non-homologous chromosomes, where n is the haploid number. This neglects complications arising from different chromosome lengths and different arm ratios. The translocation between homologous chromosomes must involve the same arms if a duplication is to be induced. (If the two arms are different, then two duplication-deficient chromosomes are produced; crossing over between them produces a normal chromosome and a pericentric inversion). Since the number of chromosome arms equals 2n the frequency with which the desired type of translocation occurs is (1/2n-1) or 1/19 in the case of maize. Even allowing for the probabilities that one break must be proximal and the other distal to the marker gene if the duplication is to be detected, the observation of duplications does not seem theoretically impossible.

The above discussion rests upon an assumption which is probably not true--that the chromosomes are randomly arranged in the interphase nucleus. It is known from the work of Longley that there is a correlation between the distances from the centromeres to the breakpoints for the two chromosomes involved in a non-homologous translocation. This is believed to be the result of polarized orientation of the chromosomes brought about by the previous telophase. Presumably, there would be a similar correlation in homologous translocations, in which case the duplications produced would tend to be short ones, and there would be a low probability of a given gene being bracketed by a proximal and distal break.

Furthermore, recent work by Feldman and Mello-Sampayo, and by Maguire suggest that homologous chromosomes tend to be associated with each other during the cell life cycle. It is quite possible that homologous chromosomes tend to lie close together during interphase and consequently are more apt to exchange segments with each other than with non-homologous chromosomes following radiation-induced chromosome breakage. The ratio of homologous translocations to non-homologous translocations would be illuminating. However, the technique for detecting homologous translocations needs more work.

G. G. Doyle

7. Pollen: a crude enzyme system.

As part of an extensive research program concerned with the biosynthesis of anthocyanin in maize, efforts were made to extract and identify

phenolic compounds in different parts of the maize plant. Standard organic extraction methods were used and thin layer and paper chromatography techniques were used for identification purposes. Such efforts concerning pollen indicated that quercetin and its 3-glucosylated form, isoquercitrin, were present in pollen with the exception that the anthocyanin mutant $\underline{bz}_1$ did not possess isoquercitrin.

If this were true then it seemed quite reasonable that pollen should have an enzyme that could catalyze this reaction. However, efforts to obtain a protein extract after freezing the pollen with liquid air and grinding it with a mortar and pestle failed. If the enzyme could not be extracted, it seemed reasonable to use the whole pollen grain as a crude enzyme system. The reaction system used was typical for the study of such a reaction and included: $MgCl_2$, uridine-5'-diphosphate glucose (UDPG), quercetin, tris buffer (pH 7.4), distilled water, and whole pollen. Incubations were carried out at 37°C for three hours with shaking. The results of these studies indicated that the conversion was enzymatically catalyzed as the activity could be destroyed by heat, that the UDPG was required as a glucose donor, and that quercetin was required as a substrate. Although the conversion rate in the reaction is low, it is substantially larger than that for control reaction samples. To date the activity has been found to be stable on storage in vacuum in the deep freeze. Studies are in progress at the present time to relate this conversion to anthocyanin synthesis.

R. L. Larson

8. Pollen: a crude enzyme system and genetic studies.

The results obtained in the studies discussed in the previous note strongly suggested further investigations to learn of any possible relationship of this reaction to the genetics of anthocyanin biosynthesis. This was possible since pollen samples were available having the following genes singly recessive: $\underline{c}_1$, $\underline{c}_2$, $\underline{r}$, $\underline{a}_1$, $\underline{a}_2$, $\underline{bz}_1$, $\underline{bz}_2$, and $\underline{pr}$. Conditions used for the different pollen samples were those given in the previous note. The results obtained indicated that $\underline{bz}_1$ was indeed the gene responsible for the glucosylation reaction, as enzymatic activity was found in all mutant pollen except $\underline{bz}_1$. Studies are presently in progress to investigate a possible gene dosage relationship using the homozygous recessive and dominant pollen for $\underline{bz}_1$ as well as the heterozygote.

R. L. Larson
E. H. Coe, Jr.

9. Knotted leaf mutations.

Two different mutations for the knotted leaf character have been found during the past two years. One occurred in the inbred line Mol4W and the other in a commercial single cross. Both mutants appear to be dominant and similar in phenotype to the original knotted leaf. Allelism tests are in progress.

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