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1. Maternal effect on oil content and fatty acid distribution.

Twelve agronomic inbreds were reciprocally crossed to produce 18 F_1 's. The hybrids were analyzed by wide-line NMR for oil content and two were analyzed for fatty acid content by gas-liquid chromatography.

The conclusions that were drawn are:

- a. Substantial maternal effects were observed.
- b. Heterosis for total oil was observed in 15 of the 18 hybrids. The mean of the F_1 was higher than the mean of the high parent in 8 of the hybrids.
- c. The genotype of the embryo primarily determines fatty acid distribution, i.e., the maternal sporophyte did not appear to have an appreciable effect.

Vernon Reich
D. E. Alexander

2. Accuracy of wide-line NMR analysis of oil in corn.

Samples of dried kernels are placed between pole pieces of a permanent magnet. A radio beam is interposed and the field strength simultaneously modified electromagnetically. Resonance for protons in the liquid phase in the kernels occurs in concert. Protons in solids resonate throughout the shift in field strength and are disregarded.

Accuracy of analysis was estimated by the standard deviation from the regression line of NMR signal on careful gravimetric analyses. The mean of two 30-second sweeps on 25 g. samples was found to fall within $\pm 0.12\%$ of the oil content 95% of the time. Approximately the same error, in terms of oil percentage, was found for single seeds.

D. E. Alexander
Luis Silveira S.
Floyd Collins
Ralph Rodgers

3. Application of wide-line NMR to breeding high oil corn.

NMR was used to non-destructively analyze 3,800 individual kernels coming from 38 ears of the third cycle of a high oil synthetic. The ten higher, the ten lower and ten intermediate oil kernels from each ear were planted and the resulting plants were self-pollinated. NMR analyses were made of oil content of each selfed ear.

The overall correlation coefficient of per cent oil of the parent kernels and per cent oil of the progenies was 0.857.

Comparisons of response to selection by classical recurrent selection for oil (destructive analysis and planting of remnant seed) and by a single kernel NMR-selection scheme suggests that progress should be about 2.25 times as rapid per generation by the latter scheme.

Luis Silvela S.
D. E. Alexander

4. Seed set in an autotetraploid maize synthetic.

Per cent seed set has been determined in autotetraploid syn B each year since 1958. The synthetic was maintained by selecting approximately 200-300 well filled ears from agronomically desirable plants each year as parents of the next generation. Each year seed set was determined in a random sample of 30-40 ears by determining the actual number of kernels on the ear and estimating the potential number from the kernel row number and a count of the potential kernels in a typical row. Mean per cent seed set for each year was:

1958	1959	1960	1961	1962	1963	1964	1965
60	68	74	69	78	80	69	83

Seed set has increased each year except for 1961 and 1964. Nineteen sixty-four was an adverse year for seed set which may account for the low seed set in this year. Improvement in seed set was rapid through 1962 but has since been slow, indicating that this synthetic is becoming stabilized at the autotetraploid level.

J. W. Dudley
D. E. Alexander

5. Mutation rate of opaque-2.

Recent findings by Nelson, et al, (Science 1964) on the altered amino acid composition of opaque-2 endosperm proteins has stimulated the interest of corn breeders in the improvement of protein quality. Many breeders are presently converting inbred lines to the opaque-2 genotype. The backcross method is satisfactory for this conversion. However, if opaque-2 mutants could be obtained directly through spontaneous mutation, considerable time could be saved in developing opaque-2 versions of these lines.

With this in mind, an investigation of the mutation rate of the normal allele (O_2) to the opaque-2 allele (o_2) was conducted in 1965. The male sterile (T-sterile) versions of the lines B37, C103, M14, and W64a (Genotypes O_2/O_2) were used as female parents in an isolated crossing block.