Untreated dwarf-1 plants grow to a height of about 8 to 12 inches. With our gibberellic acid treatment, the dwarf-1 plants grow to a height of approximately 3 feet.

At harvest all the crossed ears are saved and separately shelled. Some seed from each ear was then planted and selfed to determine whether the $\underline{Lw_1}\underline{Lw_1}$ or $\underline{Lw_1}\underline{lw_1}$ genotype was crossed by $\underline{d_1}$ plants. Progenies producing ears segregating for lemon-white were saved and the remnant seed used to produce additional seed segregating for both $\underline{lw_1}$ and $\underline{d_1}$.

In developing this second procedure it was apparent that approximately half the crossed ears segregated for both $\underline{lw_1}$ and $\underline{d_1}$. Of the selected progenies producing the $\underline{lw_1}$ phenotype, these rows contained plants of which ½ were found to be segregating for both $\underline{lw_1}$ and $\underline{d_1}$. All the progenies and all the selfs produced seed segregating for dwarf-1 expression.

The phenotypes produced by this second procedure would be for a 9 tall green:3 tall albino:3 dwarf green:1 dwarf albino ratio, or for a 3 tall green:1 dwarf green ratio.

Clarion B. Henderson

3. Studies and classification of cytoplasm variations.

Because of the seriousness of both Helminthosporium maydis race T Southern Leaf Blight and Yellow Leaf Blight and their attack on corn varieties in the T cytoplasm background, a study was initiated with cytoplasms that did not show susceptibility to these two diseases.

When this relationship of disease susceptibility and cytoplasm background became apparent, Dr. M. S. Zuber, University of Wisconsin, recalled some previous work of Dr. Jack Beckett, while Dr. Beckett was with the University of Illinois. Dr. Beckett had accumulated and studied various sources of corn which gave some expression of sterility in the different backgrounds. With the transfer of Dr. Beckett from the University of Illinois, to the University of Missouri, studies of this project were discontinued. Dr. Zuber, in recognizing the potential availability and use of this material, accumulated these stocks and made them available to research workers. Dr. A. L. Hooker, University of Illinois, and

Dr. M. S. Zuber studied the correlation of the available cytoplasms with their reaction to the T maydis Southern Leaf Blight, and released only cytoplasms not showing susceptibility.

Dr. Zuber and Dr. Hooker selected 26 cytoplasms from the pool of material. Dr. Beckett, in his work, had incorporated these cytoplasms into 10 isogenic inbred backgrounds. It was felt previously there was a high degree of similarity in these cytoplasms collected. However, it was never conclusively ascertained whether the cytoplasms were similar or dissimilar in their sterility, restoration, or disease reactions. Those 10 original inbreds are not widely used in present day hybrids. Because of the outdated nature of the germplasm and the fact that many newer inbreds are more extensively used in hybrid combinations, it was decided to initiate an incorporation program and further study the cytoplasms.

Previous and more extensive work had been initiated in regard to both the C and the S cytoplasms so these were not included in this program. The remaining 24 cytoplasms, all in the 38-11 inbred background, except for ML cyto in the Tr background, were secured from Dr. Hooker. Also included, as a check, in this program was 38-11 in its normal cytoplasm. For crossing with these 25 cytoplasms, we selected 20 of the most common and representative inbreds. At the time the F_1 crosses were being made in Hawaii, it was apparent there was little or no indication of good sterility with these cytoplasms, in the 38-11 background, with all of these varying from fully fertile, or restored, to light partial shedding. It became evident from this that the BC_1 or more advanced generations would be required before the desired information could begin to be obtained.

$Backcross_1$ generation was then made in a second generation Hawaii planting. The seed from this was returned to Champaign for observation and continued backcrossing. At Champaign, additional backcrosses were made to each of the 500 combinations, selecting the most sterile plants appearing in the BC_1 progenies. At the same time, all rows were evaluated as to whether sterile segregates were present.

Table 1. Classification of BC_1 progenies from crosses incorporating various sources of cytoplasm into twenty inbred lines.

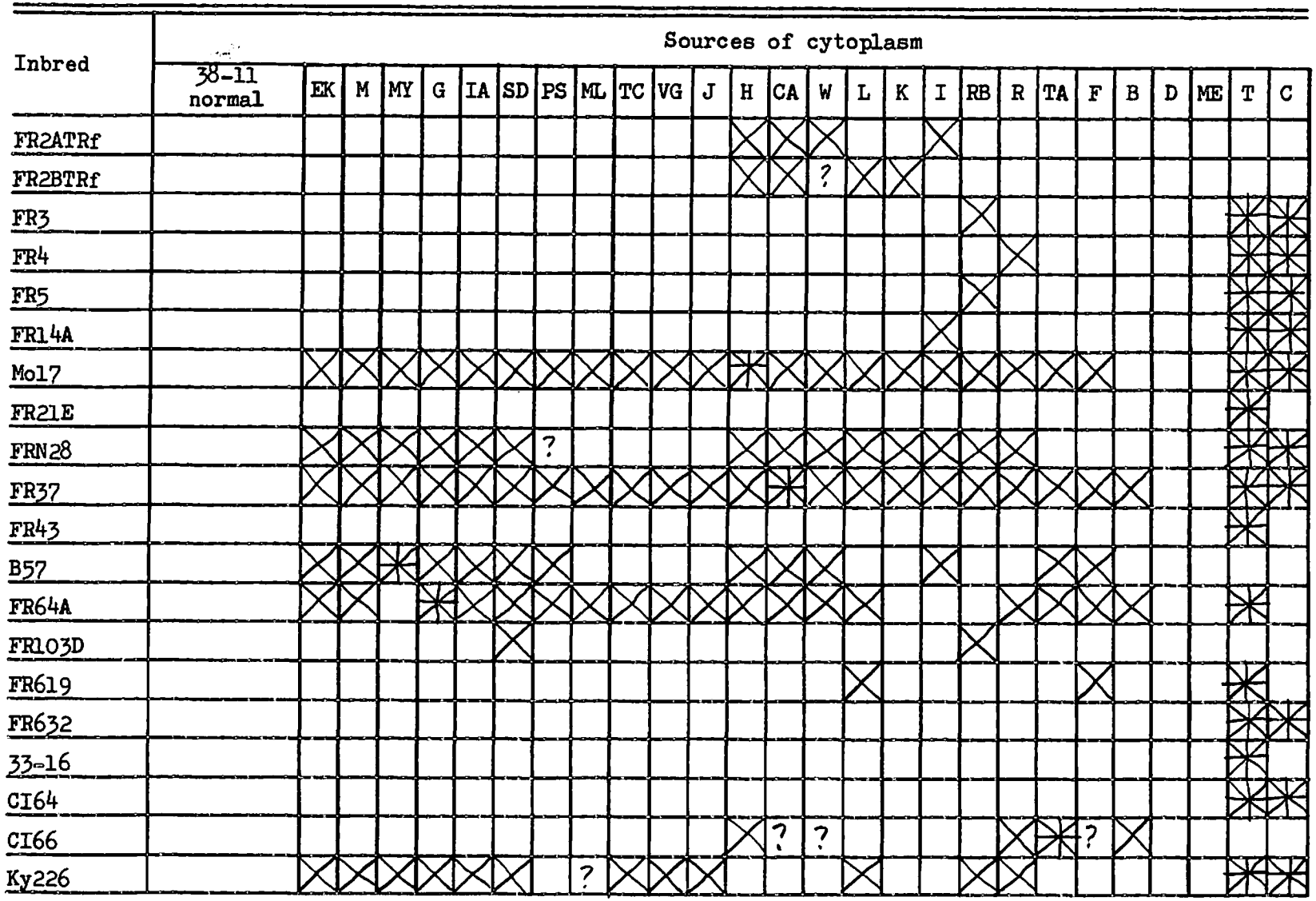

Table 1 summarizes the crosses observed and those in which there appeared to be sterile segregates. In a few cases, especially with CI66, the stands and backcross generation were not such that results are indicated or reported. In five cases, the BC_1 rows observed were completely sterile. In the other identified cases, the rows were segregating for sterile plants. In some instances, we have question marks. These rows were F_1 crosses and the pattern of behavior would indicate these combinations especially should be checked further.

The investigations are being continued by making additional backcrosses and studying these further. The five cases where the BC_1 rows were completely sterile are in an annual program of three generations to speed along the incorporation. The rows segregating for steriles, as well as those progenies in question, are presently on a two generation program. The balance of the progenies will be continued on a one generation per year basis. In this way, we shall be recovering isogenic versions of all cytoplasms. The program is also being expanded to include three additional cytoplasms, namely El Salvador (Es), Brazilian Flint (Bb), and Argentina Parana (PA).

Since in the BC_1 generation all backcrosses were made to the most sterile plants, it is anticipated it will be possible in the succeeding generations to evaluate each of the progenies as to the fertility, or the degree of fertility. This should give further evidence as to the relative similarity of the cytoplasms.

It may be necessary to initiate a progeny selfing-backcrossing program since some variation in the results may be due to the genotypic difference within a given inbred. This program may be especially helpful in securing "non-restoring" maintainer versions of the various inbreds. This progeny selfing-backcrossing program is being conducted on many inbreds in the C cytoplasm, sterile incorporation program. Here the attempt is to secure maintainer progenies, which, used with their sterile counterpart, will bring about complete sterility rather than a segregation for sterility and partial fertility.

Summary--Based on the preliminary studies of the sterile segregates of approximately 500 BC_1 crosses, it appears there is a difference

in the cytoplasms being evaluated. The cytoplasms of EK, M, MY, G, IA, SD, and PS appear to fall into an almost identical pattern. This pattern is different from that of the other 17 cytoplasms. The ML, TC, VG, and J cytoplasms appear to fall into a second group. The H, CA, and W cytoplasms fall into yet a third group. There is additional variation among the remaining cytos. Further evidence secured by additional backcrossing should substantiate, or possibly disprove, the comprehensive data obtained thus far.

Clarion B. Henderson

4. Precautions for use of "normal" 33-16 inbred.

In the reversion from ear parent inbreds which are T sterile back to so called normal versions, a review of what is normal must be considered. This is especially true in the case of 33-16.

Prior to the extensive knowledge and use of sterile and restorer inbreds in production, a case of scattergrain fill was reported with a hybrid which used 33-16 as its female parent. It was later learned that 33-16 had a special cytoplasm, which in some instances could be sterile.

With this knowledge, the inbred 33-16 was delegated for use as a male parent, either in making seed of the single crosses for hybrid production, or as the male parent in the production of the final hybrid.

During the time T cytoplasm material was being used, the 33-16 inbred was converted from its "normal" cytoplasm to the T cytoplasm version. Here the use of blending, or restorers for T cytoplasm, was relied on. Hence there was little or no concern of ample pollination in the farmers' field.

With the outdating of the T cytoplasm, 33-16 with its regular cytoplasm was brought back into production. Recently the 33-16 inbred has been classified as having the J type cytoplasm. The indiscriminant use of 33-16 could again cause problems.

In the use of regular 33-16 as the ear parent inbred either in a three way cross or in a 4 way hybrid, the following condition might exist, assuming that H21, K55, and Ky27 or similar inbreds might not restore fertility to a J sterile: