It is important to note that in all of these experiments where a heterozygous T restoring gene is acting in either T cytoplasm or in M cytoplasm there is no selective action determining the survival of either the dominant or recessive gamete as in the case with S restorers in S cytoplasm.

In another series of double crossed hybrids three types of pollen parent single crosses were compared, all crossed on the same sterile seed parents. One group was made with the original non-restoring inbreds with no restoration. In another group one inbred was sterile and the other a restored sterile version of the same inbred as used in the first group, giving approximately 50 percent of the plants shedding pollen. In the third group both of the inbreds had been converted to restored sterile versions. This group gave all plants shedding pollen normally. The restored sterile inbreds had been backcrossed four times and then selfed three times.

In all cases the three groups were closely alike in days to silking and in percent of moisture in the grain at harvest. However, in yield of grain and percent of plants erect at harvest the 50 percent restored version of the same hybrids were significantly lower. From this evidence it appears that four generations of backcrossing are not enough to change an inbred to pollen restoration without altering performance in other characters. Yield of grain was reduced less than erectness of stalk. This may be due to the source of the restoring gene which was Ky21. This inbred has good yielding ability but poor stalk quality. Evidently some of the linked genes determining stalk breakage have not been eliminated in the backcrossed plants.

In this experiment where the same hybrids were restored to 100 percent pollen fertility (both pollinator inbreds converted to pollen restoration) yield of grain was the same in one and above in two of the combinations. In these cases the other restored inbred evidently brought in additional genes for yielding ability. But in all three of these fully restored hybrids stalk quality was reduced.

Donald F. Jones

6. Recurrent selection for pollen restoration and yield performance.

In three widely used inbreds a program of selection in test crosses is underway for pollen restoration and ability to yield with proper maturity and equal or better stalk quality. The procedure is to cross the T sterile version of the inbred by a good restorer source and then backcross on to the sterile inbred for enough generations to recover the inbred type and then self for several generations to obtain homozygosity for the necessary pollen restoring genes as shown by progenies that are all normal in pollen production. During this process selection is also made for the desired maturity, stalk quality, disease and insect resistance, and other agronomic characters.

As soon as the lines are reasonably well converted to type and appear to be suitable for use as pollinators they are then further selected by test crossing. In some cases selections are made while the lines are still segregating for pollen restoration. Selected individual plants in each progeny are self-pollinated and crossed on to a suitable sterile single cross seed parent. These 3-way test crosses are then grown and scored for pollen fertility, time of flowering, stalk quality, grain quality and yield. The selfed inbreds giving both good fertility and superior performance are then composited, either by intercrossing by hand pollination or by bulking and growing in an isolated plot. Further selections from these composites are again tested. The inbreds being selected in this way at the present time are C103, Hy and Kr.

Donald F. Jones