Additional Studies of the Relative Effectiveness of Two Systems of Selection for Oil Content of the Corn Kernel

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EXPERIMENTAL RESULTS

The results obtained from the recurrent series are presented in figure 1. In each distribution the mean is indicated by the solid vertical line and the mean of the highest ears chosen as parent of the next cycle by the broken vertical line. One of the striking features is the marked shift in the mean. The mean oil percentage for the original population was 4.2, the first cycle 8.0, and the second cycle 7.0. The range for the original ears was from 2.5 to 9.5, for the first cycle from 5.2 to 10.0, and for the second cycle from 5.5 to 9.5. The second cycle populations exhibited similar shifts in both ranges. The first and second cycle populations were also characterized by marked asymmetry for the three populations. Standard deviations follow the same general trend as the ranges. The first and second cycle populations were the most variable with standard deviations of 0.64 and 0.67 respectively. The standard deviation of the original population was 0.53.

There was some indication of a difference in degree of skewness, $g_1$, was negative and not significant for the original population. In the first cycle $g_1$ was significant, but for the second cycle population it was almost negligible.

The methods used for the determination of oil have been described previously (1). The number of pollinations, analyses, and nursery space were essentially the same for the selfing and the recurrent series. An effort was made to keep the intensity of selection for phenotypic characters as similar as possible for the two series. Any differences obtained through the use of these methods would be no more significant than any inherent differences existing in the lines chosen for selection.

In a previous report (1) data were presented on the relative effectiveness of recurrent selection versus selection in selfed lines in increasing the oil percentage of the corn kernel. By any scheme of comparison used, recurrent selection was judged to be the more efficient. Since critical data on the value of the recurrent selection system of breeding are still rather meager it seemed worthwhile to present data obtained in a second experiment contrasting these two breeding systems.

The parental material used was a synthetic variety designated as Stiff Stalk. This synthetic was made in 1936 by combining 16 lines chosen very largely for their stiffness of stalk. The strain has been maintained since that time either by open-pollination in an isolated increase field or by mass sib pollination. For this study approximately 100 shoots were self pollinated and the resulting ears analyzed individually for oil percentage of the grain. The 10 ears having the highest oil percentage were used as parental material for both the selfing and the recurrent selection material.

In the recurrent series the 10 ears having the highest oil percentage were grown in ear row progenies and all possible combinations among them made by hand. In the first cycle equal quantities of seed of each combination were bulked. This was followed by selfing within this bulk increase population. Approximately 100 self-pollinated ears were analyzed individually for oil percentage of the grain and the 10 ears having the highest oil percentage were saved to propagate the strain. This process was continued during the five generations of selection.

The selfing series was derived from the same 10 foundation ears used in the recurrent series. These were grown in 25 plant progeny rows and approximately half of the resulting plants self pollinated. At harvest five of these were saved for analysis. The two ears from each family having the highest oil percentage were again planted in progeny rows for further inbreeding and selection. After the oil analyses were available the sibling progeny within each pair having the lowest mean oil percentage was discarded. In the sibling progeny having the highest mean oil percentage the two selfed ears having the highest oil percentage were saved to propagate the strain. This process was continued during the five generations of selfing.

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