IN THE cooperative corn breeding program at the Iowa Station, some attention is being given to the possibility of improving the nutritional characteristics of corn. One of the characters under study is the oil content of the corn kernel. The purpose of the present paper is to contrast the effectiveness of two systems of selection for increased oil percentage. Consideration of the relative desirability of such an increase from a nutritional standpoint is beyond our intended scope.

The experiments reported here were begun in 1939. At that time work on the early testing of inbred lines had progressed sufficiently to suggest that it might have some merit in a breeding system. The range in combining ability of a series of $S_0$ plants, as determined in top-crosses, indicated marked genetic dissimilarity. Under a system of inbreeding and selection within inbred lines, a potential ceiling is established at the time of the first selfing, determined by the genotype of the plants selected. It seemed plausible that a much higher potential ceiling might be established by a somewhat different approach. This approach was to evaluate a series of individual plants for a given character, truncate the frequency distribution at some desired level, and intercross the individuals comprising the truncated tail. This recombination would then serve as source material for a new cycle of selection.

At the time the work was initiated we thought this was a new system of breeding and we tentatively called it “truncation selection”. After some time we learned that a somewhat similar system had been suggested previously by East and Jones (2),3 and by Hayes and Garber (5). Jenkins (9) was the first to publish a detailed description of the recurrent selection method. In 1945, Hull (7) outlined a procedure which he designated as recurrent selection for specific combining ability. In principle this differed from Jenkins’ description only in the substitution of an inbred tester for a heterozygous tester. It may be of interest to note that the suggestion of mechanically similar procedures was based on quite different theoretical considerations.

In the procedures as outlined by both Hull, changes in gene frequency would be expected. In Jenkins’ case, where heterosis is assumed to dominate favorable factors, $q$ will approach a limit. In Hull’s case, where heterosis is due to over-dominance, if the mean value for dominants affecting yield in the homozygous parent is $q$, then the population under selection will approach $1-q$ as a limit. At this limit each locus represented by a dominant allele in the tester parent will be represented by a recessive allele in the selected population. Similarly each locus represented by a recessive allele in the tester parent will be represented by a dominant allele in the selected population.

Experiments to determine the effectiveness of the recurrent selection method for combining ability started first. It was obvious that the accumulation of critical data would require a considerable time. We were also interested in the development of lines or composites having a high gene frequency for characters conditioning oil percentage of the kernel. It seemed desirable to investigate the effectiveness of this method in modifying oil percentage. Therefore, accumulation of material having a high gene frequency for characters conditioning oil percentage and critical evaluation of the selection procedure, were combined in one experiment.

The original material consisted of reciprocal backcrosses involving the single cross Illinois wx00420. Individual plants were self-pollinated, backcrossed population and after harvest, ears individually for oil percentage in the growth season. A row saved from each population were intercrossed to make a heterozygous tester. Subsequently two additional related sources were included in similar procedures.

The effectiveness of selection in changing the gene frequency for characters conditioning oil percentage has been well established (13). With this information available it was deemed of interest to use this material for testing the selection procedure, were combined in one experiment.

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3 Contribution from the Farm Crops Subsection and the Chemistry Section, Iowa Agricultural Experiment Station, Ames, Iowa, cooperating.

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