Fifty generations of selection at the Illinois Station for high and low protein and high and low oil in corn were completed with the 1949 crop. This experiment was started in 1896 in the Burr White variety by Dr. Cyril G. Hopkins. It was continued to 1921 by Dr. L. H. Smith and his co-workers. Direction of the project was assumed by the senior author in 1921 and continued to the present time with the help of various persons who have been on the Plant Breeding staff since that time. The work was suspended for 3 years, 1942, 1943, and 1944, because of lack of manpower during the war. However, seed of the 1941 crop was held over and used to plant the 1945 crop.

Few adequate reports of progress on this experiment have been published especially during the latter part of the 50-generation period. The first report was published by Hopkins (3) in 1899 after 3 generations; the second by Smith (4) in 1908, after 10 generations; and the third by Winter (6) in 1929, after 28 generations. Progress on generations 29 to 50 inclusive has been described in the annual reports of the Illinois Agricultural Experiment Station. Charts showing progress of selection for generations 1 to 47 inclusive were presented by Woodworth and Jugenheimer (7).

The purpose of this paper is to give in brief form the main results and trends of selection for protein and oil in corn for 50 generations together with observations on variability of the selected strains and effects of random selection and of reverse selection. It is planned to publish a complete report as an Illinois Experiment Station bulletin at a later time.

EXPERIMENTAL PROCEDURE

Selection was begun in 1896 from a foundation stock of 163 ears of the Burr White variety of corn. Four selected strains were established, namely: Illinois High Oil, Low Oil, High Protein, and Low Protein. Ear-to-row selection was practiced for the first 28 generations of the experiment, with each strain being grown in a separate isolated plot. Within each plot, after the first nine generations of selection, alternate rows were detasseled and seed was saved only from the highest yielding detasseled rows. After 1921 (25 generations) yielding ability was disregarded and ears were saved for chemical analysis from all 12 of the detasseled rows. This changed procedure was continued until 1925.

The number of ears analyzed in each strain was somewhat variable during the first nine generations of the experiment. In the tenth to twenty-eighth generations of selection, each strain were harvested for analysis. The 24 ears most extreme in the desired direction of selection were used as seed for the succeeding generation. For example, in Illinois High Oil, 120 ears were selected each year for oil analysis from the six highest yielding detasseled rows, or 20 ears from each row. From 1921 to 1925, 10 ears were taken for analysis from each of the 12 detasseled rows. The 24 ears with the highest oil content were then used as seed for planting the High Oil plot the next year.

In 1925, the breeding system was considerably altered, because of the difficulty of locating isolated plots. Ear-to-row selection was discontinued, and the number of ears harvested from each strain was reduced to 60. In each strain, the 12 ears most extreme in desired direction of oil or protein content were saved for seed. These were divided into two bulked lots of seed from six ears each, and the lots were planted separately in adjoining plots. Pollinations were made by hand, using bulk pollen mixtures from one lot of a given strain on each ear.