PRODUCERS of commercial hybrid seed corn often believe that certain pollen parents have noticeable direct effects on the size of crossed kernels. Apart from any possible importance of such effects in influencing yield, they are of potential interest to the hybrid seed corn producer if they are large enough to influence grading percentages in processed seed. Direct effects of the pollen parent might also be of importance in studies on the inheritance of kernel size, where they have previously been given little attention.

Early investigators believed the pericarp to be the chief limiting factor determining kernel size (2, 3), and thought that the pollen parent could have no effect on kernel size in starchy types of corn. The extensive studies of Kiesselbach (6) gave no evidence of important direct effects of pollen source on kernel size in open-pollinated dent varieties. In later experiments, Kiesselbach and Leonard (7) found no significant effects of foreign pollen on kernel size, except where a change in endosperm type or heterozygosity was involved. More recently, however, Dessureaux et al. (1) have presented evidence that certain inbred lines, when used as pollen parents, may exert significant effects on the rate and duration of increase in the dry matter content of crossed kernels. Pollen of inbred R4 was found to contribute a tendency toward shortening the period during which translocation of dry matter to the kernels took place. Crossed kernels with this inbred as pollen parent were found to be smaller at maturity than kernels with other inbreds as pollen parents.

The investigations reported in this paper resulted from observations made while preparing F1 seed for experiments on the inheritance of kernel size and other quantitative characters in corn. It was observed that seed with inbred R4 as the pollen parent was almost invariably smaller and of poorer quality than seed with other inbred lines as pollen parents. Since R4 had already been observed to contribute small kernel size to its F1 hybrids, detailed studies of its effect as a pollen parent were undertaken. A survey of other breeding material was also made to investigate the possibility that pollen from other inbred lines might also have marked direct effects on kernel size. Preliminary results of these studies are summarized in this paper.

Materials and Methods

Seed of a systematic set of reciprocal crosses of nine inbred lines was produced in a paired-row crossing plot in 1946. These inbred lines were similar in maturation and considerably in kernel size. Seed from 5 to 10 ear rows of each cross was composited, and five 100-kernel lots from each reciprocal were weighed 15 months after harvest.

In 1948, 20 late-maturing inbred lines were crossed reciprocally with two single-cross testers, T8 X CL2 K201C. Four midseason inbred lines were used in crosses with the single-cross testers WF9 X38-11 and Hys. These crosses were produced in a paired-row selfed seed of 21 of the 24 inbred lines involved in an adjacent plot. Samples from composite seed lots of each cross and inbred line were weighed approximately 1 month after harvest.

Detailed tests of the effects of pollen from inbreds on size of crossed kernels were made by using seed parents in 1947 and 1948. Pollen from R4, an inbred with yellow endosperm, was mixed in approximately equal quantities with pollen from white inbred lines, and the resulting pollen mixtures were applied to the silks of several different tester strains. Seed of crossed kernels differing in male parentage could be identified on the basis of color resulting from xenia effects. In selfed lines, pollen from open-pollinated varieties and one yellow single-cross used as seed parent testers, while two white single-cross seed parents in 1948. Butt and tip kernels of ears were removed and discarded after the ears had matured. The ear was then shelled separately, the two types of kernels were separated and counted, and all kernels of each type weighed. Mean weights per hundred kernels were calculated from these data.

All seed used in these tests was produced by hand, dried after harvest, and stored in a dry room until weighed. Samples were counted on a Torsion balance or on a beam balance with a 0.01 gram scale. Except in mixture studies, weights reported are means of five samples.

Experimental Results

Weights of crossed kernels in the systematic reciprocal crosses between nine inbred lines, Table 1, indicate that there were specific effects of pollen parents on the size of crossed kernels. Inbred lines differed significantly in their ability to contribute to kernel size. Mean weights of crossed kernels were highest when inbreds WF9 and 4226 were the pollen parents, and were lowest when 90, 187-2, and R4 were the pollen parents. The effect of pollen from inbred R4 was particularly noticeable. Crossed kernels with inbred R4 as pollen parent averaged more than 10% lower in weight than kernels with any of the other eight inbred parents, as pollen parents, may exert significant effects on the rate and duration of increase in the dry matter content of crossed kernels.