There is currently an increasing interest in attempting to utilize F1 vigor for commercial production in self-pollinated crops. Aneuploids may provide the mechanism for male-sterile females and restored fertility in the F1 generation. The essential conditions are: (a) a nullisomic which is fertile enough to perpetuate seed in one environment yet male sterile in another where crosses are to be made, (b) a fertile monosomic F1, (c) significant hybrid vigor expressed in the monosomic F1, and (d) adequate cross pollination to provide F1 seed at a cost to make F1 hybrids commercially feasible. The suitability of some aneuploids in oats (Avena sativa L.) for (a) and (b) above was discussed in a previous paper (2) whereas this manuscript deals primarily with the amount of cross pollination with nullisomic plants and the expression of hybrid vigor in the F1 monosomic progenies of crosses of nullisomics with other varieties.

The male-sterile phenotype discovered in a sib line of 'Clintland 60' was found to be due to this line being a nullisomic for one of the small submedian chromosomes. Its cytology and breeding behavior have been described (2). In controlled climate experiments at a 16-hour photoperiod the nullisomic plants set no kernels at higher temperatures (constant 80°F, or 80°F day and 60°F night) but set from 0 to 55% at 60°F. Nullisomic plants produced rudimentary anthers about one-third normal size and produced functional pollen only in the more favorable environment. Nullisomic plants were phenotypically very similar to normal plants except for a slight reduction in vigor. Monosomic plants appeared normal except for a slight reduction in kernel set. Selfed monosomics produced nullisomics, monosomics and disomics in an average ratio of 4.85:0.95:0.05, respectively, indicating excellent functioning of 20-chromosome gametes.

Differences in fertility and vigor among different nullisomics and monosomics of oats have been reported previously (3, 4).

The question of whether or not sufficient hybrid vigor exists in oats for commercial utilization is largely unanswered, mainly because of the small number and the limited scope of experiments. Jensen (1) summarized some positive evidences for hybrid vigor in oats. An unusual case of hybrid vigor was recently reported by Rothman and Bowman (5).

Oats have generally shown very low natural cross-pollination (1). The cross-pollination potential with a male-sterile female parent has not been reported previously.

**MATERIALS AND METHODS**

Twenty-eight isolated crossing nurseries were established in the field at Lafayette, Indiana, in 1959 to study cross-pollination in oats and to produce crosses for studies of heterosis in the F1 and F2 generations. Each plot consisted of 5 rows, 8 feet long and 1 foot apart. The outer 4 rows were planted to a pollen parent and the center row to the female parent. The female parent was the Clintland 60 sib stock which was composed of seed from selfed monosomics; therefore, it contained male sterile nullisomics and fertile monosomics and disomics in a theoretical ratio of 4.85:0.95:0.05, respectively. Seeds produced on nullisomic sterile) plants were mostly the desired F1 crosses (monosomics), some probably were monosomic sibs from crosses with fertile Clintland 60 sib disomic plants, some were sterile nullisomics from selfs or sibbing with other Clintland 60 sib nullisomics, and some were monosomics or nullisomics from crosses with fertile monosomic Clintland 60 sibs. The measurement of heterosis on only the fertile progeny plants removed the effect of the nullisomic sibs, but not the monosomic sibs from the heterosis data.

Five crosses were examined for heterosis in the F1 and F2 generations. The pollen parents were 'Ajax' (C.I. 4157), 'Andrew' (C.I. 4170), 'Fundy' (C.I. 7288), 'Minhafer' (C.I. 6913), and Mo. 0-205 (C.I. 4988) and the female parent for all crosses was 'Burnett' (C.I. 6537) as pollen parent was available for studies of heterosis.