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N Rate, Hybrid and Plant Population Affect Corn Yield

Studies conducted over three-year span in eight different environments.

Summary: *Experiments were conducted in eight Ohio environments. Objective was to determine relationships between nitrogen (N) fertility and corn hybrids exhibiting different levels of ear adjustment (in ear determinancy and prolificacy) at varying plant populations. Grain yields were strongly influenced by N rate and plant population in most environments. Hybrid effects were significant in four of the eight environments and usually most evident under favorable growing conditions. Significant interactions involving hybrid, N, and population, occurred at only one of the eight locations. Response to N fertility and plant population was optimized under favorable growing conditions. Under drought stress, population and N fertility effects were much less pronounced or not significant. Response to N fertility and plant population for yield among the three hybrids was similar despite marked differences in hybrid ear types. For ears per plant, there were signficant interactions between hybrid, N, and plant density, with N strongly influencing prolificacy. Although the prolific hybrid showed a positive yield response to higher plant population, the increased lodging associated with greater plant density would warrant planting this hybrid at suboptimal plant populations in certain environments.*

Experiments were conducted at the Ohio Agricultural Research and Development Center branches at Hoytville and South Charleston, Ohio. Objectives were I) to determine the effects on corn yields of interactions between nitrogen fertility, plant population, and hybrid, and 2) to determine the most cost-effective rates of N for different hybrids at varying plant density. The eight environments in which the experiments were conducted allowed sampling of different soil types and weather conditions and are representative of the variation in growing conditions in the major corn producing regions of Ohio.

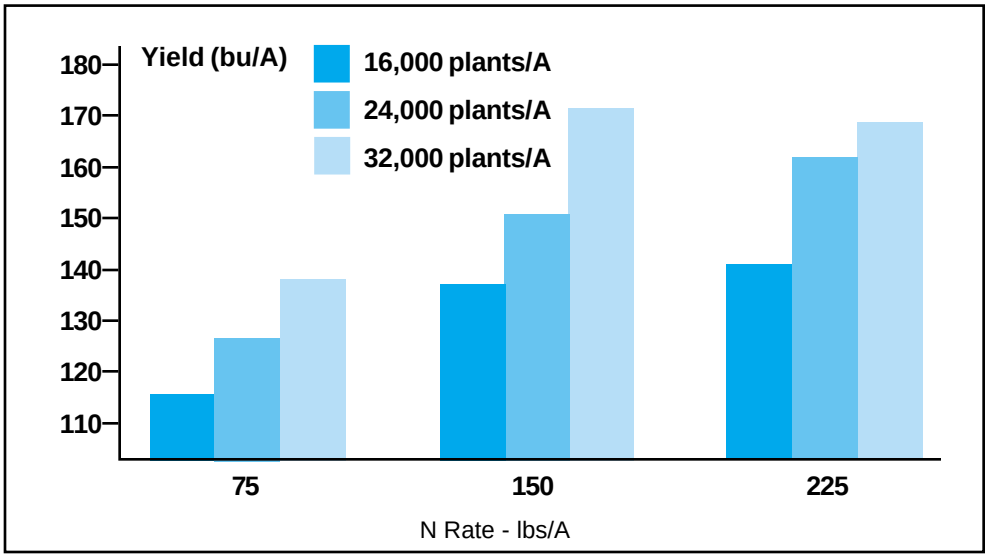

Figure 1. Nitrogen fertility and plant population effects on corn yield using a Beck's 72X hybrid on a Kokomo silty clay loam. South Charleston, Ohio, 1993.

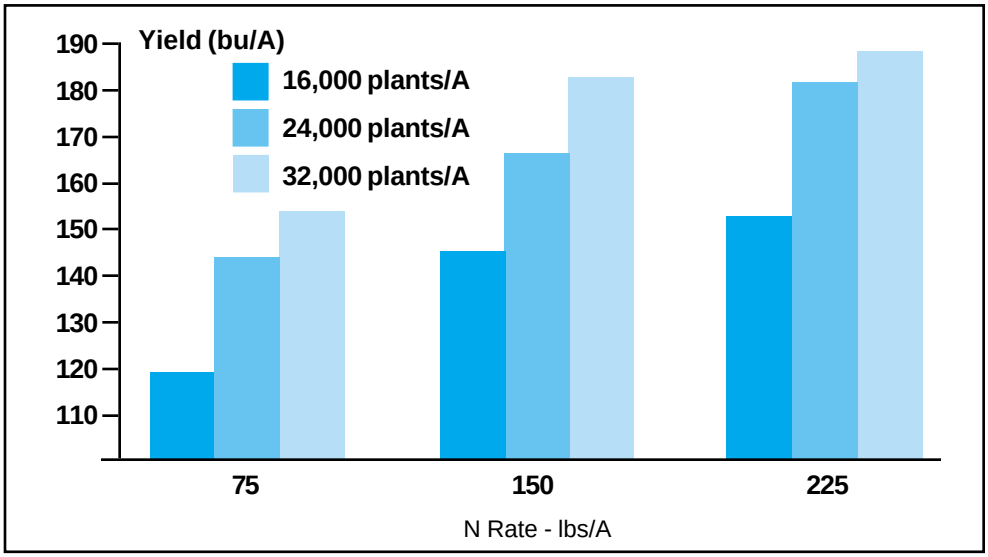

Figure 2. Nitrogen fertility and plant population effects on corn yield using a Pioneer 3379 hybrid on a Kokomo silty clay loam. South Charleston, Ohio, 1993.

Yields boosted

Grain yields were significantly affected by N rate, hybrid and plant population as shown in Figures 1, 2 and 3. The figures depict the results on a Kokomo silty clay loam in one of the eight environments (South Charleston) in 1993.

Overall, there were significant differences in yield among hybrids at four of the eight environments. The fixed ear hybrid P3379 exhibited consistently higher yields— averaged across N rates and populations—than the prolific hybrid B72X in the three 1993 experiments. At South

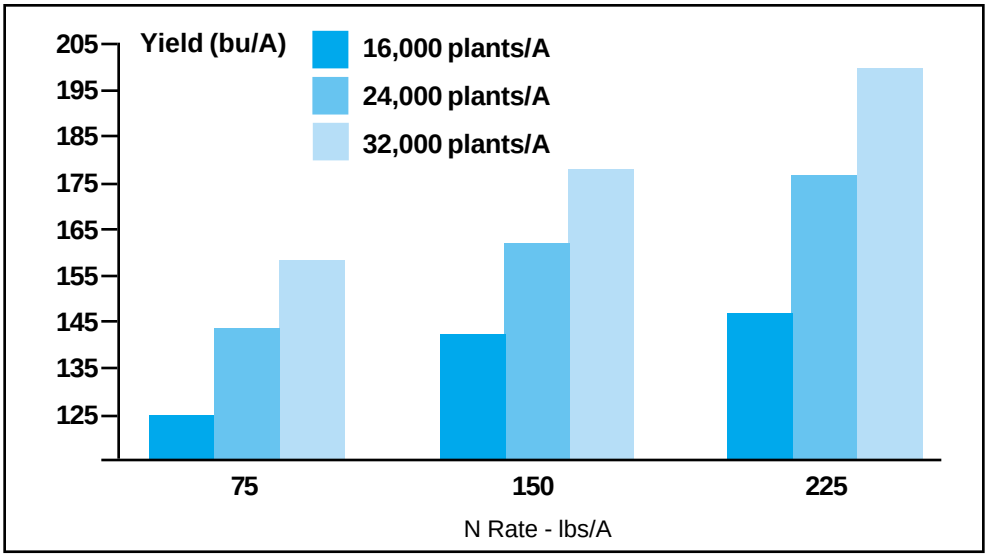

Figure 3. Nitrogen fertility and plant population effects on corn yield using a Countrymark 747AX hybrid on a Kokomo silty clay loam, South Charleston, Ohio, 1993.

Charleston, the prolific hybrid yielded significantly less than the two single-ear hybrids.

There were significant N fertility effects on yield in six of eight experiments.

Population significantly affected yield in seven of the eight environments. Responses to nitrogen and plant population were strongly influenced by environmental conditions, primarily soil available moisture. Nonsignificant responses to N and plant population occurred at sites experiencing severe drought (South Charleston in 1991 and Hoytville in 1993).

Prolificacy (ears per plant) was influenced by hybrid, N rate, and plant population. Significant interactions for ears per plant between 1) nitrogen and population, 2) hybrid and population, and 3) population and hybrid were indicated at four of the eight sites. The prolific hybrid increased number of ears per plant with increasing N rate. Higher plant densities reduced the prolific hybrids' ears per plant. The other hybrids remained relatively constant at about one ear per plant, regardless of plant N or plant density. Prolificacy was most pronounced in the B72X hybrid at low plant population and high N rate (225 lbs/A). The highest level of barrenness (plants with no ears) occurred in the CM747AX hybrid at low N rate (75 lbs/A) and high plant population (32,000/A) under drought stress conditions.

Lodging

Stalk lodging was affected by hybrid in all eight experiments, and by plant population in six of the eight experiments. Significant effects of N on lodging occurred in four of the eight experiments. Although hybrid/N, N/population, and hybrid/population interactions occurred at certain locations, no consistent trend was evident.

Levels of stalk lodging were negligible to moderate for the two single-ear hybrids. Lodging was greatest for the prolific hybrid, especially at high plant density. In 1992. the prolific hybrid exhibited lodging levels as high as 40 to 50 percent at 32,000 plants per acre.

Randomized testing

The experiments were arranged in a randomized complete-block design with four replications. Treatments were arranged in split-split plots with hybrids as main plots, N fertility rates as subplots, and plant density as sub-subplots. Nitrogen applications of UAN (28%) were split with 50 lbs/A banded shortly after planting. Balance was applied by surface dribbling when plots reached the six-leaf stage.

Field plots at Hoytville were established no-till on a poorly drained but tiled Hoytville silty clay. At South Charleston, fall moldboard plowed plots were located on somewhat poorly drained Crosby silt loam and on Kokomo silty clay loam soil types with tile improvement.

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