Evaluation of Narrow-Row Forage Maize in Field-Scale Studies

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Introduction Some dairy producers in the north-eastern USA adopted narrow row (0.38 m) maize forage production in the mid-1990s because of its 5% dry matter (DM) yield advantage (Cox *et al*., 1998). These dairy producers, however, continued to plant forage maize at high plant densities (125,000 plants/ha) under high N fertility (225 kg N/ha), despite research that indicated that forage maize had optimum DM yields and forage quality when planted at the recommended 100,000 plants/ha under 175 kg/ha of N fertility (Cox & Cherney, 2001). We evaluated forage maize at 0.38 and 0.76 m (conventional) row spacing under recommended vs. high plant densities and N fertility on a large dairy farm in New York. The objective of the study was to demonstrate to dairy producers that narrow-row forage maize does not require high plant densities and N fertility for optimum DM yield and forage quality.

Materials and methods We formed a farmer-researcher partnership to conduct field-scale studies (5-10 ha) on a large dairy farm with field-scale narrow-row equipment. We evaluated first, second, and third-year forage maize at recommended vs. high plant densities and N fertility for three years for a total of nine comparisons. The work crew on the farm performed all field operations, including applications of dairy manure, tillage, planting, spraying and harvesting. We sampled for soil NO_3-N and plant N concentrations at the 6th leaf stage (V6), silking and at harvest. We also measured neutral detergent fibre (NDF), NDF digestibility and *in vitro* true digestibility (IVTD) at harvest. Years were considered random and year in rotation and row spacing were fixed in a combined analysis of variance (ANOVA). A mixed model was used to analyse the data using PROC MIXED (SAS Inst., 1999). Mean separations were conducted using Fisher's Protected LSD (P= 0.05).

Results When averaged across years and rotations, narrow-row maize at high vs. recommended plant densities and N fertility had greater soil NO_3-N concentrations at planting (Table 1). All treatments, however, had similar soil NO_3-N and whole plant NO_3-N concentrations at the V6 stage, ear-leaf N concentrations at silking, plant N concentrations at harvest and DM yields at harvest (Table 1). Also, NDF, NDF digestibility, and IVTD did not differ significantly between narrow-row maize at high vs. recommended plant densities and N fertility (data not shown). Narrow-row maize at high vs. recommended N fertility, however, had more than twice the residual soil NO_3-N concentrations at harvest (Table 1). The doubling of residual soil NO_3-N concentrations and the non-significant 3.25% DM yield advantage of narrow-row maize at high N fertility demonstrated to dairy producers that narrow-row forage maize did not benefit from high vs. recommended plant densities and N fertility.

Table 1 Soil NO_3-N, plant N, and DM yields of forage maize when averaged across rotations and years

	Soil NO_3-N			Plant N			DM yield
Row Spacing	Planting	V6	Harvest	V6	Silking	Harvest	
	----------mg/kg----------			----------g/kg----------			t/ha
0.76 m	21	54	11	42.1	26.0	10.5	17.6
0.38 m	27	49	10	41.7	25.8	10.6	18.3
0.38 m High	37	49	21	41.2	26.2	10.6	18.9
LSD 0.05	10	NS	9	NS	NS	NS	0.7

Conclusions Dairy producers in New York with more than 700 cows are classified as a Concentrated Animal Feeding Operation (CAFO) and must have a Nutrient Management Plan that follows Cornell University guidelines. Based on the results of this study, Cornell maintained guidelines of a 175 kg N/ha limit for forage maize production, regardless of row spacing. The results of this study helped dairy producers in New York with more than 700 cows understand why there is a 175 kg N/ha recommended limit for narrow-row maize production in New York.

References

Cox, W.J, & D.J.R. Cherney (2001). Row spacing, plant density, and nitrogen effects on corn forage. *Agronomy Journal*, 93, 597-602.

Cox, W.J., D.J.R. Cherney & J.J. Hanchar (1998). Row spacing, hybrid, and plant density effects on corn silage yield and quality. *Journal of Production Agriculture*, 11, 128-134.

SAS Institute (1999). SAS User's Guide. Statistics. SAS Institute, Cary, NC.