

# **NEW JERSEY GRAIN AND FORAGE JOURNAL**

*A COMPILATION OF RESEARCH AND  
EXTENSION PROJECTS IN CORN, SOYBEAN, SMALL  
GRAIN AND FORAGE*

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# NEW JERSEY GRAIN AND FORAGE JOURNAL - 1999

## PREFACE

This is the sixth edition of the New Jersey Grain and Forage Journal, an annual journal highlighting research and extension projects in field crops. Traditionally the publication has presented work conducted in New Jersey. This year articles from Delaware and Pennsylvania are included as a result of collaborative efforts by field and forage crop agents, specialists and researchers from the Mid-Atlantic region.

Grain and forage production represents the largest agricultural acreage in the Mid-Atlantic States, adding significantly to and supporting related industries. Not only does this support the local and regional economy, but also provides the benefits of open space to the residents of the region.

We would like to acknowledge and thank the New Jersey Soybean Board and Grain and Forage Producers' Association for their financial support. The Soybean Board allocates soybean checkoff funds for research and promotional activities that benefit the soybean industry. The Grain and Forage Producers' Association promotes research, marketing, legislation and education related to the grain and forage industry.

We hope that these results will be helpful to you as you plant and produce crops in the 2000 growing season and beyond. Your suggestions for research and educational projects are always welcome, as it is our desire to develop programs that serve you most important needs.

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## TABLE OF CONTENTS

### MULTI-YEAR RESEARCH PROJECT RESULTS

<b>Evaluation of Spring Malting Barley Production</b> .....	<b>p. 1-5</b>
W. J. Bamka	
Summary p. 1-2	
Research Paper p. 3-5	
<b>Crop Safety of Foliar Applied Potassium Fertilizers on Soybean</b> .....	<b>p. 6-11</b>
J. R. Heckman, W. L. Anastasia and D. Haines	
Summary p. 6-8	
Research Paper p. 9-11	
<b>Corn Yield Response to Plant Populations in a High Yield Environment</b> .....	<b>p. 12-15</b>
A. Shoener and G. W. Roth	
<b>Roundup Ready® and Traditional Soybean Variety Performance Trials in Delaware</b> . . . .	<b>p. 16-42</b>
B. Uniatowski, R. W. Taylor and R. P. Mulrooney	

### SINGLE-YEAR RESEARCH AND DEMONSTRATIONS

<b>Survey Results Imply Improper Soil pH and Liming Material Management</b> .....	<b>p. 43-44</b>
D. Kluchinski and J. R. Heckman	
<b>Analysis of Soil Variability in Four Southern New Jersey Corn Fields</b> .....	<b>p. 45-49</b>
J. Ingerson-Mahar, D. Lee and M. Huffaker	
<b>Comparison of Fall and Spring Bait Trapping of Wireworms in New Jersey Corn Fields</b> .	<b>p. 50-52</b>
J. Ingerson-Mahar, D. Lee and M. Huffaker	
<b>Analysis of Wireworm Distribution in Two Salem County Corn Fields</b> .....	<b>p. 53-58</b>
J. Ingerson-Mahar, D. Lee and M. Huffaker	
<b>Summary of the 1998 Field Scouting for the South Jersey Crop Improvement Association</b> .....	<b>p. 59-60</b>
J. Ingerson-Mahar, D. Lee and M. Huffaker	
<b>Performance of Bt Corn Hybrids in Pennsylvania and New Jersey</b> .....	<b>p. 61-64</b>
L. Swartz, E. Chamberlain, D. Voight and G. W. Roth	
<b>Grass Species and Nitrogen Effects on Hay Yields, Quality, and Profitability</b> .....	<b>p. 65-71</b>
J. W. Singer and N. S. Mendoker	

### FIELD OBSERVATIONS

<b>Two-Spotted Spider Mites in Alfalfa</b> .....	<b>p. 72</b>
J. Ingerson-Mahar and D. Lee	

## Corn Yield Response to Plant Population in a High Yield Environment

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<b>Research Question</b>	<p>Under high yield environments, a yield potential of 175 bu/A or more, the response of corn to increased plant populations is uncertain. Grower testimonials suggest that plant populations in southeastern Pennsylvania on excellent soils where drought stress is seldom limiting should be near 30,000 plants per acre to achieve maximum yields. This study was established to measure population response of corn in a high yield environment where water stress was minimal.</p>
<b>Literature Review</b>	<p>Plant population response data from New York (Cox, 1996) and Midwest states (Nafzinger, 1994; Porter et al., 1997) suggests that yields in high yield environments where water is not limiting may increase with increasing plant populations to 30,000 or more plants per acre.</p>
<b>Study Description</b>	<p>During 1996-1998 strip trials were conducted on the Henry Riener farm in Schuylkill County, in southeastern Pennsylvania. These trials consisted of three population treatments replicated twice each year. The trials were conducted adjacent to strips cropped to potatoes that were irrigated when the potatoes began to show the first signs of drought stress. The corn strips were irrigated at the same time as the potatoes. We used a checkbook approach to estimate water usage of the corn crop and found that the irrigation met or exceeded the needs of the corn during these three years. Irrigation, hybrids, and planting dates are listed in Table 1.</p> <p>Each plot consisted of four rows approximately 1000 feet long. The plots were planted in mid-May each year and harvested with a combine and weigh wagon in the fall. Soil P and K levels for this field were in the high range. Fertilizer and pesticide applications were similar each year. At planting an 8-32-16 starter fertilizer was applied at 100 pounds per acre. After planting, 134 pounds of N was</p>

applied as a UAN herbicide carrier. The field was also sidedressed with 92 lb/A N as urea, for a total seasonal N application of 234 lb/A N (approximately 1.1 lb of N/bu for a 210 bu/A yield goal). A Bicep/Prowl herbicide program was used for weed control and the field also received 5 lb/A of Counter and 4 oz./A of Pounce at planting. Grain moisture was determined at harvest.

Table 1. Hybrids, planting dates and April to September precipitation for the population trials.

Year	Brand	Hybrid	Planting Date	Precipitation +Irrigation (inches)*
1996	Dekalb	623	May 17	23.8
1997	Dekalb	618	May 12	26.0
1998	Dekalb	595Bt	May 16	27.7

\*April 1 to September 30, 1998.

### Applied Questions

*How did the corn yield respond to increased plant populations?*

The response to plant population varied with the year (Table 2). In 1996, the combination of a cool year and a hybrid with only average resistance to stalk rot contributed to lodging. This limited the response to the highest plant population as some of the down corn could not be harvested. In 1997, we switched hybrids to Dekalb 618, which had a higher rating for stalk rot resistance and found a significant yield response to the highest plant population. In 1998, yields increased 6 bu/A by increasing the population from 27,000 to 33,000 but this was not statistically significant.

*Was lodging increased with the increased plant populations?*

Lodging increased in two of the three years with increasing plant populations, but once we switched to hybrids with better stalk ratings, they appeared to be able to tolerate the higher populations better and keep lodging to an acceptable level.

*Would increasing plant populations be economical in high yielding environments?*

If we assume a potential yield increase of 7 bu/A from increasing plant populations from 27,000 to 33,000 plants per acre, and the cost of seed is approximately \$1.00/1000 kernels, and corn is \$2.25/bu, then the net benefit of the higher population treatment would be \$9.75/A.

## Recommendations

These results demonstrate that in high yield environments, there may be potential for improving yields by increasing plant populations to 30,000 plants per acre or more, provided hybrids are selected with good stalk rot resistance and lodging ratings. This is consistent with Midwest trials conducted by Nafzinger (1994), who found corn yields maximized at 32,000 plants/A in a high yielding environment (174 bu/A average) and at 29,000 plants/A in a lower yielding environment (154 bu/A). In many northeast environments where yields are consistently lower than these levels, plant populations higher than 25,000 plants/A may not be justified. This study and another, conducted under lower yield potential conditions, will be continued for two years to confirm these recommendations.

Table 2. Corn grain yield, moisture, and lodging at three plant populations each year at the Riener farm in Schuylkill County, PA.

Year	Population # plants/A	Yield <sup>1</sup> bu/A	Moisture %	Lodging %
1996	23609	209	25.1	4.6
1996	26060	213	26.8	11.3
1996	31188	203	26.0	22.9
LSD (0.10)		NS	NS	3.4
1997	22622	209	27.5	0.7
1997	27309	212	29.2	0.5
1997	33040	220	27.7	2.0
LSD (0.10)		4	0.4	0.5
1998	23116	201	21.0	0.7
1998	27182	221	21.2	0.2
1998	32816	227	21.1	0.0
LSD (0.10)		18	NS	NS
Average for	23116	206	24.5	2.0
1996-98	26850	215	25.7	4.0
	32348	217	24.9	8.3

<sup>1</sup>Yields at 15.5% moisture.

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