Mid-Atlantic Grain and Forage Journal

*(formerly **New Jersey Grain and Forage Journal**)*

A Compilation of Research and Extension Projects on Corn, Soybean, Small Grain and Forage Production

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PREFACE

Mid-Atlantic Grain and Forage Journal

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This is the seventh edition of the *Journal*, formerly named the *New Jersey Grain and Forage Journal*. Traditionally the publication has presented work conducted in New Jersey by Rutgers Cooperative Extension faculty and staff. The name change reflects the fact that submissions to this journal have continued to come from researchers and Extension workers from the Mid-Atlantic region. Articles from New Jersey, Delaware and Maryland are included in this issue.

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. Unfortunately at the same time, dollars to support personnel conducting field and forage crop research and extension efforts for this sector of the agricultural economy are declining. It is my hope that this and other collaborative efforts by field and forage crop agents, specialists and researchers from land-grant colleges and universities in the region will assist in information sharing across state borders.

I 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 check off 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. In addition I would like to thank the following people who joined me as reviewers for this edition: Richard Taylor, University of Delaware, Robert Kratochvil, University of Maryland, and Greg Roth, Penn State University. Lastly, thank you to the Cook College Computing Services Office for their assistance in publishing this web-based journal.

I hope that these results will be of interest and use to you. Our goal is to provide information to farmers, industry personnel and Cooperative Extension faculty and staff. Your suggestions for research and educational projects are always welcome, as it is our desire to develop programs that serve your most important needs.

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Research Question

A drawback to organic grain production is the requirement for continual tillage and cultivation for weed control. Many farmers have spent decades utilizing and perfecting soil conservation practices such as no-tillage to protect soil from erosion and organic matter losses. It would be commendable to produce organic no-till grain crops utilizing cropping sequences and cover crop options that will continue past conservation efforts and advancements. Another difficulty with organic grain production is meeting the high nitrogen requirements for cereal grain crops with organic fertilizer sources, which are typically higher in phosphorus and potassium. An organic no-till grain rotation must include leguminous grain and cover crops to provide nitrogen via *Bradyrhizobia* N-fixation. Legume utilization may reduce over application of organic fertilizer amendments in order to achieve sufficient nitrogen amounts, and also eliminate the subsequent soil phosphorus loading.

This study was implemented to examine the feasibility of an organic no-till grain rotation, where the successive grain crops barley, soybeans, corn and sorghum are intercropped with the cover crops cereal rye, and Austrian winter peas. The grain crops must remain competitive with weeds, while yielding economically. A goal would be for the grains and cover crops in rotation to behave as aggressively as a perennial sod towards weed intrusion.

Literature Summary

Many researchers have stated that current no-till planter technology allows precise seed placement through heavy cover crops and residue. Heavy cover crops or residues may delay weed emergence thus allowing the successive crop no-tilled into a heavy covers or residue to have a competitive advantage. The no-till grain and cover crops in an organic rotation should have certain natural seasonal advantages and disadvantages to allow a fluid rotation; whereby, planting occurs into a maturing or senescing crop. Cover crop systems and grain rotations have been thoroughly researched with herbicide and tillage utilization. For organic production a cropping system needs to be developed where herbicides are replaced by natural or mechanically induced senescence, and tillage is replaced with competitive crop advantages.

Study Description

This on-farm study was conducted in 2000 at the Horizon Organic Dairy/ Naval Academy Facility, in Gambrills, Maryland, which has utilized no-till and reduced tillage crop production techniques since 1969. The Naval Academy Dairy discontinued all tillage production practices from 1991 until its closure as a dairy in 1997 on 860 acres, namely due to advances in no-tillage planter technology. The managers of the Horizon Corporation were interested in the development of organic no-till grain rotations to continue the historical conservation efforts made at the facility.

In the summer of 1999, soybeans were no-till planted into barley stubble. In mid-November following the soybean harvest, rye was drilled into the beans stubble to provide winter cover, also volunteer barley was present. This field was flagged for six treatments and four replications. The treatment plots dimensions were 20 feet by 50 feet. The soil was a Butlertown silt loam with optimum levels of phosphorus and potassium and pH of 6.8.

The six treatments consisted of cover rye or cover rye with Austrian winter peas followed by sorghum, corn, or corn with flamed rows as follows:

Treatment 1: Cover rye/sorghum
Treatment 2: Cover rye/corn
Treatment 3: Cover rye/flame corn
Treatment 4: Cover rye with peas/sorghum
Treatment 5: Cover rye with peas/corn
Treatment 6: Cover rye with peas/flame corn

Austrian winter peas were planted on March 4, 2000 at a 75 lb/A seeding rate in 7.5 inch rows with a John Deere 750 no-till grain drill into the rye cover followed by sorghum, corn, or corn with flamed rows. The corn (Pioneer Brand 3394) was no-till planted on May 3, 2000 in 36-inch rows at a population of 28,500 seeds per acre, and an over-the-row flaming was made immediately after planting in the corn/flame plots. The grain sorghum (Southern States Brand SS160) was planted on May 24, 2000 at a 48 lb/A seeding rate in 7.5 inch rows with a 750 John Deere no-till grain drill.

After the harvest in all six treatments, barley (Southern States Variety Barsoy) was no-till drilled on October 4, 2000 at a 125 lb/A seeding rate in 7.5 inch rows with a 750 John Deere no-till grain drill. In the 2001 crop year soybeans will follow the barley, thus in this crop rotation three grain crops are harvested in two years as corn or sorghum followed by barley and soybeans. During the two years there are two legume crops, namely soybeans and field peas. Additional nutrient requirements will be added in March 2001 to the barley prior to stem elongation with an application of poultry litter.

Applied Questions

Will weeds be adequately controlled in an organic no-till grain rotation?

The weeds rated were summer annual species co-emerging with the corn and included pigweed, lambsquarter, crabgrass, and foxtails. As shown in Figure 1 the weed control for the corn plots was significantly better for the corn planted without the peas. The flame treatment over the planted corn row increased the level of weed control, but not significantly. The resulting percent weed control was 68.8, 78.8, 43.8, and 50.0 for the corn, flame/corn, peas/corn, and peas/flame/corn, respectively. Based on these preliminary findings the weed control for the corn plots without peas was adequate. It was apparent that the peas were competitive with the corn during early corn emergence.

Based upon these preliminary findings shown in Figure 2, weed control for the sorghum plots was excellent and essentially was equal whether planted into the rye cover or the pea/rye cover, with 95 and 97.5 percent weed control, respectively. Perennial weeds may encroach in a field obligating a tillage event for profitability. In order to control perennial weeds within this rotation, one might disk in the spring prior to establishing a pea cover-crop. Oats may be planted as a spring cover to replace the rye cover-crop option when tillage for weed control is required.

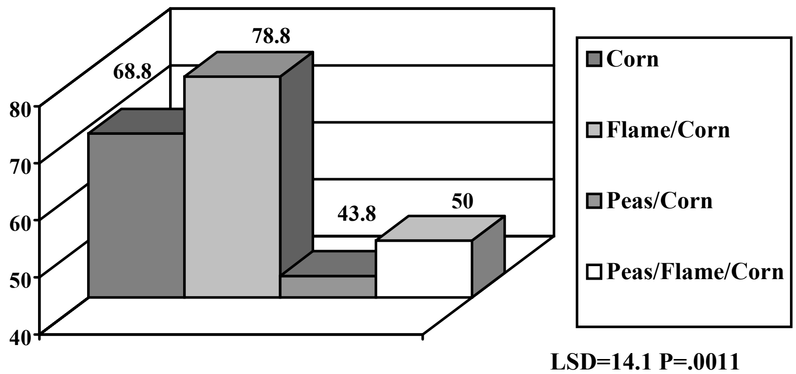

Figure 1. Percent weed control in corn, September 28, 2000

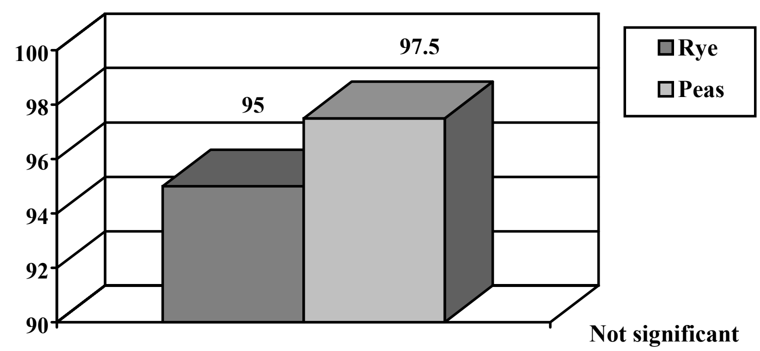

Figure 2. Percent weed control in sorghum, October 4, 2000

Were corn harvest populations affected by the weed control treatments?

The harvest corn populations shown in Figure 3 were not significantly different for the corn and corn/flame treatments at 16,638, and 18,016

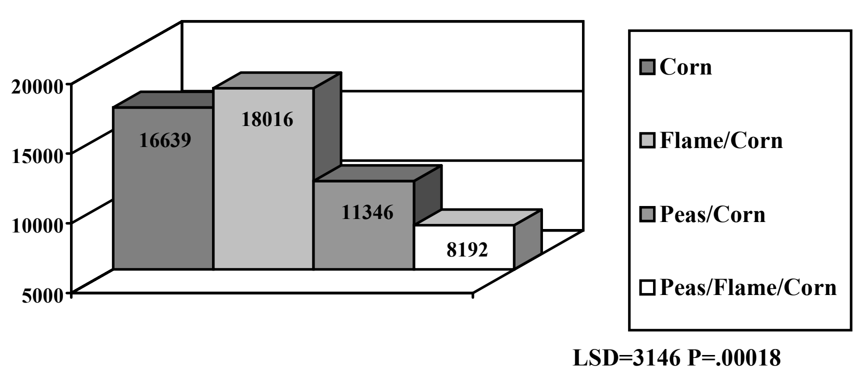

Figure 3. At harvest corn plant populations, September 28, 2000

plants/A, respectively. However, there was a significant drop in the corn harvest populations for the plots planted in peas and a further significant drop for the peas/flame/corn plots of 11,346, and 8,192 plants/A, respectively. This dramatic difference in corn populations in this study reveals the impact and variability of production without seed insecticide and fungicide treatments as well as the competitive effects of cover-crops that are not senescing at crop emergence.

Will lower organic grain yields anticipated in a no-till organic grain system be counterbalanced by higher market prices?

The grain market price quotes for September 19, 2000, revealed in Table 1, indicates the organic grain price advantage from area organic grain brokerages over the Chicago Board of Trade (CBOT) commodity quotes. It is also important to bear in mind that farmers also receive the Loan Deficiency Payments (LDP’s), which has substantially supported the recent low commodity prices.

Table 1. Grain market price quotes, September 19, 2000

Market	Organic Unlimited	McGreary Grain	CBOT
Production System	organic	organic	conventional
Corn #2 ($/bu)	5.18	4.30	1.80
Soybeans #2 ($/bu)	---	8.80	4.58
Wheat #2 SRW ($/bu)	5.40	4.40	2.05
Barley #3 ($/bu)	3.84	3.30	1.45
Sorghum ($/bu)	---	---	3.70
Soymeal 48% ($/ton)	415.00	---	203.00

How where yields affected by the weed control treatments?

The 2000 corn yields are shown in Figure 4. The significantly highest average no-till organic corn yield was 63.4 bushels/A for the treatment planted into the rye cover. There was no corn yield advantage from peas or the flaming over the planted row.

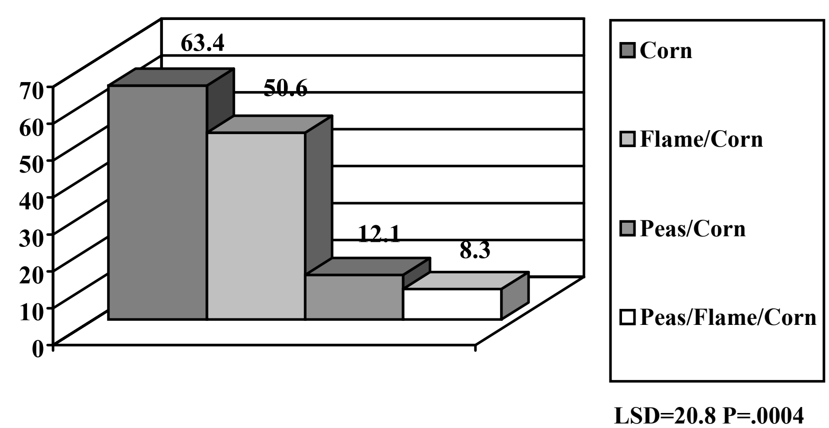

Figure 4. Corn yield (bu/A), September 2, 2000

Upon examination of the economic incentive for organic corn production, it was found that the organic no-till corn at $4.30/bushel multiplied by 63.4 bushels/A equals $272.62/A gross income. Whereas, for a comparable non-organic Maryland state average corn yield of 125 bushels/A multiplied by $1.80/bushel a $270.00/A gross income was discovered.

The 2000 grain sorghum yields are shown in Figure 5. The significantly highest average sorghum yield was 65.1 bushels/A planted into the peas. Examining the economic incentive for organic production of grain sorghum is speculative because there was no available organic price quotes. If the organic grain sorghum value were set at twice the Chicago Board of Trade (CBOT) of $3.70/bushel, then the value of the organic sorghum would be $7.40/bushel multiplied by 65.1 bushel for a gross income/A of $481.00. The average grain sorghum yields in Maryland of 110 bushel/A multiplied by $3.70/bushel equals $407.00/A gross income. In this first year, the grain sorghum appears to have the advantage over the corn in yield consistency and stability, as well as economic return potential.

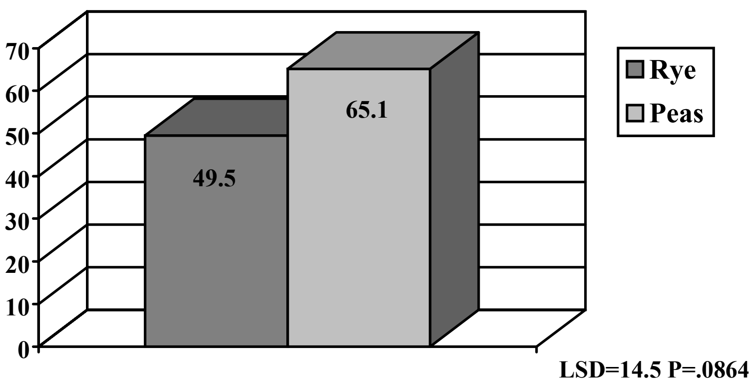

Figure 5. Grain sorghum yield (bu/A), October 4, 2000

Anticipated yields for the barley and soybeans in 2001 may be best estimated at half of the state conventional averages, and would be 45 bushels and 20 bushels, respectively. Given the current market advantage for organic commodities, and the achieved yields there appears to be merit in an organic no-till grain production system thus far.

Recommendations

In order to implement an organic no-till cropping rotation the following guidelines may be helpful in a successful start:

1. First start the rotation with weed free fields, especially of perennial weeds.
2. Have target-planting dates in mind and then plant timely and with precise seed placement.
3. Anticipate 25-30% stand mortality due to seedling decay and insect damage, therefore, increase seeding rates accordingly.
4. Keep the soil disturbance to a minimum, and covered at all times if possible. If tillage becomes necessary, do so in the late fall or early spring when the growth of weeds may be kept to a minimum.

5. Apply manure and organic fertilizers after the establishment of the crop, to minimize nitrogen losses, and enhance the availability of nutrients during the grain fill period. This will also reduce weed competitiveness.

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