

NUTRIENT MANAGEMENT FOLLOWING THE 2000 PIK PROGRAM

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INTRODUCTION

Following the 2000 Payment-In-Kind sugar beet program, questions were raised concerning nutrient management. It was not clear if sugar beets left in the field would tie up nutrients in the spring or release nitrogen during late summer, compared to conventional management practices. An Integrated Pest Management grant totaling \$2,238 was secured last spring to soil and tissue sample various crops and evaluate nutrient differences on fields that had both PIK and non-PIK residues.

METHODS

Fields that had acres involved in the 2000 PIK program, and had acres that were harvested, were chosen to sample. Since each field was split into PIK and non-PIK, this allowed a comparison between the two treatments under the same management conditions. Five fields were selected for sampling, including Harrington malt barley, Galena malt barley, soft white spring wheat, Durum wheat, and potato. Representative soil samples, 12-18 inches deep, were taken approximately every two weeks from May to August in grain crops, and from May to early-September in the potato crop. A whole plant sample and a flag leaf sample were taken and analyzed for total nitrogen in the grain fields, except for the Galena malt barley. Four petiole samples were taken in the potatoes from early-July to late August.

In addition, insect and disease symptoms were scouted in each field to see if there were any differences between PIK and non-PIK acres. Observations were made during each tissue sampling allowing for a representative sample over a larger area.

1. Malt Barley

Variety: Harrington
Planted: Non-PIK April 5, 2001, PIK April 7, 2001
Field prep: Disked in fall (no Roundup), plowed in spring. Non-PIK was roller harrowed once and planted, PIK was roller harrowed twice and planted.
Fertilizer: 100 units nitrogen on PIK and non-PIK ground.
Other: Non-PIK yielded 30 tons per acre last fall. Barley on PIK side emerged quicker than non-PIK side, possibly due to better seed contact.

2. Malt Barley

Variety: Galena
Planted: March 22, 2001

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- Field prep: Plowed, roller harrowed, and planted.
 Fertilizer: None
 Other: Entire field (PIK and non-PIK) was grazed in fall. No beets are visible on PIK side.
3. Durum Wheat
 Planted: March 19, 2001
 Field prep: Disked, roller-harrowed, and planted
 Fertilizer: March 28 - 95 units of nitrogen and 100 units of phosphorus; early June - 30 units of nitrogen.
 Other: Uniform field. Cattle grazed entire field (PIK and non-PIK) in fall but beets still visible on surface.
4. Soft White Spring Wheat
 Variety: Penawawa
 Planted: April 10, 2001
 Field prep: Disked once on non-PIK, disked twice on PIK, roller-harrowed, planted.
 Fertilizer: April 4 - 150 units of nitrogen (46-0-0).
 Other: Field is not uniform (high and low areas). Beets were harvested on the north 30 acres (non-PIK). The remainder of the field was sampled for the PIK ground due to the variability of the soil.
5. Potatoes
 Variety: Russet Burbank
 Planted: May 8, 2001
 Field prep: Fall - disked, ripped, chisel plow, disked, marked out.
 Fertilizer: Additional through the water.
 Other: PIK beets were located on east side of pivot. An equal area on the west side of the pivot was sampled for the non-PIK. The soil is similar and there was less variability than sampling the whole field.

RESULTS

pH, Salts, Organic Matter

Salts and pH did not show a consistent pattern throughout the season on any of the fields. Soil samples in August indicated that pH was somewhat higher on the non-PIK ground of the Durum wheat. The potato field pH was somewhat higher on the PIK ground compared to the non-PIK ground from early-July though early-September. However, pH often did not vary more than 0.2 between the two treatments.

Salt reading fluctuated on all the fields over the course of the season. It was not uncommon to see salt readings higher on the PIK ground at one sampling date, then higher on the non-PIK ground at the next. However, throughout the season the salt readings did not vary more than 0.6 mmhos/cm between the PIK and non-PIK ground across all fields.

The organic matter was slightly higher on the PIK portion of the Galena and Harrington malt barley fields, over all sampling dates. However, this may have been due to sampling location rather than sugar beet residue. The non-PIK ground was almost 1% higher compared to the PIK ground for the last sampling date on the Durum wheat. This may

have been a result of tillage on a portion of the PIK ground during the last sampling date. Since some of soil on the PIK ground was mixed, and very little of the non-PIK was tilled, this may account for the wide variability. Typically, all other samples did not vary more than 0.25%, with the PIK ground having higher organic matter in the Harrington malt barley, Galena malt barley, and Durum wheat fields. The non-PIK ground had higher organic matter on the other fields.

Organic Nitrogen and Nitrate Nitrogen

Organic nitrogen did not vary more than 5 lb/A at any sampling date. The PIK ground had consistently higher organic nitrogen in the Harrington malt barley field. However, there was essentially no difference between the two treatments on the other fields.

Nitrate nitrogen in the Galena malt barley field was consistently higher on the PIK ground throughout most of the season. Nitrate-N on the PIK ground was also higher in the soft white spring wheat field, but the difference was no more than 5 ppm. On the potato field, nitrate-N was consistently higher on the non-PIK ground with the greatest range being 15 ppm on July 18. All other fields showed no consistent pattern, with the treatments not varying more than 10 ppm.

There was one exception, however. On June 8, nitrate-N on the non-PIK ground in the Durum wheat was approximately 25 ppm higher than the PIK ground due to the application of 30 units of nitrogen to boost protein.

Phosphorus and Potassium

Although phosphorus in the Harrington malt barley field was higher on the PIK ground throughout most of the season, in the Galena malt barley and soft white spring wheat fields, the non-PIK ground was higher in phosphorus. Some samples in the soft white spring wheat showed differences of almost 10 ppm. All other fields showed no consistent pattern in phosphorus difference between PIK and non-PIK ground.

Potassium showed the greatest nutrient difference between the treatments. In Harrington malt barley, Galena malt barley, and Durum wheat fields, the PIK ground had higher potassium levels than the non-PIK ground, with the Harrington malt barley field showing the greatest difference at 150 ppm on May 24. The non-PIK ground had higher potassium readings compared to the PIK ground in the soft white spring wheat and potato fields. However, they typically did not vary more than 25 to 50 ppm.

Tissue analysis

Whole plant total-nitrogen was sampled on all the grain crops at the end of May. Total-N in the PIK ground edged out the non-PIK ground in the soft white spring wheat and Durum wheat fields. But total-N in the non-PIK ground was greater than the PIK ground on the two malt barley fields, with the greatest difference (0.5%) on the Galena malt barley.

Flag leaf analysis for total-nitrogen was sampled early- to mid-June on the Harrington malt barley, soft white spring wheat, and Durum wheat. The Galena malt barley was not sampled. The total-N varied only 0.3% between the PIK and non-PIK ground, with the PIK having higher total-N in the Harrington malt barley and Durum wheat fields and non-PIK having higher total-N on the soft white spring wheat field.

Potato petiole samples were taken four times. With the exception of July 18, nitrate-N was greater on the PIK ground compared to the non-PIK. The samples on July 3 and August 23 had the greatest range at approximately 5000 ppm.

CONCLUSIONS

There was a concern in the spring of 2001 that fields involved in the 2000 Payment-In-Kind program might have nutrient tie up in the spring and a significant release of nitrogen in August. It appears that those sugar beets left in the field did not significantly impact the nutrient levels as first predicted. Salts, pH, and organic matter stayed relatively level between the PIK and non-PIK ground across all fields. Organic nitrogen, nitrate nitrogen, phosphorus, and potassium showed no clear pattern or major difference between the PIK and non-PIK ground. However, there were some clear differences between the PIK and non-PIK ground for certain samples in certain fields. With that said, looking at all fields collectively there appears to be no more difference between the PIK and non-PIK ground than what would be considered normal variation in the field under standard management practices.

A question that has been raised during the course of this observational study is whether or not the results of the soil samples can be correlated to nutrient availability? Early observations in late-May to early-June indicated that nutrients may not have been as readily available in the Harrington and Galena malt barley because of soil and tissue nutrient test differences between the PIK and non-PIK ground. The results of the total plant sample for the malt barley fields on May 22 showed that total nitrogen in the plant was higher on the non-PIK ground compared to the PIK ground. However, the soil sample taken on the same day showed that organic-N and nitrate-N were higher on the PIK ground than on the non-PIK. Was nitrogen tied up in the soil and not made available to the plant on the PIK acres?

It is important to keep in mind that a soil sample only measures nutrient levels in the soil at that point in time, not what is available to the plant.

Sample results in the Durum wheat indicated that there was essentially no nutrient difference in the soil or tissue samples between the PIK and non-PIK ground. But differences in foliage color were still observed with the PIK ground appearing stressed for nitrogen. Color differences were not observed in the malt barley; therefore, it is unclear what was happening in the crops.

Disease and insect pressure did not appear to be impacted by the PIK program. Cereal leaf beetle was observed on the Durum wheat field but no difference between the PIK and non-PIK ground was observed. No insect or disease symptoms were observed in the potato or malt barley fields.

Although the excess sugar beets from the PIK program did not appear to harm the various crops due to late season nitrogen release, producers are still encouraged to destroy the crop as completely as possible in the fall. Pungent smell, difficulty making furrows, and sugar beet root maggots were common problems last spring. Fields that were destroyed in the fall, either through disking or feeding, had fewer management problems and frustrations.