

Phosphorus Starter Project – Results of the 2002 Growing Season

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2002 Participating Producers:

Hendee Homestead Farm (Hornell), Gary Tiernan (Waddington), Tim and Mark Heiden (Madrid), Kevin McCollum (Canton), Bill Kilcer (Genoa), Steve Nemecek (New Hope), Mike McMahon (Homer), Maurice Stoughton (Newark Valley), Gary Gaige (Mecklenburg), Dudley French (Chemung), Rob Williams (Waterville), Gary Teel (W. Barneveld), Tom Moskin (Ava), Glenn and Larry Taylor (Cassville), Ralph Lott (Seneca Falls).

2002 Participating CCE Educators:

Pete Barney (St. Lawrence Co.), Shawn Bossard (Cayuga Co.), Janice Degni (CCTTS Area Extension

Specialist), Mike Dennis (formerly Oneida Co., currently Seneca Co.), Jeff Miller (Oneida Co.), Carl Albers (Steuben Co.), Mike Stanyard (North West New York Dairy, Livestock and Field Crops Team).

Other 2002 Participants:

Elaine Dalrymple (Schuyler Co. SWCD), Ev Thomas (Miner Institute), Ron Stutzman (Stutzman's Research Farm), Dr. Greg Roth (Penn State), Dr. Adam Khan (Morrisville Technical College).

2002 Sponsors:

NE SARE (project funding), Carovail (fertilizer) and Pioneer Hi-Bred International Inc. (seed).

Background and Summary of 2000 and 2001 Results

The NY starter phosphorus (P) project was initiated in 2000 to evaluate and demonstrate the value of P starter applications for corn on soils testing high or very high in P. With support from USDA-NRCS and a fertilizer donation from Agway, ten on-farm demonstration trials were established that year on soils ranging in soil test P (STP) levels from 14-118 lbs P/acre (Cornell soil test). Trials were conducted in Cayuga, Delaware, Clinton, Herkimer, Otsego, Schuyler, and Tioga counties. Cornell recommendations for P₂O₅ use on each of these sites amounted to 20 lbs/acre or less. At each location two P application rates were tested: 200 lbs 10-0-10 (without P) and 200 lbs 10-10-10 (with P). The results of these trials showed that on average no yield increase was obtained by adding starter P in a 2" by 2" band to soil testing high to very high in P, even in a cool spring (see What's Cropping Up? 2001, Volume 11, no 3). There was some variation in the data but the number of trials was not large enough to assess whether planting date, recent manure applications and/or soil type (slowly warming clay versus quickly warming sandy soils) could have made any difference.

In 2001, we expanded the number of treatments per farm to four (no starter, no P in the starter, 10-25 lbs of P₂O₅ in the starter and >25 lbs P₂O₅) and increased the number of on-farm trials to 27. Trials were conducted in Cayuga, Chemung, Chenango, Cortland, Delaware, Herkimer, Oneida, Otsego, Saratoga, Schuyler, St. Lawrence, and Tioga counties. In addition, replicated trials were conducted at Cornell experimental stations in Batavia, Aurora and Willsboro. The treatments at the experimental stations were: 200 lbs/acre of 10-0-10 (no P₂O₅), 200 lbs of 10-10-10 (20 lbs P₂O₅), and 200 lbs of 10-20-10 (40 lbs P₂O₅). At field days, participants agreed that it was visually impossible to differentiate the treatments. Yields showed a response to N+K in the on-farm trials but no significant response to P application on soils testing high or very high in P in either the on-farm or the experimental station trials. See What's Cropping Up? 12(2): 4-5 for a summary of the results of the 2001.

2002 Results of Replicated Research Trials (experimental stations)

In 2002, NE SARE funding and a fertilizer donation by Carovail allowed us to expand our efforts. Trials were established in four replicates at the Mt Pleasant Farm (Mardin), the Willsboro Research Farm (Cosad), Ralph Lott's Farm (Empire Farm Days, Schoharie), the Musgrave Farm at Aurora (Kendaia), Morrisville Technical College (Palmyra), and Stutzman's Research Farm (Scio). The latter was a joint project with Penn State and included two additional treatments; an ammonium sulfate starter and a higher P application (213 lbs of 10-30-10). The results of these trials, corrected for actual soil test P level, are shown in Table 1.

Mt Pleasant, the Empire Farm Days site and Aurora were severely impacted by drought during the 2002 growing season. This drought may explain the lack of a response at Mt Pleasant where the soil tested medium in P and a response was expected at the 40 lbs P₂O₅ rate. Despite an apparent increase in *silage* yield upon the addition of 40 lbs of P₂O₅ at the Stutzman's field site, variability in yield between replicates with the same treatment was too large to conclude that the differences were due to fertilizer treatment. This was most likely caused by a comparatively small harvest area (2 rows of 17 feet versus 3-4 rows of 40 feet for the other sites). Conversely, phosphorus additions of 20 or 40 lbs/acre did not increase *grain* yields at the Stutzman's site where harvest areas were much larger. The average grain yields after the application of 213 lbs of 10-30-10 was 164.9 bu/acre (compare to 162.0 without the addition of P) and the ammonium sulfate application resulted in 173.8 bu/acre. These results were not statistically different from yields obtained with any of the other fertilizer blends, confirming that P addition at this high testing site was not needed for optimum economic yield. Morrisville was the only location where a significant fertilizer effect on silage yield was seen. Inexplicably, the no starter treatment yielded more than any of the fertilized plots hence the fertilizer effect was negative.

Table 1: Results of the 2002 starter P research trials conducted in New York*.

Location	Soil test P Morgan (lbs/acre)**	No starter	200 lbs 10-0-10	200 lbs 10-10-10	200 lbs 10-20-10	Fertilizer Effect?
-----Silage Harvest (tons/acre 35% dry matter)-----						
Mt Pleasant	5 (40)	12.8	11.9	13.3	12.3	No
Empire Farm Days	9 (20)	8.5	8.3	8.6	8.7	No
Aurora	10 (20)	10.0	9.1	10.2	9.3	No
Willsboro	17 (20)	15.9	16.5	16.4	16.4	No
Stutzman's	21 (10)	20.8	22.9	21.8	26.0	No
Morrisville	101 (0)	19.5 A	15.7 B	17.0 B	16.4 B	Yes (-)
Average	27 (10)	14.8	13.9	14.7	14.4	No
-----Grain Harvest (bu/acre 15% moisture)-----						
Mt Pleasant	5 (40)	81.3	79.1	96.9	93.5	No
Empire Farm Days	9 (20)	65.4	63.0	64.9	60.2	No
Aurora	10 (20)	59.2	51.0	51.0	51.8	No
Willsboro	17 (20)	113.8	129.2	129.9	140.1	No
Stutzman's	21 (10)	157.7	162.0	169.4	163.6	No
Morrisville	101 (0)	168.7	174.9	176.8	173.5	No
Average	27 (10)	108.0	109.7	114.2	114.6	No

* trials were planted between May 11 and June 4, 2002.

** in between parentheses is the optimum economic P₂O₅ recommendation according to Cornell University.

2002 On-farm Demonstration Trials

The wet and cold spring reduced the number of on-farm trials from 27 in 2001 to 16 trials in 2002. However, trials were conducted in two to three replicates per treatment versus single replications in 2000 and 2001. Thus, a more robust dataset was obtained. The 16 trials were conducted by 9 cooperators and producers in St. Lawrence, Essex, Steuben, Cayuga, Tioga, Cortland, Chemung, Schuyler, and Oneida counties. The trials were conducted on soils ranging in soil test P from 6 (medium) to 68 lbs P/acre (very high). Soils in 3 trials fell in the medium range (4-8 lbs P/acre) with recommendations varying from 25-35 lbs P₂O₅/acre; 9 trials were conducted on soils testing high in P (9-39 lbs P/acre) with recommendations of 10-20 lbs P₂O₅/acre; and soils in 4 on-farm trials were in the very high range (≥40 lbs P/acre) where the Cornell recommendation would be to not add any additional P. Of the 16 trials, 10 fields had received manure within the past two years. At 11 locations, N management consisted of starter + sidedress N. At the other five locations, N was applied pre-plant or as starter only. Soils varied in pH, texture, parent material, position on the landscape, etc. Only six trials were planted prior to May 23rd. Four trials did not get planted until June including a trial that was planted on June 30th.

The number of treatments varied among the trials. Most typically they included comparisons of yields obtained without starter fertilizer (10 trials), with starter fertilizer containing no P (16 trials), with starter containing 10-25 lbs of P₂O₅/acre (16 trials), and with starter P application of >25 lbs P₂O₅/acre (8 trials). The latter category consisted of the producer's fertilizer blends and rates and actual rates varied from just over 25 to 104 lbs P₂O₅/acre. At two farms, ammonium sulfate was used for the "without P" treatment.

The wet and cold spring was followed by a severe drought in some parts of NY in 2002, causing large yield differences among counties and farms. Silage yields varied from less than 10 tons/acre to more than 25 tons/acre. The drought did reduce yields but did not change the effects of P starter application. Two trials were harvested for grain corn only, while silage harvests were recorded for all other trials. For trials where no silage was harvested, grain yields were converted to a silage equivalent by assuming that 1 ton of silage equals 5.9 bu/acre of grain. Treatment means for silage yield are given in Table 2.

Table 2: Corn silage yields as affected by use of starter fertilizer. These results are averages of 16 on-farm demonstration trials conducted in 2002 in 9 NY Counties.

Treatment	Corn silage yield (tons/acre 35% dry matter)	Significant? (α=0.05)
No starter	15.7	A
No P in starter	16.2	A
10-25 lbs P ₂ O ₅ in starter	16.5	A
>25 lbs P ₂ O ₅ in starter	16.0	A

The A's for the different treatments in the "significant?" column mean that yields were unaffected by the starter application or composition. Two sites of the ten that had a "no starter comparison" showed clear responses to starter N+K addition. These sites were in Oneida Co. and in St. Lawrence Co. The trial in Oneida Co. was planted on May 23rd. The trial in St Lawrence

Co. was planted on the 28th of May. Fields planted after May 23rd that were recently manured and drought stressed generally showed a less than 1 ton/acre fertilizer effect with the exception of a site in St Lawrence and one in Steuben Co. At the one site where ammonium sulfate application was compared to a no-starter and a 10-0-10 application, results showed that sulfur was not a limiting nutrient. The addition of zinc to the starter on a farm in Schuyler Co. did not affect yields either.

When considering the cost of fertilizer alone, the economic advantage per acre for reducing P₂O₅ may not be substantial. The cost of 200 lbs of 10-0-10 was \$16.50 versus \$18.00 for 200 lbs of 10-10-10 and \$21.00 for 200 lbs of 10-20-10. With the increased attention directed toward non-point sources of P, it makes little sense to use more starter P than is necessary to support optimum yields, especially on fields where significant amounts of manure nutrients are regularly applied.

Conclusions

On average, corn grain and silage yields showed no response to additions of P in starter fertilizer applied to soils falling mostly in the high and very high STP categories. We do recommend the application of N in the starter band, regardless of STP level, especially when planting occurs early in the season on fields without a recent manure history. On sites testing high in P, no yield penalty is expected when P starter levels are *reduced* below 25 lbs P₂O₅/acre. When manure is applied to high testing sites or on sites that test very high in phosphorus, P can be *eliminated* from the starter without a yield penalty. Forage analyses are being conducted and the effects of P addition on forage quality and milk yield will be reported in a future issue of What's Cropping Up?

The NY Starter P Project in 2003

The starter P project will be continued in 2003. We are looking for farmer participation for the on-farm trials. Participation includes the establishment of at least two 4-row and 100 feet long strips of each of the following 4 treatments: 1) no starter; 2) 200 lbs of 10-0-10 (i.e. no P in the starter); 3) 200 lbs 10-10-10; and 4) the producers' own blend and application rate. We will provide the 10-0-10 and 10-10-10 and participating farmers will receive a small financial reimbursement. For more information contact Quirine Ketterings (qmk2@cornell.edu or 607 255 3061) or Karl Czymmek (kjc12@cornell.edu or 607 255 4890).

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