

Project name and contact information

Organic Sweetpotato Fertilizer Trial
Project number FNE07-621
916 River Road Westmoreland, NH 03467
(603) 399-7772 schreierlori@aol.com

Goals

Sweet potatoes are a highly nutritious and marketable storage vegetable with a great marketing potential for New England growers. However, they have not been commonly grown in northern New England, and there is much we don't yet know about sound production practices. On researching the suggested fertilizing practices available from an organic standpoint, we discovered a wide discrepancy- particularly regarding nitrogen application rates. Some sources warned that too much nitrogen for these light feeders would produce excessive vine growth and spindly tubers, recommending less than 50 lbs. N/acre, while other sources advocated up to 140 lbs. N/acre (along with several inches of compost). We began to formulate a potential research project hoping to learn the best methods of organic sweetpotato production.

Our goals included the following:

- to see if sweetpotatoes can be grown successfully without excessive nitrogen inputs;
- to repeat our experiment in a sandy soil and an average loam to see if that would affect the result;
- the effect nitrogen fertilization rate has on marketable yield, tuber quality and sugar content.

Farm Profile

Fertile Fields Farm is a diversified certified organic farm located in Westmoreland, New Hampshire, in the Connecticut River Valley. We started the farm when we bought our property in October 2004. We have level well-drained riverbed soil, 4 greenhouses, 2 beehives, and grow over 50 varieties of vegetables, herbs, flowers and berries. Our property is 3 acres and we are now farming about 1 ¼ acres.

We were certified organic since 2005 by the State of New Hampshire Department of Agriculture, Markets and Food. Our methods to enhance soil fertility and manage weeds and pests include crop rotation, naturally derived soil amendments, cover crops, hand cultivation, composting, minimal tilling and biodynamic practices, such as, planting and harvesting in rhythms with the cycles of nature and applying biodynamic soil preparations.

Participants

Building on sweetpotato research already performed in New Hampshire (see attached copies of Becky Grube's (UNH Cooperative Extension Sustainable Horticultural

Specialist) variety trials comparing yields, brix and flavor) we decided to use only one variety, beauregard, which was shown to produce well commercially among several short season varieties. Becky was very helpful in guiding us to take the next step from her research to our new project and has been connected to our growing experiment along the way. Carl Majewski, the county Agricultural Resources Educator for UNH Cooperative Extension, graciously agreed to be our project advisor. He helped us establish the parameters of our experiment, edit our grant proposal and came to the farm to observe during the growing season and help harvest and measure our crop yields at the end. Becky used her computer skills to perform the final statistical analysis of our results and both Carl and Becky assisted us in the interpretation of the results.

We are grateful to Carl and Becky for all their support on this project. We would also like to thank Jane Carlson and Amber Garrard for help with the project. Thank you to the SARE grant organization for giving us the opportunity to obtain funding to do this research.

Project Activities

Given the variability of our farm's river bottom soil, we were able to create two distinct planting sites with quite different soil types in order to replicate our experiment in both a sandy and more loamy situation. Both sites were composed of six raised beds (50 sq. ft. each) amended with light compost applications of about 10 lbs. N/acre (from compost test) to establish a baseline of fertility. Three different fertilizer rates (0, 60, or 120 pounds of actual N per acre) were then calculated (using soybean meal as our source of nitrogen) each repeated in two of the six beds in both sites.

All of the twelve planting beds were thoroughly warmed, above 65 degrees, in late spring (with the aid of clear plastic) to create a comfortable planting environment for this heat loving crop. Since all our soil is quite well drained, we created a trough for watering down the center of each bed to keep the newly planted slips moist while roots were forming. Given the drier than normal conditions we experienced this year, it helped to plant all our crops that way. Since the one planting site was extremely sandy, we generously mulched the beds to conserve moisture.

Finally, after weeks of attentive watering and careful weeding (17 slips in each bed) the sweetpotato vines began to establish themselves. Our living experiment would now begin to grow at an exponential rate, carpeting the beds and beyond. Even after many months of sprawling vines, the tubers were still confined to the planting beds.

Results

Marketable Yields

These results show that a quality sweetpotato (i.e. in terms of sweetness and marketable size) can be grown without excess fertilizer. Different rates of nitrogen did not produce statistically significant difference in yields, although moisture seemed to be a factor.

An unexpected result was that the heavier loam soil was found to be drier than the sandy soil by harvest time. This seemed to be due to the long duration of the drought, which allowed the sandier hay-mulched beds to ultimately retain a bit more moisture. When the soil went below a critical level of moisture this seemed to decrease the yield somewhat.

The sandier site had more moisture, as it was covered with hay mulch and showed an average yield of 2.33 lbs. per foot/plant. The more loamy soil, which got drier without the hay mulch, had an average yield of 1.5 lbs. per foot/plant. The overall average of unmarketable yields on all plots was about 7%.

Brix Readings (% sucrose)

According to the brix refractometer supplier, “within a given species of plant, the crop with the higher refractive (brix) index will have a higher sugar content, higher mineral content, higher protein content and a greater specific gravity or density. This adds up to a sweeter tasting, more minerally nutritious food with lower nitrate and water content and better storage attributes.”

A brix reading for a sweetpotato is considered poor at 6, average at 8, good at 10 and excellent at 14 and over. For the variety beaugard, a reading of 8 is typical. It is known to be a good commercial growing choice because of its higher marketable yields even though the taste is considered average for sweetness.

The sandy loam had significantly higher brix readings than the sand site, but nitrogen fertilization rate did not appear to have an effect on brix readings. The brix readings for the sandier but moister plots (with the higher yields) ranged from 5.4 - 5.8 before curing and 7.2 - 7.8 after curing (11 days). The drier site, with lower yield, had brix readings in the range of 5.8 - 7 before curing and 8.3 - 9.0 after curing. Therefore, it seems that lower yields equals denser potatoes, higher sugar content and less water weight due to less moisture in the soil.

As an aside, there were extra slips that we planted in extremely sandy and dry soil in another location without any added fertilizer and these turned out to have the lowest yield per foot (1.04 lbs. per foot/plant) but the highest brix readings for sweetness, with a range of 9.2-9.5 after curing. And this during pretty severe drought conditions.

These results, confirm what an Oklahoma Cooperative Extension publication states: that sweetpotatoes grown in a rich heavy soil will produce high yields of low quality tubers while a light sandy soil will produce low yields of high quality tubers.

Conditions

As described above, the location of our farm near the river allows for a slightly longer growing season and the sandy soil is also a plus for sweetpotato growing. The drought

conditions are also thought to have affected our results in that less moisture likely resulted in overall smaller yields, albeit sweeter potatoes.

Economics

Even though our yields may have been reduced by lack of soil moisture we still yielded 238 lbs from the sandy, but moister site, and 154 lbs. from the sandy loam site, each site being 102 feet. At the additional location of 300 feet, we yielded 288 lbs. Altogether we had about 700 lbs of marketable yield. At farmers market we sold the sweet potatoes at \$22.5 per lb. We also gave some to our CSA. This crop attracted a lot of new customers and brought in a nice profit for the work involved. Also the sample that we retained in our cellar had excellent storage over the winter, and into spring, showing that growing more for winter markets would be a smart choice.

Assessment and Adoption

As a result of this research we would not use any additional nitrogen other than a base amount of compost. We would also continue to plant in trenches and use hay as mulch, and perhaps black plastic to help retain moisture and reduce weed pressure (in this experiment we took the plastic off after the soil reached the desired temperature for planting).

Outreach

We presented a workshop at the NOFA VT conference on February 17, 2008 in Randolph, VT. Over 1000 people attended the conference over two days. About 30 people attended our workshop. We received numerous enthusiastic comments from attendees (many of whom are now going to plant sweetpotatoes).

We were scheduled to present at NOFA NH on March 1, 2008 but a winter storm came in overnight and into the morning hours making the 2 hour drive a treacherous one, so we had to cancel. Instead Becky Grube, who has been doing sweetpotato research and who was assisting us in our research, was sharing the workshop slot with us at our request. She was able to attend given that her drive was closer and mostly highway. She presented a summary of our research and invited people to contact us for more information.

Additionally, I put a note on the NOFA NH list serve inviting anyone who wants a summary of our research to email me. I received a dozen requests for information and sent them some handouts.

We wrote an article, which was published in the March issue of the Small and Beginner Farmers of NH newsletter and in *Country Folks*. We also submitted articles to The Natural Farmer, NOFA-NH's newsletter and the New Hampshire Vegetable, Berry & Tree Fruit Newsletter.

Report Summary

The purpose of the project was to determine how best to fertilize organic sweetpotatoes from among the wide variation in nitrogen fertilizer recommendations we found in the literature. We used test plots for growing organic sweetpotatoes with varied amounts of nitrogen to see how this would affect yield, tuber quality and sugar content. Different rates of nitrogen did not produce statistically significant yields but differences in moisture did. Likewise, there was no statistically significant difference between plots with different nitrogen rates and unmarketable yields. There was no significant difference in brix readings either among the different plots with varying nitrogen rates. However, the site with the drier soil and lower yields had significantly higher brix readings than the site with moister soil.

James Warren and Lori Schreier
March 31, 2008

Final Financial Report
Project number FNE07-621
James Warren, Project Leader
SARE award: \$2,806

Annual project expenses to date:

	Approved Budget	Actual Expense
Personnel		
James Warren	50 hrs@\$22.00=\$1100	55 hrs@\$22.00=\$1210
Lori Schreier	60 hrs@\$18.00=\$1080	62 hrs@\$18.00=\$1116
Materials and Supplies		
250 sweet potato slips	\$75.00	\$27.50
1 roll plastic mulch	\$16.00	\$16.00
2 General soil tests	\$17.00	\$18.00
1 soil test for compost	\$35.00	\$70.00 (for two piles)
Travel		
NOFA VT conference	\$89.00	\$79.21
BFNH conference	\$89.00	0
(could not present research since conference took place in early Fall before results were in)		
Other Direct Costs		
Misc. postage and phone	\$25.00	\$20.55
Photocopying	\$80.00	\$ 8.00
(free copies of some handouts from UNH and ATTRA)		
Miscellaneous		
Brix Refractometer	\$200.00	\$294.88
Hotel at NOFA VT conference	0	\$130.00
Total Budget	\$2906	\$2990.14
First Payment Received	\$1403	
Payment Remaining	\$1585.14	

I declare the foregoing is a true and correct statement of the expenses incurred between April 5, 2007 and March 31, 2008.

James Warren

Dated: