

Fertility Trials, Vegetable Crops

Field crops aren't the only things we grow in Iowa. More and more field crop producers are edging into the local farmers' market with vegetables and fruits, and new farmers are entering agriculture through veggies as well. Many vegetable crops have seasons similar to that of corn and soybeans, but there are differences too. Vegetable production is intensive and may justify a higher level of management and inputs than our commodity crops. Two PFI cooperators carried out trials in 2002 to examine fertility amendments for vegetable crops.

Gary and Nancy Guthrie, Nevada, weren't thinking about soil fertility. Gary was curious about foliar (leaf) fertilizer treatments. He wondered if a crop like potatoes would respond to nutrients applied to the leaves - even though he uses compost and plenty of mulch in his organic CSA operation. 2002 was the second year that the Guthries evaluated "foliar feeding." In mid-May, potato plants received either: a spray of fish emulsion; a spray of a product called Calcium-25; a spray of both fish and calcium; or no spray (this was the control treatment). You can think of these four treatments as the cells of a 2x2 grid (see above), with fish options (with and without) down the side and calcium options along the top. These two factors may be evaluated, or all four treatments can be compared.

Table 4, click to view, shows production and economic outcomes from 2001, and Figure 8 show results from both years. Yields were lower overall in 2002 than 2001, but the results were similar. Neither the calcium foliar spray nor the fish emulsion increased potato yield. And although the Calcium-25 is said to increase uptake of fish emulsion, the table shows that calcium and fish emulsion combined had no cumulative positive effect either. (Note the table presents results per 100 feet of row, while the graph shows results per 10 feet. \$ Benefit in the table is profitability relative to other treatments.) Based on these results, Gary concludes "These products may work where there are poorer soils, but in Iowa and with my system, good rotations, green manures, and composted manure seem to provide what my crops need."

Continuing on the theme of nutrients in organic vegetable production, take a look at **Angela Tedesco's** work from Turtle Farm, near Granger. Angela also imports mulch from her hay field, but in addition she has applied alfalfa meal to plants as a nitrogen fertility source. Alfalfa meal is roughly 2½-to-3 percent nitrogen. In 2002 Angela wanted to compare alfalfa meal to a new possible amendment for her farm - worm castings. The worm product that she purchased was said to be 1 percent nitrogen. In a comparison of two such products, it is important to include a "check" or control treatment that receives neither fertilizer. That way if there is no difference between the amendments, you will be able to tell whether additional fertility was even needed.

Angela carried out the trial on greenhouse tomatoes and peppers. She tracked the growth of the plants (Figure 9), and she recorded part of the fruit harvest (Figure 10). Figure 9 shows that there really wasn't much difference in plant height between the three treatments. Figure 10 shows tomato and pepper yields, and there would seem to be differences there. But look at the error bars. Those are the vertical brackets through the control treatment bars. Bars falling within the error brackets are statistically the same. In other words, a treatment bar taller or shorter than the error bracket would occur by chance only 5 percent of the time. The differences among the treatments were not consistent for tomatoes and peppers either. So the three treatments are probably all the same.

This was a little surprising. Plants need fertility, don't they? The third piece of the puzzle came in the form of tests of available nitrogen in the potting media. Because the plants had not responded to the amendments when they were growing in soil, a "pot test" was designed for both soil and pure sand. These two media were amended with alfalfa meal or worm castings at rates calculated to contain equal amounts of nitrogen.



Angela Tedesco discusses different sources for N.

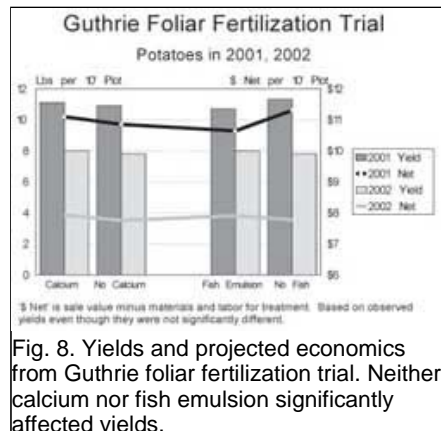


Fig. 8. Yields and projected economics from Guthrie foliar fertilization trial. Neither calcium nor fish emulsion significantly affected yields.

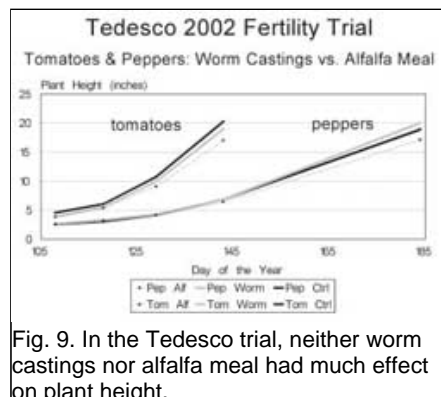


Fig. 9. In the Tedesco trial, neither worm castings nor alfalfa meal had much effect on plant height.

Then the pots, without plants, were incubated in the greenhouse for six weeks. They were watered weekly, but not so much that water ran from the pots.

At the end of the trial, the sand and soil were analyzed for nitrate nitrogen. Nitrate-N is a good indicator of nitrogen release from the amendments or from the potting media. Figure 11 shows that the potting medium was a more important contributor to soil nitrate than were the treatments. In sand, there was a modest treatment effect, with alfalfa meal showing somewhat more available nitrogen than worm castings or the control. But in soil there was much more available nitrogen; the soil organic matter actually released more N than the treatments applied to the soil. Andrea's trial appears to be another case where good Iowa soil and a good field history make purchased inputs unnecessary.

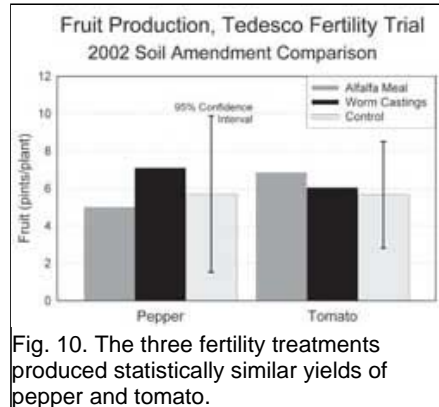
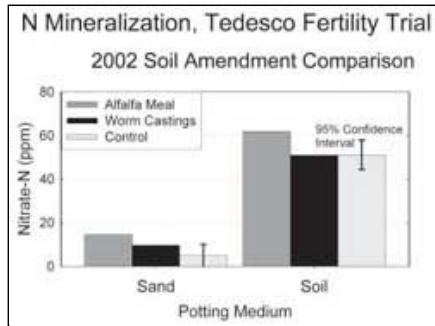


Fig. 10. The three fertility treatments produced statistically similar yields of pepper and tomato.

Table 4. Multiple-Treatment Fertility Trials – Vegetable Crops

				TREATMENT "A"				
COOPERATOR	CROP	PREVIOUS CROP	YIELD SIGNIFI-CANCE	DESCRIPTION	YIELD (bu or T)	STAT.	TRT COSTS	\$ BENEFIT
GUTHRIE	POTA-TOES	GARLIC		CALCIUM FOLIAR	80.5 lbs/100'	a	\$0.46	(\$0.46)
				CALCIUM + FISH FOLIAR	77.3 lbs/100'	a	\$0.58	(\$0.58)
	FACTORIAL:	CALCIUM FACTOR	N.S.	CALCIUM	79.8 lbs/100'	a	\$0.46	(\$0.46)
		FISH FACTOR	N.S.	FISH	79.8 lbs/100'	a	\$0.42	(\$0.42)
TEDESCO	PEPPER		N.S.	ALFALFA MEAL	5.0	a	\$0.64	\$1.33
	TOMATO		N.S.	ALFALFA MEAL	6.9	a	\$0.64	\$1.33

Multiple-Treatment Fertility Trials – Vegetable Crops

TREATMENT "B"										TREATMENT "C"					OVERALL COMMENTS
DESCRIPTION	YIELD (bu or T)	STAT.	TRT COSTS	\$ BENEFIT	DESCRIPTION	YIELD (bu or T)	STAT.	TRT COSTS	\$ BENEFIT						
FISH FOLIAR	79.8	a	\$0.42	(\$0.42)											
CONTROL	75.5	a	\$0.00	\$0.00											
NO CALCIUM	77.6	a	\$0.00	\$0.00								CALCIUM LSD=7 LBS			
NO FISH	77.8	a	\$0.00	\$0.00								FISH EMULSION LSD=7 LBS			
WORM CASTINGS	7.1	a	\$1.96	\$0.00	CONTROL, NO ADDED NUTRIENTS	5.7	a	\$0.00	\$1.96			ECONOMICS BASED ON COSTS ALONE Ñ YIELDS NOT SIGNIFICANTLY DIFFERENT.			
WORM CASTINGS	6.1	a	\$1.96	\$0.00	CONTROL, NO ADDED NUTRIENTS	5.7	a	\$0.00				YIELDS IN PINTS PER 24 SQ FT. PEPPERS @ \$2/PINT, TOMATOES @ \$3/PINT. AMENDMENTS RAISED NO3 IN SAND BUT NOT IN SOIL.			