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Institute of Food and Agricultural Sciences
North Florida Research and Education Center – Suwannee Valley

Comparison of Different Commercial Fertilizer and Poultry Manure Rates in the Production of Eggplant 96-15

Robert C. Hochmuth, George J. Hochmuth, Chris Vann [1]

Introduction

A large poultry industry has developed in the middle Suwannee Valley region of North Florida. Broiler production in Florida increased from 75.7 million birds in 1977 to 104.2 million in 1985, and to 132.7 million in 1994. Suwannee, Madison, and Hamilton counties are among the leading broiler producing counties in Florida. Total value of state-wide broiler production in 1994 was 191.2 million (Freie and Pugh, 1994; Geuder and Pugh, 1996). Broiler production is more common in northern Florida, with a typical grower harvesting between five and six flocks annually at approximately 70,000 birds per flock (Tervola, 1996). An estimated 4,400 lbs of manure are produced for every 1,000 broiler birds (Mitchell el al., 1990), resulting in a considerable amount of poultry manure to be managed.

The importance of choosing an appropriate rate of manure and of properly managing that manure has been stressed (Sims, 1986). Various equations have also been developed to estimate manure needs in order to supply crop N requirements (Douglas and Magdoff, 1991; Mathers and Goss, 1979; Pratt et al., 1973; Sims, 1986). Factors affecting appropriate manure-application rates include: crop N requirement, N mineralization rate, N content of the manure, method and timing of manure application, prior and subsequent leaching and volatilization losses of N, and previous cropping history. Crop N requirements for vegetable crops in Florida have been summarized by Hochmuth and Hanlon (1995).

Several research projects have been conducted at the North Florida REC - Suwannee Valley to evaluate various nutrient management programs for eggplant (Hochmuth et al., 1991; Hochmuth et al., 1993a; Hochmuth and Hochmuth, 1994; Hochmuth and Hochmuth, 1995). Poultry manure trials have also been conducted at the same locations on cabbage (Hochmuth et al., 1993b). This trial was conducted to evaluate poultry

[1] Robert C. Hochmuth, Multi-County Extension Agent, University of Florida, IFAS, North Florida Research and Education Center - Suwannee Valley, Live Oak, FL 32060
George J. Hochmuth, Center Director, University of Florida, IFAS, North Florida Research and Education Center, Live Oak, FL 32060
Chris Vann, Extension Agent, University of Florida, IFAS, Lafayette County Extension Office, Route 3 Box 15, Mayo, FL 32066-1901

manure as a potential nutrient source in the production of mulched eggplant with drip irrigation.

Materials and Methods

Plots were established on a Lakeland fine sand (thermic, coated, Typic Quartzipsamment) at the North Florida REC - Suwannee Valley near Live Oak, Florida using a full-bed, polyethylene mulch system with drip irrigation. Treatments in 30 x 5 ft plots were arranged in a randomized complete-block design with 4 replications in the spring of 1996. Pre-plant (0-6 inches) soil tests were conducted (Table 1). The manure source was a broiler clean out and was collected from piles stored under shelter. Manure rates were selected for the trial based on estimated available N and targeting a low, medium, and high rate of application. The medium rate (6 T/A) was estimated to supply the crop N requirements (150 lbs/A) assuming 50% or more of the N was mineralized over the season. The recommended rate and a higher rate of commercial fertilizer were also used.

Manure or commercial fertilizer was applied tot he soil on March 13, 1996. All materials were applied to level ground over the center 4 ft width of each 5 ft plot, rototilled to a depth of 6 inches, immediately bedded, and fumigated with a mixture of 98% methyl bromide: 2% chloropicrin at a broadcast rate of 400 lbs/A. Drip irrigation tubing was applied to the center of the bed top and black polyethylene mulch was applied to form a 3 ft wide and 6 inch high production bed. Row middles were treated with napropamide for weed control prior to crop establishment.

Eggplant transplants were planted in one row per bed at spacing of 18 inches between plants in-row. 'Classic' transplants were planted on April 4, 1996. Eggplant was irrigated by drip irrigation using tensiometers as a scheduling aid. Water was applied to maintain a soil-moisture of -8 to -12 centibars at the 12-inch depth. Insecticide and fungicide applications were made in accordance with the University of Florida recommended spray program.

Eggplant fruits were harvested six times between June 6 and July 9, 1996. Number of eggplant fruit and total weight for each fruit grade per plot were recorded and the data subjected to analysis of variance.

Results and Discussion

Early eggplant yield (first 2 harvests) was affected by nutrient source (Table 2). Highest early marketable yields were found in the two commercial fertilizer treatments. The two rates of commercial fertilizer performed the same for early yield. All three poultry manure treatments were also similar to each other in early marketable yield, but significantly less than two commercial fertilizer treatments. It is possible that N

mineralization from the manure was not fast enough to support early yield comparable to commercial fertilization. Plants receiving no fertilization had much lower yields than with any other treatment. Most of the significant difference in early marketable yield was attributable to the differences in large versus #1 fruit. The highest early large U.S. #1 fruit was found in both commercial fertilizer treatments.

Total seasonal yields were also affected by nutrient sources. The highest total marketable yield was found with both commercial fertilizer treatments and the two highest rates of poultry manure. Intermediate yield was found with the low rate (6,000 lbs/A) of poultry manure. The poorest total marketable yield was found with the no-fertilizer treatment. Average state yields for eggplant have been reported at 652 to 850 bushels (33 lbs) per acre (Geuder and Pugh, 1996). Highest marketable yields in this trial were in the range of 1200 to 1400 bushels per acre.

Highest total season yield of large U.S. #1 fruit was found with both commercial fertilizer treatments and the high rate of poultry manure. Intermediate yield of large U.S. #1 fruit was found in the medium and low poultry manure treatments. All treatments, except no-fertilizer, produced similar yield of U.S. #1 medium fruit. No significant differences in average fruit weight were found among any treatments.

These results suggest the current University of Florida recommended nitrogen crop nutrient requirement of 160 lbs N per acre is adequate. In this trial, no significant difference in any yield category was found between the two commercial fertilizer treatments. One treatment supplied 160 lbs N per acre and the other 200 lbs N per acre. The commercial fertilizer treatments produced higher yields than any poultry manure treatment. In terms of total marketable yield, the 12,000 and 18,000 lbs per acre rates of poultry manure produced similar yields to both commercial fertilizer treatments. The low poultry manure rate (6,000 lbs per acre) produced lower marketable yields. All nutrient sources performed better than no fertilizer treatments.

Making manure recommendations based on at least 50% N mineralization in the season seems to be appropriate. In this study the medium rate of manure (6 T/A) supplied 310 lbs/A nitrogen and this was adequate for total season production equal to commercial fertilizer at 160 lb N per acre. However, early yield was not optimized with manure probably due to slow mineralization rate. Perhaps combinations of commercial fertilizer and manure are needed to optimize both early and total yields.

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Table 1. Soil test nutrient levels and nutrients supplied by the various experimental fertilizer treatments.

	Soil Test Level (ppm)[z]	**IFAS Fertilizer Recommendation (lbs/A)**	**Total Nutrients Supplied by Treatments (lbs/A)**					
			No Fertilizer	**13-4-13 Fert (lbs/A)**		**Poultry Manure (lbs/A)**		
				1230	**1540**	**6,000**	**12,000**	**18,000**
Nitrogen (N)	N/A	160	0	160	200	160	310	470
Phosphorus (P_2O_5)	52 (P)	0	0	50	60	70	130	200
Potassium (K_2O)	37 (K)	80	0	60	200	110	220	320

[z] Soil test (Mehlich 1) indices were high for P and medium for K.

Table 2. Effect of various nutrient sources and rates on yield, quality, and fruit weight of eggplant.

Source	Rate (lbs/A)	Total Mkt.	Large #1	Large #2	Medium #1	Medium #2	Avg. Fruit Wt. (lbs)
		- - - - - - - - - - - - Early Yield (ctn/A) [z] - - - - - - - - - - - -					
No Fertilizer	0	111	47	0	60	4	0.7
Fertilizer (13-4-13)	1230	517	288	27	156	6	1.1
Fertilizer (13-4-13)	1538	488	298	21	148	19	1.1
Poultry Manure	6000	311	173	7	121	9	1.1
Poultry Manure	12000	352	215	111	109	13	1.1
Poultry Manure	18000	347	200	91	131	6	1.1
Significance [y]		**	**	NS	NS	NS	NS
LSD (0.05) [x]		123	71				
		- - - - - - - - - - - - Total Season Yield (ctn/A) [z] - - - - - - - - - - - -					
No Fertilizer	0	637	255	17	227	70	0.8
Fertilizer (13-4-13)	1230	1274	581	52	445	72	0.9
Fertilizer (13-4-13)	1538	1400	673	38	478	117	0.9
Poultry Manure	6000	1085	436	54	415	115	0.9
Poultry Manure	12000	1215	504	43	429	119	0.9
Poultry Manure	18000	1370	560	53	477	147	0.9
Significance [y]		**	**	NS	**	NS	NS
LSD (0.05) [x]		235	139		132		

[z] One carton of eggplant equals 33 lbs.
[y] Significant at either the 5% (*) or 1% (**) level or not significant (NS).
[x] Least significant difference between treatments at the 5% level of probability.