

PUBLICATIONS

2002

REDUCING SOIL PHOSPHORUS BUILDUP BY COMBINING NITROGEN FERTILIZER WITH BROILER LITTER

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Background. Approximately 400,000 tons of broiler litter are generated by the poultry industry in East Texas each year. Because broiler litter is high in plant nutrients, most of it is used to fertilize pastures instead of using commercial fertilizer. One of the disadvantages of using broiler litter on pastures is that the nutrient ratio in the broiler litter does not match that of the forage crop. Excess nutrients from the broiler litter not used by the crop will buildup in the soil and possibly cause environmental problems. High soil phosphorus (P) levels are the main concern since phosphorus can move into streams, rivers, and lakes in runoff with heavy rains. Elevated P levels increase aquatic plant and phytoplankton (single cell plants) growth which is the beginning of the food chain for fish. However, when excess plant material dies and decays, the oxygen level decreases which causes fish die offs. Reducing the broiler litter rate and applying commercial nitrogen (N) fertilizer should improve the utilization of P and potassium (K). Four tons/acre of broiler litter were applied in October 1998 and 1999 to Coastal bermudagrass overseeded with annual ryegrass. Fifty lb N/acre were applied 1, 2, 3, or 4 times/year in December, March, May, and/or July. Yield increased about 1000 lb/acre for every N application up to 150 lb N/acre and P and K uptake increased up to 100 lb N/acre/year. These reports are found else where in this publication. At the end of the 2 year study, soils samples were collected from each plot to a 24 in. depth.

Research Findings. The 24 in. soil core was divided into 0 to 6, 6 to 12, and 12 to 24 in. depths and analyzed for P. Statistically there were no significant differences among N fertilizer treatments because of the large variation in measured P levels among the four replications of the same N fertilizer treatment. Essentially all the P was found in the 0 to 6 in. depth which is in agreement with published literature that P moves very little in the soil. Broiler litter was applied to the soil surface so one would expect most of the P to be in the top 1 to 2 in. of the soil profile. The high soil P level in the no N fertilizer treatment is to be expected since it had the lowest yield and P uptake.

The large variation in measured soil P levels among replications of the same N treatment may be due to several factors. The broiler litter was hand applied with a 5-gal. bucket that resulted in a trickling effect instead of a uniform distribution as with a spreader truck. A second factor was the soil cores were collected with a hydraulic probe mounted on a ¾ ton truck. Although three soil cores were collected from each plot, they were about 6 in. apart. Taking

additional soil cores at different locations in the 6 by 15 ft. plot should reduce the P variability within and between plots of the same N treatment. This study will be repeated for two more years and then sampled again for determination of soil P.

Application. Adding commercial N fertilizer with 4 tons/acre of broiler litter to an annual ryegrass-Coastal bermudagrass system increased yield and P uptake. However, after 2 years, no difference in residual soil P was detected.

Table 1. Residual soil phosphorus levels at three depths after applying 4 tons/acre of broiler litter each October and ten nitrogen fertilizer treatments for two years.

50 lb N/acre/month	Depth (in.)		
	0-6	6-12	12-24
	-----P (ppm)-----		
None	48.0	0.82	0.23
Dec.	30.8	1.95	0.91
Mar.	20.1	0.98	0.24
May	42.0	0.98	0.01
July	35.3	0.47	0.00
Dec., Mar.	48.9	0.45	0.18
May, July	38.2	1.46	0.01
Mar., May	45.9	1.34	0.22
Mar., May, July	24.9	0.59	0.00
Dec., Mar., May, July	36.3	1.19	0.00