

MANAGING CLOVER AND POULTRY LITTER FOR PECAN PRODUCTION

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Poultry Litter & Clover as a Fertilizer Source for Pecan

- Ponder Farm—Tifton/ Solid Set Irrigation
- ~25 year old 'Desirable' trees
- 4 treatments/ 6 replications/ RCB
- Single Tree Plots/Border Trees between treatments
 1. 'Dixie' Crimson Clover
30 lbs/Acre planted in November '07
 2. Poultry Litter
1 ton/Acre
 3. Clover+Poultry Litter
 4. Ammonium Nitrate (75 lbs N/A)
 5. Untreated Control (2009)

All Litter & Fertilizer Application Made in April

In 2009, untreated control added (3 reps)



● Poultry Litter Analysis

Year 1:

75 lbs N; 30 lbs K; 16 lbs P; 0.44 lbs Zn

Year 2:

60 lbs N; 62 lbs P; 68 lbs K; 0.58 lbs Zn

Effect of Poultry Litter and Clover on Leaf Elemental Analysis of 'Desirable' Pecan Year 1 (2008)

Treatment	N	P	K	Mg	Ca	S	B	Zn	Mn	Fe	Cu
Poultry Litter	2.52a	0.15a	1.38a	0.54a	1.56a	0.23a	39a	98a	193a	83a	8.5a
Crimson Clover	2.41a	0.15a	1.20b	0.46b	1.49a	0.22a	32b	98a	325a	106a	8.8a
Litter + Clover	2.44a	0.15a	1.46a	0.46b	1.45a	0.23a	36ab	91a	143a	117a	8.8a
Ammonium Nitrate (75 lbs N/acre)	2.57a	0.16a	1.45a	0.43b	1.39a	0.23a	35b	75a	161a	198a	8.2a

Effect of Poultry Litter and Clover on Leaf Elemental Analysis of 'Desirable' Pecan --Year 2 (2009)

Treatment	N	P	K	Mg	Ca	S	B	Zn	Mn	Fe	Cu
Poultry Litter	2.63a	0.147ab	1.34a	0.49a	1.54ab	0.22b	37a	73ab	265b	111b	9.3a
Crimson Clover	2.67a	0.145b	1.28a	0.46b	1.69a	0.22b	36a	92a	637a	97b	9.5a
Litter + Clover	2.96a	0.153a	1.28a	0.5a	1.68ab	0.24a	38a	83ab	372b	156a	9.5a
Ammonium Nitrate (75 lbs N/acre)	2.66a	0.145b	1.26a	0.47ab	1.52b	0.21b	33a	64b	226b	95b	8.1b
Untreated	2.67a	0.15ab	1.27a	0.44b	1.58ab	0.22b	33a	63b	184b	111b	7.8b

Clover Tissue Analysis

May 2008

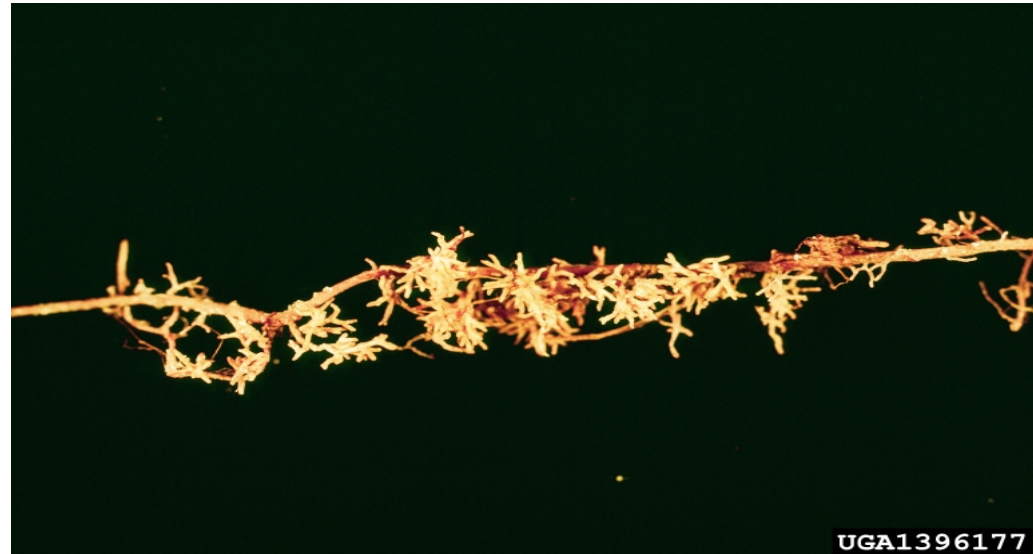
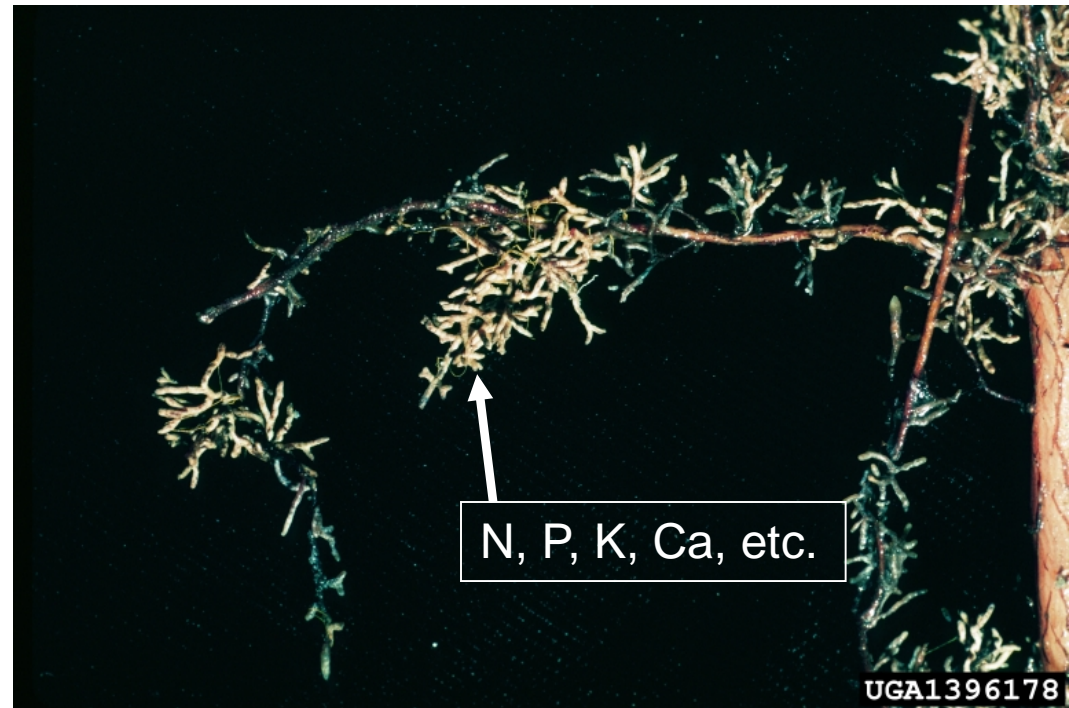
Treatment	% N	% P	% K	Zn ppm
Crimson Clover	1.98a	0.25a	1.25a	59.35a
Litter + Clover	2.63b	0.26a	2.80b	62.09a

May 2009

Treatment	% N	% P	% K	Zn ppm
Crimson Clover	1.98a	0.10a	1.63a	64.2b
Litter + Clover	2.63b	0.13b	1.74b	52a

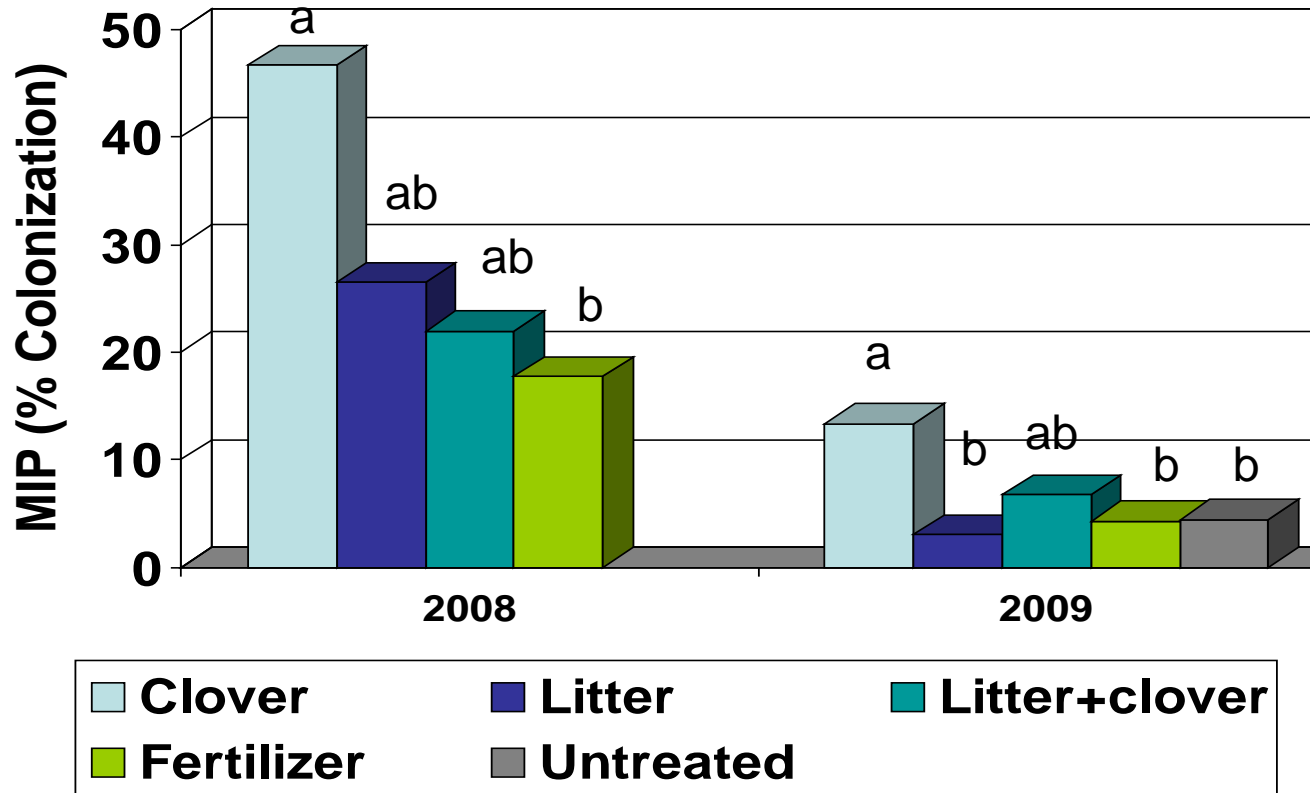
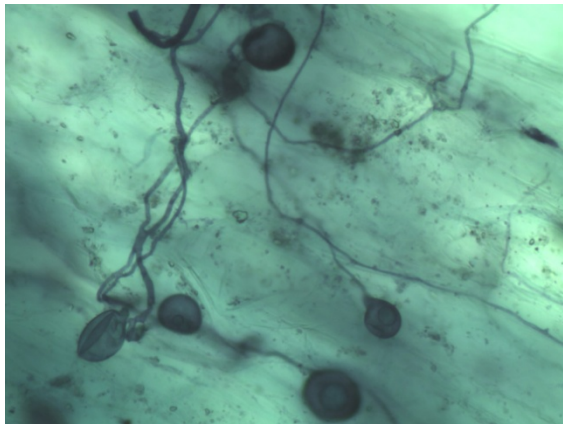
Mycorrhizae

- Fungi colonizing the roots of plants
- Mycorrhizal associations enable trees to compete for limited resources
- Pecan seedlings inoculated with mycorrhizae have >uptake of N,P, K, Ca, Mg, Cu, and Mn (Sharpe and Marx, 1986)
- Conditions favorable for mycorrhizal development:
 - High organic matter
 - High light intensity—related to carbohydrate production
 - Adequate soil moisture



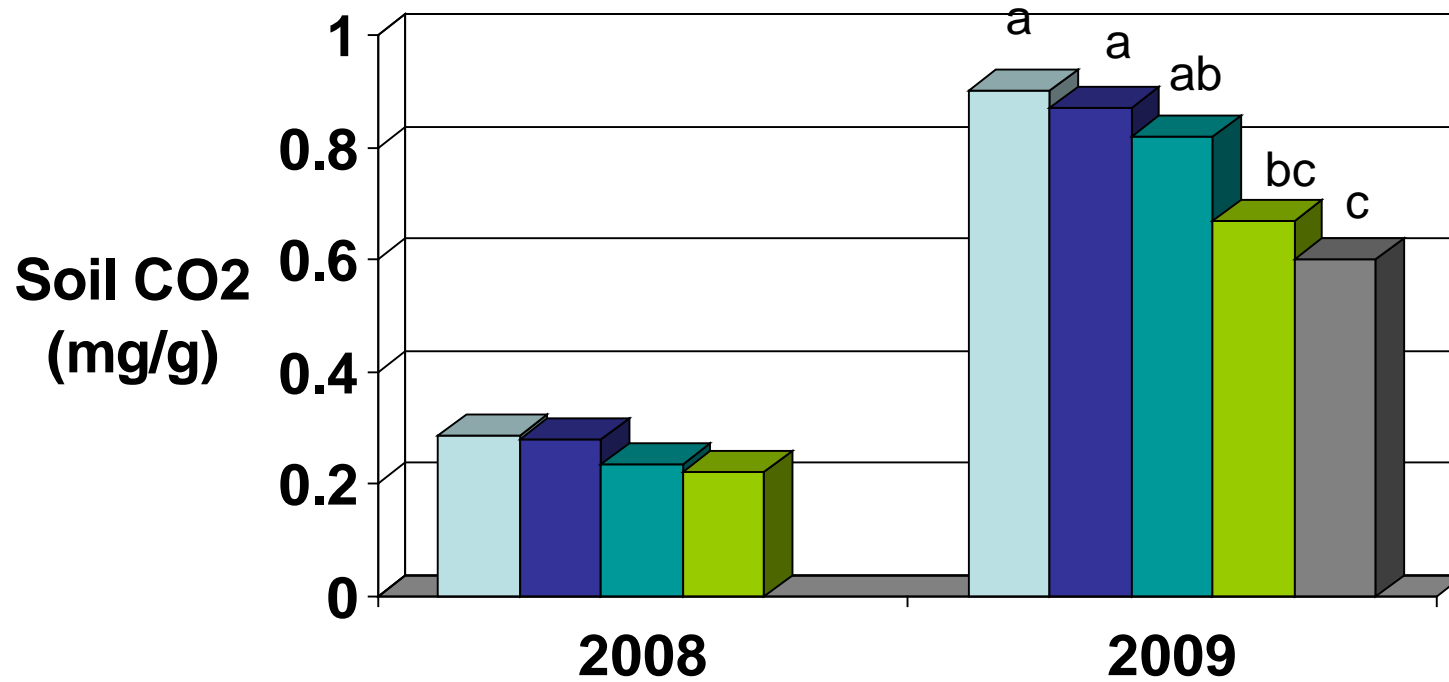
Effects of Clover/Litter on Soil MIP

MIP=
Mycorrhizae
Inoculum Potential
Bioassay
using sweet corn
as host plant

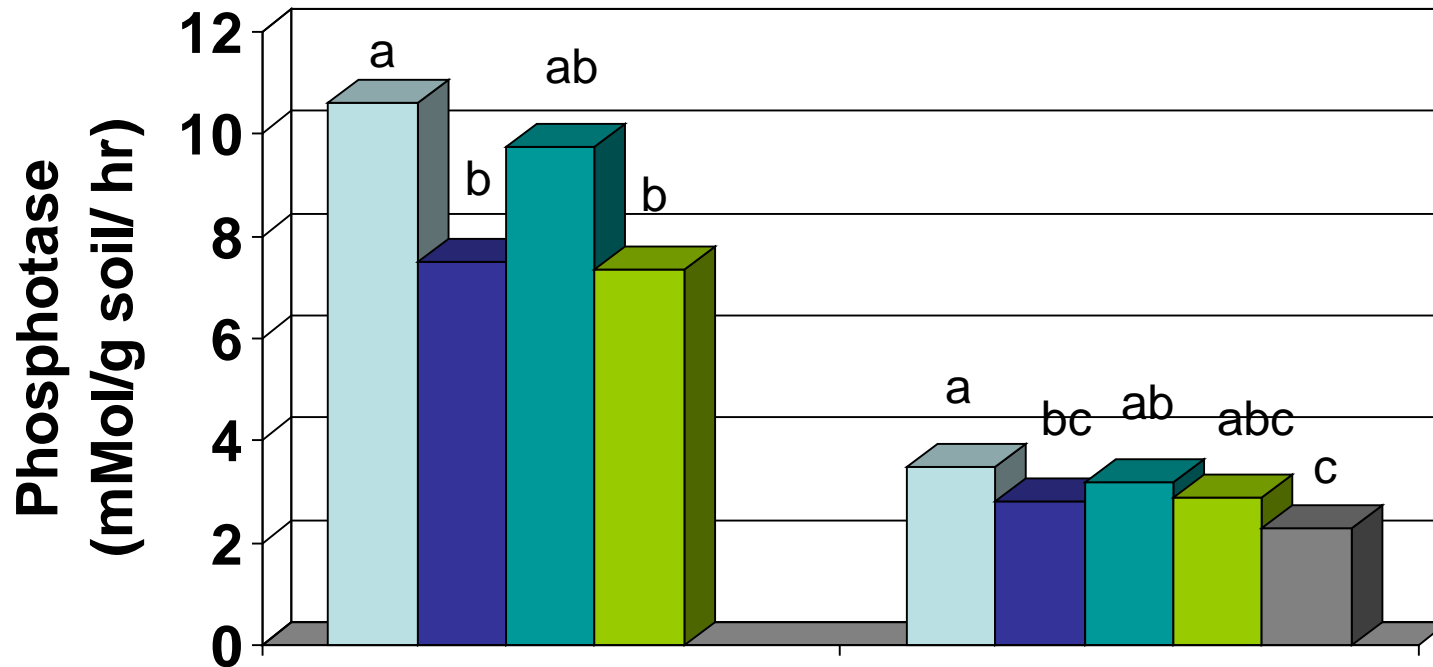


MIP determines suitability of soil for mycorrhizal colonization of roots

Soil Respiration



Phosphorous Availability



Clover roots produce phosphatase

Effect of Poultry Litter and Clover on 'Desirable' Pecan

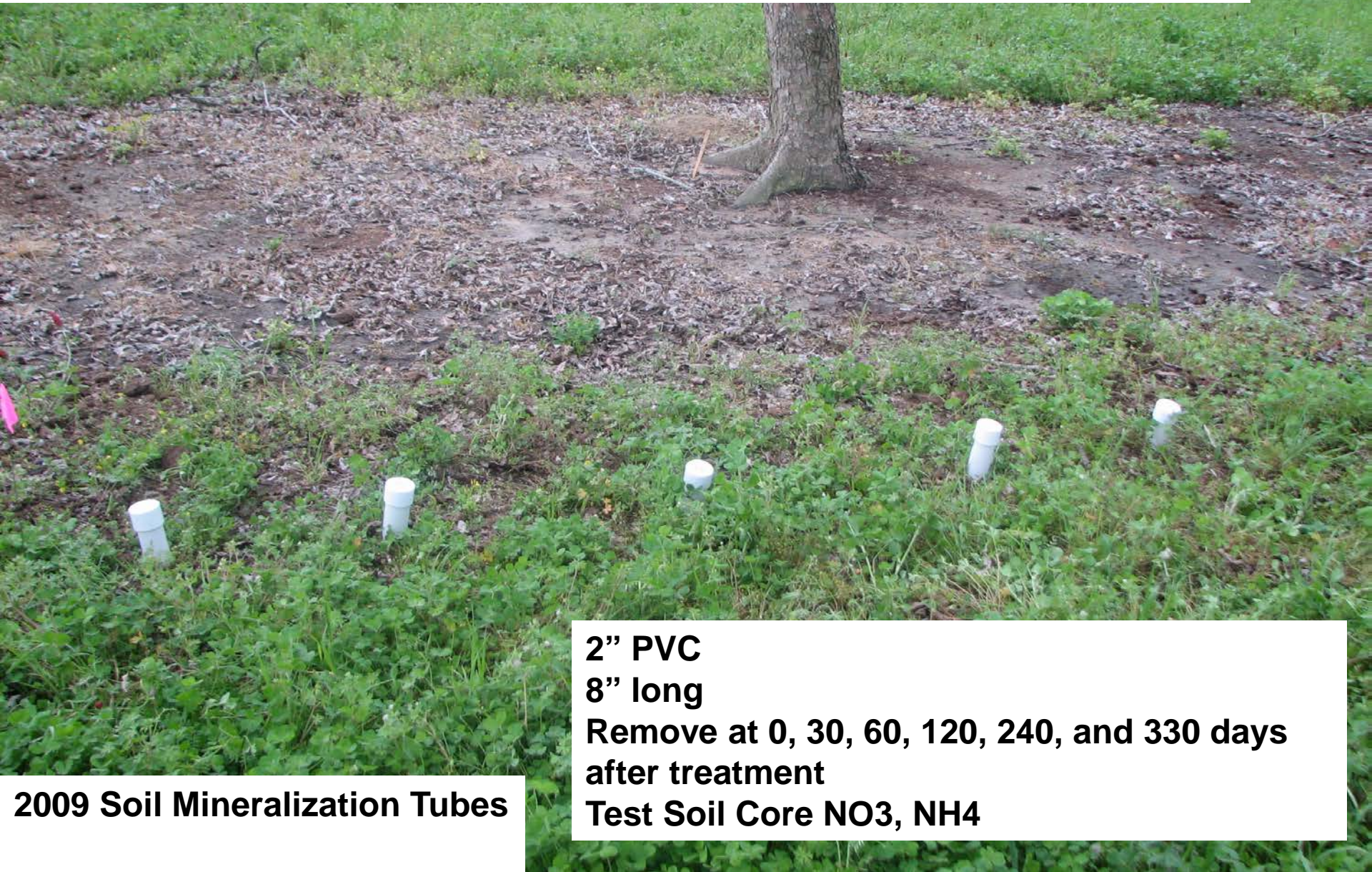
Treatment	N Cost/A	Percent Kernel (2008)	Percent Kernel (2009)	Yield/tree (2008)	Yield/tree (2009)	2 Year Avg Yield/tree
Poultry Litter	\$35	54a	51.7a	92.7a	122ab	107.4a
Crimson Clover	\$40*	53.4a	50.8a	94.7a	86ab	90.4ab
Litter + Clover	\$75*	52a	50.3a	87a	84b	85.5b
Ammonium Nitrate (75 lbs N/acre)	\$75	52.4a	52.1a	62a	129a	95.5ab
Untreated	\$0	---	52.6a	---	130a	---

Conclusions

- A single application of 1 ton poultry litter/acre appears to provide adequate N for pecans
- Clover alone may provide enough N for pecans in the second year after establishment
- Clover can remove significant P, K, and Zn from orchard soils
- Clover can bring otherwise unavailable P into the feeder root zone
- Microbial activity in pecan orchard soil is higher where clover is grown or litter is applied than where ammonium nitrate is used
- **No *Salmonella* spp. recovered from poultry litter or orchard soil in any treatment from application through harvest**

Fertilizer studies on pecan require multiple (4-6) years to get accurate interpretation of results

When is N from clover and poultry litter available to pecan trees?



2" PVC

8" long

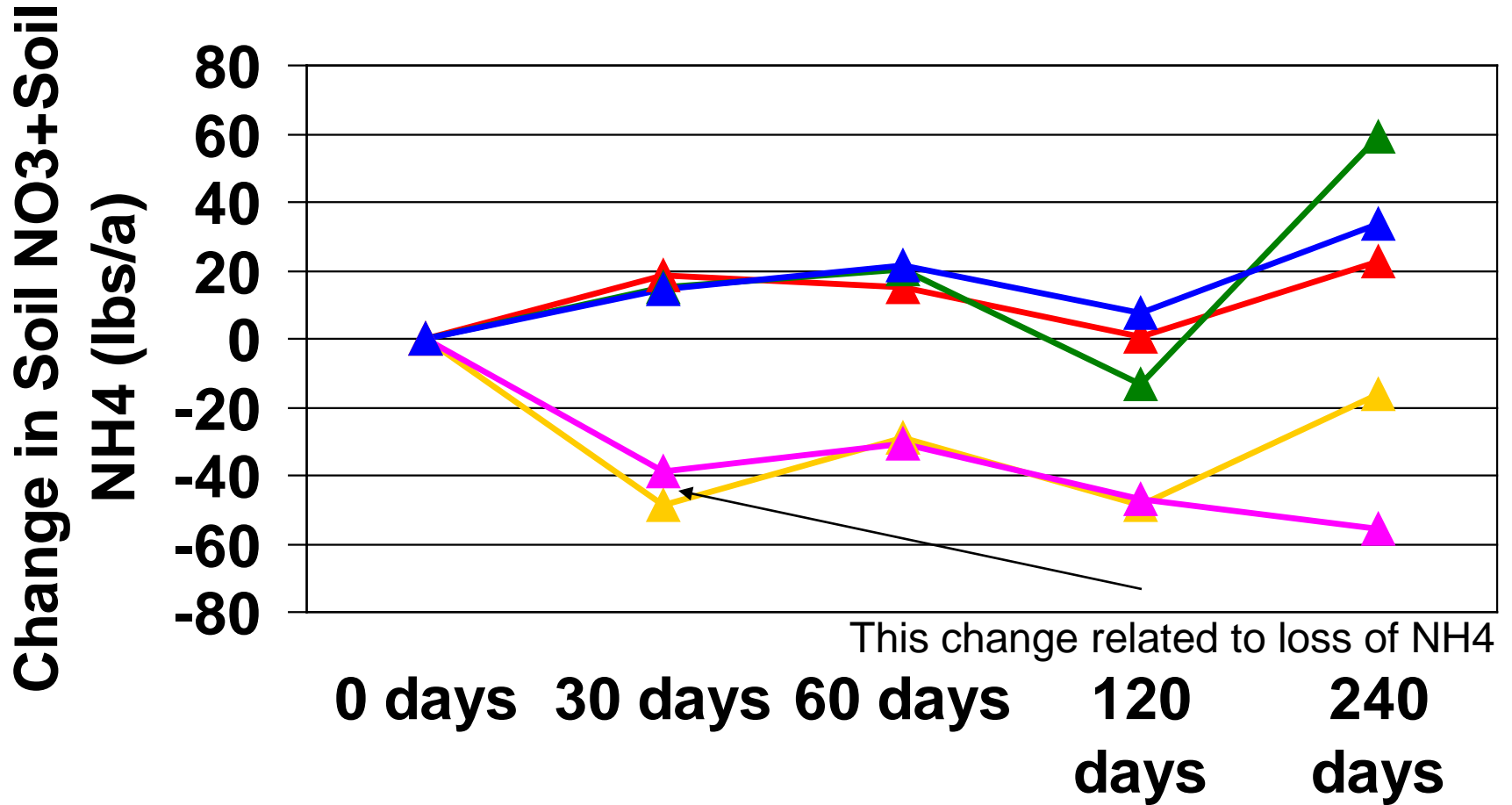
**Remove at 0, 30, 60, 120, 240, and 330 days
after treatment**

Test Soil Core NO₃, NH₄

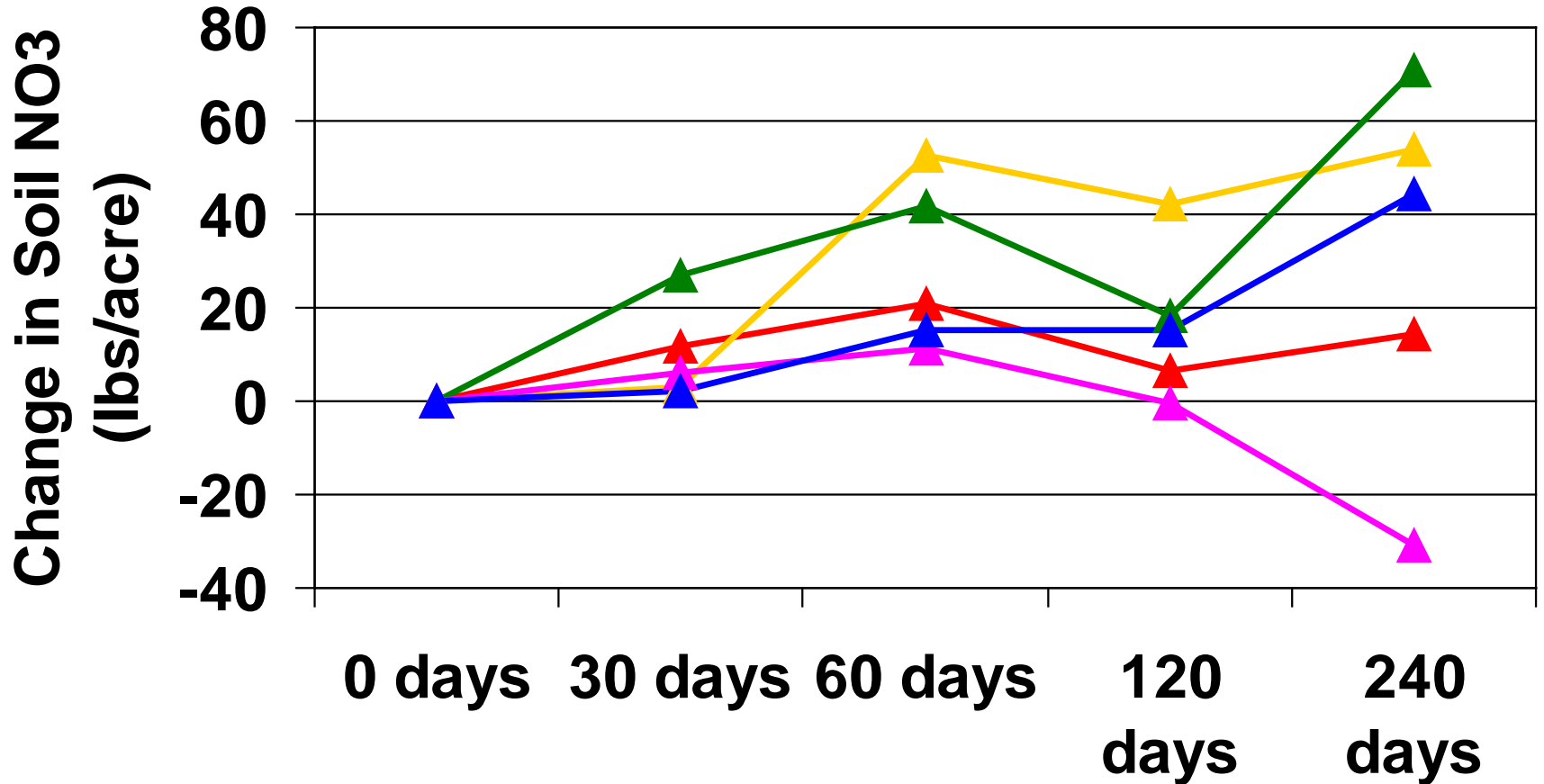
2009 Soil Mineralization Tubes

- Plots established for 1 full year before tubes are set
- Tubes placed in orchard immediately after application of fertilizer/manure
(April 2009: clover blooming but not yet at peak bloom)

Nitrogen Availability



Nitrogen Availability



Management Conclusions

- Most N from synthetic N is utilized or lost within 1st 60 days after application
- Poultry Litter provides adequate season long N for pecan
- Use synthetic N for early spring N needs and clover for late season
- Clover can provide adequate N for pecans; Best used as a N supplement;
- The longer clover is in the orchard, the more it can be relied upon
- Monitor P, K, and Zn where clover is planted