EVALUATING MYCONATE TO STIMULANT NATURAL MYCORRHIZAE IN SOIL TO DECREASE COTTON PLANT STRESS AND INCREASE YIELD

J.D. Schovajsa, Cooperator (2006)
Joe D. Janak, Jr., Sam Womble, Stephen Biles, Dr. Tom Isakeit, Dr. Roy Parker
County Extension Agent - Ag/NR, County Extension Agent - NR, Calhoun, Refugio & Victoria Extension IPM Agent, Extension Pathologist, Extension Entomologist, respectively
Victoria County

SUMMARY:

Native mycorrhizae were found in the soil in this demonstration in Victoria County but were reported to be at low numbers; 10 – 20 spores per gram of soil. Stimulating the native mycorrhizae with Myconate did not show to increase mycorrhizae vesciles or spores or affect plant height, plant population or lint qualities or lint yield.

OBJECTIVE:

To determine if native mycorrhizal fungi are present and if they play a role in normal crop production. To determine if native mycorrhizal fungi can be stimulated to grow and enhance plant production and crop yield.

According to Plant Health Care Inc. "Myconate, the potassium salt of formonanetin, is a naturally occurring compound discovered in plant roots, which stimulates the natural growth of vesicular arbuscular mycorrhizae (VAM), thereby enhancing the growth of many plant species. Mycorrhizal fungi form symbiotic associations with plant roots in the majority of terrestrial habitats and with approximately 85 % of all plants on the earth, including most agriculturally important crops. VAM fungi can have profound beneficial effects on plant growth, yields, nutrition, and tolerance to both abiotic and biotic stress."

MATERIALS and METHODS:

Cotton variety FiberMax FM 832LL was planted March 13, 2006 at the rate of 55,000 seeds/acre. The variety was planted on 38 inch centers with a White 6700 Air planter. The previous crop was soybeans.

Fertilizer applied included 400 lbs/a of 22-6-2-3sulfur applied on December 21, 2005. Herbicides applied at planting included a banded application of 1 pt/a of Prowl H20 and 0.65 oz/a of Staple. The insecticide Asana was banded at the rate of 1.6 oz/a with the herbicide at planting.

At planting time, soil samples were collected from the top six inches of soil. Two soil samples were sent to Plant Health Care Inc. in Pittsburgh, Pennsylvania for counting native mycorrhizae in the demonstration area and another soil sample was sent to Texas A&M University Soil Testing Laboratory for nutrient analysis and recommendations.

Myconate treated plots were about 0.8 acres in size with 0.1 acre plots harvested. Plots were 12 rows wide planted in 38 inch rows and approximately 1300 feet long. Four different Myconate treatments replicated three times were applied to this test plot including:

1) Control Treatment: FM 832LL seed planted with a starter fertilizer of 27 lbs/a of 7-20-2-0.1Fe-0.17Mn-0.25 Zn fertilizer (2.5 gal/a) applied in-furrow at planting.
2) FM 832LL seed planted with 30 gm/a of Myconate mixed with 2.5 gal/a of water applied in-furrow at planting.
3) FM 832LL seed planted with 30 gm/a of Myconate mixed with a starter fertilizer of 27 lbs/a of 7-20-2-0.1Fe-0.17Mn-0.25 Zn fertilizer (2.5 gal/a) applied in-furrow at planting.
4) FM 832LL Myconate treated seed (by Sub-Sahara International, Inc.) at the rate of 30 gm per 6 pounds of seed (30 gm/a) with a starter fertilizer of 27 lbs/a of 7-20-2-0.1Fe-0.17Mn-0.25 Zn fertilizer (2.5 gal/a) applied in-furrow at planting.

About 2 weeks prior to harvest 4 cotton plants per treatment were dug up with a shovel and fine roots were collected. The roots were washed to remove soil, cut into one-quarter inch pieces, and soaked in 10% KOH for 24 hours. After 24 hours, the root samples were rinsed with water and soaked in 0.01% HCl for 15-20 minutes, rinsed again, and stained in 0.5% aniline blue in Lacto glycerol (875ml lactic acid, 63ml glycerol, 63ml distilled water) for 1-2 hours. Again, the roots were rinsed and soaked in Llacto glycerol for a permanent storage stage. Samples of roots were taken from each treatment to create 3 microscopic slides per treatment and vesicles within a defined area were counted using a microscope to assess colonization of mycorrhizae.

Plant stand populations and plant height were recorded in four and two locations respectively within each treatment. Harvest of the treatments occurred on August 7, 2006 with a cotton picker harvesting 4 of the 12 rows following the same row pattern throughout the field.

RESULTS and DISCUSSIONS:

Rainfall from November, 2005 through spring of 2006 was nearly inexistent and the county was experiencing a drought. Soil moisture was good at planting due to a recent rain although subsoil moisture was minimal. Rains fell in adequate levels through the growth stage.

There was no problem mixing the Myconate with the liquid fertilizer as in the other demonstrations, possibly due to a different fertilizer formula and a lower rate of fertilizer application. Evaluated at harvest, there were no noticeable differences between the treatments.

The two soil samples sent to Plant Health Care Inc. in Pittsburgh, Pennsylvania for counting native mycorrhizae returned with 10 and 40 spores per gram of soil. According to Dr. Don H. Marx, Chief Scientist of Plant Health Care, Inc., these results fell close to the lowest twenty percent of the 60 soil samples from throughout the United States the lab has tested this year. The average is 40 spores per gram and some in Wisconsin soils it exceeded 140 spores per gram.

Soil samples sent to Texas A&M University Soil Testing Laboratory requesting fertility levels for 2 bale/acre recommended the following: 35-3-0-0sulfur.

The only statistically difference noted in the cotton crop as a result of these treatments was a difference in cotton micronaire. Micronaire values were lower for the Myconate seed treatment. There were no other differences in any agronomic characteristic including yield which showed a trend. See Tables 1 and 2 for complete results.

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DISCLAIMER CLAUSE:

Trade names of commercial products used in this report are included only for better understanding and clarity. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Texas A&M University System is implied. Readers should realize that results from one experiment do not represent conclusive evidence that the same response would occur where conditions vary.

Table 1. Myconate treated cotton crop and its effect on root colonization, agronomic characteristics and lint quality. J.D. Schovajsa, Cooperator, Victoria County, Texas 2006.

TREATMENT	MYCOR-RHIZAE VESICLES a/ b/		PLANT HEIGHT INCHES		PLANTS 1000/A		SEED COTTON TURNOUT %		LINT LENGTH INCHES	
Check with starter fertilizer	30.7	a	33.1	a	32.2	a	43.7	a	1.22	a
Myconate in furrow with water	31.6	a	34.6	a	35.4	a	43.6	a	1.17	a
Myconate in furrow with starter fertilizer	28.1	a	33.9	a	32.0	a	42.6	a	1.20	a
Myconate treated seed	21.9	a	33.3	a	31.0	a	44.3	a	1.18	a
			3.72		4.20		1.47		0.042	
			2.33		2.63		0.92		0.026	
			6.9		8.05		2.11		2.22	
			0.7910		0.1698		0.1504		0.1624	

a/ Mycorrhizae vesicles counted on slides made from sorghum roots to determine mycorrhizal growth and colonization.

b/ Means within a data column followed by the same letter are not significantly different by ANOVA (P = 5 %; LSD).

Table 2. Myconate treated cotton crop and its effect on lint quality and yield. J. D. Schovajsa, cooperator, Victoria County, Texas 2006.

TREATMENT	LINT MIC		LINT STRNG G/TEX		LINT UNIF %		LINT NET LOAN CENTS/LB		LINT YIELD LBS/ACRE		NET RETURN $/ACRE a/	
Check with starter fertilizer	3.9	ab	32.2	a	85.8	a	54.89	a	965	a	421	a
Myconate in furrow with water	4.1	a	32.3	a	84.2	a	54.75	a	1088	a	475	a
Myconate in furrow with starter fertilizer	3.8	bc	32.1	a	85.0	a	54.75	a	1003	a	436	a
Myconate treated seed	3.7	c	31.7	a	84.1	a	54.64	a	949	a	414	a
	0.24		2.77		1.76		0.340		238.0		104.7	
	0.15		1.73		1.10		0.213		148.0		65.5	
	3.95		5.41		1.3		0.39		14.86		15.0	

	0.0207	0.9530	0.1699	0.4272	0.5755	0.5819

a/ Means within a data column followed by the same letter are not significantly different by ANOVA (P = 5 %; LSD).