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

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SUMMARY:

Native mycorrhizae were found in the soil in this demonstration in Victoria County but were reported to be at low numbers; 10 – 30 spores per gram of soil. Stimulating the native mycorrhizae with Myconate did not show to increase mycorrhizae vesciles or spores or affect plant height, harvesting seed moisture, bushel weight or sorghum yield. There was a difference noted in plant population.

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:

Grain sorghum hybrid Garst 5360 was planted April 6, 2006 at the rate of 6 pounds/acre. The hybrid was planted on 38-inch centers with a John Deere 7100 planter. The previous crop was soybeans.

Fertilizer applied included 450 lbs/a of 24-8-0-2 applied on December 12, 2005. Insecticide included Mustang Max banded at 0.6 oz/a. Herbicides applied at planting included a banded application of 1 pt/a of Guardsman Max and 1/2 pt/a of Roundup. The plot was sprayed for sorghum midge with Mustang Max on three dates: June 7, 10, and 13, 2006 at the rate of 1 gallon/100 acres for first two dates and 1 gallon/50 acres on the last date.

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 1.5 acres in size. Plots were 12 rows wide planted in 38 inch rows and approximately 1720 feet long. Four different Myconate treatments replicated three times were applied to this test plot including:

1) Control Treatment: Garst 5360 seed planted with a starter fertilizer of 50 lbs/a of 8-15-0-1+ 0.5 Zn fertilizer (8 gal/a) applied in-furrow at planting.
2) Garst 5360 seed planted with 30 gm/a of Myconate mixed with 8 gal/a of water applied in-furrow at planting.
3) Garst 5360 seed planted with 30 gm/a of Myconate mixed with a starter fertilizer of 50 lbs/a of 8-15-0-1+ 0.5 Zn fertilizer (8 gal/a) applied in-furrow at planting.
4) Garst 5360 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 50 lbs/a of 8-15-0-1+ 0.5 Zn fertilizer (8 gal/a) applied in-furrow at planting.

About 2 weeks prior to harvest 4 sorghum 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 three locations within each treatment replication. Harvest of the treatments occurred on August 16, 2006 with a combine harvesting 6 of the 12 rows.

RESULTS and DISCUSSIONS:

Rainfall from November, 2005 through spring of 2006 was nearly inexistent and the county was experiencing a drought. Soil moisture was fair at planting except on the lower end of the field in the heavier soils where it was very dry. Apparently the fast, heavy rain which fell 10 days prior to planting, ran off the powder-dry seed beds and soaked into the furrows verses soaking evenly as it did in the mixed soil on the upper end of the field. As a result, the planter was driven off from the bed center by about 4 inches to plant in more consistent soil moisture. Even still, there was a reduction in plant stand in the heavier soils.

In the mixing of the Myconate with the liquid fertilizer for application, there was a problem mixing the Myconate powder thoroughly and even when thoroughly mixed, it did segregate out and did plug up some of the 40 mesh screens in the fertilizer applicator hoses. These were cleaned and replaced as needed.

Evaluated on June 14, 2006 and at harvest, there were no noticeable differences between the treatments. Harvest was delayed due to excessive rains and the field stood in water for about 10 days. Some sprouting of sorghum occurred in the head causing about a 10 percent seed loss.

The two soil samples sent to Plant Health Care Inc. in Pittsburgh, Pennsylvania for counting native mycorrhizae returned with 10 and 30 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.

The only difference noted in the final analysis of the data was a significant difference in plant population due to treatment. Although plant populations differed, minor changes in plant

population in grain sorghum usually does not make a difference in yield due to sorghum's ability to tiller out to compensate for reduced plant stand. There was no other variable that proved significant. See Table 1 for complete results.

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DISCLAIMER CLAUSE:

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Table 1. Myconate treated sorghum crop and its effect on root colonization, agronomic characteristics and yield. Brian Adamek, Cooperator, Victoria County, Texas 2006.

TREATMENT	MYCOR-RHIZAE VESICLES a/ b/		PLANT HEIGHT INCHES		PLANT STAND 1000/A		% MOIS-TURE		BUSHEL WEIGHT LBS/BU		YIELD LBS/A	
Check with starter fertilizer	37.8	a	52	a	56.5	ab	15.8	a	51.0	a	3177	a
Myconate in furrow with water	48.8	a	48	a	55.5	b	15.2	a	50.3	a	2845	a
Myconate in furrow with starter fertilizer	31.1	a	50	a	57.6	a	14.9	a	51.3	a	3048	a
Myconate treated seed	29.9	a	50	a	52.6	c	15.2	a	50.0	a	2707	a
			0.32		1.91		0.95		2.28		432.2	
			0.20		1.19		0.60		1.42		270.2	
			4.75		2.15		3.91		2.81		9.18	
			0.3406		0.0014		0.2241		0.5761		0.1364	

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).