



## **Foliar Application of Different Organic Products on Soybeans Grown during the 2005 season near Comstock MN**

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### **Introduction**

Soybean rust (*Phakopsora pachyrhizi* /*P. meibomia*) is an important exotic disease threatening commercial soybean production in the US. Environmental conditions in the US may be favorable for rust development.

The rust pathogen survives and reproduces only on live hosts. Soybean rust is not seed-borne, although spores could travel as contaminants in seed lots from infested areas. Urediniospores are very easily wind disseminated. Soybean is susceptible at any growth stage but symptoms usually appear at or after flowering and show up on the lower leaves first. The pathogen prefers prolonged wet and cool conditions.

Varietal screening done in quarantine by the USDA reveals that virtually all the existing commercially grown soybean cultivars are susceptible. A number of different synthetic fungicides are known to be effective in rust management but organic management has not been sufficiently studied due to the absence of the disease in the US. The quick arrival of soybean leaf rust (first reported in 2004) in the U.S. from points south (South America and Africa) caught many by surprise.

Soybean rust may or may not find its way to NW MN organic soybean field in the future. Soybean rust will not overwinter in MN. We will have to wait for the spores to travel from the south every season. Risk of soybean leaf rust may be based on spring rust occurrence in the southern US and early summer weather systems, such as tropical storms, that may influence the travel of spores.

### **Testing in 2005**

NW Minnesota has a group of around 75 growers of organic soybeans and all producers are concerned about the prospect of rust appearing in NW Minnesota in the future.

The study during the 2005 season looked at available organically-approved materials (Compost tea, Ballad™, MicroAF™, Sporan™, Calcium-25, Maxicrop, MicroAC™ also named Aphrid™ and AgroKelp®) and their effect on yield in the absence of soybean rust. The trial was conducted in a certified organic grower's production system at Comstock just south of Moorhead. The test was laid out as a

randomized block trial with 4 replicates and 18 treatments comparing treatments with a control plot not sprayed with any product and a control sprayed with water at the first application date. The plot length was 25 feet x 4 rows seeded 22 inches apart. The soybean variety was S 0 8 - 8 0 seeded on May 25 2005. Weeds were controlled by the producer cultivating the plots.

Organic farmers, like conventional soybean farmers, will need to do a risk/benefit assessment and determine what the economics are of spraying any potentially beneficial materials if diseases and aphids will be occurring on a regular basis.

Products used

**Biological products:**

**“Compost tea”**

A product made at the farm under controlled brewing conditions with compost and other materials.

The product was composed on farm with:

1.5 gallons Damm Fish with kelp

1.5 gallons compost tea

1 gallon Sure K (Potassium sulphate)

4 oz Neem oil

4 oz Koranja oil

.25 gallons Molasses

.25 gallon organic trace blend

Estimated cost \$10.60 per acre

**Ballad™**

Biofungicide based on patented strain of *Bacillus pumilus*.

**MicroAF™**

This is a formulation with eight different microorganisms in a liquid material. The eight strains are

*Methylobacterium mesophilicum*

*Rhodococcus erythropolis*

*Kocuria varians*

*Pseudomonas diminuta*

*Streptomyces violaceusniger subsp. violaceusniger*

*Streptomyces roches subsp. Rochei*

*Streptomyces lavendula*

*Bacillus megaterium*

**Sporan™**

A concentrated blend of plant essential oils. (Rosemary oil 17.6% by weight and Oil of Wintergreen 82.4% by weight). Fast-acting curative contact fungicide. Broad-spectrum control. Controls disease within days of application.

### Growth Stimulants:

#### **Calcium-25®**

A foliar applied product was developed for the market in 1981 by Dr. Andrew J. Welebir of the company Bio-Gard as an organic calcium source. The product is supposed to act as a non –toxic plant growth enhancer.

**AgroKelp®** is a marine algae concentrate. AgroKelp is a bio stimulant and growth promoter. Its active ingredients are oligosaccharides, laminaran and manitol, which are reserve sugars in Kelp and in land plants that work as germination promoters, sub-defenses and stimulate enzymatic reactions that promote growth. Present in the extract: auxin, cytokinin and gibberelic Acid. The product is made from 100% *Macrocystis pyifera*, or Kelp.

#### **Maxicrop®**

Is a biostimulant produced from *Ascophyllum nodosum* seaweed or Norwegian kelp. The product contains a wide range of trace elements and growth stimulants for plant growth.

### Aphid control product

There was also a concern that this year there would be soybean aphid pressure, therefore treatments with an organic insecticide were included in the trial.

**MicroAC™ (or Aphrid™)** this is a blend of beneficial microorganisms that impact the growth of the soybean aphid. The blend contains three naturally occurring fungi, selected for their ability to colonize and infect the aphids and use them as a food source. The product also contains a proprietary nutrient blend to create an environment where the fungi can survive as a foliar spray application.



Photo 1. Producer field July 7, 2005



Photo 2: Soybean at First application July 7<sup>th</sup> 2005.



Photo 3. Individual plant July 7<sup>th</sup> 2005.

Table 1. Treatments, applied rate of application, and date of application organic soybean trial, Comstock MN 2005.

Treatment	Name	Product / Acre <sup>1</sup>	Application <sup>2</sup>	Date
1	Sporan	3 pt/A	1	7-Jul
2	Ballad	8 pt/A	1	7-Jul
3	Maxicrop	24pt/A	1	7-Jul
4	MicroAF	12.8oz/A	1	7-Jul
5	MicroAC	0.1lb/A	1	7-Jul
6	Compost tea	8 pt/A	1	7-Jul
7	Calcium-25	0.1lb/A	1	7-Jul
8	MicroAF	12.8oz/A	1	7-Jul
	MicroAC	0.1lb/A	1	7-Jul
9	Maxicrop	24pt/A	1	7-Jul
	Maxicrop	24pt/A	3	5-Aug
10	Water check		1	7-Jul
11	Compost tea	8 pt/A	1	7-Jul
	Compost tea	8 pt/A	3	5-Aug
12	Ballad	8 pt/A	2	26-Jul
13	Maxicrop	24pt/A	3	5-Aug
14	MicroAF	12.8oz/A	2	26-Jul
15	MicroAC	0.1lb/A	2	26-Jul
16	Calcium-25	0.1lb/A	2	26-Jul
	Calcium-25	0.1lb/A	3	5-Aug

17	MicroAF	12.8oz/A	3	5-Aug
	MicroAC	0.1lb/A	3	5-Aug
18	Sporan	3 pt/A	2	26-Jul
19	Control		1	7-Jul
20	AgroKelp	4pt/A	2	26-Jul
	AgroKelp	4pt/A	3	5-Aug

<sup>1</sup>All products were applied with 10 gallons of water per acre; Calcium-25 concentration was 1.44 g/liter

<sup>2</sup>1= Applied July 7 with slight southern wind at 7.5 miles per hour; temperature 79 degrees.

2=Applied July 26 with slight northern wind at 6 miles per hour; temperature 69 degrees.

3=Applied 5 Aug 8-9:30 calm; temperature 74 degrees.



Photo 4: Soybean crop on August 5<sup>th</sup> 2005.

#### Results:

During the season the soybean plots were visited on a regular basis. No visual differences in the treatments were observed. No soybean leaf rust was reported in NW MN. A low level of soybean aphids was observed in the field as well as natural predators. Crop height was measured on September 21<sup>st</sup>.

The soybean plots were harvested on Thursday September 29<sup>th</sup>. Plots were end trimmed to a length of 20 feet and the two inside rows were harvested. Soybean samples were cleaned and weighed. Test weight, oil, and protein content determined. The statistics were determined with the Statistix software program. The conclusion is that none of the treatments outyielded the controls (no treatment at all, and water applied on July 7<sup>th</sup>).



Photo 5: Water Check Control plot on September 21<sup>st</sup> 2005.



Photo 6. Balad plot on September 21<sup>st</sup> 2005.



Photo 7. Small plot combine in front of soybean experiment, September 29.

Table 2. Crop height, bushel per acre, test weight, protein and oil percent of different treatments applied to organic soybeans grown near Comstock MN during the 2005 growing season.

Treatment	Rate	Application date	21-Sep-05 Crop height (inch)	Yield (bu/acre)	Test weight (lb/bu)	Protein (%)	Oil (%)
MicroAC	0.1lb/A	2	29.3	54.9	57.9	34.6	18.4
Maxicrop+Maxicrop	24pt/A +24pt/A	1+2	28.1	53.9	57.9	34.7	18.4
Ballad	8 pt/A	2	27.9	53.9	57.8	34.5	18.4
<b>Control</b>		none	28.9	<b>53.3</b>	57.7	34.8	18.3
Compost tea	8 pt/A	1	28.5	52.6	57.7	34.7	18.4
Calcium-25 + Calcium-25	0.1lb/A+0.1lb/A	1+2	28.4	52.5	57.5	34.8	18.4
MicroAC	0.1lb/A	1	28.5	52.5	57.6	34.9	18.3
Calcium-25	0.1lb/A	1	27.4	52.4	57.5	34.8	18.4
Maxicrop	24pt/A	3	29.1	52.4	57.4	34.8	18.3
Sporan	3 pt/A	1	28.4	52.0	57.6	34.8	18.4
MicroAF+MicroAC	12.8oz/A + 0.1lb/A	1	27.8	51.8	57.8	34.6	18.4
<b>Water control</b>		1	28.3	<b>51.7</b>	57.4	34.7	18.4
MicroAF	12.8oz/A	1	28.4	51.6	57.8	34.7	18.4
Maxicrop	24pt/A	1	27.9	51.5	58.0	34.7	18.3
MicroAF	12.8oz/A	2	27.9	51.0	57.4	34.8	18.4
Compost tea + compost tea	8 pt/A + 8pt/A	1+2	27.9	50.6	57.9	34.5	18.4
Sporan	3 pt/A	2	27.4	50.2	57.7	34.8	18.3
AgroKelp + AgroKelp	4pt/A+4pt/A	2+3	27.0	50.1	57.7	34.7	18.3
MicroAF + MicroAC	12.8oz/A + 0.1lb/A	3	26.4	50.1	57.9	34.7	18.4
Ballad	8 pt/A	1	29.5	47.6	57.5	34.6	18.4
<b>Average</b>			28.2	51.8	57.7	34.7	18.4
<b>LSD 0.05</b>			N.S.	N.S.	N.S.	N.S.	N.S.

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