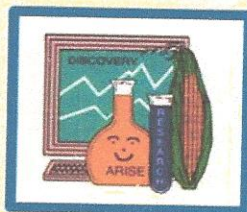


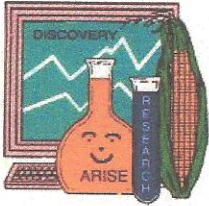


Evaluation of Performance of  
Sea-90/Humate product for Yield  
Potential in Corn.  
**12-SA0112-12**

Work Conducted By:



**Arise Research & Discovery, Inc.**  
3998 E. Snake Trail Road - Martinsville, Illinois 62442  
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# **Arise Research & Discovery, Inc.**

3998 E. Snake Trail Road - Martinsville, Illinois 62442

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## **PROJECT PROTOCOL**

**Project Proposal Code:** 12-SA0112-12

**Date:** May 16, 2012

**Simplified Title:** Evaluation of Performance of Sea-90/Humate product for Yield Potential in Corn

**Company:** SeaAgri Inc

**Contact:** Robert Cain, President  
SeaAgri Inc  
P.O. Box 88237  
Dunwoody, GA 30356  
[www.seaagricom](http://www.seaagricom)

Tel: 770-361-7003

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E-Mail: [Robert@seaagri.com](mailto:Robert@seaagri.com)

### **Objectives:**

1. Test Sea90/Humate at 2 different rates with normal grower rates of urea and at ½ of normal rate of urea on corn and compare against Sea 90 by itself.
2. Evaluate for Yield, Protein, in the Grain, ERGS and microbe populations in the soil

**Location:** Arise Research & Discovery, Inc.; Martinsville, IL.

**Crop (Variety):** Corn NON-GMO

### **Critical: Yield**

Soil and Nitrate Test

Use Midwest Labs (S2N)

ERGS

In-House

Feed Tests

Use International Ag Labs

Soil Microbes testing

Use Ward Labs in Kearney, NB

Chlorophyll Testing

In-House

**Study Length:** One Growing Season

## **Treatments: All With NON-GMO Corn**

- 1. Control Urea 150 LbN/ac broadcast PPI**
2. Urea 150 LbsN/ac plus Sea90/Humate at 25 Lbs/ac broadcast with the Urea PPI
3. Urea 150 LbsN/ac plus Sea90 at 25 Lb/ac broadcast with the Urea PPI
4. Urea 150 LbsN/ac plus Sea90/Humate at 75 Lb/ac broadcast with the Urea PPI
5. Urea 150 LbsN/ac plus Sea90 at 75 Lb/ac broadcast with the Urea PPI
- 6. Control Urea 75 LbsN/ac broadcast PPI**
7. Urea 75 LbsN/ac plus Sea90/Humate at 25 Lb/ac broadcast with the Urea PPI
8. Urea 75 LbsN/ac plus Sea90 at 25 Lb/ac broadcast with the Urea PPI
9. Urea 75 LbsN/ac plus Sea90/Humate at 75 Lb/ac broadcast with the Urea PPI
10. Urea 75 LbsN/ac plus Sea90 at 75 Lb/ac broadcast with the Urea PPI

## **Data Collection:**

Yield, MC% Test Weight  
ERGS energy at Preplant (each treatment)  
Soil Nitrates Preplant One composite sample (Use Midwest Labs S2N test)  
Soil microbes test Preplant one composite sample Use Ward Labs  
ERGS energy at 60 DAT each Treatment  
Soil Nitrates at 60 DAT each Treatment (Use Midwest Labs S2N test)  
Soil microbes Test 60 DAT each treatment Use Ward Labs  
Chlorophyll leaf Test at 60 DAT, and at R1  
Feed Test for protein for Grain (use International Ag Labs)  
Fall Corn Stalk N Test

**Plot Design:**      **Type:** Strip   **No. Reps:** 2      **No. Field Plots:** 20

**Plot Size:** 10 ft x 30ft   **No of Rows:** 4      **Row Spacing:** 30-inch wide rows

## Summary

### Evaluation of Performance of SeaAgri's SEA-90/Humate Products for Yield Potential in Corn.

Wet early, wet late and dry and miserable hot in the middle summed up this growing season's weather here at the station.

After adequate rainfall in April, it turned dry from May 1 to the middle of August. May had a total of 1.4 inches with most of it coming very early and very late in the month.

The ground used for the SeaAgri plots had been in turf for several years. It was subsoiled with a single shank ripper and then moldboard plowed on March 24 and disced three times.

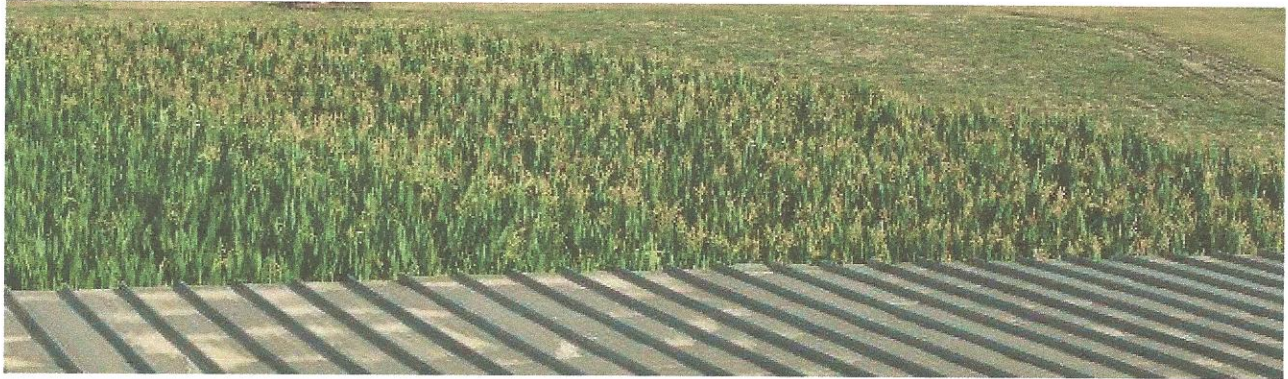
We waited until the likelihood of a heavy freeze had passed during the second week of May.

Treatments were broadcast by hand on May 19 and incorporated with a field cultivator. Spectrum Non-GMO 4130 (91 day RM) was planted into dry soil on May 22. A light rain followed on May 23 and another 0.6 inches followed on May 31 which got the corn germinated and out of the ground. After that there was no significant rainfall between June 1 and August 9<sup>th</sup>. No herbicides, insecticides, fungicides were applied and it was not cultivated.



Drip Irrigation was applied on SeaAgri plots over a five day period starting July 17. Four rows were irrigated at the same time for about 4-5 hours. The T-Tapes were then moved to the next set of 4 rows the following day. This supplied the equivalent of about 1.0 of rainfall.

August rainfall totaled 4.1 inches and then the remnants of hurricane Isaac dropped 5.76 inches during the first week of September with virtually no runoff.

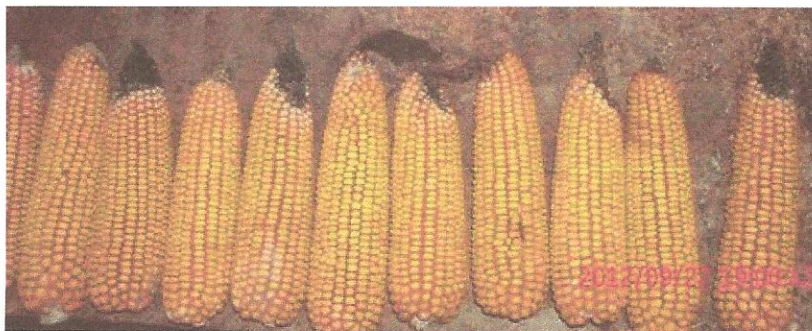


SeaAgri plots at tassel on July 17.

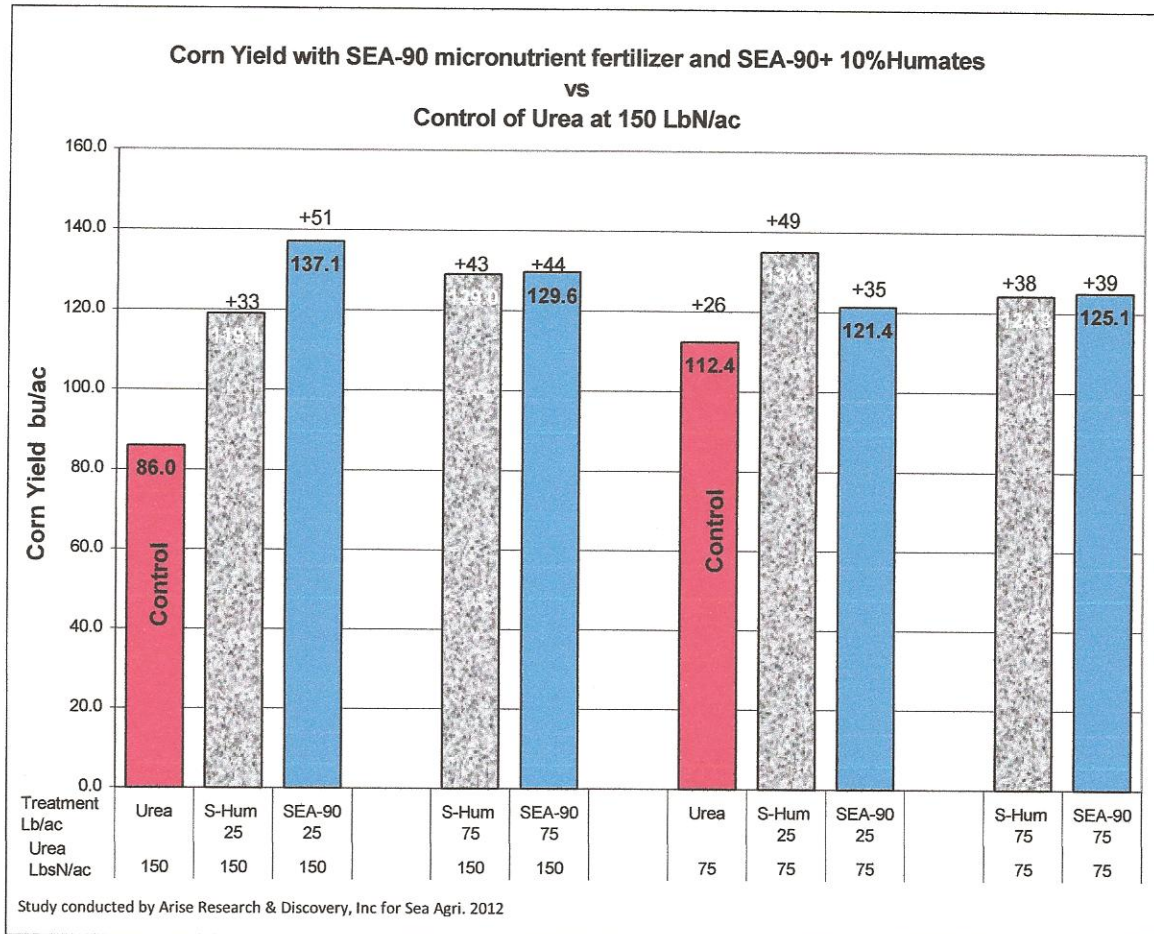
The corn hybrid used did not have a strong root system and a wind storm later in the growing season did cause some them to lean, but did not blow them completely down. This hybrid had a very loose husk which opened up and allowed bird damage to occur making it more susceptible to aflatoxin.



Photo on Sept 16. Corn was hand harvested 4 days later on Sept 20.



Ear worms, birds and aflatoxin all had some effect on the corn this year, however, the treated plots still yielded extremely well as shown in the graph on the next page.

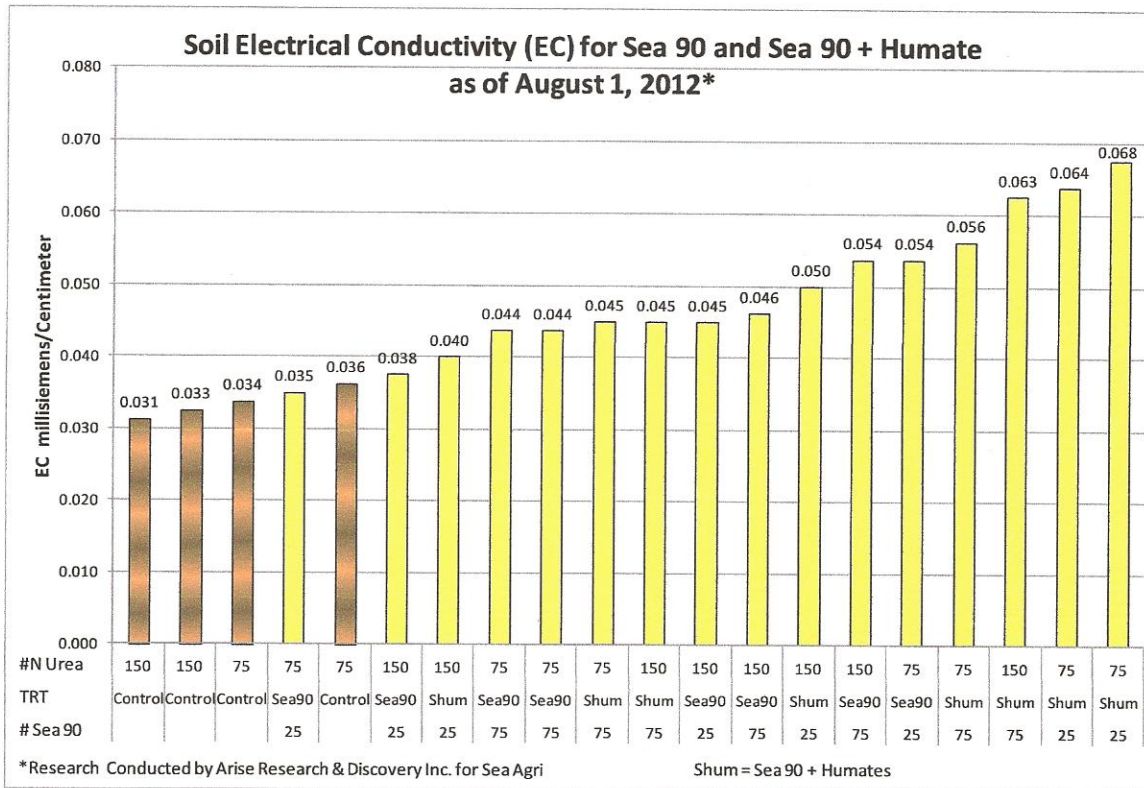


Corn yields for treatments with SEA-90 and SEA-90 + 10 % Humates averaged between 119 and 137 bu/ac and were 33 to 51 bu/ac higher than the Control fertilized with 150 LbN/ac of Urea. This is highly significant in a dry year, especially with a short-season 91-day non-GMO corn. Most corn in the area around Martinsville yielded 0 to 40 bu/ac due to earlier planting that caused pollination to try to occur in the extreme 106 degree heat in early July. SeaAgri's plots were planted on May 22 so their pollination period missed the extreme heat. But it is obvious that yields benefited greatly from the SEA-90 micronutrient fertilizer and humate treatments.

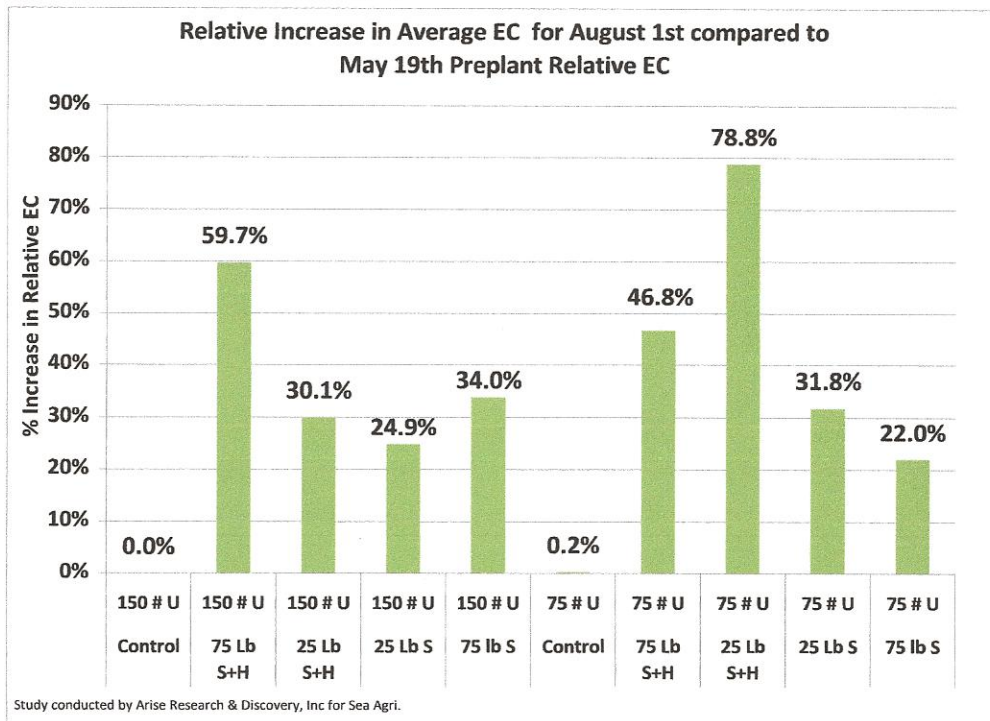
Corn yields at the 75 Lb/ac rates of SEA-90 and SEA-90+Humates were about equal, although the plots with 150 LbN/ac of urea averaged 4 to 5 bu/ac higher than those with 75 LbN/ac of urea.

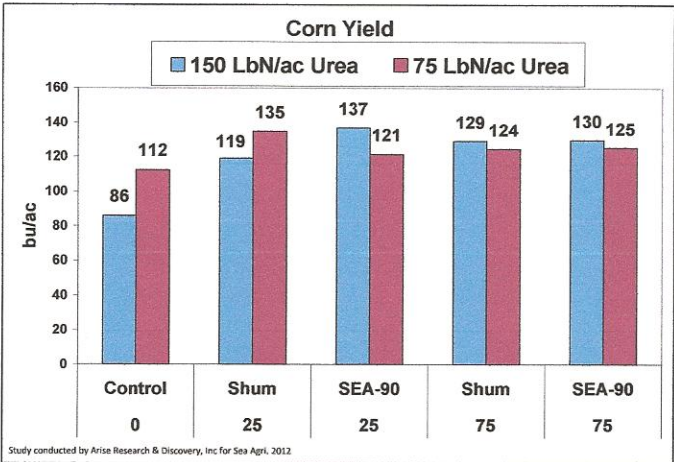
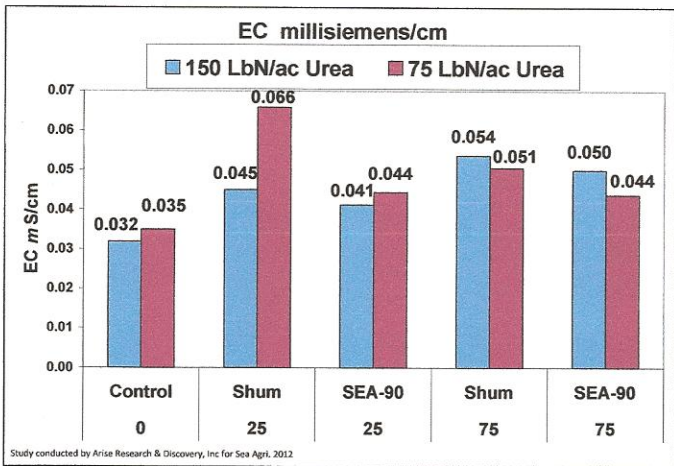
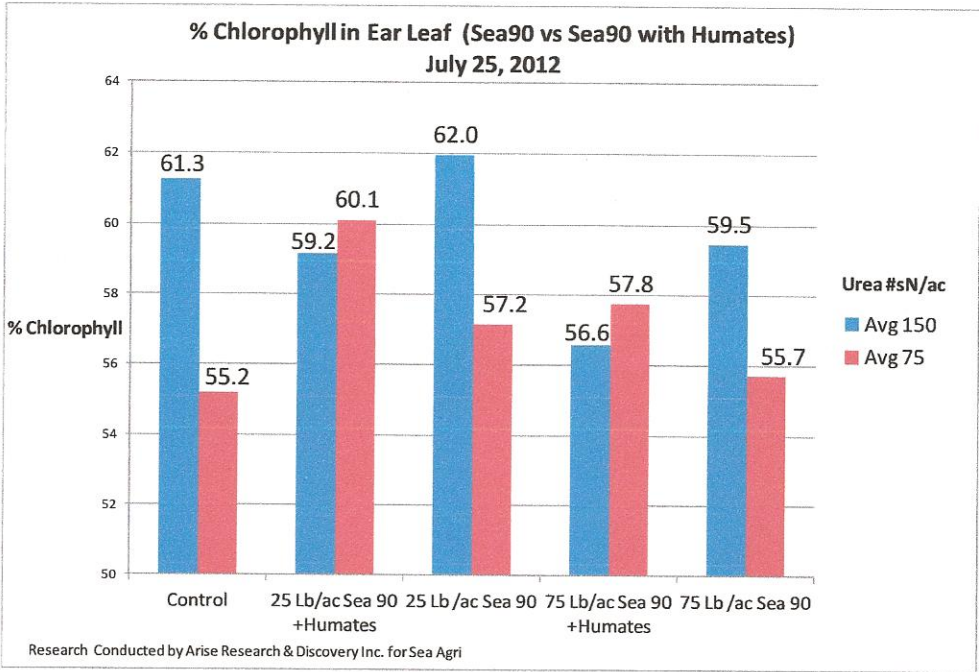
An interesting reversal occurred at the 25 Lb/ac treatment rate. In the plots with 150 LbN/ac of urea, the SEA-90 yielded 18 more bu/ac than the SEA-90 + Humates. However, in the plots with 75 LbN/ac of urea the SEA-90+ Humates at 25 Lb/ac averaged 13.5 bu/ac higher than the SEA-90.

Data collected from around the country after the drought of 1988 confirms what was noted in the controls here. More energy was used to convert the nitrogen in 150 LbN/ac rate and was unavailable to go to yield. However, SeaAgri's treatments seemed to release that energy and make it available to the soil microbes and ultimately to the corn plants.



Even though the dry soil in August caused actual EC levels to be one-tenth as high as in May, the SEA-90 and SEA-90 with Humate both increased compared to the Controls with Urea. On a relative scale, each of the treatments also increased substantially (22 to 78.8%) when compared against its own level on May 19<sup>th</sup>.





While Humates increased the ear leaf Chlorophyll by about 1 percentage point for the 75 LbN/ac urea rate compared to the 150 LbN/ac urea rate, it only increased yield (135 bu/ac) when added at the lower treatment rate of 25 Lb/ac of SEA-90+humante. This treatment also had the highest EC of 0.066 when measured in dry soil on August 1.

The 150 LbN/ac Urea Control plots had the second highest chlorophyll reading (61.3) but the lowest yield (86 bu/ac) and the lowest conductivity reading (0.032).

The SEA-90 and humate treatments increased soil energy as measured by electrical conductivity by a minimum of 17% up to 89% and increased yield by 6% up to 59%.

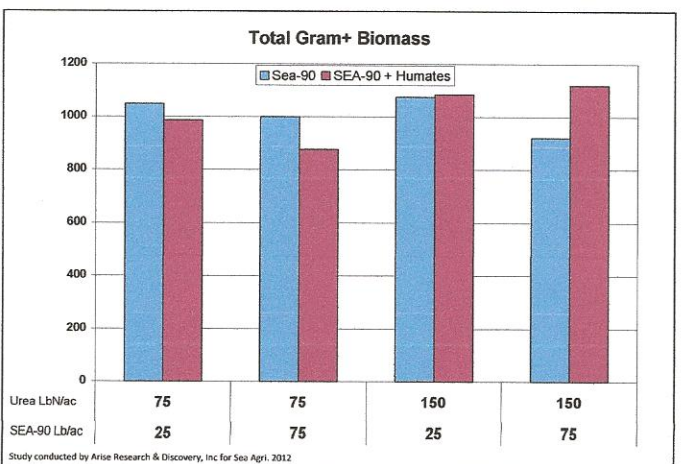
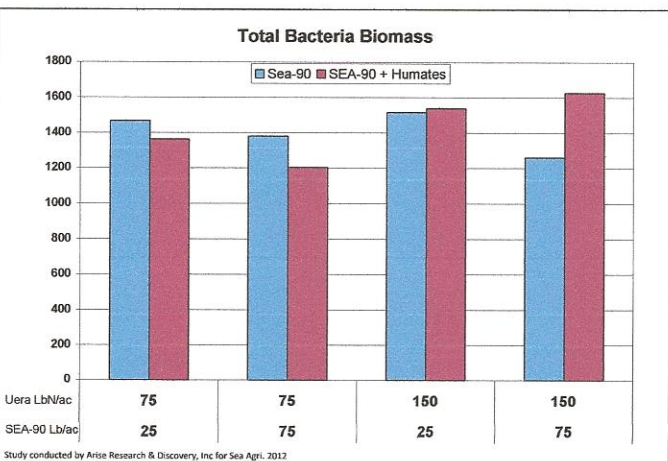
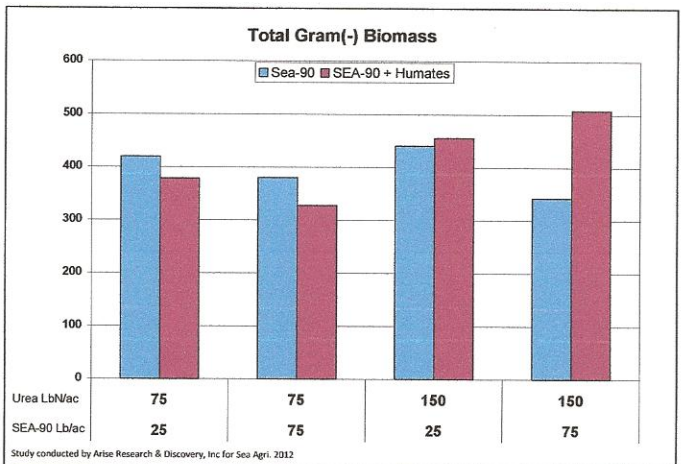
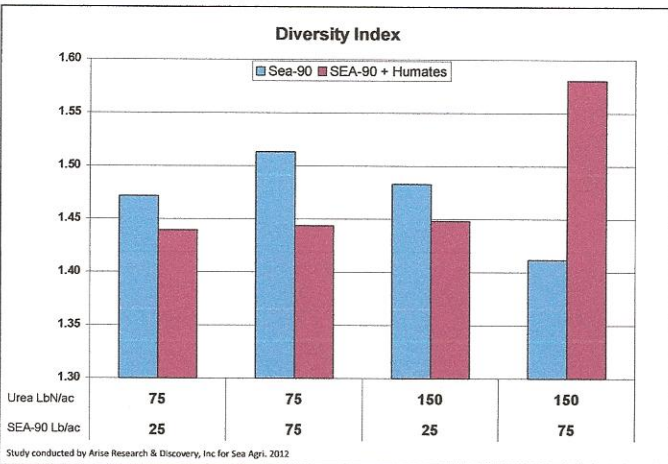
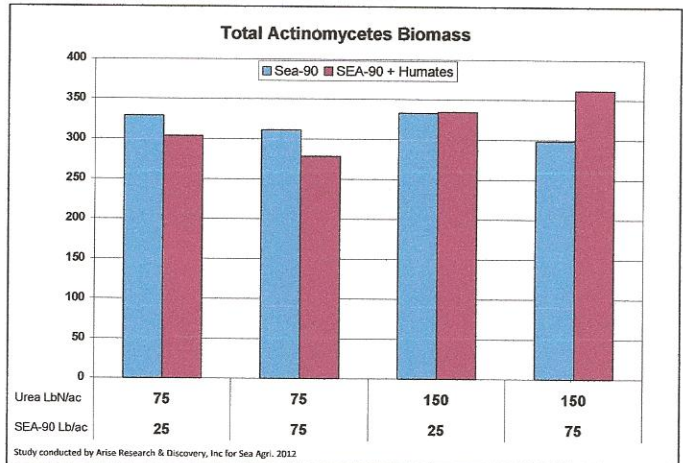
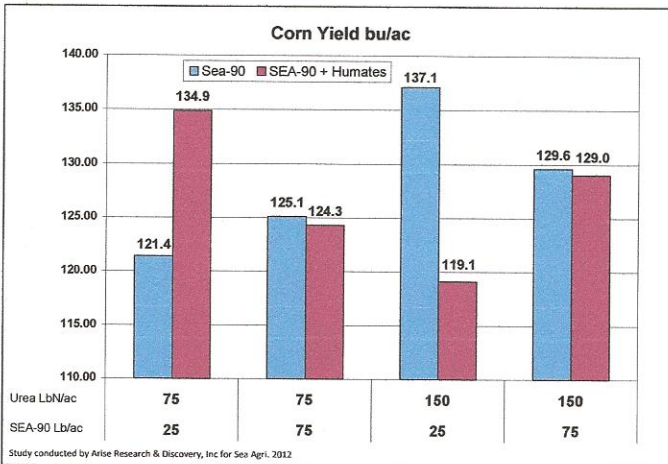


### Microbe Activity vs. Corn Yield

While corn yield did not match up exactly with the trends in bacteria and fungi measurements made on August 1, there were some interesting and consistent trends in the microbe data. At the 75 LbN/ac rate for urea, corn yield bounced down 10.6 bu/ac as SEA-90 + Humates increased from 25 to 75 Lb/ac. Eight of the eleven microbe categories also had less activity with the 75 Lb/ac rate of SEA-90 + Humates; only the diversity index, rhizobia and protozoa biomass increased.

At 150 LbN/ac urea and 25 Lb/ac SEA-90 + Humates, yield dropped to 119.1 bu/ac even though all but two of the microbe categories increased compared to either of the 75 LbN/ac urea rates.

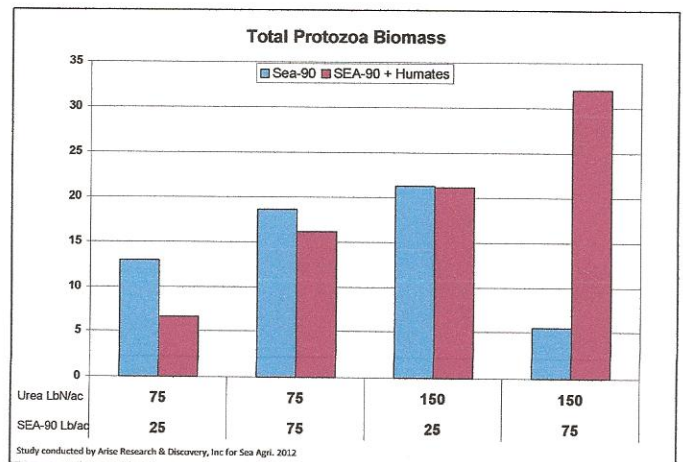
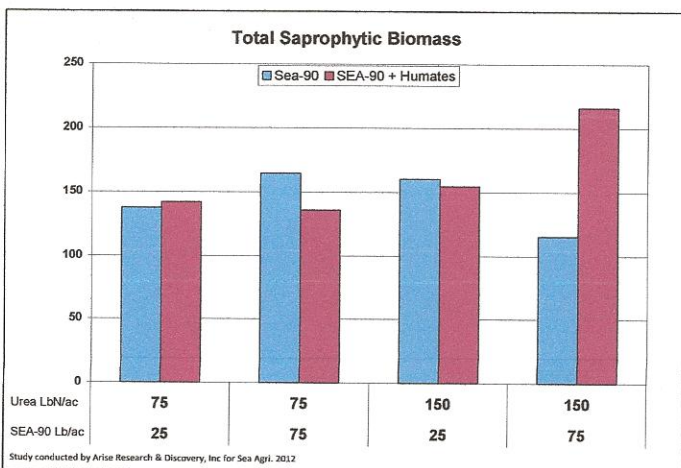
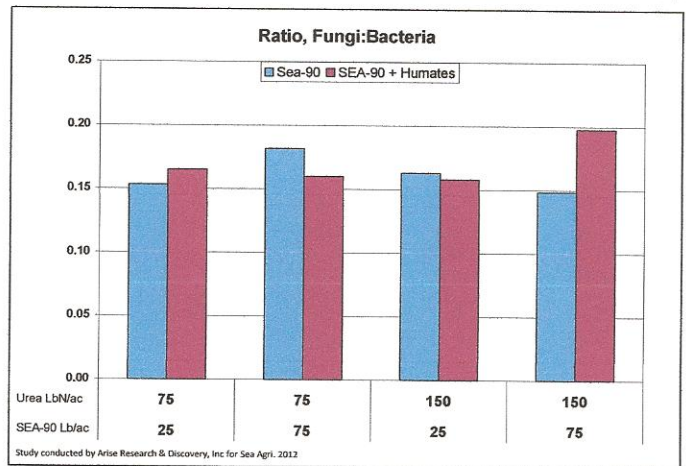
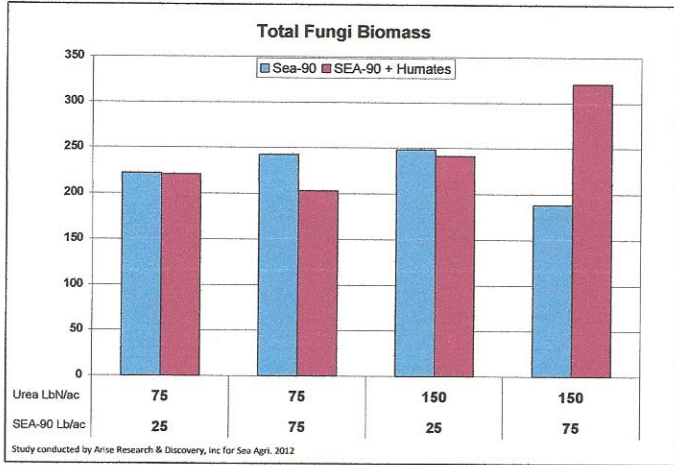
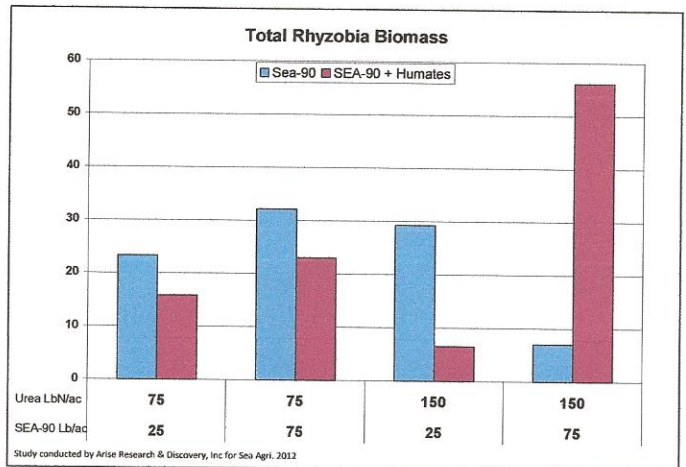
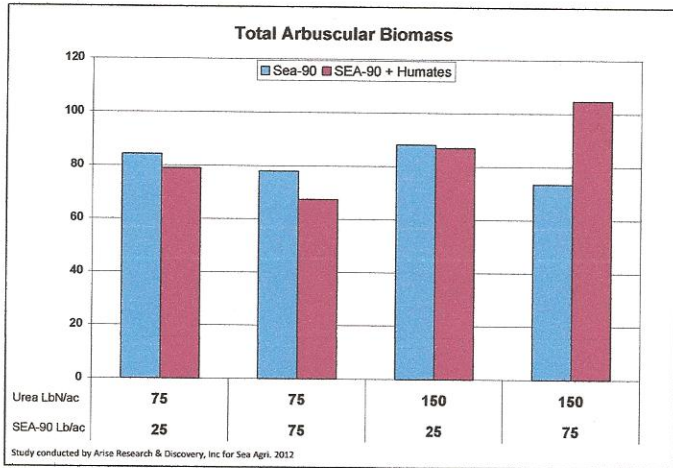
When 75 Lb of SEA-90 + Humates were added to the 150 Lb/ac urea plots, yields jumped back to 129.0 bu/ac and the highest microbe activity levels were recorded in all eleven microbe categories. In this dry year, humates mixed at 10% with SEA-90 in the 25 lb/ac rate along with 75 LbN/ac of urea, resulted in 134.9 bu/ac.

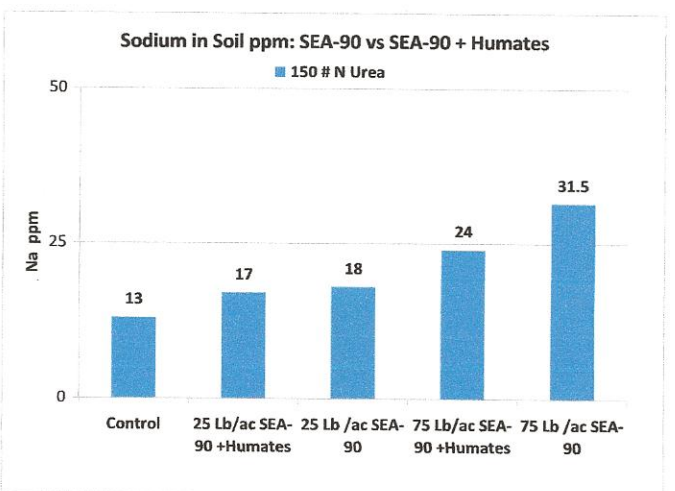
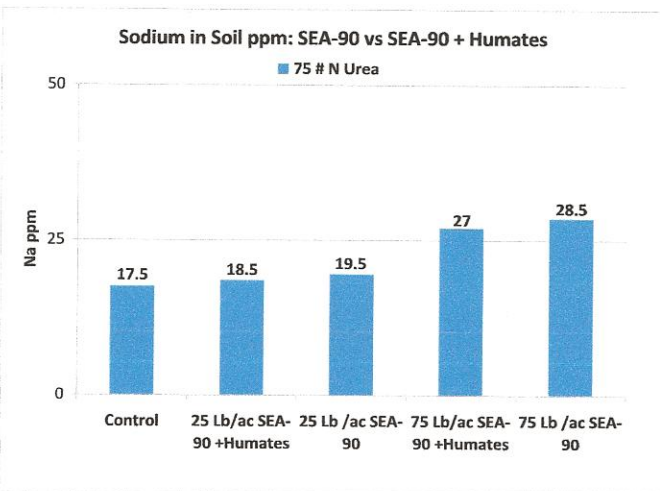
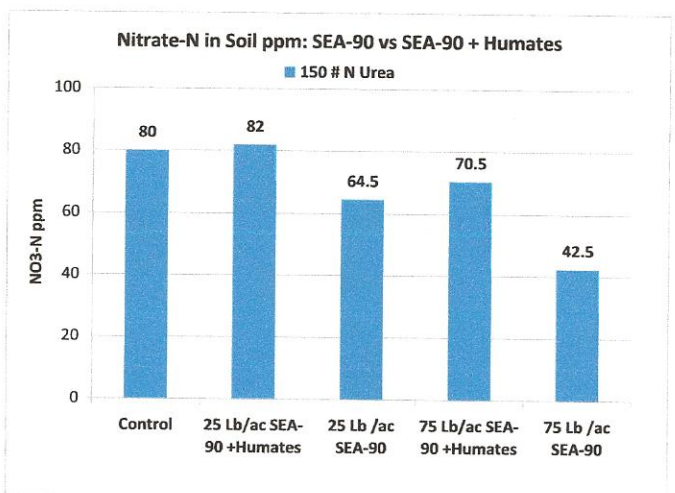
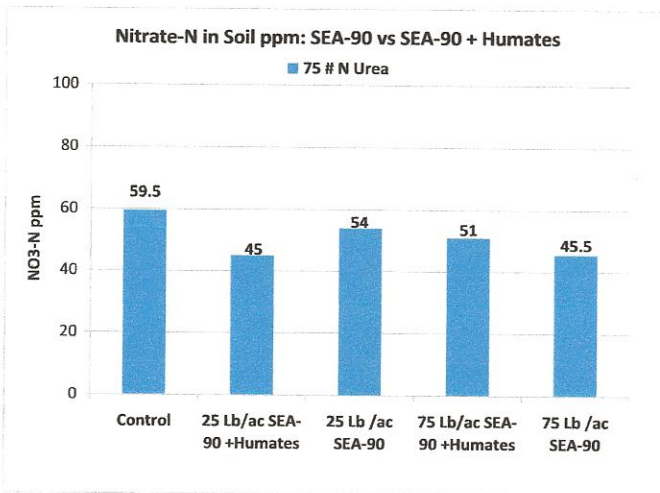
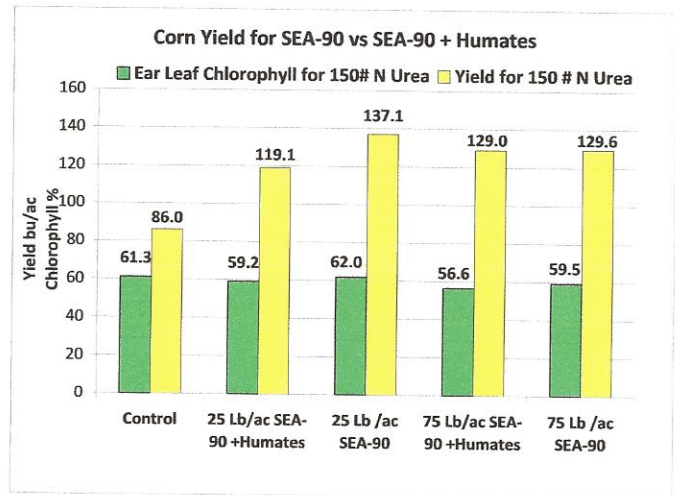
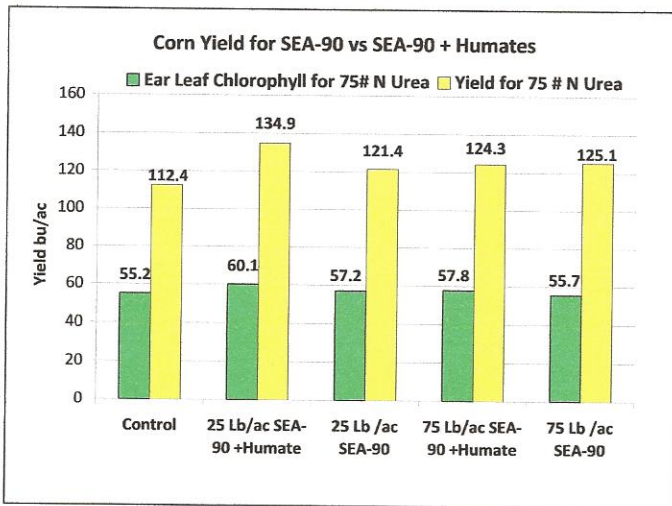


For SEA-90 by itself, corn yield topped out at 137.1 bu/ac in the plots with the 150 LbN/ac urea rate and 25 Lb/ac of SEA-90. Fungi and bacteria biomass were both at their highest levels in these plots.

When the SEA-90 level was increased to 75 Lb/ac in the 150 Lb/ac urea plots, the microbe activity decreased in all eleven categories and yields dropped by 7.4 bu/ac from 137.1 to 129.6 bu/ac. It seems the extra sea salts and higher nitrogen levels were not handled as well by the soil microbes.

**Economics** were evaluated with corn at \$7.00/bu, Urea at \$0.40/LbN, SEA-90 at \$0.25/Lb and SEA-90 + Humates at \$0.45/Lb. While SEA-90 by itself did slightly better than with the humates in 3 out of the 4 comparisons, SEA-90 + Humates at the 25 Lb/ac rate had the best value after subtracting the N and treatment costs at \$903.05/ac. That was \$146.25 and \$361.05 more per acre than the Control with 75 LbN/ac and the Control with 150 LbN/ac. The cost of the SEA-90 + Humates was only \$11.25/ac for its 25 lb/ac rate. SEA-90+ Trts improved income by at least \$220/ac vs. the 150 LbN Urea Control.

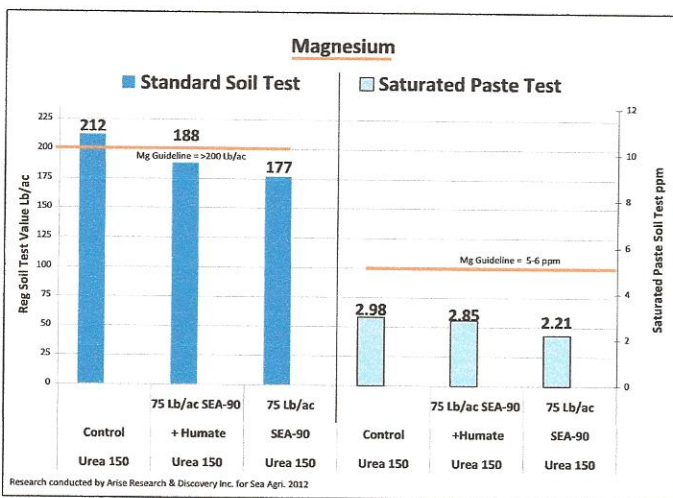
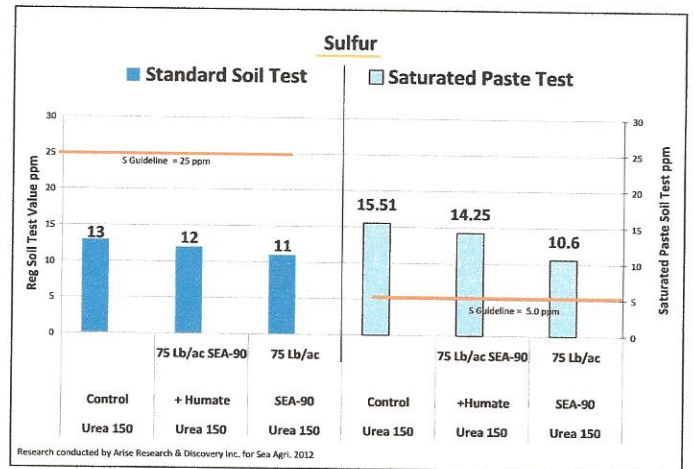
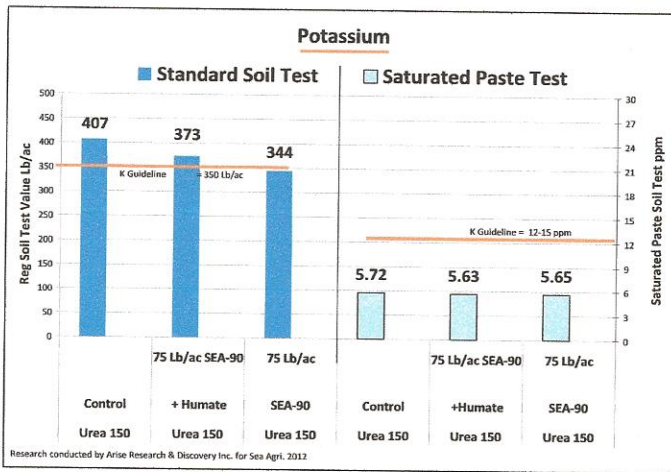
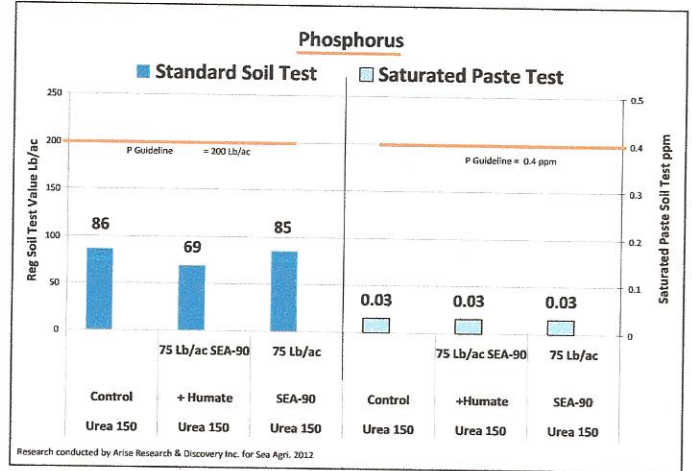
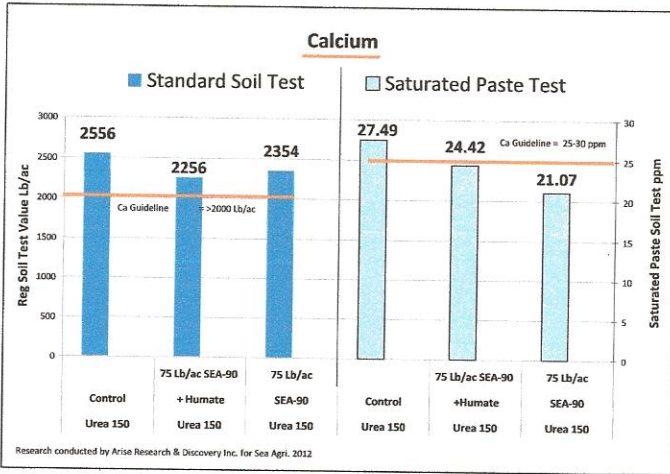




### Sodium, Soil Nitrate, Chlorophyll and Yield

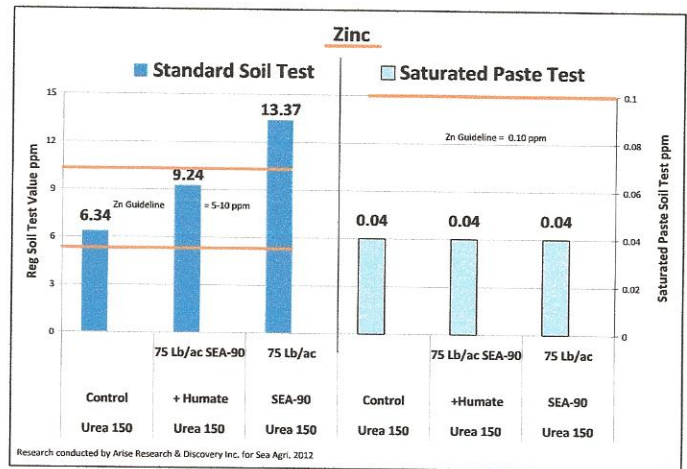
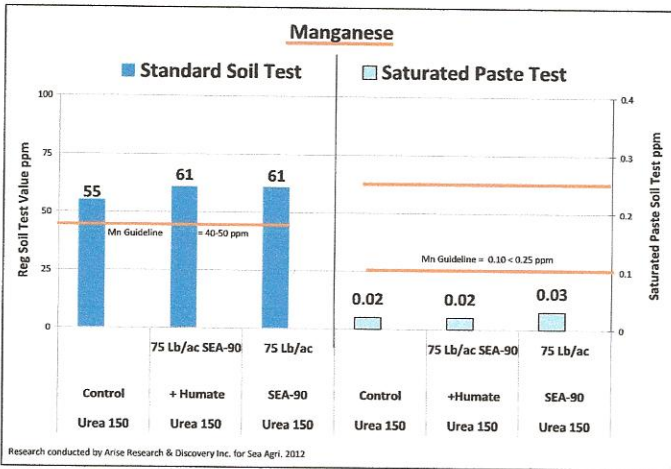
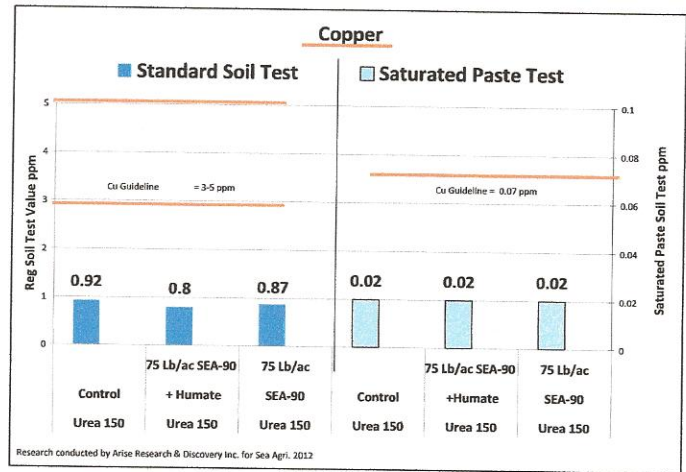
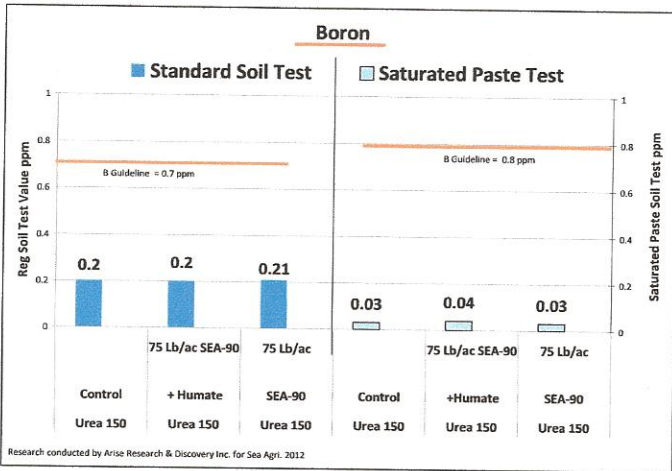
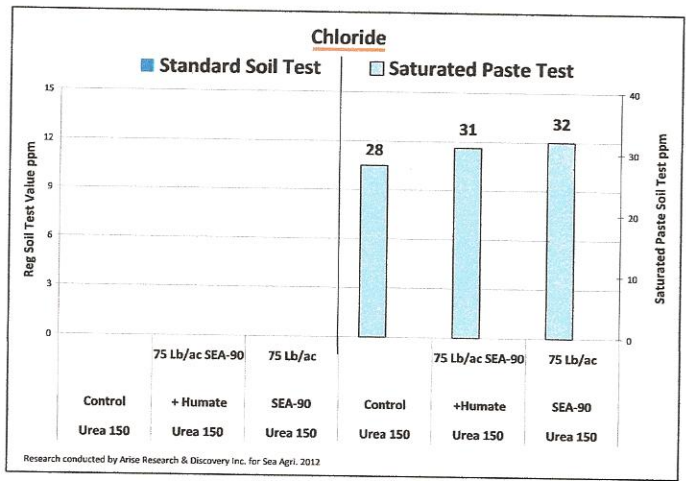
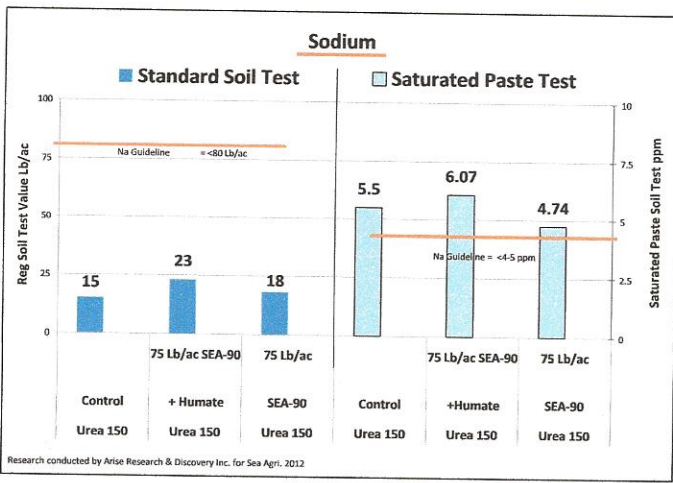
Compared to the controls (with just urea), all four treatments increased the sodium content of the soil (by 6 to 142%) and increased corn yield by 8% up to 59%. Addition of the Humates to the SEA-90 tended to slightly lower the sodium content of the soil tests taken July 30 compared to the SEA-90 by itself. But, in 3 out of

4 comparisons, the Humates raised the soil Nitrate-N concentration. At the 75 LbN/ac Urea rate, the humates increased the leaf chlorophyll and corn yield slightly. But at the 150 LbN/ac Urea rate SEA-90 by itself increased the leaf chlorophyll and grain yield compared to the humates. In this dry year, the most profitable combination was 25 Lb/ac Sea-90 + Humates with the 75 LbN/ac rate of urea.



**Soil Test Post Harvest** - After harvest, 3 of the plots were selected to have both a regular Mehlich 3 soil test and a saturated paste test performed on the soil. The Mehlich 3 test uses strong acids to extract the minerals and is useful to estimate nutrient reserves in the soil. The saturated paste test is conducted with distilled water and better indicates the bioavailability of the nutrients. Sometimes the paste test will indicate a major deficiency whereas the standard Mehlich 3 test might indicate that the mineral in question was in sufficient abundance.

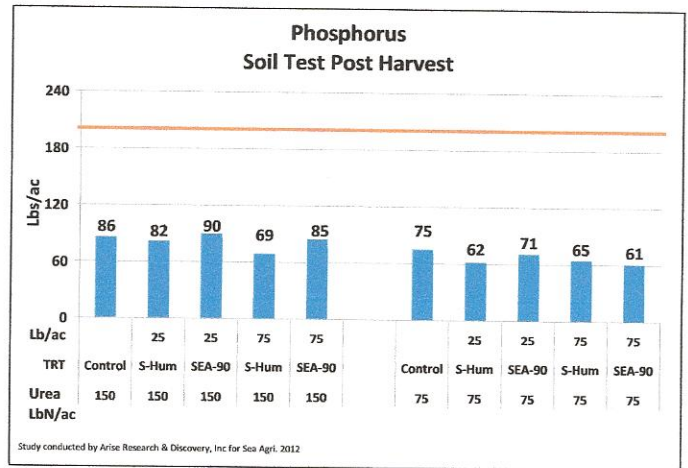
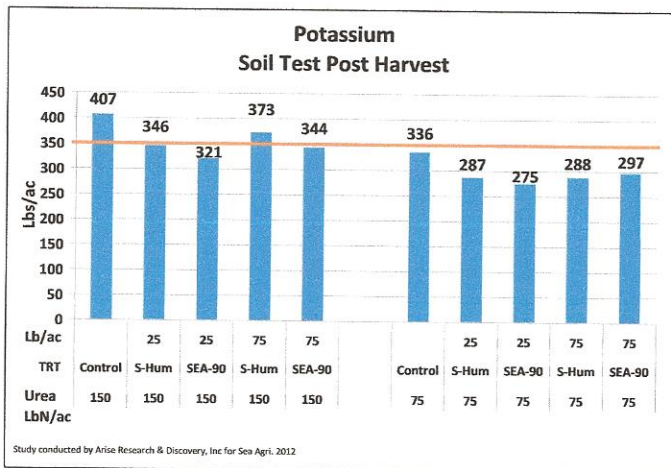
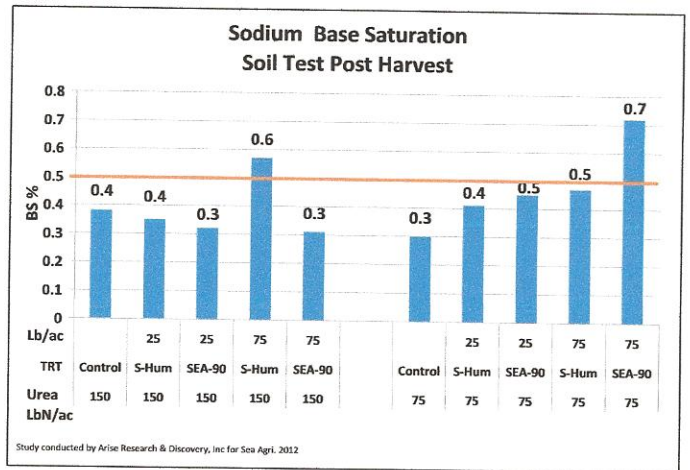
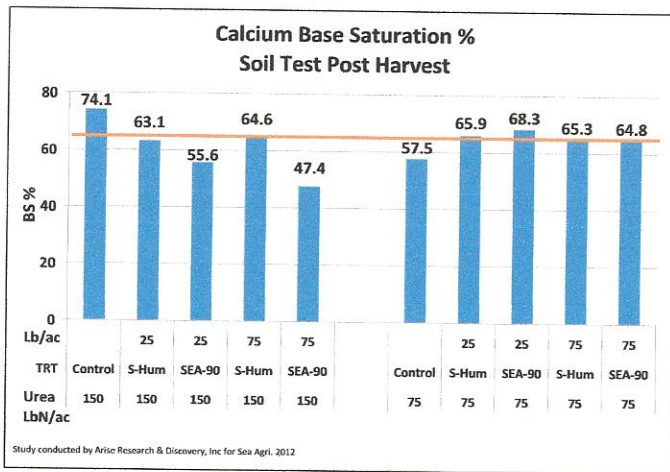
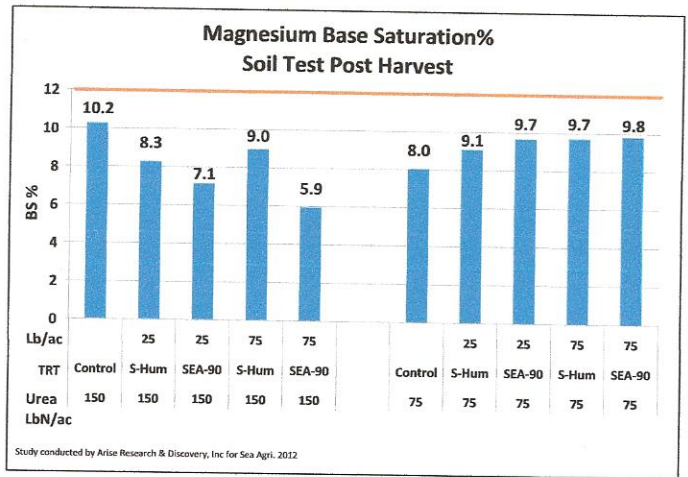
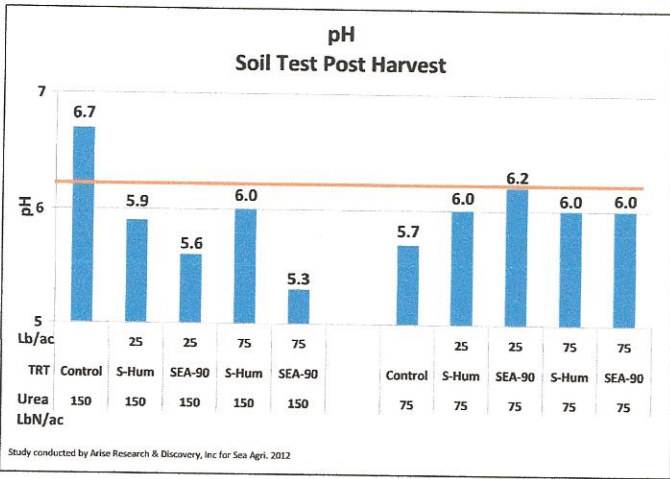
The 3 plots chosen for this test were those with the highest input levels (150 LbN/ac Urea and the 75 Lb/ac rates of SEA-90 and SEA-90+humates. Macro nutrients Ca, Mg and K looked to be mostly adequate by the standard soil test. However, the paste test indicated deficiencies in Mg & K. Sulfur and Phosphorus were very low, except the sulfur paste test which indicated there was more than enough sulfur available.



Sodium and Chloride were of interest because they are major components of SEA-90. While not measured by the standard soil test, chloride did increase where the SEA-90 treatments were applied. Sodium was well below the standard test's <math>< 80 \text{ Lb/ac}</math> guideline, but did show higher levels where the SEA-90 and humate treatments were applied. Sodium was pretty much within the guidelines for the saturated paste test.

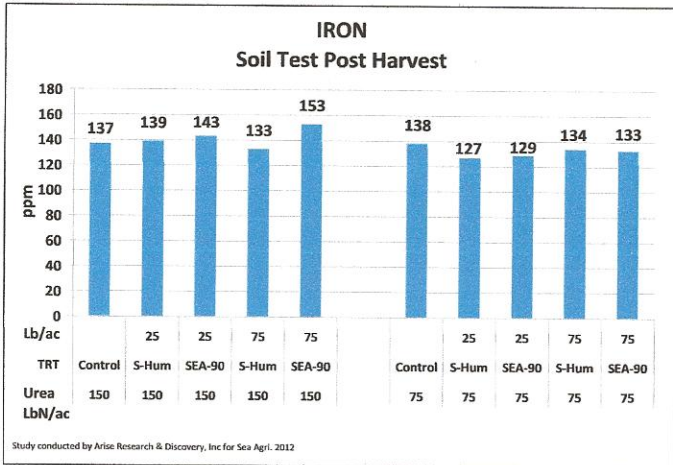
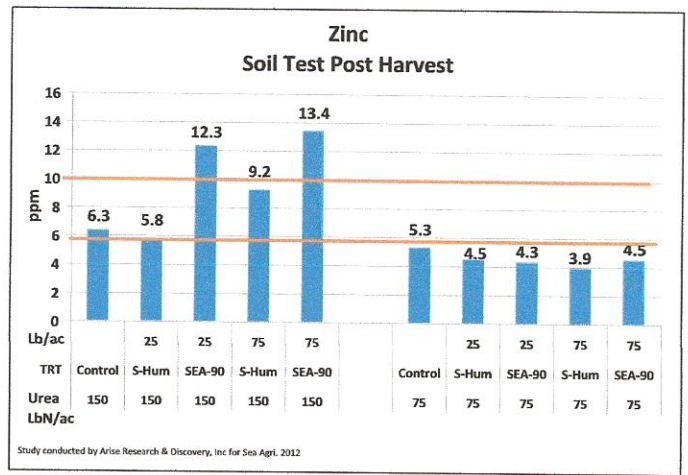
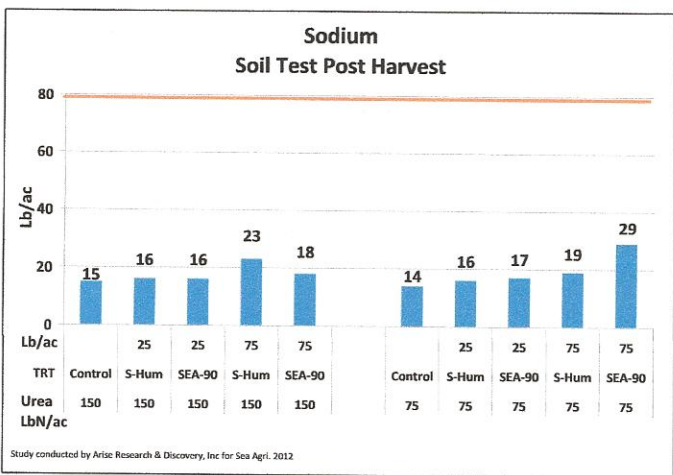
Boron and Copper were both very low in both tests.

Manganese and zinc increased with the SEA-90 applications and were within or above the guidelines for the standard tests. They were considerably below the guidelines for the saturated paste test, and the SEA-90 treatments did not seem to make a difference in their concentrations.



Soil tests after harvest seemed to show an acidifying effect for the treatments when used with 150 LbN/ac of urea, but an alkalizing effect in the plots with 75 LbN/ac of urea. This could be caused by more nitrate being finally released in the 150 LbN/ac plots as a result of the September rains.

After harvest, the SEA-90 and SEA-90+ humate treatments had noticeably lower soil test levels of calcium, potassium. Sodium levels were consistently higher for the treatments than the controls.



Grain Test	Control	Control	SEA-90	SEA-90
	75 LbN/ac	75 LbN/ac	75 LbN/ac	75 LbN/ac
	Urea	Urea	Urea	Urea
	Dry matter	Dry matter	Dry matter	Dry matter
% Crude Protein	10.05	9.5	9.04	9.9
% P	0.18	0.35	0.35	0.35
%Ca	0.41	0.33	0.34	0.36
% Mg	0.31	0.18	0.19	0.21
%K	0.32	0.35	0.33	0.36
Sugar	7.08	4.77	4.69	7.14
%Salt	0.23	0.28	0.27	0.28
REV	1257.55	1272.55	937.63	1269.52
pH	6.3	6.3	6.2	6.4

Zinc was an interesting dichotomy. Levels in the treated plots were much higher than the control plots for the 150 LbN/ac urea rate. They were consistently lower in the treated plots at the 75 LbN/ac urea rate.

Grain was also submitted for analysis to see if there were any major differences between the lowest input Control plots with only 75 LbN/ac Urea and the highest input plots with 150 LbN/ac Urea and 75 LbN/ac of SEA-90. There were no consistent trends. However, crude protein percentage was between 9 and 10 percent, which is considerably above normal for most current GMO hybrids which are being bred for starch.