Making a difference 2010

AgriLIFE EXTENSION Texas A&M System

Agriculture and Natural Resources

**Class A Sludge Used As A Fertilizer**
**Texas AgriLife Extension Service**
**Jasper County**


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## Summary

The City of Jasper through a Federal Grant has recently installed an additional treatment process to their waste water facility, which takes the sludge from the existing treatment process and further processes it through a Biosolid Dryer that is made by Fenton Environmental Inc. out of Brownwood Texas. The end result is an EPA certified Class "A" Sludge. With this addition the need for public awareness of the product arose. The use of the biosolid as a fertilizer was also of interest with local beef and hay producers. Since the completion of the project and an increase in awareness of potential uses and benefits, the facility has a waiting list and have begun to research ways to package or sell the product.

Our objective with this research demonstration was to compare field corn growth rates, germination rates, and dry matter yield showing the use of Class A Sludge (Biosolid) used as a non-certified organic type fertilizer compared to a commercial fertilizer at the same Nitrogen rate. Using a "split plot" design replicated four times, the biosolid and the commercial fertilizer were applied to randomly selected plots at 5 different rates, 0, .5, 1, 5, and 10 tons per acre. Our objective was met with data being collected on all three categories. However, several factors were involved that contributed to the outcome of the research. The largest contributing factor was the lack of rain both before planting and during the growing period. An additional factor that affected the true comparison of the two fertilizers was that we were unable to secure the commercial fertilizer until the third week of the trial, so it was applied later than the biosolid and was not tilled in but side dressed. We did see germination suppression in the 2 highest rates of the biosolid. There was also growth suppression in both the 2 highest rates of the biosolid and the commercial fertilizer.

Informal evaluations were done with random participants. Overall the process of using the split plot design was educational and beneficial mainly to the Master Gardeners. Overall public awareness and general knowledge of the use of the biosolid as a fertilizer was increased as a result of the project. A couple of suggestions were made to improve the outcome and reliability of the results. A few of those were: start the research during the spring growing season so that data can be collected for a longer period. Apply the commercial fertilizer at the beginning and till it in the same as the biosolid. Use irrigation on the research plot to eliminate lack of water from the contributing factors.


## Objective

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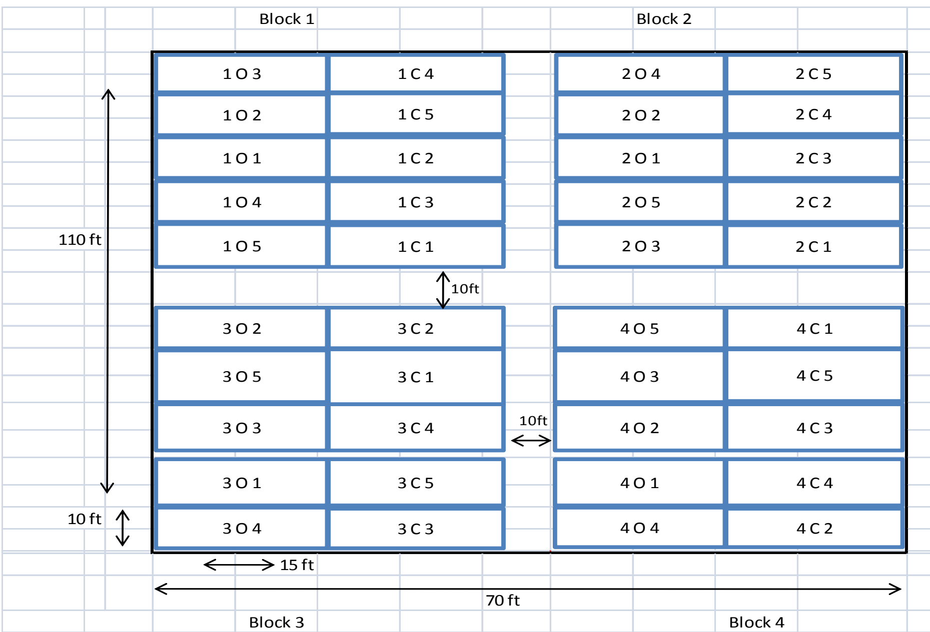
## Materials and Methods

Initial soil tests taken before planting and application of fertilizer indicated a nitrate nitrogen level of 22ppm. The soil had a ph of 6.78 and is a Doucette-Boykin association loamy fine type soil. The electrical conductivity (EC) was low.

For this research we used a “Split Plot” design using 4 replicated blocks each containing 5 rates of the commercial fertilizer (33-0-0) as well as the biosolid (5-2-0).




The biosolid was weighed by hand using digital scales and then applied by hand to each of the randomly selected plots before being tilled in.



The rates were 0, .5, 1, 5, and 10 tons per acre equivalent. Based on the lab results of the biosolid nutrient value the actual nitrogen applied was as follows:

- 0 tons/ acre 0 lbs. of N/ acre
- .5 tons / acre 48 lbs. of N/ acre
- 1 tons / acre 98 lbs. of N/ acre
- 5 tons / acre 490 lbs. of N/ acre
- 10 tons / acre 980 lbs. of N/ acre

The actual lbs. of biosolid applied to the plots (150sq. ft.) were as follows:

- Rate 1 (0 tons)= 0 lbs.
- Rate 2 (.5 tons)= 3.44 lbs.
- Rate 3 (1 ton)= 6.88 lbs.
- Rate 4 (5 tons)= 34.4 lbs.
- Rate 5 (10 tons)= 68.8 lbs.

The commercial fertilizer rates were then calculated to match the biosolid for actual N and then applied by hand on the 3rd week of the 8 week research period. Lbs. of commercial fertilizer (33-0-0) per 150 sq. ft. (plot) applied were as follows:

- Rate 1 ( 0 tons )= 0 lbs.
- Rate 2 ( .5 tons )= .55 lbs.
- Rate 3 ( 1 ton )= 1.1 lbs.
- Rate 4 ( 5 tons ) = 5.5 lbs.
- Rate 5 ( 10 tons ) = 11 lbs.

The rates were randomly selected for each plot. The individual plots were 10'X 15' (150 sq. ft.) for a total research plot area of 6000 sq. ft. Each plot was planted using an Earthway planter with 4 rows of field corn. The rows were planted at 30" row spacing at an approximate rate of 18 lbs. of seed per acre. Data was collected once per week on the same day by the same people from the middle 2 rows of each plot only. The outside rows were used as buffers. The data was then entered for the 8 week period into an Excel spreadsheet as well as into Statistical Analysis Software (SAS) for statistical analysis using Duncan's multiple range. The three variables measured were height in inches, germination count for the 1st 2 weeks only, and dry matter yield at the 8th week which was the end of the research period.


**Results and Discussion**

As seen in Table 1, germination rates were significantly suppressed on the 2 highest rates (5 and 10 ton/acre) of biosolid. One factor could have been a “salt effect” from the high amounts of nitrogen.

Growth rates were significantly different for the highest rates of both the biosolid and the commercial fertilizer as compared to the lower rates as seen in Table 2. Again one factor could be a “salt effect” from the high amounts of nitrogen.

The possible contributing factor of a “salt effect” could be supported by the high level of EC (electrical conductivity) in soil samples taken from each plot at the time of harvest represented in Table 3. Salt effect occurs when nutrients in the soil including Nitrogen break down and build up in the soil. These build ups can occur at or near the surface around the root zone of the plants. Excess salts in the root zone hinder plant roots from withdrawing water from surrounding soil. This lowers the amount of water available to the plant, regardless of the amount of water actually in the root zone.

Dry matter yield was significantly lower in the highest rates of both the biosolid and the commercial fertilizer represented in Table 4.

**Table 1**

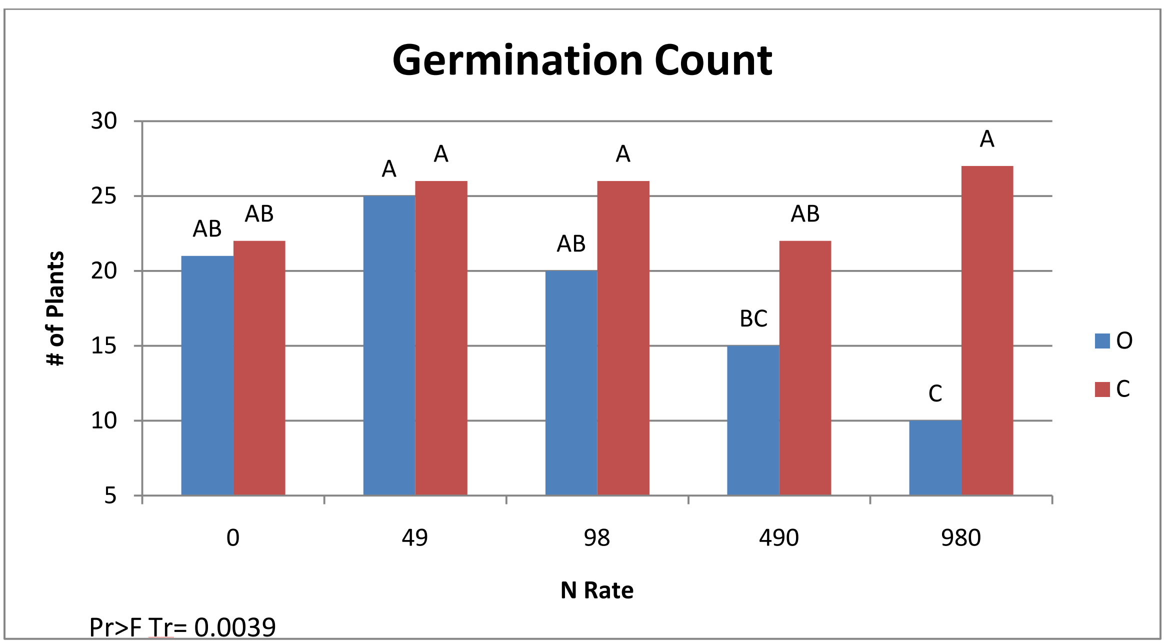



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**Table 2**

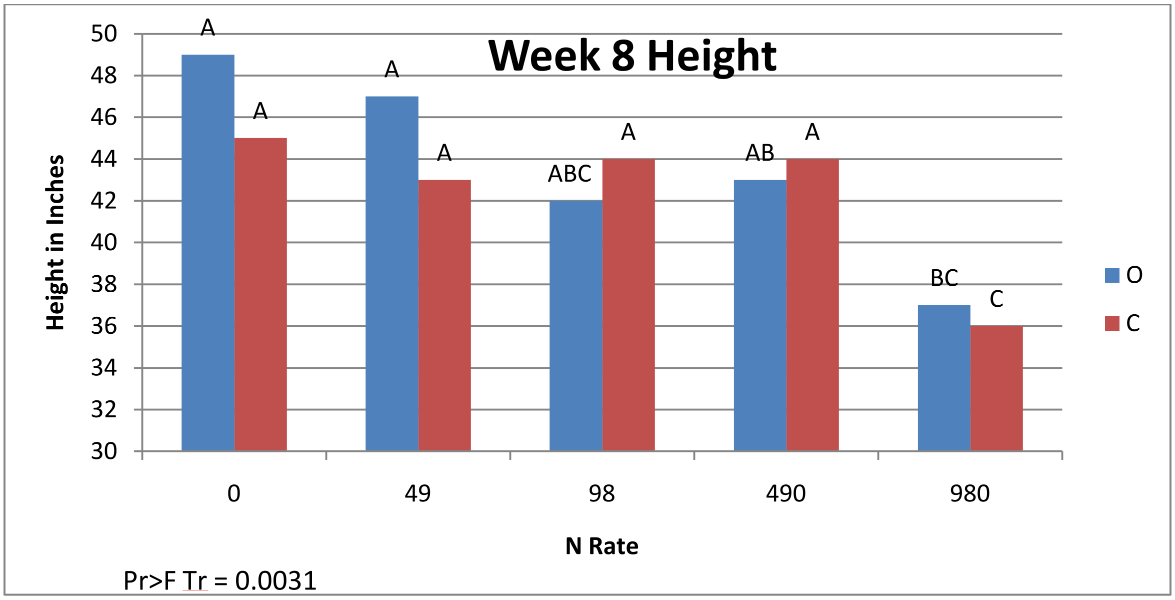



**Table 3**

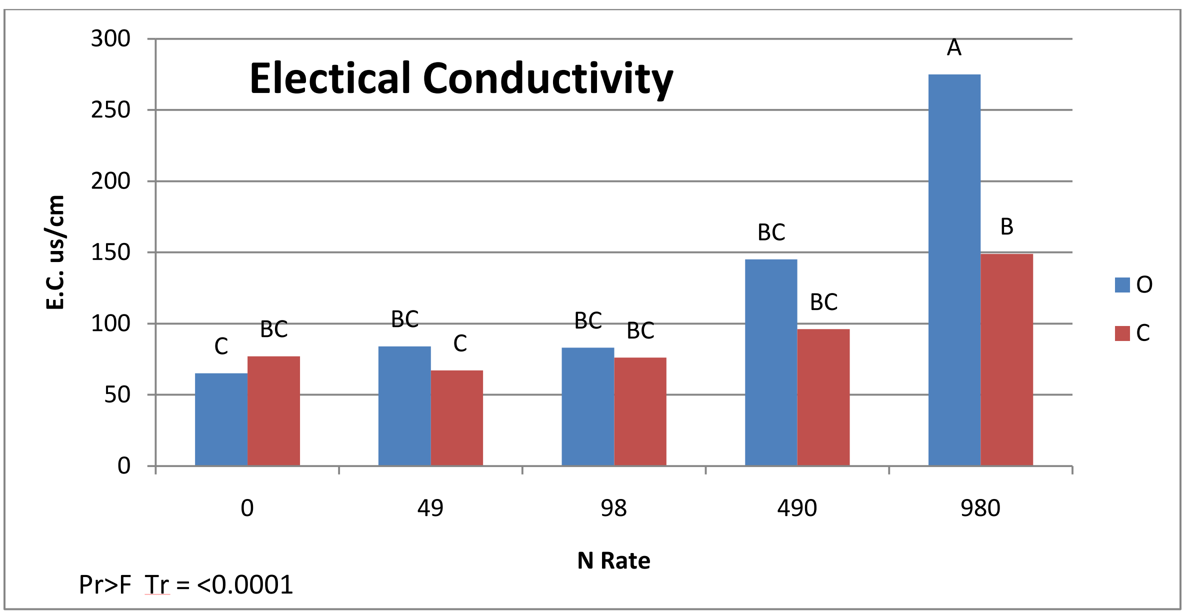
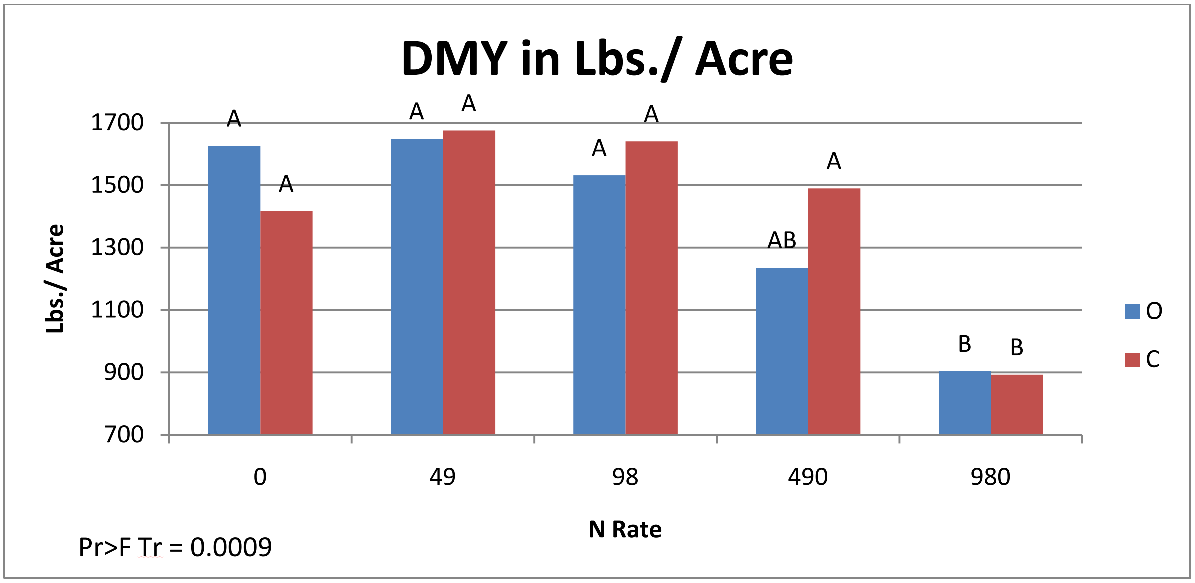


**Table 4**




**Conclusions**

In conclusion the objectives were met; however, we did not see a significant difference in the 0 to 1 ton rates mainly due to the high levels of nitrogen already present in the soil at the time of planting. Because the research was designed to measure the effects of nitrogen rates, the fact that nitrogen was not limiting reduced the variation that normally would be seen. We can conclude that the 5 to 10 ton rates can be detrimental to germination rate and growth rate as well as dry matter yield (DMY). However, more research needs to be done with the biosolid at varied rates to include smaller intervals of a 2 ton, 3 ton, and 6 ton rate. The research should also take place during better growing conditions, preferably the spring growing season. The commercial fertilizer should also be applied at the same time as the biosolid and tilled in before planting to better compare germination effects from each rate.

**Acknowledgements**
I would like to not only acknowledge but thank those that contributed and helped with this research demonstration; thanks to Will Lewis, owner of Pecan Hill Farm, for the use of the land and equipment. To the City of Jasper Waste Water Facility for donating the Class A Sludge (biosolid) and providing information on the treatment process. To Dr. Young and Stephen F. Austin for help in harvesting soil testing and sampling as well as donating the seed and commercial fertilizer. To the Jasper County Master Gardeners: Margie Saulsbury, Tom Banks, Terry McFall, Sue Singletary, Lori Horne, Will Lewis, Barbara Methvin, Paula Moore, Gene and Martha Hamilton, Debbie Hollis, and Sharon Kerr for help with ALL aspects including data entry during this project. To the NRCS for their help with setup and harvest sampling. And to Lisa Wall of AgriLife Extension, Newton County, for help with harvest sampling.