

Trial Design BG-CA-CNPk-04 Genica and Fertilizer Efficiency in Cotton

Title: Genica in Traditional & NPK Balanced Fertilizer Program as a side-dress.

Background: Nitrogen is always a focus of fertilization. Phosphate fertilizers are NOT always used in cotton production and seldom or never is potash used. But the ratio of needs of a cotton plant in average production is 3 : 1 : 2.5 as N:P:K. There are roughly in any given year 1 million acres of cotton in California and another 7 million in the rest of the USA. Getting cotton to respond is a challenge since its growing habits and root system is different than fibrous root crops. Consequently many suppliers don't deal with the crop and the market potential has been much more neglected than any of the vegetable crops. Potassium is key in N utilization and quality of fiber as well as higher yields. Recently, evidence has shown the positive effect of ortho-phosphate fertilizer on rhizosphere mycorrhizal and cotton is mycorrhizal. It is assumed by most growers that there are no problems with root parasites like nematodes much less consider the benefits of beneficial VAM. The intention was to increase the yield sufficiently so as to be able to analyze the soil for beneficial organisms. The yields did not vary enough to warrant this laborious analysis. Nothing is applied at planting time so the only opportunity was in a side dress. Un-32 was used instead of aqua ammonia because it is easier to mix with additives, it is not detrimental to the soil structure. It has some slow release type features. Ammonia is very volatile and can be lost to vaporization, it has a pH of 13 which is bad on alkaline soils. The units of N should have cut back because it is much more efficient than NH_3 and would be easy to apply too N as Un-32. However, neither the supplier nor the grower wanted to cut it back since we were working with large areas of the field.

Objective:

- 1) To measure the effectiveness of Genica to increase the efficiency of phosphate and potash fertilizer separately and in combination.
- 2) To evaluate the effectiveness of Genica when mixed with NPK fertilizer
- 3) To observe disease suppression of Genica on cotton compared to normal cultural practices
- 4) To evaluate the use of biological inoculums on cotton production and health.
- 5) To observe effects of Genica and NPK on VAM and nematode infections of roots of cotton.
- 6) To show grower that yield increases can be achieved with minor changes to normal practices.
- 7) To use yield monitor to be able to collect individual row data and evaluate the uniformity of the field so as to be able to assess reliability of the results.

Methods: Un-32 nitrogen was used instead of aqua ammonia. The early season application was at the 12-15" stage in a side-dress band. The nitrogen was applied at the traditional rate per acre. Then phosphate was added followed by potash in the next application. Genica was to be applied at 2 gallons per acre in all treatments except the 2 controls but due to plugging and the buckets only contained $\frac{3}{4}$ usable product a lesser amount was applied.

Treatment 1 is the traditional amount of N as aqua ammonia plus Genica;

T-2 is same units of N but in different source of N (Un-32) plus Genica;

T-3 is same level of N plus 8-21 (ortho phos) and Genica;

T-4 is T-3 plus 0-0-20 potash plus an inoculant (bacteria);

T-5 is T-4 plus Amino 21 (microbial nutrients and plant stimulation);

T-6 is the N P control with no additives and

T-7 is traditional N Control

Questions to be Answered:

- 1.) Does Genica increase nitrogen efficiency and uptake in cotton? Was not measured
- 2.) Does ortho phosphate increase N efficiency & yields when used with Genica?
- 3.) Does potash increase production and possible efficiency of nitrogen when applied with Genica?

- 4.) Does an inoculant increase the effectiveness of balanced NPK and Genica?
- 5.) Does balanced fertilization have an positive affect on VAM infection and a negative effect on nematode of cotton roots?

Investigator: Bio-Gro, Inc.

Crop: Cotton **Variety:** Roundup Ready Cotton

Location of Test: Wasco, CA; **Cooperator:** Nachtigall Farms, Wasco, CA & Dave German, Wilbur Ellis

Application Equipment: Use Wilbur Ellis side-dress rigs.

Plot Size: 72 rows at 36 inch spacing by 1200 ft. long.

Treatment Width: 12 rows @ 36" spacing by 1200 ft. (aprox. 1 acre).

Treat.	Material & Rate / Acre
1**	*100 gal/acre Aqua ammonia + 2 gal Genica
2	41 gal Un-32 + 1.25 gal Genica + 58 gal Water
3	38 gal Un-32 + 7.7 gal 8-21 + 2 gal Genica + 52 gal water
4	36 gal Un-32 + 7.7 gal 8-21-0 + 3 gal 0-0-20 + 2 gal Genica + 12 oz Activate
5	34gl Un32 + 7.5 gl 8-22 + 5gl 0-0-20 + 5gl Amino21 + 48 al water
6	Control -- 39 gal Un-32 + 7.5 gal 8-21-0 + 54 gal water
7	Control – 100 gal Aqua ammonia

**T-1 is the same as 3T-1 on the other cotton trial.

*Units of N is based on traditional rate used where T-1 is traditional;

Units of NPK and other nutrients are expressed as lbs. per acre N, P₂O₅, K₂O, Ca, Organic Matter dry, humic acid dry

Treat.	Early Season Sidedress Product	N	P ₂ O ₅	K ₂ O	Ca	OM	Humic	Amino
1	Aqua Amonnia + Genica	148	0	0	.95	5.7		
2	Un-32 + Genica	143	0	0	.59	3.7		
3	Un-32 + 8-21 + Genica	139	16.5	0	.95	6.2		
4	Un-32 + 8-21-0 + 0-0-20 + Genica + Activate	132	16.5	6	.95	6.2		
5	Un32 + 8-22 + 0-0-20 + Amino21	125	16.8				2.2	7.3
6	Control -- Un-32 + 8-21-0	142	16	0				
7	Control – Normal fertilization 100 gal/ac Aqua Am	150	0	0				

Results in Bales per Acre

T #	Treatment	Yield bales/ac	Lint Increase	Rank
1	Aqua Amonnia + Genica	3.15	165	2
2	Un-32 + Genica	3.37	274	1
3	Un-32 + 8-21 + Genica	3.05	115	5
4	Un-32 + 8-21-0 + 0-0-20 + Genica + Activate	3.00	81	6
5	Un32 + 8-22 + 0-0-20 + Amino21	3.14	162	3
6	Control -- Un-32 + 8-21-0	3.11	143	4
7	Control south -Normal fertilization 100 gal/ac Aqua Am	2.82	0	7

Observations:

1. The best performing combination was the Genica with the Un-32 alone.
2. After comparing the yield map and the aerial photo it can be seen that the weak strip on the southside of the field penetrates into Treatments 4 & 3 to the degree of affecting the rank order of the yields but still far behind the leader.
3. Comparing T-1 & T-2 only the source of N changes but even though T-1 came from the stronger side of the field the Un-32 appears better than ammonia.
4. The yield map shows a treatment effect but not as clearly as 3T-3 of the first cotton trial.
5. It appears that there is a correlation of yield to higher levels of nitrogen even though this cotton was very rank (typical to high rates of N). The quantities and timing of the P & K were too low and late to be of any real value.
6. This trial proves that using precision geo-referenced equipment can measure very small differences that would be impossible otherwise. With experience this method will prove invaluable.
7. The inoculums used was several years old and may have not been viable may be the reason here was no response.
8. No biological analysis of the soil nor roots were performed because the weak areas of the field were not identified in time while soil was still moist to ensure reliability.
9. By all rights the P & K should have been applied before or at planting to really evaluate its effectiveness. T-4 showed a small potassium response in the tissue analysis.
10. In T- 5 which had the highest Amino 21 applications which contains the humic, showed the highest Calcium response even though slight.
11. More variation in the nitrogen levels would have been better to demonstrate N efficiency.