# V- SUMMARY AND CONCLUSION

This study was carried out during 2008, 2009 and 2010 seasons on 96 uniform in vigour 15-years old head trained Thompson seedless grapevines grown in a private vineyard located at El- Faroukia village, Samalout district, Minia Governorate. The vineyard soil is silty clay and well drained and with a water table not less than two meters deep. Winter pruning during each season was conducted on the first week of Jan. by using head pruning system leaving 72 eyes (10 long fruiting spurs x six eyes plus six replacement spurs x two eyes). All the selected vines had the same vine load (72 eyes) and planted at 2.0 $^{x}$ 2.0 m apart. Surface irrigation system was followed.

The main target of this study was examining the impact of different proportions of inorganic N and compost enriched with actinomyces as well as the antioxidant citric acid on some vegetative growth characters, leaf chemical composition, plant pigments, yield as well as physical and chemical properties of Thompson seedless grapes. Finding out the effect of the present treatment on berry juice content of nitrite ($NO_2$) (ppm) was also investigated. Selecting the best combination treatment that responsible for obtaining an economical yield is considered another goal.

The present experiment included 32 different treatments from various N sources and application of citric acid. It was included two factor (A & B). The first factor (A) comprised from the following eight treatments from different N sources:-

1-Application of the recommended rate of N i.e. 80 g / vine ( R.R.) completely via 100% inorganic form 388 g ammonium sulphate / vine)

2-Application of (R.R.) through 90% inorganic N (349 g ammonium sulphate / vine + 10 % compost enriched with actinomyces ( 2%N) (400 g/ vine).

3-Application of (R.R.) through 80% inorganic N (310 g ammonium sulphate / vine + 20 % compost enriched with actinomyces ( 2%N) (800 g/ vine).

4-Application of (R.R.) through 70% inorganic N (272 g ammonium sulphate / vine + 30 % compost enriched with actinomyces ( 2%N) (1.2 kg/ vine).

5-Application of (R.R.) through 60% inorganic N (233 g ammonium sulphate / vine + 40 % compost enriched with actinomyces ( 2%N) (1.6 kg/ vine).

6-Application of (R.R.) through 50% inorganic N (194 g ammonium sulphate / vine + 50 % compost enriched with actinomyces ( 2%N) (2.0 kg/ vine).

7-Application of (R.R.) through 40% inorganic N (155 g ammonium sulphate / vine + 60 % compost enriched with actinomyces ( 2%N) (2.4 kg/ vine).

8-Biofertilization with *Bacillus Polymyxa* + 75% compost enriched with actinomyces ( 3.0 kg / vine)

The second factor (B) comprised from four concentrations of citric acid namely $a_1$) 0.0 ppm , $a_2$) 500 ppm, $a_3$) 1000 ppm and $a_4$) 2000 ppm.

Each treatment was replicated three times, one vine per each. Total number of selected vines used for achieving this study was 96 vine. Organic N source namely compost enriched with actinomyces was added once at the second week of January during the three seasons *Bacillus Polymyxa* biofertilizer was added once at 50 ml (containing 10 x $10^6$ cfu/mL) at the first week of March. Inorganic N fertilizer namely ammonium sulphate (20.6 % N) was applied at three unequal batches as 50 % ; 30% and 20% on the first week of March, April and May, respectively. Citric acid as an antioxidant was sprayed four times during each season at the first week of March, April, May and June,

The present experiment was statistically analyzed according to complete randomized block design in split- plot arrangement where the eight fertilization treatments and the four antioxidant treatments were occupied the main and sub- plots, respectively.

During the three seasons, the following parameters were measured.

1- Some vegetative growth characters namely the leaf area ($cm^2$), main shoot length (cm,) and cane thickness (cm).
2- Percentages of N, P and K in the leaf petiole .
3- Plant pigments namely chlorophylls a & b and total chlorophylls( mg/ 100 g fresh weight).
4- Yield per vine expressed in weight (kg.) and number of clusters/ vine as well as cluster weight (g.) and dimensions (length & width in cm.)
5- Some physical characters of the berries namely berry weight (g) and dimensions (longitudinal & equatorial) in cm.

6- Some chemical characters of the berries namely total soluble solids % , total acidity % , T.S.S. / acid and total sugars , as well as nitrite in the juice ( ppm) .

7- Total counts of bacteria in the soil ( cfu/ g)

The nearly same obtained data in the three seasons could be summarized under the following main items .

**1-Some vegetative growth characters:**

Growth characters namely leaf area, main shoot length and cane thickness were positively affected by using the suitable rate of N ( 80 g N/ vines) through 60 to 90% inorganic source (ammonium sulphate) plus 10- 50% compost enriched with actinomyces comparing with using N in another proportions . The promotion was associated with decreasing inorganic from 90 to 60%. Biofertilization with Bacillus polymyxa + 75% compost enriched with actinomyces of the suitable N materially depressed growth characters comparing with using N as 100% inorganic form.

Foliar application of citric acid at 500 to 2000 ppm caused substantial promotion on these growth characters comparing with control. Increasing concentrations from 1000 + 2000 failed to show measurable increase on these growth aspects. The maximum values were recorded on the vines treated with 2000 ppm citric acid.

The maximum values were recorded on the vines that fertilized with the suitable N through 60 % inorganic + 40 % compost enriched with actinomyces + citric acid at 2000 ppm.

**2-Percentages of N, P and K in the leaves:**

They were maximized in the vines that fertilized with the suitable N via 60 to 90% inorganic + 10 – 60% compost enriched with actinomyces comparing with using N at an other proportions. Deceasing percentages of inorganic N from 90 to 60 % and at the same time increasing percentages of compost enriched with actinomyces from 10 to 40 % of the suitable N. effectively enhanced these nutrients. Biofertilization with *B. Polymyxa* + using compost enriched with actinomyces at 75% at the suitable N materially improved these nutrients comparing with using N completely via inorganic form. Fertilizing the vines with N as 90% inorganic + 10% compost enriched with actinomyces effectively produced the maximized values.

There was a gradual stimulation on these nutrients with increasing citric acid concentrations. Meaningless promotion was observed among using 1000 and 2000 ppm. Treating the vines four times with citric acid at 2000 ppm had the maximum values.

The maximum values were recorded on the vines that received N as 90% inorganic + 10% compost enriched with actinomyces + citric acid at 2000 ppm.

**3- Plant pigments:**

They were materially enhanced in response to application of the suitable N ( 80 g N/ vine) through inorganic N at 40 to 90% + 10 to 60% compost enriched with actinomyces comparing with using N completely via inorganic alone ( 100% inorganic). The promotion on the plant pigments namely chlorophylls a & b as well as total

chlorophylls was associated with decreasing inorganic percentages from 90 to 0.0 % and at the same time increasing compost enriched with actinomyces from 10 to 75%. Biofertilization with *Bacillus Polymyxa* was considerably favourable in enhancing comparing with using N via inorganic N source alone (100 % inorganic). The maximum values were recorded with using the suitable N as 40 % inorganic plus 60% compost enriched with actinomyces. Unbio and organic fertilization (100% inorganic) effectively minimized these plant pigments.

Plant pigments were progressively enhanced with increasing citric acid concentrations from 500 to 2000 ppm. Using citric acid at 2000 ppm gave the maximum value.

Combined application of inorganic N at 40% of the suitable + 60% compost enriched with actinomyces + citric acid at 2000 ppm resulted in the best results with regard to plant pigments. Using N completely via inorganic form gave the lowest values.

**4- Yield / vine:**

Varying proportions of N sources had no effect on the yield expressed in number of clusters per vine in the first season of study. Application of the suitable N via 60 to 90% inorganic form + 10 to 40% compost enriched with actinomyces considerably improved the yield expressed in weight and number of clusters / vine compared with using N via another proportions of N sources as well as using N via inorganic alone (100 % inorganic). A great decline on the yield was observed due to using the suitable N as 40- 50% inorganic + 50-60% compost enriched with actinomyces, biofertilization with

*B. Polymyxa* + 75% compost enriched with actinomyces or using N via inorganic source only. The maximum yield was observed on the vines that received N as 60% inorganic + 40 % compost enriched with actinomyces. Neglecting the use of inorganic N as well as the application of *B. Polymaxa* as biofertilizer + 75% of the suitable N compost enriched with actinomyces gave the minimum values.

Application of citric acid at 500 to 2000 ppm was very effective in improving the yield expressed in weight and number of clusters/ vine comparing with non- application. The promotion was in proportional to increasing concentrations. Meaningless increase on the yield was recorded among higher the two concentrations namely 1000 and 2000 ppm. Therefore, it is recommended to use citric acid at 1000 ppm from economical point of view.

The best results with regard to yield from economical point of view were obtained when the vines were fertilized with the suitable N ( 80 g/ vine) through 60 % inorganic plus 40 % compost enriched with actinomyces + citric acid at 1000 ppm.

**5- Cluster weight and dimensions**

They were positively affected by application of the suitable N as 60 to 90% inorganic plus 10 to 40% compost enriched with actinomyces comparing with using the other N management. The promotion was associated with decreasing the percentages of inorganic N from 90 to 60 % and at the same time increasing organic N from 10 to 40% . A great decline on cluster weight and dimension was observed when inorganic N was used at percentages lower than 60%. The minimum values were recorded with using *Bacillus*

*Polymyxa* biofertilizer + 75% compost enriched with actinomyces Application of N as 60% inorganic + 40% compost enriched with actinomyces gave the best results.

Cluster weight and dimensions were gradually improved by increasing citric acid concentration from 0.0 to 2000 ppm. The maximum values were recorded when the vines were treated with citric acid at 2000 ppm.

Fertilizing the vines with N as 60% inorganic N + 40% compost enriched with actinomyces + citric acid at 1000 ppm is suggested to be beneficial in this respect.

**6-Quality of the berries:**

Treatments namely the application of N as 40 to 90% inorganic form plus compost enriched with actinomyces at 10 to 60% as well as unfertilization with B. polymyxa and 75% compost enriched with actinomyces had promotive effect on quality of the berries in terms of increasing berry weight and dimensions, total soluble solids %, total sugars % and reducing total acidity comparing with using N completely via inorganic form (100% inorganic). The promotion on quality of the berries was associated with decreasing percentages of inorganic form from 100 to 0.0% and at the same time increasing percentages of compost enriched with actinomyces from 0.0 to 75% . The best results were obtained when the vines were treated with actinomyces + unbiofertilization with inorganic + compost enriched with actinomyces at 75%.

Increasing citric acid concentrations caused a gradual promotion on quality of the berries. A slight promotion on quality of the berries was recorded among the higher two concentrations namely 1000 and 2000 ppm.

The best results with regard to quality of the berries were obtained when the vines received the suitable N as 75% compost enriched with actinomyces + biofertilization with *B. Polymyxa* (without inorganic fertilization) + spraying citric acid at 1000 ppm.

**7- Juice content of nitrite:**

Supplying the vines with the suitable N as 0.0 to 90 % inorganic plus 10 to 75% compost enriched with actinomyces was responsible for reducing nitrite in the juice as compared with using N completely via inorganic form. The reduction was associated with decreasing the percentages of inorganic N from 90 to 0.0 % and at the same time increasing percentages of Compost enriched with actinomyces from 10 to 75%. The lowest values were obtained due to application of uninorganic fertilization, biofertilization with B. polymyxa + compost enriched with actinomyces. Using MN completely via inorganic from effectively produced the maximum values.

Spraying citric acid four times at 500 to 2000 ppm was favourable in reducing nitrite in the juice comparing with unspraying the juice. The reduction in nitrite in the juice was associated with increasing citric acid concentrations.

Fertilizing of the vines with N as 75% compost enriched with actinomyces + biofertilization with *B. Polymyxa* + application of 1000 ppm citric acid gave the lowest values of nitrite in the juice.

**8-Total counts of bacteria:**

Amending the vines with the suitable N through 0.0 to 90 % inorganic + 10 to 75% compost enriched with actinomyces was very effective in increasing total counts of bacteria in the tested vineyard soil comparing with using N completely via inorganic form. The promotion was associated with increasing the percentages of compost enriched with actinomyces and at the same time decreasing the percentages of inorganic N. The minimum values were recorded on the vineyard soil amended with biofertilization with *B. Polymyxa* and received compost enriched with actinomyces . Using the suitable N as 100% inorganic form gave the minimum values.

**Conclusion:**

It is suggested to fertilize Thompson seedless grapevines growing under Minia region with the suitable amount of N namely 80 g / vine through 60 % ammonium sulphate ( 233 g/ vine) + 40% compost enriched with actinomyces (1.6 kg) and spraying citric acid at 1000 ppm ( 1.0 g / L) maintaing superior yield and improving quality of the berries. Thus, it can be recommended to replace 40% of the inorganic N fertilizers in order to improve production and reduce pollution and to produce healthy and high fruit quality crop fitted for safe local consumption. This promising treatment if it was applied in one feddan contains 1000 vines increased net return by 7840, 11330 and 18840 Egyptian pounds over the application of N completely via ammonium sulphate in the three seasons, respectively.