RESULTS AND DISCUSSION

4- RESULTS AND DISCUSSION

The effect of nitrogen forms treatment on Thompson seedlees grapevines have been handed in four main parts as follows :-

4.1- Vine growth:

The effect of nitrogen fertilizer sources, namely ammonium sulphate and urea (as fast release), sulphur coated urea and phosphorus coated urea (as slow release) and biofertilizer as well as their combination on vine growth of Thompson seedless grapevines during 2000 and 2001seasons as bud burst, vegetative and fruitful shoots, number of leaves per shoot, leaf area and shoot length are presented in Tables (2).

4.1.2- Number of bud burst and % bud burst :

Table (2A) shows that slow release N-fertilizer(SCU) induce higher values of number of bud burst or bud burst percentage as compared with the other N-fertilizers.

Furthermore, the higher rate of N-fertilizers (100 g N/vine) produced higher numbers of bud burst or bud burst percentage than did those received the other rates (40, 60 and 80 g N/vine).

As far, biofertilizer with bacteria induced more effective onnumber of bud burst or bud burst percentage as compared to vine unfertilized with bacteria .

In addition, the interaction between N-fertilizer forms and N-fertilizers rate (Table 2,B) demonstrated that slow release N-fertilizers (SCU and PCU) with higher rate of N-fertilizer(80 and 100 g N/vine) in both seasons induce higher values of number of bud burst or bud burst percentage as compared with fast release N-fertilizers with

Table (2): Effect of nitrogen fertilizer form rate and biofertlizer on (Number of bud burst, Bud burst percent) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	Number of bud burst		Bud burst percent	
	2000	2001	2000	2001
Fast release				
AS	70.21 b	69.70 c	77.54 b	77.49 c
U	70.96 b	70.87 c	78.60 b	78.31 c
Slow release				
PCU	71.25 b	74.12 b	79.16 b	81.94 b
SCU	75.71 a	79.20 a	84.28 a	86.94 a
40 gn/vine	71.13 b	73.37 b	78.81 b	79.99 a
60gn/vine	71.29 b	73.16 b	79.12 b	81.33 a
80 gn/vine	71.88 b	73.29 b	79.62 b	80.98 a
100gn/vine	73.83 a	74.08 a	82.03 a	82.36 a
With (bio)	71.63 a	73.68 a	79.59 a	81.83 a
Without (bio)	72.44 a	73.27 b	80.21 a	80.51 b

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	Number of bud burst							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	69.17 e	72.17 c	69.50 e	70.00 d	68.16 k	70.50 ij	68.50 k	71.66 gh
U (fast)	70.83 d	69.50 e	70.67 d	72.83 b	70.16 j	71.16 hi	70.16 j	72.00 fg
PCU (slow)	72.50 b	70.67d	68.67 e	73.17 b	77.66cd	72.66 f	73.50 e	72.66 f
SCU (slow)	72.00c	72.82 b	78.67 a	79.33 a	77.50 d	78.33 c	81.00 a	80.00 b
	Bud burst percent							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	74.96 d	80.18 b	77.22 bc	77.77 bc	75.73 d	78.32 d	76.10 d	79.80 d
U (fast)	78.70 bc	77.21 bc	77.59 bc	80.92 b	77.95 d	79.06 d	76.18 d	80.04 cd
PCU (slow)	80.55 b	78.52 bc	76.29 c	81.29 b	84.61 bc	80.74 cd	81.66 cd	78.32 d
SCU (slow)	80.96 b	80.59 b	87.40 a	88.14 a	81.68 cd	87.21 b	89.99 a	88.88 a

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-Form	Number bud burst				Bud burst percent			
	2000		2001		2000		2001	
	With	Without	With	Without	With	Without	With	Without
Fast release								
AS	69.17 c	71.25 bc	69.83 f	69.58 f	76.85 c	78.24 bc	77.67 d	77.30 d
U	71.58 bc	70.33 bc	75.08c	70.83 e	79.07 bc	78.14 bc	83.42 b	78.72 cd
Slow release								
PCU	70.17 bc	72.33 b	75.08 c	73.16 d	77.96 bc	80.37 b	83.42 b	80.45 c
SCU	75.58 a	75.83 a	78.91 b	79.50 a	84.48 a	84.09 a	88.32 a	85.55 b

D) The interaction between N application rates and biofertilizers.

Biofertilizer	Number of bud burst							
	2000				2001			
	40	60	80	100	40	60	80	100
With	71.33 c	70.00 d	71.50 c	73.67 a	73.83 b	73.42 bc	73.17 c	74.83a
Without	70.92 d	72.58 b	72.25 b	74.00 a	72.92 c	73.42 bc	73.43 bc	73.33bc
	Bud burst percent							
	2000				2001			
	40	60	80	100	40	60	80	100
With	79.25 ab	77.77 b	78.98 b	81.85 a	82.03a	81.66a	80.40ab	83.23a
Without	77.86 b	80.47 ab	80.27 ab	82.22 a	77.96b	81.01a	81.57a	81.50a

E) The interaction between three factors N form, rates and biohertilizers.

Number of bud burst									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g/vine				Rate of applied nitrogen g/vine			
		40	60	80	100	40	60	80	100
AS	With	68.67 fg	69.67 fg	67.67g	70.67 efg	69.67 jk	69.67 jk	67.67 L	72.33 fgh
	With out	69.67 fg	74.67 cd	71.33 def	69.33 fg	66.67 m	71.33 hi	69.33 k	71.00 l
U	With	72.33 def	68.33 g	72.67 def	73.00 de	70.67 ij	71.67 ghi	68.67 k	72.67 fg
	With out	69.33 fg	70.67 efg	68.67 fg	72.67 def	69.67 jk	70.67 ij	71.67 ghi	71.33 hi
PCU	With	69.67 fg	71.67 defg	67.67g	71.67 defg	79.67 bc	73.00 f	74.67 e	73.00 f
	With out	75.33 bc	69.67 fg	69.67 fg	74.67 cd	75.67 e	72.33 fg	72.33 fg	72.33 fgh
SCU	With	74.67 cd	70.33 efg	78.00 b	79.33 a	75.33 e	77.33 d	81.67 a	81.33 a
	With out	69.33 fg	75.33 bc	79.33a	79.33 a	79.67 bc	79.33 bc	80.33 b	78.67 c
Bud burst percent									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate Ammonium	With	76.29 hi	77.40 ghi	75.18 i	78.51 fgh	77.40 ghi	77.40 ghi	75.18 hi	80.73 efg
	With out	73.70 I	82.96 cde	79.25 efgh	77.03 ghi	74.07 i	79.25 fgh	77.03 ghi	78.89 fgh
Urea	With	80.37 def	75.92 hi	78.88 efgh	81.11 def	78.51 fghi	79.62 fgh	72.75 I	80.74 efg
	With out	77.03 ghi	78.49 fghi	76.29 ghi	80.74 defg	77.40 ghi	78.51 fghi	79.62 fgh	79.35 gh
PCU	With	77.40 ghi	79.63 efgh	75.18 i	79.62 efgh	88.51 bc	81.11 efg	82.96 def	81.11 fg
	With out	83.70 bcd	77.40 ghi	77.41 ghi	82.96 cde	80.73 efg	80.37 efg	80.37 efg	80.36 fg
SCU	With	84.96 bc	78.14 fgh	86.66 b	88.14 a	83.70 cde	88.51 bc	90.73 a	90.36 a
	With out	77.03 ghi	83.03 bcd	88.14 a	88.14 a	79.66 fgh	85.92 bcd	89.25 b	87.41 b

higher or lower rate of N-fertilizers in 2000 and 2001 seasons except,100g during 2001 season in number of bud burst.

On the other hand, the interaction between N-fertilizers form and biofertilizers showed that (Table2,C) biofertilizers induce significant effect in number of bud burst or bud burst percentage(PCU ,SCU). Beside, slow release N-fertilizers(PCU ,SCU)espically (SCU) surpassed fast release N-fertilizers and gave higher values of number bud burst or bud burst percentage.

Moreover, the interaction between N-fertilizer rate and bio-fertilizers showed that,(Table 2,D) the biofertilizer induce significant effect and gave higher values of bud burst percentage or number of bud burst on this point. Beside, higher rate of N-fertilizer (100 g N/vine) induce higher values of number of bud burst or bud burst percentage compared with the other rates of N-fertilizers(40,60 and 80g N/vine).

Finally, the interaction between N-fertilizer form, N-fertilizers rate and bio-fertilizers showed that,(Table 2,E) bio-fertilizer with SCU 80g N/vine induce significant effect in number values bud burst or bud burst percentage during tow seasons of study.

4.1.2. The number vegetative and fruitful shoot percent:

It is quite evident from Table (3,A) that fertilizing Thompson seedless grapevine with different forms of slow release nitrogen fertilizers(PCU ,SCU). decreased the vegetative shoots percent than in fertilized with different forms of fast release nitrogen fertilizers in 2000 and 2001seasons, respectively, while with fruitful shoot percentage values,slow release nitrogen fertilizers(PCU ,SCU) gave

Table (3): Effect of nitrogen fertilizer form rate and biofertlizer on (Vegetative shoot %and Fruitful shoot %) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	Vegetative shoot %		Fruitful shoot %	
	2000	2001	2000	2001
Fast release				
AS	79.25 a	78.37 a	20.75 d	21.62 d
U	77.50 b	74.54 b	22.38 c	25.46 c
Slow release				
PCU	75.88 c	70.95 c	23.88 b	29.04 b
SCU	71.25 d	63.25 d	28.54 a	36.75 a
40 gn/vine	77.17 a	74.41 a	22.63 d	25.58 d
60gn/vine	76.04 b	71.58 b	23.58 c	28.41 c
80 gn/vine	75.50 b	70.25 c	24.46 b	29.75 a
100gn/vine	75.17 b	70.87 c	24.88 a	29.12 b
With (bio)	76.15 a	71.83 a	23.85 a	28.17 a
Without (bio)	75.79 a	71.73 a	23.92 a	28.27 a

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	Vegetative shoot %							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	79.67 b	80.67 a	79.17 bc	77.50 de	78.33 b	79.83 a	77.50 c	77.83 bc
U (fast)	79.00 bc	76.50 f	76.17 f	78.33 cd	78.50 b	74.50 d	73.00 e	72.16 f
PCU (slow)	76.33 f	74.33 g	76.67ef	75.67 f	73.83 d	71.67g	68.66 h	71.66 g
SCU (slow)	73.67h	72.17 h	70.00 i	69.17 i	67.00 i	62.33 j	61.83 j	61.83 j
	Fruitful shoot %							
	2000				2001			
	40	60	80	100	40	60	80	100
AS	20.33 ij	19.33 j	20.83hi	22.50 fg	21.66I	20.16 j	22.50 h	22.16 hi
U	20.67 hij	22.67fg	24.33 de	21.83 gh	21.50 I	25.50 g	27.00 f	27.83 e
PCU	23.33 ef	25.00cd	22.67fg	24.50de	26.16 g	26.17 g	31.33 c	28.33 d
SCU	26.17bc	27.33 b	30.00 a	30.67 a	33.00 b	37.66 a	38.16 a	38.16 a

AS= Ammonium sulphate, U= Urea, PCU= phosphouas coated urea, SCU= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-form	Vegetative shoot %				Fruitful shoot %			
	2000		2001		2000		2001	
	With	Without	With	Without	With	Without	With	Without
Fast release								
AS	78.92 ab	79.58 a	77.75 b	79.00 a	21.08 e	20.42 e	22.25 f	21.00 g
U	77.83 bc	77.17 cd	75.08 c	74.00 d	22.17 d	22.58 cd	24.91 e	26.00 d
Slow release								
PCU	76.58 d	75.17 e	70.75 e	71.16 e	23.42 bc	24.33 b	29.25 c	28.83 c
SCU	71.25 f	71.25 f	63.75 f	62.75 g	28.75 a	28.33 a	36.25b	37.25 a

D) The interaction between N application rates and biofertilizers.

Biofertilizer	Vegetative shoot %							
	2000				2001			
	40	60	80	100	40	60	80	100
With	77.42 a	76.25 abc	75.67 bc	75.25 c	75.50 a	71.67 c	69.92 e	70.25de
Without	76.92ab	75.83bc	75.33c	75.08 c	73.33 b	71.50 c	70.58d	71.50c
	Fruitful shoot %							
	2000				2001			
	40	60	80	100	40	60	80	100
With	22.58 d	23.75 bc	24.33 bc	24.75a	24.50e	29.42b	30.08a	29.75 ab
Without	22.67d	23.42cd	24.58ab	25.00a	26.67d	28.50c	29.42b	28.50c

E) The interaction between three factors N form, rates and biohertilizers.

Vegetative shoot percent									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	79.33 bcd	80.67 a	78.33 bcde	77.33 efghi	79.33 bc	77.67 de	75.67 f	78.33 cd
	With out	80.00 b	80.67 a	80.00 b	77.67 defg	77.33 de	82.00 a	79.33 bc	77.33 de
Urea	With	79.67 bc	77.00 fghij	76.67 fghij	78.00 cdefg	80.00 b	75.33 f	73.33 gh	71.67 ij
	With out	78.33 cdef	76.00 hijk	75.67 ijk	78.67 bcde	77.00 e	73.67 gh	72.67 hi	72.67 hi
PCU	With	77.67 defgh	74.33 l	78.00 cdefg	76.33 ghijk	74.00 g	70.33 kl	68.00 n	70.67 jk
	With out	75.00 kl	75.33 jk	75.33 jk	75.00 kl	73.67 gh	69.00 mn	69.33 Lm	72.67 hi
SCU	With	73.00 m	73.00 m	69.67 o	69.33 o	68.67 mn	63.33 p	62.67 p	60.33 q
	With out	74.33 l	71.33 n	70.33 o	69.00 o	65.33 o	61.33 q	61.00 q	63.33 p

Fruitful shoot percent									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	20.67 klm	19.37 m	21.67 ijkl	22.67ghi	20.67op	22.33mn	24.33L	21.67no
	With out	20.00 klm	19.33 m	20.00m	22.33hij	22.67mn	18.00q	20.67op	22.67mn
Urea	With	20.33 lm	23.00 gh	23.33gh	22.00hijk	20.00p	24.67 e	26.67jk	28.33hi
	With out	21.00 jklm	22.33 hij	23.33de	21.67ijkl	23.00m	26.33jk	27.33ij	27.33ij
PCU	With	22.33 hij	25.67 d	22.00hijk	23.67fg	26.00k	29.67fg	32.00d	29.33gh
	With out	24.33 ef	24.33 ef	23.33gh	25.33de	26.33jk	31.00de	30.67ef	27.33ij
SCU	With	27.00 c	27.00 c	30.33a	30.67a	31.33de	36.67b	37.33b	39.67a
	With out	25.33 de	27.67 b	29.67a	30.67a	34.67c	38.67a	39.00a	36.67b

the higher values compared with fast release N-fertilizer in both seasons. Generally, ammonium sulphate gave the best number of vegetative shoots, while,SCU gave the highest number of fruitful %.

Furthermore, the higher rate of nitrogen fertilizers (80 and 100 g N/vine) reduced the vegetative shoots percent compared with lower rate of nitrogen fertilizers (40 and 60 g N/vine) in 2000 and 2001 seasons, respectively.While the higher rate of nitrogen fertilizers(100 g N/vine) increased the fruitful shoot percentage in two seasons compared with the lower rate of nitrogen fertilizer.

Furthermore, fertilizing with biofertilizer improved vegetative shoots or fruitful shoot % percentage than fertilized without biofertilizers in both seasons.

Table(3,C)clear, the interaction between nitrogen fertilizer form and rate, on vegetative shoots percent of Thompson seedless grapevine. Data cleared that, Thompson seedless grapevine fertilized with (60g N/vine) recorded the highest values of vegetative shoot percentage..In contrast with that fertilizers with the higher rate (100g/n/vine) of slow release N fertilizers (SCU) induced more possitive effect in fruitful shoot percentage as compared with the higher or lower rate of fast release N fertilizers.

. Additionally, the interaction between nitrogen sources and biofertilizers (table 3,D) induced similar trend to that of interaction between N-form and rate of application, where fast release N-fertilizers supported with or without biofertilizers gave significantly the highest vegetative shoots percentage in both seasons 2000 and 2001 compared with slow release N-fertilizers with or without biofertilizers.Also, to that,fruitful percentage

with slowe release N fertilizers with biofertilizers gave significantly the highest values of frutful shoot percentage.

On the other hand, the interaction between nitrogen rate and biofertilizer (table (3,D) clear that the lower rate of nitrogen(40g N/vine) with biofertilizer gave the highest vegetative shoot percentage as compared to the other treatment..On the contrary fruitful shoot percentage, N fertilizers with higher rate(80 and 100g N/vine)with biofertilizers gave the highest values of fruitful percentage .

Finally, the interaction between the three studied factors i.e., nitrogen forms, nitrogen rate and biofertilizers(table 3,E) demonstrated that fast release N-fertilizer applied with 60gN/vine and unfertilized with biofertilizers gave higher values of vegetative shoot percent compared with the other treatments. The same values were observed in fruitfull shoot% in fertilized grapevines with SCU(100g N/vine)and fertilized with bacteria in both seasons, respectively.

4.1.3. Number of leaves per shoot and leaf area

Table (4,A) indicated that slow release N-fertilizers(SCU) produced higher number of leaves per shoot and leaf area as compared with those vines recived the other N-fertilizers.

Furthermore, Thompson seedless grapevine, received higher nitrogen fertilizer rate (100 g N/vine) produced higher number of leaves per shoot and leave area as compared with those fertilized with nitrogen fertilizers rate.

In addition, Thompson seedless grapevine received biofertilizer induce a remarkable effect on number of leaves per shootand leaf area in both seasons.

Table (4): Effect of nitrogen fertilizer form rate and biofertlizer on (Number of leaves/shoot and Leaf area (cm^2)) of Thompson seedless grapevines during (2000,2001).

A) Main effects of N form, rate and biofertilizers.

Treatment	Number of leaves/shoot		Leaf area (cm^2)	
	2000	2001	2000	2001
Fast release				
AS	48.65 c	57.61 c	223.03 d	209.40 d
U	48.99 c	59.87 b	246.57 c	237.83 c
Slow release				
PCU	51.45 b	60.07 a	256.08 b	257.92 b
SCU	56.06 a	59.53 b	265.81 a	263.99 a
40 gn/vine	51.08 a	60.23 a	235.97 c	227.50 d
60gn/vine	49.88 a	57.66 b	248.26 b	239.39 c
80 gn/vine	52.01 a	60.65 a	249.84 b	247.41 b
100gn/vine	52.27 a	58.33 b	257.40 a	254.83 a
With (bio)	53.84a	61.16 a	249.86a	243.23a
Without (bio)	48.78b	56.93 b	245.88 b	241.35b

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	Number of leaves/shoot							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	50.16 cde	45.33 f	48.88 e	50.22 cde	56.84 fg	55.55 gh	59.84 b	61.47 ab
U (fast)	48.55 e	48.00 e	49.38 de	50.05 cde	58.91 cd	59.10 c	60.18 b	59.07 c
PCU (slow)	50.33 cde	50.61 cde	53.05 bcd	52.16 bcd	57.93 de	58.07 de	61.69 a	61.04 ab
SCU (slow)	55.27 bc	55.61 b	56.72 a	56.66 a	58.22 d	57.81 ef	60.90 ab	61.59 ab
	Leaf area (cm^2)							
	2000				2001			
	40	60	80	100	40	60	80	100
AS	217.80 I	213.74 I	229.64g	230.90 g	191.04 j	206.02 I	213.07 h	226.86 g
U	222.86 h	243.31 f	257.20d	262.88 c	226.87 g	236.00 f	237.37 f	251.07 d
PCU	249.61 e	273.04b	249.35e	252.33 e	241.99 e	237.40 f	267.20 b	268.38 b
SCU	253.61 de	263.02c	263.15c	283.46 a	250.11 d	261.46 c	271.36 ab	273.03 a

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-form	Number of leaves/shoot				Leaf area (cm^2)			
	2000		2001		2000		2001	
	With	Without	With	Without	With	Without	With	Without
Fast release								
AS	45.19 b	52.11 ab	56.36 c	58.86 b	217.70 f	228.35 e	209.38 d	209.43d
U	45.75 b	52.25 ab	57.60 b	62.15 ab	246.91 d	246.23 d	258.50 b	240.66 c
Slow release								
PCU	49.36 ab	53.72 ab	57.61 b	56.16 c	254.73 c	257.41 c	257.31 b	258.53 b
SCU	54.83 ab	57.30 a	62.89 a	62.56 ab	267.46 a	264.16 b	263.69 a	264.30 a

D) The interaction between N application rates and biofertilizers.

Biofertilizer	Number of leaves/shoot							
	2000				2001			
	40	60	80	100	40	60	80	100
With	48.83 a	46.66 a	50.69 a	48.94 a	62.50a	60.57 b	58.90 c	56.13 d
Without	53.33 a	53.11 a	53.33a	55.61 a	57.97c	54.94 e	62.41 a	60.94b
	Leaf area (cm^2)							
	2000				2001			
	40	60	80	100	40	60	80	100
With	232.70 g	242.33e	260.52b	266.88a	227.40 d	247.60 b	247.22b	253.99a
Without	239.21f	254.22c	239.15f	247.92d	227.61 d	242.02c	247.62b	255.70 a

E) The interaction between three factors N form, rates and biohertilizers.

N Form	Bio fertilizer	Number leaves/shoot							
		2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	44.55i	41.55j	48.44e	46.22h	55.09j	53.37l	59.84f	57.14h
	With out	55.77a	49.11e	49.33e	54.22b	58.58g	57.73h	59.84f	59.30f
Urea	With	46.44h	44.11i	47.44g	44.99h	59.30f	56.16i	58.63g	56.29i
	With out	50.66e	51.88d	51.33d	55.11a	62.67c	62.24c	61.74d	61.85d
PCU	With	48.66f	47.44g	51.55d	49.77e	59.54f	55.06j	59.83f	56.03i
	With out	51.99d	53.77c	54.55b	54.55a	63.65b	61.08d	63.56b	61.80d
SCU	With	55.66a	57.66a	55.33a	58.55a	57.93ah	54.36k	57.29h	55.07j
	With out	54.88a	53.55 c	58.11a	54.77b	65.01a	61.27d	64.50b	60.80e

N Form	Bio fertilizer	Leaf area							
		2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	213.7jk	208.6k	224.3l	224.2i	193.50n	203.50m	213.70L	226.90 jk
	With out	221.9l	218.9ij	234.9h	237.7h	188.60n	208.60lm	213.70L	226.90jk
Urea	With	224.2l	237.7h	262.9e	262.9e	224.20k	234.90hij	234.90hij	245.90ef
	With out	221.6l	249.0fg	251.5f	262.9e	229.50ijk	237.10ghi	239.80fgh	256.20cd
PCU	With	248.7fg	271.60d	274.50cd	224.20l	240.40fgh	251.50cde	268.70ab	268.70ab
	With out	250.50f	274.50cd	224.20l	280.50b	243.60efg	256.70cd	265.80b	268.10ab
SCU	With	244.30g	251.50f	280.40bc	280.40bc	251.50cde	257.20c	271.60ab	274.50a
	With out	262.90e	274.50cd	245.90fg	286.50a	248.70de	265.80b	271.20ab	271.60ab

On the other hand, the interaction (table 4,B) between N-fertilizers source and fertilizer rate recorded that, the higher rates(80 and100 g N/vine) of (SCU) scored higher values in this subject as compared with N-fertilizers under study.

As for the interaction(table 4,C) between N- fertilizer form and biofertilizers showed that, the biofertilizers inoculation induce with SCU N- fertilizer a positive effect on this corner. Generally, fast release N-fertilizers with or without biofertilizer gave lower values of number of leaves per shoot and leaf area.

Moreover, the interaction(table 4,E) between N-fertilizers rate and biofertilizer showed that, the biofertilizers with the lowest rate(40g N/vine) induce a positive effect on number of leaves /shoot, while(100g N /vine) gave the same trend in 2001 season when leaf area concerned .

Finally, the interaction (table 4,D)between the three studied factors, fertilizers forms, fertilizers rate and biofertilizers demonstrated that, the biofertilizers gave higher distinctive effect on number of leaves per shoot and leaf area. Beside, slow release N-fertilizer (SCUand PCU) with higher rate of N-fertilizers (80 and 100 g N/vine) induced higher values of number of leaves per shoot and leaf area as combared with fast release N- fertilizer with lower or higher rate.

4.1.4. Shoot length and leaf chlorophyll content:,

Table (5A) reveals that slow release N- fertilizers (SCU,PCU) especially (SCU) surpassed the fast release nitrogen fertilizers(Ammonium sulphate, Urea)in enhancing shoot length and leaf chlorophyll content. The highest values were obtained in SCU N forms treatment in this subject.

In addition, the higher rate of nitrogen fertilizers (100 g N/vine) succeeded in increasing shoot and leaf chlorophyll

Table (5): Effect of nitrogen fertilizer form rate and biofertlizer on (shoot length (cm^2) and leaf chlorophyll cotent) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	shoot length (cm^2)		leaf chlorophyll cotent	
	2000	2001	2000	2001
Fast release				
AS	192.83 d	188.80 d	39.11 c	35.45 c
U	200.83 c	214.00 c	39.25 c	34.45 c
Slow release				
PCU	219.27 b	234.62b	40.64 b	36.25 b
SCU	229.65 a	248.56 a	43.75 a	40.14 a
40 gn/vine	194.64 c	211.95 c	39.42 c	34.83 b
60gn/vine	209.78 b	214.66 c	39.57c	35.60 b
80 gn/vine	214.20 b	222.92 b	41.37 b	37.52 a
100gn/vine	223.95 a	236.45 a	42.40 a	38.36 a
With (bio)	218.59 a	223.20 a	42.09 a	36.87 a
Without (bio)	202.69 b	219.80 b	39.29 b	36.28 a

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	shoot length (cm^2)							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	156.42 f	190.65 e	204.93 d	219.30 c	169.88 h	187.25 g	202.10f	195.95 g
U (fast)	185.55 e	190.65 e	216.35 cd	210.77 d	203.91 f	198.61 fg	209.28 e	244.20 c
PCU (slow)	226.53 b	218.30 cd	212.97 cd	219.30 c	236.81 cd	230.88 d	231.73 d	239.05 cd
SCU (slow)	210.05 d	239.50 a	222.55 c	240.50 a	237.20 cd	241.90 cd	248.33 b	266.61 a
	leaf chlorophyll cotent							
	2000				2001			
	40	60	80	100	40	60	80	100
AS	37.32 j	38.52 i	40.78 ef	39.83 fg	33.22 h	33.18 h	36.35 e	39.03 c
U	39.78 g	38.35 j	39.28 hi	39.60 gh	34.42 gh	33.35 h	34.82 fgh	35.23 fg
PCU	39.32 hi	39.60 gh	39.53 hi	42.68 c	33.48 gh	35.45 f	37.78 d	38.30 c
SCU	41.27 d	40.38 efg	45.87 b	47.50 a	38.18 c	40.40 b	41.12 a	40.87 a

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-form	shoot length (cm^2)				leaf chlorophyll cotent			
	2000		2001		2000		2001	
	With	Without	With	Without	With	Without	With	Without
Fast release								
AS	186.55 g	199.10 e	178.05e	199.55 d	40.33 d	37.89 f	35.52 bc	35.39 bc
U	195.46 f	206.20 d	214.07c	213.93 c	41.35 c	37.16 f	34.83cd	34.08 d
Slow release								
PCU	208.42 d	230.10 b	236.25b	232.99 b	41.84 c	39.44 e	36.57 b	35.94 bc
SCU	220.34c	238.95a	250.81a	246.30 a	44.83 a	42.68 b	40.55 a	39.73 a

D) The interaction between N application rates and biofertilizers.

Biofertilizer	shoot length (cm^2)							
	2000				2001			
	40	60	80	100	40	60	80	100
With	184.92 e	204.23d	207.28 cd	233.57a	204.84d	217.11bc	222.08 bc	235.15 a
Without	204.35d	215.33 bc	221.13b	214.34 bc	219.07bc	212.20 cd	223.76 b	237.76 a
	leaf chlorophyll cotent							
	2000				2001			
	40	60	80	100	40	60	80	100
With	40.37 cd	40.97 c	43.05 b	43.96 a	35.18 e	35.79d	37.63 c	38.87 a
Without	38.47 e	38.17 e	39.68 d	40.35 c	34.47 f	35.40 e	37.41 c	37.85 b

E) The interaction between three factors N form, rates and biohertilizers.

Shoot length									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate Ammonium	With	138.9k	191.7hi	198.3ghi	217.3ef	145.40h	190.50fg	196.10fg	180.20g
	With out	173.9j	189.6hij	211.6efg	221.3cdef	194.30fg	184.00g	208.20ef	211.80def
Urea	With	183.70ij	189.60hij	211.30efg	197.20ghi	197.90fg	199.50fg	210.40ef	248.50abc
	With out	187.40ij	191.70hi	221.40cdef	224.30bcde	210.00ef	197.80fg	208.10ef	239.90c
PCU	With	217.40ef	199.20ghi	219.80def	197.20ghi	237.20c	233.00c	231.90cd	242.90bc
	With out	235.70abcd	237.40abc	206.10fgh	241.30ab	236.40c	228.70cde	231.60cd	235.20c
SCU	With	199.70ghi	236.40abcd	199.70ghi	245.60a	238.90c	245.40bc	249.90abc	269.10a
	With out	220.40cdef	242.60a	245.40a	247.40a	235.50c	238.40c	247.20bc	264.20ab
leaf chlorophyll content									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	37.50lmn	40.60hi	40.97gh	42.27defg	33.47jk	32.67k	36.03ghi	39.90abcde
	With out	37.13lmno	36.43no	40.60hi	37.40Lmn	32.97k	33.70jk	36.67gh	38.17cdef
Urea	With	41.40efgh	39.87hig	42.90de	41.23fgh	35.17hijk	33.37k	35.00hijk	35.80ghij
	With out	38.17klm	36.83mno	35.67 o	37.97kLmn	33.67jk	33.33k	34.63ijk	34.67ijk
PCU	With	40.07hij	42.80de	41.37efgh	43.13d	33.63jk	36.23ghi	37.93ef	38.47cdef
	With out	38.57jkl	39.27ijk	37.70Lmn	42.23defg	33.33k	34.67ijk	37.63fg	38.13def
SCU	With	42.53def	40.63hi	46.97b	49.20a	38.47cdef	40.90b	41.53a	41.30a
	With out	40.00hij	40.13hi	44.77c	45.80bc	37.90ef	39.90bcd	40.70abc	40.43bcd

content elongation than did the lower rates (40 , 60 and80 g N/vine) in both seasons.

Furthermore, fertilizing with *Azotobacter chrocoocum* increased shoot length and leaf chlorophyll content than the treatment without biofertilizer. Beside, biofertilizer inoculation induce a distinctive effect on shoot length and leaf chlorophyll content from the statistical standpoint in both seasons.

Moreover, the interaction(table 5, B) between N-fertilizer form and N-fertilizer rate demonstrated that the higher rates (100 g N/vine) of slow release N-fertilizers (SCU) exerted statistically the highest values of shoot length and leaf chlorophyll content. Moreover, the lower rate of the slow release N-fertilizers (PCU and SCU) come next in their positive effect on shoot length and took similar trend of the higher rate of these fertilizers. Also, the higher and lower rates of fast release N-fertilizers (ammonium sulphate and urea) took the same trend of the analogous ones of slow release N-fertilizers regarding shoot length and leaf chlorophyll content during both seasons 2000 and 2001.

Additionally, the interaction(table 5,C) between N-fertilizers form and biofertilizers(*Azotobacter chrocoocum*) demonstrated that slow release N-fertilizers induce a positive effect on shoot length and leaf chlorophyll content with biofertilizers(*Azotobacter chrocoocum*) compared without biofertilizers in the second season.Nitrogen fertilizers (SCU)with biofertilization gave highest values of shoot length and leaf chlorophyll content with biofertilizers (*Azotobacter chrocoocum*) as compared with treatment without biofertilizers and fertilized with the other forms.

On the other hand, interaction(table 5,D) between rate of N-fertilizers applied and biofertilizer data cleared that the higher

rates of N-fertilizers (100 g N/vine) exerted statisticaly the highest values of shoot length and leaf chlorophyll content in both seasons with or without Azotobacter N-fixing bacteria. Beside, the lower rate of N-fertilized (40 , 60,and 80 g N/vine) came next in their positive effect on shoot length and leaf chlorophyll content in both seasons.

Finally, interaction(table 5, E) between three factors studied N-fertilizers form (fast and slow release), N-rate and biofertilizers (*Azotobacter chrocoocum*) demonstrated that slow release N-fertilizers(SCU and PCU) with higher rates (80,100 g N/vine) of nitrogen applied and with biofertilizers gave the highest values on shoot length and leaf chlorophyll content in both seasons. slow or fast release N-fertilizers with higher rates (80,100 g N/vine) and with (*Azotobacter chrocoocum*) improved shoot length and leaf chlorophyll content .

Generally, slow release N-fertilizers trees produced higher bud burst, vegetative and fruitful shoot, shoot length, number of leaves/shoot, leaf surphase area, and leaf chlorophyll content than the analogous ones fertilized with fast release N-fertilizers. Besides, the studied vegetative growth parameters produced significantly to the increase in nitrogen fertilizer rate, hence the higher N-fertilizer rate (100 g N/vine/year) recorded the highest values of the previously mentioned vegetative growth parameters than did the lower nitrogen fertilizer rate (40 g N/vine/year).

Briefly, SCU proved to be the superior slow release N-fertilizer form followed descendingly by PCU. On the other contrary, urea showed to be the least efficient fast release N-fertilizer form in this respect. Furthermore, the improvement of tree growth as a result of biofertilizers may be due to the production of growth regulators as well as N-fixation.

The obtained results regarding the effect of fast release N-fertilizers on tree growth are agree with the finding of **Katano** *et al.* (**1986**) on grapevine, **Mansour** (**1998**) on grapevines, **Clougnati** *et al.* (**1999**) on grapevines, **Abd El – Hady (2002)**, **Alia (2002)**, and **Jarad (2004)** on grapes.

They mentioned that nitrogen fertilization enhanced the growth traits of Thompson seedless grapevine. Moreover, the achieved results of slow release N-fertilizers in this respect are in harmony with the reports of **Mansour** (**1997**) on grapevines,

They demonstrated that supplying fruit trees with slow release N-fertilizers effectively enhanced growth characters of the tree compared with the conventional soluble ones. They added that frequency and rate of N-application could be reduced and NO_3 leaching could be minimized by using slow release N-fertilizers without adverse affect on tree growth. On the other hand, the obtained result of N-fertilizer rate in this respect are in agreement with the finding of **Mansour** (**1998**) on grapevines. They reported that growth of grapevines was materially enhanced as the nitrogen application rate increased.

Furthermore, positive effect of tested biofertilizers on tree growth are in harmony with the findings of **Faten (2003)** on grape vine, **Omran (2003)** on grape, **Fawzi (2004)** on flame seedless **Ahmed** *et al.* (**1998**) on grapevines.

on Navel orange. They showed that, biofertilizers (*Azotobacter*) caused material improvement in shoot length, leaf area and number of leaves/shoot,

4.2. Leaf minerals content:,

Leaf minerals content (N, P, K, Ca, Mg, Zn and B) of Thompson seedless grapevines during 2000 and 2001 seasons in response to fast release N-fertilizers (ammonium sulphate and

urea). Slow release N-fertilizers (phosphorus coated urea (PCU) and sulphur coated urea (SCU) and N-fixing bacteria (*Azotobacter chrocoocum*) as well as their interactions is reported in Tables (6 -9).

4.2.1- Nitrogen and Phosphorus:

It is clear from Table (6,A) that leaves of slow release N-fertilizers (PCUand SCU) had higher values of N content as compared with those fast release N-fertilized in the first and second seasons, while leaves of fast release N-fertilizers (sulphate ammonium (NH4 (SO4)2) and urea (U) vines had higher values of phosphorus content (0.19 & 0.23%) in the first season and (0.20 & 0.22%) in the second season compared with those slow release N-fertilizers (0.20 & 0.20%) in first season and (0.20 & 0.21%) in the second season, respectively.. Anyhow, the best result of leaf N% content was obtained with SCU N form, but urea treatment gave the same trend in leaf P % content.

Furthermore, the higher rate of nitrogen forms (100gN / vine / year) application successful to induce a positive effect on leaf nitrogen content in two seasons .Moreover, Thompson seedless grapevines received low nitrogen fertilizer rate (40, 60 g N/vine) scored higher values of the leaf phosphorus content as compared with the corresponding ones fertilized with higher nitrogen fertilizer rate (80 and 100 g N/vine) in both seasons.

In addition, fertilizing Thompson seedless grapevines with biofertilizers N-fixing bacteria *Azotobacter chrocoocum* improved leaf nitrogen and phosphorus contents than uninoculated vine with N-fixing bacteria.

Table (6): Effect of nitrogen fertilizer form rate and biofertlizer on (Leaf N% and Leaf P%) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	Leaf N %		Leaf P %	
	2000	2001	2000	2001
Fast release				
AS	2.35 d	2.16 d	0.19 c	0.20 c
U	2.51 c	2.47 c	0.23 a	0.22 a
Slow release				
PCU	2.62 b	2.58 b	0.20 b	0.20 c
SCU	2.76 a	2.77 a	0.20 b	0.21 b
40 gn/vine	2.48 c	2.40 d	0.21 a	0.22 a
60gn/vine	2.52 b	2.46 c	0.22 a	0.22 a
80 gn/vine	2.60 a	2.54 b	0.20 b	0.20 b
100gn/vine	2.64 a	2.59 a	0.19 c	0.19 b
With (bio)	2.76 a	2.54 a	0.21 a	0.21 a
Without (bio)	2.37 b	2.45 b	0.20 b	0.20b

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	Leaf N %							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	2.15 j	2.31 I	2.44 h	2.51 gh	2.06 j	2.31 ij	2.18 I	2.26 h
U (fast)	2.48 h	2.45 h	2.55 fg	2.55 fg	2.34 g	2.46 f	2.53 e	2.55 de
PCU (slow)	2.59 ef	2.59ef	2.63 e	2.66 d	2.53 e	2.53 e	2.61 cd	2.68 b
SCU (slow)	2.67d	2.75 c	2.78 b	2.85 a	2.67 bc	2.71 b	2.85 a	2.84 a
	Leaf P %							
	2000				2001			
	40	60	80	100	40	60	80	100
AS	0.19 g	0.20 fg	0.20 fg	0.18 h	0.21 bc	0.20 bc	0.22 bc	0.19 c
U	0.24 ab	0.25 a	0.23 bc	0.12 de	0.21 bc	0.24 a	0.22 bc	0.20 c
PCU	0.21 ef	0.21 de	0.19 g	0.18 gh	0.21 bc	0.21 bc	0.20 bc	0.19 bc
SCU	0.22 cd	0.21 ef	0.19 g	0.19 g	0.23 b	0.22 bc	0.20 bc	0.19 c

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-form	Leaf N %				Leaf P %			
	2000		2001		2000		2001	
	With	Without	With	Without	With	Without	With	Without
Fast release								
AS	2.51 d	2.20 f	2.11 f	2.21 e	0.19 c	0.18 d	0.20 c	0.19 d
U	2.79 b	2.23 f	2.65 b	2.44 d	0.23 a	0.23 a	0.22 a	0.21 b
Slow release								
PCU	2.82 b	2.42 e	2.67 b	2.51 c	0.20 c	0.20 c	0.20 c	0.20 c
SCU	2.90 a	2.62 c	2.88 a	2.66 b	0.21 b	0.20 c	0.21 b	0.21 b

D) The interaction between N application rates and biofertilizers.

Biofertilizer	Leaf N %							
	2000				2001			
	40	60	80	100	40	60	80	100
With	2.66 b	2.72 b	2.81 a	2.84 a	2.44 d	2.50 c	2.60 a	2.62 a
Without	2.29 e	2.34 de	2.40 cd	2.45 c	2.37 e	2.42 d	2.48 c	2.55 b
	Leaf P %							
	2000				2001			
	40	60	80	100	40	60	80	100
With	0.21 a	0.22 a	0.22 a	0.19 b	0.21ab	0.22a	0.21ab	0.19 b
Without	0.22 a	0.22 a	0.20 b	0.19 b	0.21ab	0.21 ab	0.19 b	0.18 b

E) The interaction between three factors N form, rates and biohertilizers.

N %									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate Ammonium	With	2.14n	2.43ijk	2.68fg	2.78bcde	2.04q	2.06q	2.13pq	2.20p
	With out	2.16n	2.19mn	2.20mn	2.24Lmn	2.09q	2.20p	2.23op	2.34n
Urea	With	2.77cdef	2.68efg	2.86abcd	2.84abcd	2.32no	2.50ijkl	2.59fghi	2.58ghi
	With out	2.20mn	2.21mn	2.24Lmn	2.26 Lmn	2.37mn	2.41Lmn	2.47jkl	2.52hijk
PCU	With	2.86abcd	2.84abcd	2.81bcde	2.77cdef	2.60fghi	2.64defg	2.69cdef	2.76bc
	With out	2.32klm	2.35jkl	2.45ij	2.54hi	2.45jklm	2.44klm	2.53hijk	2.60fghi
SCU	With	2.86abcd	2.90ab	2.89abc	2.94a	2.79bc	2.80b	2.98a	2.95a
	With out	2.47 hij	2.60gh	2. 67fg	2.75def	2.55ghij	2.63efgh	2.71bcde	2.74bcd

P %									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	0.19jklm	0.20ijkl	0.21efgh	0.17n	0.21ab	0.21ab	0.19ab	0.20ab
	With out	0.19lmn	0.19jklm	0.18mn	0.18mn	0.21ab	0.19ab	0.18b	0.18b
Urea	With	0.23bcd	0.24abc	0.24abc	0.21efgh	0.21ab	0.24ab	0.24ab	0.20ab
	With out	0.24ab	0.19jklm	0.23cde	0.21ghij	0.21ab	0.19ab	0.20ab	0.19ab
PCU	With	0.20 ijkl	0.22def	0.20ijkl	0.18mn	0.20ab	0.20ab	0.21ab	0.19ab
	With out	0.21fghi	0.21ghij	0.19Lmn	0.19 lmn	0.21ab	0.22ab	0.19ab	0.19ab
SCU	With	0.22defg	0.22defg	0.20jkl	0.25a	0.23ab	0.22ab	0.20ab	0.25a
	With out	0.22def	0.20ijkl	0.18mn	0.19lmn	0.23ab	0.22ab	0.20ab	0.19ab

Moreover, the interaction (table 6,B)between nitrogen fertilizer form and rate nitrogen fertilizers addition demonstrated that, leaf nitrogen content was more higher values with slow release N-fertilizer, (SCU)than N-fertilizer with higher or lower rate of nitrogen application.On the other hand,the lower rate (60gN/vine) of urea increased leaf P %content as compared with the other treatments.

Additionally, Table (6,C) indicated that leaf nitrogen content responded largely to nitrogen form especially slow release N-fertilizers (SCU and PCU) with biofertilizers N-fixing bacteria, where nitrogen form supported by N-fixing bacteria (*Azotobacter chrocoocum*) recorded the highest values of leaf nitrogen content, especially with slow release nitrogen fertilizers sulphur coated urea (SCU) with N-fixing bacteria.But leaf phosphorus content showed more response to fast release N-fertilizers rather than slow release N-fertilizers. They highest values of leaf P content, followed descendingly by those of urea applied.

Moreover, the addition(table 6,D) of nitrogen form to Thompson seedless grapevines at the high rate (80,100 g N/vine) with N-fixing bacteria proved to be most efficient interaction in enhancing leaf nitrogen content, while (40gn/vine)with N-biofertilization gave the highest values of leaf phosphorus content of Thompson seedless grapevines.

Finally, the interaction (table 6,E)between nitrogen form, rate of addition and N-fixing bacteria shows that the interactions of nitrogen form, especially when slow release N-fertilizers (SCU) sulphur coated urea applied at rate 80 and 100 g N/vine and supported with *Azotobacter chrocoocum* as N-fixing bacteria induced the highest positive effect on leaf nitrogen content. On

the other contrary, the combination of fast release N-fertilizers exerted the least positive effect on leaf nitrogen content. But, in the same subject, the data recorded the nearly or similarly values of leaf phosphorus content. On the contrary the combination of urea(60gN/vine) fertilizer with biofertilizers *Azotobacter chrocoocum* or without biofertilizers *Azotobacter chrocoocum* induced the highest positive effect on leaf phosphorus content.

4.2.2. Potassium and Calcium:

It is obvious from Table (7,A) that leaves of slow release N-fertilizers (phosphorus coated urea (PCU) and sulphur coated urea (SCU) had higher values of potassium and calcium followed by those (PCU) and lastly by those of $NH_4(SO_4)2$ and urea in 2000 and 2001 seasons, respectively. The differences between the four studied N sources, regarding leaf calcium content were remarkable to be significantly .

Moreover, grapevines received higher nitrogen fertilizer rate (100 N/vine) gave higher values of leaf potassium content compared with the corresponding ones fertilized with low rates (40 and 60 g N/vine) of nitrogen fertilizer in the first season but in the seson2001recorded the nearly or simialry values of potassium content.

In addition, the application of four studied N forms, the higher rates application (80 and 100 g N/vine) induced highest positive effect on leaf calcium content in Thompson seedless grapevines as compared with the low rate nitrogen fertilizers application (40 and 60 g N/vine).

Furthermore, revealed that fertilizing Thompson seedless grapevines with Azotobacter as N-fixing bacteria improved leaf potassium and calcium content rather than without N-fixing

Table (7): Effect of nitrogen fertilizer form rate and biofertlizer on (Leaf K% and Leaf ca%) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	Leaf K %		Leaf Ca %	
	2000	2001	2000	2001
Fast release				
AS	2.67 d	2.66 a	2.66 b	2.71 c
U	2.73 c	2.65 a	2.63 c	2.70 c
Slow release				
PCU	2.81 b	2.67 a	2.66 b	2.78 b
SCU	2.85 a	2.70 a	2.68 a	2.81 a
40 gn/vine	2.75 c	2.64 a	2.62 d	2.68 d
60gn/vine	2.70 d	2.66 a	2.64 c	2.71 c
80 gn/vine	2.78 b	2.69 a	2.68 b	2.78 b
100gn/vine	2.83 a	2.68 a	2.69 a	2.84 a
With (bio)	2.76 a	2.67 a	2.66 a	2.76 a
Without (bio)	2.77 a	2.75 a	2.65 a	2.74 b

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	Leaf K %							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	2.63 j	2.72 g	2.79 d	2.85 b	2.63 e	2.65 d	2.67 c	2.69 b
U (fast)	2.59 k	2.66 I	2.75 f	2.81 c	2.63 e	2.65 d	2.67 c	2.67 c
PCU (slow)	2.69 h	2.71 g	2.84 b	2.86 a	2.64 d	2.65 d	2.70 b	2.70 b
SCU (slow)	2.76 e	2.82 c	2.87 a	2.87 a	2.66 c	2.68 b	2.72 b	2.73 a
	Leaf Ca %							
	2000				2001			
	40	60	80	100	40	60	80	100
AS	2.63 gh	2.65 de	2.66 cd	2.68 b	2.62 I	2.69 gh	2.74 e	2.81 d
U	2.61 I	2.62 hi	2.65 ef	2.65 de	2.67 h	2.65 i	2.68 gh	2.81 d
PCU	2.62 hi	2.64 fg	2.67 bc	2.68 b	2.70 fg	2.72 f	2.84 c	2.86 b
SCU	2.64 ef	2.65 de	2.72 a	2.72 a	2.72 f	2.78 de	2.87 b	2.88 a

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-form	Leaf K %				Leaf Ca %			
	2000		2001		2000		2001	
	With	Without	With	Without	With	Without	With	Without
Fast release								
AS	2.75 d	2.74 d	2.66 a	2.67 a	2.66 c	2.65 c	2.71 d	2.72 d
U	2.69 f	2.72 e	2.66 a	2.65 a	2.63 d	2.63 d	2.78 bc	2.70 d
Slow release								
PCU	2.77 c	2.78 b	2.67 a	2.68 a	2.65 c	2.65 c	7.77 c	2.78 bc
SCU	2.83 a	2.83 a	2.70 a	2.70 a	2.70 a	2.67 b	2.80 ab	2.82 a

D) The interaction between N application rates and biofertilizers.

Biofertilizer	Leaf K %							
	2000				2001			
	40	60	80	100	40	60	80	100
With	2.67 e	2.71 d	2.82 b	2.85 a	2.64 d	2.65 cd	2.70 a	2.69 ab
Without	2.67 e	2.75 c	2.82 b	2.84 a	2.65 cd	2.66 c	2.68 b	2.70 a
	Leaf Ca %							
	2000				2001			
	40	60	80	100	40	60	80	100
With	2.63 d	2.64 c	2.69 a	2.70 a	2.68 ef	2.70 de	2.76 c	2.83 a
Without	2.63 d	2.65 c	2.67 b	2.68 b	2.67 f	2.71 d	2.80 b	2.85 a

E) The interaction between three factors N form, rates and biohertilizers.

K %									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	2.64o	2.72m	2.79ij	2.86 bcde	2.63a	2.65a	2.68a	2.69a
	With out	2.62o	2.72m	2.79 ij	2.85efg	2.64a	2.64a	2.67a	2.69a
Urea	With	2.59q	2.61p	2.75kl	2.81hi	2.64a	2.65a	2.67a	2.67a
	With out	2.59q	2.72m	2.74L	2.82 h	2.62a	2.65a	2.66a	2.67a
PCU	With	2.67n	2.72m	2.83g	2.87abc	2.63a	2.65a	2.71a	2.69a
	With out	2.71m	2.71m	2.85def	2.86bcde	2.65a	2.66a	2.70a	2.70a
SCU	With	2.77k	2.80hij	2.88a	2.88a	2.65a	2.67a	2.72a	2.73a
	With out	2.76kl	2.84fg	2.87abcd	2.86bcde	2.67a	2.69a	2.71a	2.72a
Ca %									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	2.62 mno	2.66fgh	2.67def	2.69bcd	2.61j	2.69fghi	2.74ef	2.78de
	With out	2.63Lmn	2.65hijk	2.65ghij	2.68cde	2.62j	2.69fghi	2.73ef	2.85abc
Urea	With	2.61o	2.63Lmn	2.64jkl	2.66ghi	2.70fghi	2.66 ghij	2.66hij	2.81bcd
	With out	2.62no	2.62mno	2.65hijk	2.65ghij	2.65ij	2.65ij	2.71fghi	2.81bcd
PCU	With	2.62no	2.63klm	2.68cde	2.69bcd	2.70fghi	2.71fgh	2.81bcd	2.85abcd
	With out	2.62no	2.64ijkl	2.67def	2.68cd	2.69fghi	2.72fg	2.86abc	2.87ab
SCU	With	2.65ghij	2.65ijkl	2.75a	2.74a	2.72fgh	2.75ef	2.84abc	2.89a
	With out	2.64jkl	2.66efg	2.70b	2.69bc	2.72fgh	2.81bcd	2.89a	2.88a

bacteria in season 2000 seasons but in the seson2001recorded the nearly or simialry values of potassium content.

As for the interaction(table 7,B) between nitrogen applied form and nitrogen applied rates found that, slow release nitrogen fertilizers applied showed to be the most efficient combination in enhancing leaf potassium and calcium content in both 2000 and 2001 seasons compared with fast release N-fertilizers. The highest values of leaf potassium and calcium content in Thompson seedless grapevines obtained with SCU with highest rate nitrogen fertilized (100 g N/vine) in both seasons.

In addition, the interaction(table 7,C) between nitrogen form and biofertilizer (N-fixing bacteria) ,the best reasuted were showed with SCU form and fertilized with bacteria in leaf potassium and calcium content during two seasons of study .

On the other side, interaction(table 7,D) between rates of nitrogen applied and biofertilizers (N-fixing bacteria) the higher rate(100 g N/vine) with N-fixing bacteria recorded statistically higher leaf potassium and calcium content compared with un fertilized vines with bacteria.

Finally, the interaction(table 7,E) between the three studied factors, N-fertilizers form and rate with N-fixing bacteria demonstrated that the higher rate(80,100 g N/vine) of PCU and SCU (slow release N-fertilizers) with *Azotobacter chrocoocum* induced statistically the highest positive effect in descending order, followed by the higher rate of fast release N-fertilizers with *Azotobacter chrocoocum* ammonium sulphate and urea in the same descending order.

4.2.3 Leaf Mg % and Zinc ppm:,

Briefly, Table (8,A) show that slow release N-fertilizers surpassed fast release N-fertilizers in enhancing leaf Mg and Zn

Table (8): Effect of nitrogen fertilizer form rate and biofertlizer on (Leaf Mg% and Leaf Zinc (ppm) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	Leaf Mg %		Leaf Zinc (ppm)	
	2000	2001	2000	2001
Fast release				
AS	0.76 d	0.86 c	35.92 d	37.75 c
U	0.82 c	0.82 d	38.04 c	36.17 c
Slow release				
PCU	0.91 b	0.90b	40.33 b	40.13 b
SCU	1.01 a	1.00 a	41.66 a	45.50 a
40 gn/vine	0.86 c	0.75 d	36.21 c	36.46 d
60gn/vine	0.78 d	0.84 c	36.00 c	38.83 c
80 gn/vine	0.90 b	0.96 b	40.37 b	41.33 b
100gn/vine	0.97 a	1.05 a	43.37 a	42.92 a
With (bio)	0.87 a	0.88a	39.69 a	39.73a
Without (bio)	0.89 a	0.91 a	38.29 a	40.04 a

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	Leaf Mg %							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	0.85 de	0.81 de	0.85 de	0.91 c	0.71 ij	0.85 g	0.93 de	0.97 c
U (fast)	0.67 f	0.76 f	0.83 de	0.87 de	0.70 j	0.75 hi	0.90 ef	0.94 cd
PCU (slow)	0.75 f	0.85 de	0.90 d	1.08 b	0.76 h	0.86 fg	0.94 cd	1.04 b
SCU (slow)	0.76 ef	0.88 de	1.05 b	1.19 a	0.82 g	0.90 e	1.06 b	1.23 a
	Leaf Zinc (ppm)							
	2000				2001			
	40	60	80	100	40	60	80	100
AS	33.00 h	35.66 fg	37.50 de	38.66 cd	34.33 I	37.50 fgh	39.33 def	39.83 de
U	35.00 g	35.66 fg	36.66 ef	36.66 ef	34.50 I	34.83 I	37.00 gh	38.33 efg
PCU	36.16 efg	38.33 cd	41.83 b	45.16 a	36.17 hi	37.67 gh	41.83 c	44.83 b
SCU	39.50 c	42.50 b	45.33 a	46.16 a	40.83 cd	45.33 b	47.17 a	48.67 a

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-form	Leaf Mg %				Leaf Zinc (ppm)			
	2000		2001		2000		2001	
	With	Without	With	Without	With	Without	With	Without
Fast release								
AS	0.89 c	0.83 cd	0.85 ef	0.87 de	36.75 e	35.66 f	37.83 c	37.67 cd
U	0.77 d	0.79 d	0.91 c	0.83 fg	36.66 e	35.33 f	35.75 e	36.58 de
Slow release								
PCU	0.87 c	0.93 b	0.89 d	0.92 c	41.08 c	39.66 d	39.75 b	40.50 b
SCU	0.95 b	0.98 a	0.98 b	1.02 a	44.25 a	42.50 b	45.58 a	45.42 a

D) The interaction between N application rates and biofertilizers.

Biofertilizer	Leaf Mg %							
	2000				2001			
	40	60	80	100	40	60	80	100
With	0.80 de	0.81 de	0.88 cd	1.04 a	0.73 f	0.82 d	0.93 c	1.03 a
Without	0.72 e	0.85 d	0.94 bc	1.00 ab	0.76 e	0.85 d	0.98 b	1.06 a
	Leaf Zinc (ppm)							
	2000				2001			
	40	60	80	100	40	60	80	100
With	36.42 e	38.50 c	41.33 b	42.50 a	36.42 e	38.25 d	40.58 c	43.67 a
Without	35.42 f	37.58 d	39.33 c	40.83 b	36.50 e	39.42 d	42.04 b	42.08 b

E) The interaction between three factors N form, rates and biohertilizers.

Mg %									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	1.03cd	0.80fghi	0.84efghi	0.89efg	0.71L	0.81j	0.92efg	0.98d
	With out	0.69hi	0.83efghi	0.86efghi	0.94def	0.72l	0.88h	0.93defg	0.96de
Urea	With	0.66l	0.74ghi	0.83efghi	0.87efgh	0.68L	0.73l	0.88h	0.94defg
	With out	0.67i	0.79fghi	0.83efghi	0.87fgh	0.72l	0.77k	0.91fg	0.94cefg
PCU	With	0.76ghi	0.84efgh	0.87efg	0.99cde	0.72l	0.88h	0.95def	0.99c
	With out	0.75ghi	0.86efghi	0.94def	1.16b	0.79j	0.83i	0.95def	1.09b
SCU	With	0.77ghi	0.86efghi	0.98cde	1.22a	0.82j	0.89g	0.98d	1.23a
	With out	0.76ghi	0.90efg	1.12bc	1.16b	0.82j	0.90fg	1.13b	1.22a
Zin %									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	33.33o	36.00klm	38.33hi	39.33gh	34.33n	37.33jkl	39.00hij	40.67g
	With out	32.67o	35.33lm	36.67jkl	38.00hij	34.33n	37.67ijk	39.67ghi	39.00hij
Urea	With	35.67lm	36.33jklm	37.33ijk	37.33ijk	33.00n	34.67n	36.67klm	3867hij
	With out	34.33no	35.00mn	36.00klm	36.00klm	36.00lm	35.00mn	37.33jkl	38.00ijk
PCU	With	36.67jkl	38.33hi	42.67cd	46.67a	36.67klm	37.67ijk	38.67hij	46.00c
	With out	35.67lm	38.33hi	41.00ef	43.67b	35.67lm	37.67ijk	45.00d	43.67e
SCU	With	40.00fg	43.33c	47.00a	46.67a	41.67f	43.33e	48.00b	49.33a
	With out	39.00h	41.67de	43.67b	45.67a	40.00gh	47.33bc	46.33bc	48.00b

content in 2000 and 2001 seasons.The highest values of leaf Mg and Zn content were obtained in SCU N form treatment.

Moreover, Thompson seedless grapevines received higher rate of N-fertilizers (100 g N/vine) scored the higher values of leaf Mg and Zn content compared with the corresponding ones fertilized with the other rates of N- fertilized (40 , 60,80 g N/vine) in both seasons.

Additionally, fertilizers with biofertilizers failed to induce significant effect in both seasons.

Besides the interactions(table 8,B) between N-form and N-rate showed that slow release N-fertilizers surpassed the corresponding ones of fast release N-fertilizers in enhancing Mg and Zn content in both seasons. Also, the higher rate (80,100 g N/vine) of N-fertilizers of slow (SCU) gave the highest values of leaf Mg and Zn content than the other fertilizers with all rates during two seasons of study.

Furthermore, the interaction(table 8,C) between N-form and biofertilizers demonstrated at biofertilizer failed induced significant effect in both seasons in fast N form when leaf Mg and Zn content were concerned. The highest values of leaf Mg content were showed with SCU and without N biofertilization, while ,the same values in leaf Zn content were obtained with SCU and with biofertilization treatment.

On the other hand, interaction (table 8,D)between N-rate and biofertilizers showed that biofertilized induced higher rate (100 g N/vine) of N-fertilizers gave the highest values of leaf Mg and Zn content compared with the other rates with or without biofertilization

Finally, interaction (table 8,E)between three studied factors (N-form, rate and biofertilizers) revealed that,slow

release(SCU) N-fertilizers with higher rate(100 g N/vine) of N-fertilizers and with biofertilization induce higher values of leaf Mg and Zn content compared with slow or fast release N-fertilizers with high or low rate of N-fertilizers in 2000 and 2001seasons.The least values of leaf Mg and Zn contents were showed in ammonium sulphate (40g N/vine) and unfertilized with bacteria.

4.2.4. Leaf Boron ppm:

Table (9,A) showed that slow release N-fertilizers(SCU and PCU) surpassed fast release N-fertilizers(Ammonium sulphate,Urea) to induce highest values of leaf B content .The highest values of leaf boron content were obtained with SCU Nform treatment.

Moreover, higher rate(100 g N/vine) of N-fertilizers gave highest values compared with the other rates under study in both seasons.

Furthermore, biofertilizer inoculation emproved leaf Bo content during the two seasons.

Also, interaction(table 9,B) between N-form and N-rates recorded that higher rate (100 g N/vine) of N-fertilizers with slow release N-fertilizers(SCU) produced the highest values of leaf Bo content compared with the other rate in all form s under study.

On the other hand, interaction(table 9,C) between N-form and biofertilizers showed that slow release N-fertilizers(SCU and PCU) with biofertilizer improved leaf Bo content compared with fast(Ammonium sulphate,Urea) without biofertilizers.In general, the best values of leaf Bo content were showed in SCU Nform and with bacteria treatment.

Table (9): Effect of nitrogen fertilizer form rate and biofertlizer on (Boron (ppm)) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers..

Treatment	Boron (ppm)	
	2000	2001
Fast release		
AS	54.66 c	55.04 c
U	54.87 bc	54.13 d
Slow release		
PCU	55.33 b	56.54 b
SCU	56.20 a	57.83 a
40 gn/vine	55.8 b	53.88 d
60gn/vine	53.25 c	54.46 c
80 gn/vine	56.04 a	57.00 b
100gn/vine	56.71 a	58.21 a
With (bio)	55.69 a	55.96 a
Without (bio)	54.85 b	55.82 a

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	Boron (ppm)							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	54.33 e	55.33 d	54.50 e	56.16 b	53.33 g	53.00 h	55.82 e	58.00 c
U (fast)	53.50 e	53.33 e	55.50 c	55.00 d	52.00 h	53.50 g	55.00 f	56.00 e
PCU (slow)	55.50 c	55.00 d	56.33 b	57.33 ab	55.00 f	55.00 f	58.00 c	58.67 b
SCU (slow)	55.83 c	56.00 c	57.00 b	58.00 a	55.17 f	56.83 d	59.17 b	60.17 a

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-form	Boron (ppm)			
	2000		2001	
	With	Without	With	Without
Fast release				
AS	55.50 c	54.66 c	54.75 e	55.33 d
U	53.66 d	52.83 d	56.75 c	54.00 e
Slow release				
PCU	56.50 a	55.58 b	56.57c	56.33 c
SCU	57.08 a	56.33 b	88.08 a	57.58 b

D) The interaction between N application rates and biofertilizers.

Biofertilizer	Boron (ppm)							
	2000				2001			
	40	60	80	100	40	60	80	100
With	55.25 c	55.08 cd	55.83 b	56.58 a	54.08 d	57.67 b	56.33 c	58.75 a
Without	54.08 d	54.67 d	54.83 cd	55.83 b	53.67d	54.25 d	57.67 b	57.67 b

E) The interaction between three factors N form, rates and biohertilizers.

Boron ppm									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	55.33efgh	55.67defg	54.67fghi	56.33bcde	53.33no	52.67o	56.67klm	58.33cde
	Without	55.33jk	55.00efgh	54.33ghi	56.0bcdef	53.33no	23.33no	57.00fgh	57.67efg
Urea	With	53.63ijk	55.33jk	54.00hijk	53.67ijk	51.33p	54.67klm	54.33Lmn	56.67ghi
	Without	52.33k	53.00k	53.00jk	53.00k	52.67o	52. 33op	55.67ijk	55.33jkl
PCU	With	56.00cdef	55.00efgh	57.00bcd	58.00b	55.33jkl	54.67Lmn	58.00def	59.00bcd
	Without	55.00efgh	55.00efgh	55.67defg	56.67bcde	54.67klm	54.33Lmn	58.00def	58.33cde
SCU	With	56.00cdef	56.33bcdef	57.67bc	58.33a	56.33hij	56.67ghi	58.33cde	61.00a
	Without	55.67defg	55.67defg	56.33bcde	57.67bc	54.00mn	57.00fgh	60.00ab	59.33bc

Furthermore, the interaction(table 9,D) between N-rates and biofertilizers recorded that, higher rate(100 g N/vine) of N-fertilizers with biofertilizers induced highest values of leaf Bo content compared with the other rates without or with biofertilizers.

Finally, interaction(table 9,E) between N-form, N-rate and biofertilizers, demonstrated that, biofertilizers scored statistically similarly values of leaf Bo content. Besides, slow release N-fertilizers(SCU and PCU) with higher rate(80 and 100 g N/vine) of N-fertilizers with or without biofertilizers induced highest values of leaf B content compared with fast release N-fertilizers(Ammonium sulphate, Urea) with higher or lower rate of N-fertilizers with or without biofertilizers during 2000 and 2001 seasons.

Briefly, the results of fast release N-fertilizers and rate gave line with the findings of **Abd El Hady (2002), Alia (2002), Jarad (2004)**on grapevines.

They demonstrated that increasing nitrogen fertilizer rate of ammonium sulphate or urea enhanced most of leaf nutrient content of Thompson seedless grapevines. Besides, the results of slow release N-fertilizer in this concept are in agreements with the findings of **Ahmed** and **El-Dawwey** (**1992**) on grapevine, **Darwish** and **Ahmed** (**1993**) on grape.

They reported that raising nitrogen fertilizer rate of slow release N-fertilizer rate induced a remarkable and pronounced effect on leaf content than those of fast release N-fertilizers.

Moreover, the results of biofertilizer regarding leaf mineral content are in agreement with the findings **Faten (2003), Omran (2003), Fawzi (2004) Ahmed** *et al.* (**1998**) on grape,

Mansour (1998) on grape on flame seedless. They mentioned that Azotobacter enhanced most leaf mineral content.

4.3- Vine fruiting:

Data presented in Tables (10)how the effect of nitrogen fertilizer form, nitrogen fertilizer rates and biofertilizer (*Azotobacter*) as well as their interaction on vine fruiting parameters, number of cluster per vine and yield per vine (kg) of Thompson seedless grapevines during 2000 and 2001 seasons.

4.31- Yield (kg)/vine and Cluster number per vine:,

It is quite evident from Table (10,A)w that slow release N-fertilizers(SCU and PCU) significantly increased vine yield as compared with fast release N-fertilizers in both seasons. And illustrated that slow release N fertilizers produced higher cluster number per vine than those produced by fast release N fertilizer vine during two seasons.Also,the best results of cluster number and yield per vine were showed in SCU nitrogen form treatment.

Furthermore, the high application rate (80 and 100 g. N/vine) significantly increased vine yield and induced higher values of cluster number per vine as compared with the application Thompson seedless grapevines with (40 and 60 g N/vine) in both seasons and find in this table, the yield is increased by increasing rates in both seasons.

Moreover, biofertilizer namely (*Azotobacter chrocoocum*) as a N-fixing bacteria improved the yield and number of cluster per vine as compared to unfertilized with bacteria during the two seasons.

In addition, the interaction(table 10,B) between fast release N-fertilizers (Ammonium sulphate and urea) and slow release N-fertilizers (PCU, sulphur coated urea and SCU, sulphur coated urea) with application rates found that slow release

Table (10): Effect of nitrogen fertilizer form rate and biofertlizer on (Cluster number per vine and Yield / vine(kg) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	Cluster number per vine		Yield per vine/kg	
	2000	2000	2001	2001
Fast release				
AS	26.33 c	25.79 c	8.66 d	10.57 d
U	26.63 c	26.00 c	11.06 c	11.13 c
Slow release				
PCU	27.92 b	26.42 b	11.39 b	11.34 b
SCU	27.33 a	28.46 a	12.37 a	11.79 a
40 gn/vine	26.63 c	25.79 c	10.30 c	10.47 d
60gn/vine	27.67 b	26.42 b	10.88 b	11.01 c
80 gn/vine	27.63 b	26.75 b	10.90 b	11.45 b
100gn/vine	28.29 a	27.71 a	11.41 a	11.90 a
With (bio)	27.65 a	26.90 a	10.86 a	11.29 a
Without (bio)	27.46 a	26.44a	10.88 a	11.13 a

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	Cluster number per vine							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	25.50 j	25.83 j	27.17 fg	26.83 g	25.17 e	26.00 de	25.67 de	26.33 bcde
U (fast)	26.50 hi	27.50 f	25.83 j	26.67 h	25.33 e	26.00 de	25.83 de	26.83 bcd
PCU (slow)	28.50 d	27.83 e	27.00 g	28.33 d	25.83 de	26.00de	26.33cde	27.50 bc
SCU (slow)	26.20 ij	29.50 c	30.50 b	31.33 a	26.33bcd	27.66 b	29.17 a	30.17 a
	Yield per vine/kg							
	2000				2001			
	40	60	80	100	40	60	80	100
AS	8.33 j	8.80 I	8.23 j	9.27 h	9.73 I	10.35 h	10.87 fg	11.33 d
U	10.15 g	10.98 f	11.33 ef	11.78 c	10.82 fg	11.10 e	10.80 fg	11.82 c
PCU	11.00 f	11.00 f	11.37de	11.72 cd	10.62 h	10.87 fg	11.72 c	12.07 b
SCU	11.72 cd	12.23 b	12.67 a	12.87 a	10.70 g	11.65 c	12.42 a	12.40 a

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-form	Cluster number per vine				Yield per vine/kg			
	2000		2001		2000		2001	
	With	Without	With	Without	With	Without	With	Without
Fast release								
AS	26.33 c	26.33 c	25.58 c	26.00 bc	8.48 f	8.83 e	10.41 f	10.73 e
U	26.50 c	26.75 c	25.75 c	26.25 bc	11.17 cd	10.96 d	11.45 c	11.01 d
Slow release								
PCU	29.08 a	27.67 b	28.67 a	26.67 b	12.31 a	11.44 b	11.45 c	11.23 d
SCU	29.58 a	28.17 b	28.25 a	26.17 bc	12.43 a	11.34 bc	12.05 a	11.53 b

D) The interaction between N application rates and biofertilizers.

Biofertilizer	Cluster number per vine							
	2000				2001			
	40	60	80	100	40	60	80	100
With	26.92 d	27.58 c	27.75 bc	28.33 a	25.67 f	26.92 c	26.58 de	28.00 a
Without	26.33 e	27.75 bc	27.50 c	28.25 ab	25.92 f	26.75 cd	26.92 c	27.42 b
	Yield per vine/kg							
	2000				2001			
	40	60	80	100	40	60	80	100
With	10.28 c	10.95 b	11.32 a	11.50 a	10.51 f	11.53 c	11.53 c	12.10 a
Without	10.32 c	10.80 b	10.87 b	10.93 b	10.43 f	11.00 e	11.37 d	11.71 b

E) The interaction between three factors N form, rates and biohertilizers.

N Form	Bio fertilizer	Cluster number per vine							
		2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	24.67k	26.33ijk	27.33ghi	27.00ghij	25.00h	25.67fgh	25.67gh	26.00fgh
	Without	26.33ijk	25.33k	27.00ghij	26.67hij	25.33gh	26.33efgh	25.67gh	26.67defg
Urea	With	27.00ghij	26.33ijk	26.33ijk	26.33ij	25.33gh	25.67gh	25.67gh	26.33efgh
	Without	26.00jk	28.67def	25.33k	27.00ghijk	25.33gh	26.33efgh	26.00fgh	27.33def
PCU	With	28.00cde	28.00efg	27.00ghij	28.33efg	25.67gh	25.67gh	26.00fgh	27.33def
	Without	27.67fgh	27.67fgh	27.00ghij	28.33efg	26.00fgh	26.33efgh	26.67defg	27.67cde
SCU	With	26.67hij	29.67cd	30.33bc	31.67a	26.67defgh	27.33def	29.00abc	30.00a
	Without	25.33k	29.33cde	30.67bc	31.00b	27.00defg	28.00bcd	29.33ab	30.33a

N Form	Bio fertilizer	Yield kg							
		2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	8.33gh	8.80fgh	8.00h	8.80fgh	9.33m	10.07L	10.73ijk	11.50def
	Without	8.33gh	8.80fgh	8.47fgh	9.73efg	10.131	10.63jkl	11.00ghi	11.17fghi
Urea	With	10.17def	11.13bcde	11.47abcd	11.90abc	11.10fghi	11.33fgh	10.80hij	11.80cd
	Without	10.13def	10.83cde	11.20bcde	11.67abcd	10.53jkl	10.87hij	10.80hij	11.83cd
PCU	With	10.87cde	11.50abcd	11.37abcde	11.63abcd	10.90ghig	10.80hij	11.80cd	12.30b
	Without	11.13bcde	11.47abcd	11.37abcde	11.80abcd	10.33kl	11.10fghi	11.63de	11.83cd
SCU	With	11.77abcd	12.37abc	12.67ab	12.93a	10.70ijk	11.90cd	12.80a	12.80a
	Without	11.67abcd	12.10abc	12.67ab	12.80ab	10.70ijk	11.40cefg	12.03c	12.00c

N-fertilizers (PCU, sulphur coated urea and SCU, sulphur coated urea) applied with 80 or 100 g N/vine showed distinctive and higher values of yield/vines and induced higher values of cluster number per vine in both seasons. On the contrary, fast release N-fertilizers (NH4(SO4)2 or urea) whether applied with (40, 60, 80 and 100 g N/vine) recorded the lowest values of yield/vine and induced higher values of cluster number per vine. Generally the highest yield and cluster number per vine were obtained in SCU (80,100gN/vine)treatment.

However, the interaction(table 10, C) between N-forms (fast release and slow release) and biofertilizers exerted that slow release N-fertilizers with *Azotobacter chrocoocum* as a N-fixing bacteria proved to be the most effective combination in enhancing vine productivity to Thompson seedless grapevines and gave the higher values of yield/vine and induced higher values of cluster number per vine especially with slow release N-fertilizers SCU, sulphur coated urea with N-fixing *Azotobacter chrocoocum* in both season (2000 & 2001).On the contrary, fast release N-fertilizers interaction showed to be the lowest effective combinations in this study especially in the first season.

Furthermore, the interaction(table 10, D) between rates of N application and biofertilizer N-fixing bacteria *Azotobacter chrocoocum*, the high rate application (100 g N/vine) with biofertilizers showed distinctive and higher positive effect on yield/vine and induced higher values of cluster number per vine in both seasons.

Finally, the interaction(table 10, E) between N form, N rate application and biofertilizers, indicated that out of the tested combinations, slow release N fertilizers SCU N-form applied with 80 or 100 g N/vine with N-fixing bacteria (*Azotobacter*

chrocoocum) showed a remarkable and higher positive effet on yield per vine and induced higher values of cluster number per vine..

Abstractly, slow release N fertilizers (SCU) proved to be the most effective N forms in enhancing vine fruiting Thompson seedless grapevines, hence it improved vine yield and number of cluster/vine. Besides, highest N rates applications gave the high yield/vine as compared with the lowest N rate applications. Moreover, biofertilizers inoculation enhancing the yield/vine as a result may be due to the production of growth regulator as well as N fixation.

Briefly, slow release N fertilizers increased number of cluster per vine and yield per vine (kg/vine). On the other hand, fast release N fertilizers increased number of produced fruits per vine. Increasing nitrogen fertilization rate from 40 to 100 g N/vine/year induced the positive effect on vine fruiting parameters. In addition, the different forms of slow release N fertilizers particularly SCU and PCU enhanced the previously mentioned fruiting parameters which showed better response to fast release N fertilizers particularly urea combinations.

In addition, the improvement of vine fruiting as a results of biofertilizers may be due to the production of growth regulators as well as N fixation.

The obtained results of fast release N fertilizers and their rate regarding tree fruiting go in line with the finding of **Abd El Hady (2002), Alia (2002), Jarad (2004)** On grapes. **Shikhamang** et al. (**1991**) on grape, **Stroehlein** *et al.* (**1991**) on grape.

They mentioned that, used of the fast release N fertilizers were beneficial in improving the yield per vine.

Besides, the results of slow release N fertilizer in this respect are in agreement with the findings of **Paramasivan (2000)**. Mentioned that used of slow release N fertilizers was surpassed in improving the yield per vine than fast release.

In addition, tree fruiting results produced by biofertilizers are in harmony with the findings of **Faten (2003)** on Flame seedless, **Omran (2003)** on grapevines, **Fawzi (2004)** on flame seedless.

4.4. Fruit quality:

4.4.1. Fruit physical properties:

The effect of nitrogen fertilizer form, nitrogen fertilizers rate and biofertilizers as well as their interactions on fruit physical properties expressed as cluster of weight, lengthand diameteras well as berry weight, weight of 100 berries, berry length, berry diameter and juice volume per 100 berriesof Thompson seedless grapevines during 2000 and 2001 seasons.

4.4.1.1. Cluster weight (g):,

Table (11,A) revealed that slow release N-fertilizers surpassed the fast release N-fertilized in both seasons in cluster weight .The best weight of cluster was obtained in vines were fertilized with SCU form.

As for higher rate of N-fertilizers (100 g N/vine) induced the highest values of cluster weight than the other rates (40,60and 80 g N/vine) of N-fertilizers.

Moreover, biofertilizers enhanced cluster weight increase than those without biofertilizers in both seasons.

Furthermore, interaction(table 11,B) between N-form and N-rates showed that the higher rate (80 and 100 g N/vine) of slow release N-fertilizers (PCU and SCU), followed descending

Table (11): Effect of nitrogen fertilizer form rate and biofertlizer on (Cluster weight (g) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	Cluster weight (g)	
	2000	2001
Fast release		
AS	603.68 b	571.62 d
U	603.80 b	617.55 c
Slow release		
PCU	603.69 b	632.56 b
SCU	609.86 a	661.04 a
40 gn/vine	604.68 b	585.23 d
60gn/vine	601.48 c	618.17 c
80 gn/vine	601.57 c	627.50 b
100gn/vine	613.29 a	651.83 a
With (bio)	608.33 a	626.88 a
Without (bio)	602.18 b	614.48 b

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-From	Cluster weight (g)							
	2000				2001			
	40	60	80	100	40	60	80	100
AS	604.99 c	599.08 d	599.85 d	610.80 b	567.65 h	565.12 h	569.36 h	584.35 g
U	606.34 c	604.75 c	595.56 e	608.72 b	583.87 g	583.91 g	635.25 d	667.20 c
PCU	600.72 d	599.07 d	604.96 c	609.99 b	583.07 g	584.30 g	620.40 e	680.58 ab
SCU	606.67 c	603.19 c	605.92 c	623.67 a	606.33 f	677.77 ab	684.86 a	675.20 b

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-Form	Cluster weight (g)			
	2000		2001	
	With	Without	With	Without
Fast release				
AS	599.35 d	608.01 b	569.72 f	573.53 f
U	599.93 d	607.67 b	627.20 d	607.92 e
Slow release				
PCU	613.66 a	603.99 c	642.20 c	622.78 d
SCU	606.07b	603.39 c	668.41 a	653.69 b

D) The interaction between N application rates and biofertilizers.

Biofertilizer	Cluster weight (g)							
	2000				2001			
	40	60	80	100	40	60	80	100
With	602.05 d	600.46 f	601.41 e	621.77a	588.43 e	619.30 c	641.84 b	657.94 a
without	607.32 b	602.49 d	601.73 e	604.81 c	582.03 f	617.02 cd	613.10 d	645.76 b

E) The interaction between three factors N form, rates and biohertilizers.

Cluster weight									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	576.40cd	598.34bcd	599.80bcd	602.86bc	564.70o	567.10o	565.50o	581.60Lm
	Without	613.29bc	599.83bcd	599.90bcd	618.86b	570.60no	563.10o	573.20mno	587.10L
Urea	With	599.36bcd	598.14bcd	596.74cd	606.47bc	587.60L	581.20Lm	671.10cde	668.90def
	Without	614.33bc	611.00bc	594.37d	610.97bc	580.10Lmn	586.70L	599.40k	665.50ef
PCU	With	602.11bc	598.67bcd	608.49bc	604.37bc	587.00L	650.70gh	641.10 I	650.00ab
	Without	599.34bcd	599.47bcd	601.52bc	615.61bc	579.10Lmn	641.10I	599.10k	671.20cde
SCU	With	611.34bc	606.71bc	600.71bc	641.80a	614.40j	678.40cd	689.60ab	691.20a
	Without	602.01bc	599.68bcd	611.14bc	605.45bc	598.20k	677.20cd	680.10bc	659.20fg

by the higher rate of fast release N-fertilizers (NH_4SO_4 and urea) give the highest values of cluster weight.

On the other hand, interaction(table 11,C) between N-form and biofertilizers demonstrated that, slow release N-form (SCU and PCU) with biofertilizer induced highest values of cluster weight than fast release N-fertilizers(NH_4SO_4 and urea).

Moreover, interactions(table 11,D)between N-rate and biofertilizers gave the highest values of cluster weight, the higher rate of N-fertilizers(100 g N/vine) with biofertilizer induced highest values of cluster weight in both seasons.

Finally, interaction(table 11,E)between N-form, N-rate and biofertilizers demonstrated that slow release N-fertilizers(SCU) with higher rate of N-fertilizers(100 g N/vine)with biofertilizers induced the highest values of cluster weight in both seasons of study as compared with slow orfast release N-fertilizers with or without biofertilization.

4.4.1.2.Cluster diameter and cluster length

Table (12,A) showed that (SCU and PCU)as slow release N-fertilizers surpassed fast release N-fertilizer in both seasons and induced highest values of cluster width andcluster length.The best results of diameter and length of cluster were found in SCU N-form treatment.

As for, the higher rate of nitrogen (100 g N/vine) gave the highest values of cluster width and cluster length. than the other rates (40,60 and 80 g N/vine) of N-fertilizers in both seasons.

On the other hand, biofertilizers inoculation gave a positive effect in cluster width and cluster length in both seasons.

Furthermore, interaction(table 12,B) between N-fertilizers form and N-fertilizers rate found that the Thompson

Table (12): Effect of nitrogen fertilizer form rate and biofertlizer on (Cluster diameter (cm) and Cluster length (cm)) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	Cluster diameter (cm))		Cluster length (cm)	
	2000	2001	2000	2001
Fast release				
AS	13.66 c	13.78 c	20.63 c	22.87 d
U	13.85 c	13.71 c	23.31 b	23.85 c
Slow release				
PCU	14.30 b	13.36 b	22.98 b	24.88 b
SCU	14.79 a	15.70 a	26.06 a	25.73 a
40 gn/vine	13.73 c	14.19 b	21.78 b	23.79 c
60gn/vine	14.16 b	14.29 b	22.67 b	23.90 c
80 gn/vine	14.22 b	14.40 b	23.86 a	24.45 b
100gn/vine	14.49 a	14.68 a	24.70 a	25.18 a
With (bio)	14.18 a	14.36 a	23.54 a	24.38 a
Without (bio)	14.12 a	14.44 a	22.97 a	24.28 a

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	Cluster diameter (cm)							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	13.20 g	13.57 g	14.07 def	13.80 g	14.15 cd	13.45 f	13.72 d	13.83 d
U (fast)	13.82 fg	13.90 ef	13.68 g	13.98 ef	13.60 f	13.66 e	13.73 d	13.86 d
PCU (slow)	13.92 ef	14.50b de	14.27 cde	14.42 cd	13.73 d	14.23 c	14.33 c	15.16 b
SCU (slow)	13.97 ef	14.67 c	14.87 b	15.65 a	15.28 b	15.83 a	15.83 a	15.86 a
	Cluster length (cm)							
	2000				2001			
	40	60	80	100	40	60	80	100
AS	20.35 g	20.85 g	20.02 g	21.28 g	21.20 g	21.68 g	23.83 ef	24.77 cde
U	21.07 g	20.93 g	25.02 c	26.23 c	23.71 f	23.61 f	23.60 f	24.45 def
PCU	21.73 fg	22.20 fg	23.75 ef	24.25 d	24.88 cd	24.76 cde	24.73 cde	25.15 c
SCU	23.98 de	26.70 b	26.65 b	27.05 a	25.38 bc	25.55 b	25.65 b	26.36 a

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-form	Cluster diameter (cm)				Cluster length (cm)			
	2000		2001		2000		2001	
	With	Without	With	Without	With	Without	With	Without
Fast release								
AS	13.51 d	13.81 d	13.67 c	13.80 c	20.66 d	20.59 d	22.67 a	23.06 d
U	13.81 d	13.88 d	14.64 b	13.79 c	23.86 c	22.77 c	23.82 c	23.87 c
Slow release								
PCU	14.40 b	14.20 c	14.42 b	14.30 b	22.98 c	22.98 c	24.92 b	24.84 b
SCU	14.99 a	14.58 b	15.56 a	15.84 a	26.65 a	25.54 b	25.72 a	25.75 a

D) The interaction between N application rates and biofertilizers.

Biofertilizer	Cluster diameter (cm)							
	2000				2001			
	40	60	80	100	40	60	80	100
With	13.66 c	14.15 b	14.31 a	14.59 a	14.07 b	14.29 b	14.34 b	14.69 a
Without	13.79 c	14.17 b	14.13 b	14.36 a	14.30 b	14.30 b	14.47 b	14.68 a
	Cluster length (cm)							
	2000				2001			
	40	60	80	100	40	60	80	100
With	21.73 e	22.89 d	24.43 b	25.09 a	23.61 d	23.99 d	24.25 d	25.29 a
Without	21.83 e	22.45 d	23.28 c	24.32 b	23.98 d	23.82 d	24.66 c	25.08 b

E) the interaction between three factor N form, rates and biohertilizers.

Cluster width									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	13.10L	13.37kl	14.13efgh	13.43jkl	14.20def	13.37f	13.37ef	13.83ef
	Without	13.30l	13.77hij	14.00fghi	14.17defg	14.10def	13.53ef	13.53ef	13.83ef
Urea	With	13.90ghij	13.53jkl	13.73ihij	14.07efgh	13.60ef	13.60ef	13.60ef	13.70ef
	Without	13.73hijk	14.27cdef	13.63ijkl	13.90ghij	13.60ef	13.73ef	13.73ef	14.03def
PCU	With	13.97fghi	14.80cde	14.27cdef	14.57cdef	13.73ef	14.33de	14.23def	15.40abc
	Without	13.87ghij	14.20defg	14.27cdef	14.47cde	13.73ef	14.13def	14.43de	14.93bcd
SCU	With	13.67ijk	14.90cd	15.10b	16.30a	14.77cd	15.87a	15.80ab	15.83a
	Without	14.47cdef	14.43cdef	14.63cde	15.00c	15.80ab	15.80ab	15.87a	15.99a
Cluster length									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	19.83L	21.40hijk	19.93L	21.47hijk	20.97h	21.70h	23.27g	24.77def
	Without	20.87ijkl	20.30kl	20.10l	21.10hijk	21.43h	21.67h	24.40defg	24.77def
Urea	With	21.33hijk	20.67jkl	26.90bc	26.53bcde	23.30g	23.90fg	23.63fg	24.43def
	Without	20.80jkl	21.20hijk	23.13fghi	25.93bcde	24.13efg	23.33g	23.57g	24.47defg
PCU	With	21.50hijk	21.83hijk	24.10defg	24.50bcd	24.77def	24.97cde	24.57defg	24.40bcd
	Without	21.97hijk	22.57ghij	23.40efg	24.00defg	25.00cde	24.57defg	24.90cdef	24.90cdef
SCU	With	24.27cdefg	27.67b	26.80bcd	27.87a	25.40bcd	25.40bcd	25.53bcd	26.57a
	Without	23.70defg	25.73bcde	26.50bcde	26.23bcd	25.37bcd	25.70bc	25.77bc	26.17b

seedless grapevines fertilized with higher rate (100 g N/vine)of slow release N-fertilizers recorded higher values of cluster diameter and length, followed descendinglly by those fertilized with the lower rate cluster diameter and cluster length of the same source (slow release) as compared with fast release N-fertilizers with higher or lower rate of nitrogen. In this point SCU surpassed PCU and fast release N- fertilizers(AS,U) and gave the highest values of cluster diameter and cluster length

Furthermore, interaction(table 12,C)N-form and biofertilizers recorded, biofertilizer inoculation with slow release gave higher values of cluster diameter than fast release with bacteria. Besides, slow release N-fertilizers(SCU) treatment induced the highest values of cluster diameter and cluster length with biofertilizers compared with the other N-fertilizers forms with or without nitrogen biofertilization.

On the other hand, interaction(table 12,D) between N-rate and biofertilizers gave the higher rate of nitrogen with biofertilizers or without biofertilizers induced highest values of cluster width and cluster length than lower rate of nitrogen in 2000 and 2001 seasons.In general,100g N/vinewith biofertilization gave thje best values of cluster diameter and length.

Finally, interaction(table 12,E) between N-form, N-rate and biofertilizers demonstrated that, slow release N-fertilized with higher rate of N-fertilized with or without biofertilized induced highest values of cluster width and cluster length than fast release N-fertilized with higher or lower rate of N-fertilized with or without biofertilizers in both seasons. SCU surpassed PCU and fast release N- fertilizers(AS,U) and gave the best

values of cluster width and cluster length as compared with the other treatments under study.

4.4.1.3. Berry weight and weight of 100 berries

It is obvious from Table (13 A) that slow release N-fertilizers surpassed fast release N-fertilizers and gave significant increasing of berry weight and weight of 100 berries in both seasons.The highest weight of berry or 100 berries were showed SCU N-form treatment.

It is quite clear that high rate(100g/vine) of N-fertilizer (SCU) induce higher values of berry weight as compared with the other rates of N-fertilizers.

In addition, biofertilizer with Azotobacter enhanced berry weight increase than without biofertilizers during 2000 and 2001 seasons.

Furthermore, the interaction (table 13,B) between N-form and N-rate showed that slow release N-fertilizers (SCU and PCU) with the lower or higher rates increased berry weight and 100 berries weight than the analogous ones of fast releaseN-fertilizers. with higher or lower rates.The highest values of berry weight and weight of 100 berries were obtained with SCU nitrogen form with 100g N/vine in both seasons of study.

As for the interaction(table 13,C) between N-fertilizers form and biofertilizers showed that, the slow release N-fertilizers with biofertilizers induce higher values of berry weight than fast release N-fertilizers (AS,U)with or without biofertilizers in both seasons.The best berry weight and weight of 100 berries were obtained with SCU nitrogen form with biofertilization treatment.

Table (13): Effect of nitrogen fertilizer form rate and biofertlizer on (Berry weight (gm) and Weight of 100 berries (gm)) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	Berry weight (gm)		Weight of 100 berries (gm)	
	2000	2001	2000	2001
Fast release				
AS	2.47 d	2.44 d	232.00 c	269.50 d
U	2.62 c	2.58 c	236.38 b	279.04 c
Slow release				
PCU	2.70 b	2.68 b	237.88 b	290.30 b
SCU	2.83 a	2.82 a	248.04 a	295.04 a
40 gn/vine	2.60 b	2.58 c	236.46 b	268.40 d
60gn/vine	2.63 b	2.57 c	237.58 b	284.54 c
80 gn/vine	2.67 a	2.67 b	238.50 b	287.75 b
100gn/vine	2.70 a	2.71 a	241.75 a	293.20 a
With (bio)	2.71 a	2.64 a	239.25 a	284.98 a
Without (bio)	2.58 b	2.63 a	237.89 a	281.96 b

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	Berry weight (gm)							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	2.40 j	2.43 j	2.45 j	2.50 I	2.40 g	2.40 g	2.48 f	2.50 f
U (fast)	2.60 g	2.56 h	2.63 g	2.67 f	2.58 e	2.51 f	2.57 e	2.67 c
PCU (slow)	2.60 g	2.70 e	2.73 d	2.78 c	2.64 d	2.63 d	2.69 c	2.77 b
SCU (slow)	2.80 b	2.82 b	2.87 a	2.83 b	2.71 c	2.75 b	2.92 a	2.90 a
	Weight of 100 berries (gm)							
	2000				2001			
	40	60	80	100	40	60	80	100
AS	231.50 g	232.80 fg	230.80 g	232.80 fg	238.50 j	272.33 h	279.50 g	287.66 e
U	239.17 d	234.80 efg	235.67 ef	235.83 ef	257.30 i	278.50 g	286.83 e	293.50 cd
PCU	236.17 ef	236.50 e	237.67 d	241.17 c	283.20 f	286.80 e	292.50 d	294.00 c
SCU	239.00 d	246.17 b	249.83 b	257.17 a	294.50 c	295.83 b	292.16 d	297.66 a

AS= Ammonium sulphate, U= Urea, PCU= phosphouas coated urea, SCU= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-form	Berry weight (gm)				Weight of 100 berries (gm)			
	2000		2001		2000		2001	
	With	Without	With	Without	With	Without	With	Without
Fast release								
AS	2.50 e	2.39 f	2.44 f	2.45 f	233.75 e	230.25 f	270.83 f	268.16 g
U	2.67 c	2.57 d	2.56 d	2.61 d	238.25 c	234.50 d	282.60 d	275.50 e
Slow release								
PCU	2.78 b	2.63 c	2.68 c	2.68 c	238.00 c	237.75 c	290.08 c	290.50 c
SCU	2.90 a	2.76 b	2.85 a	2.81 b	247.00 a	240.08 b	296.41 a	293.66 b

D) The interaction between N application rates and biofertilizers.

Biofertilizer	Berry weight (gm)							
	2000				2001			
	40	60	80	100	40	60	80	100
	2.67 c	2.69 b	2.72 b	2.76 a	2.59 c	2.68 b	2.68 b	2.71 a
	2.53 f	2.56 f	2.62 e	2.63 d	2.58 c	2.58 c	2.65 b	2.72 a
	Weight of 100 berries (gm)							
	2000				2001			
	40	60	80	100	40	60	80	100
With	237.42 c	238.75b c	238.75 c	242.02 a	268.92 f	286.80 d	289.83 c	294.33 a
Without	235.50 c	236.40 c	238.25 b	241.42 b	267.83 f	282.25 e	285.67d	292.08 b

E) The interaction between three factors N form, rates and biohertilizers.

Berry weight									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	2.47lmn	2.50klm	2.47lmn	2.57ijkl	2.40op	2.37p	2.51jklm	2.49klmn
	Without	2.33o	2.37no	2.43mno	2.43mno	2.41nop	2.43mno	2.46Lmn	2.51jklm
Urea	With	2.67fghi	2.60hijk	2.67fghi	2.73defg	2.53jkl	2.49klm	2.56ijk	2.66fgh
	Without	2.53jklm	2.53jklm	2.60hijk	2.60hijk	2.63ghi	2.53jkl	2.59hij	2.69efg
PCU	With	2.70defg	2.76cdef	2.83abcd	2.83abcd	2.69fg	2.59hij	2.68fg	2.78cde
	Without	2.50klm	2.63hij	2.63ghij	2.73defg	2.59hij	2.67fgh	2.70efg	2.77cde
SCU	With	2.87abcd	2.90abc	2.93a	2.90ab	2.73def	2.80cd	2.99a	2.91b
	Without	2.73defg	2.73defg	2.80bcde	2.77cdef	2.69fg	2.71efg	2.85bc	2.90b
Weight of 100 berries									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	233.0jklm	235.7ghij	232.3klm	234.0ijkl	235.3o	274.7j	285.7gh	287.7g
	Without	230.0n	230.0n	229.3n	231.7lmn	241.7n	270.0k	273.3j	287.7g
Urea	With	240.7ef	239.3efgh	238.3efgh	234.7hijkl	265.00l	283.0h	287.3g	294.7bcde
	Without	237.7efgh	230.3mn	233.0jklm	237.0fghi	249.30m	274.0j	286.3g	292.3cdef
PCU	With	236.0fghi	237.0fghi	237.3efgh	241.7de	286.70i	292.0def	293.3cdef	295.3bcd
	Without	236.3fghi	236.0fghi	238.0efgh	240.7ef	286.70g	291.0f	291.7ef	293.7cdef
SCU	With	240.0efg	243.0d	247.0c	258.0a	295.30bcd	297.7ab	293.0cdef	299.7a
	Without	238.0efgh	249.3b	252.7b	256.3a	294.0cdef	294.0cdef	291.3ef	295.7bc

In addition, the interaction(table 13,D) between N-rates applied and biofertilizers demonstrated that, the higher and lower rates of N-fertilizers with biofertilizers induce higher values of berry weight and weight of 100 berries. compared with lower or higher rate without biofertilizers in both seasons.In this point found that also, increasing nitrogen fertilization rate from(100g N/vine) with nitrogen biofertilization induced the best effect on berry weight and weight of 100 berries.

Finally, the interaction(table 13,E) between N-form, N-rates and biofertilizers recorded that slow release N-fertilizers with higher rate (80 and 100 g N/vine) with biofertilizers significantly increased berry weight and weight of 100 berries than fast release N-fertilizers with higher lower rates with or without biofertilizer. In addition the different form of slow release N- fertilizer particularly SCU(100g N/vine) enhanced berry weight and weight of 100 berries than the other treatments under study in both seasons.

4.4.1.6- Berry length and berry diameter:,

4.4.1.7- Table (14,A) show that slow release N-fertilizers vines produced fruits with increasing berry length and berry diameter than those produced by fast release N-fertilizers vines during 2000 and 2001 seasons.The best berry length and diameter were produced from fertilized vines wuth SCU nitrogen form.

Furthermore, fruit of Thompson seedless grapevines received higher N-fertilizers rate (100g N/vine)had increasing of berry length and berry diameter than the corresponding ones of Thompson seedless grapevines fertilized with the other rates.

Table (14): Effect of nitrogen fertilizer form rate and biofertlizer on (Berry length (cm) and Berry diameter (cm)) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	Berry length (cm)		Berry diameter (cm)	
	2000	2001	2000	2001
Fast release				
AS	1.71 c	2.07 d	1.21 d	1.31 d
U	1.89 b	2.11 c	1.30 c	1.45 c
Slow release				
PCU	2.04 a	2.23 b	1.33 b	1.53 b
SCU	2.00 a	2.37 a	1.45 a	1.60a
40 gn/vine	1.78 c	2.07 b	1.29 b	1.36 c
60gn/vine	1.93 b	2.10 b	1.28 b	1.40 c
80 gn/vine	1.93 b	2.10 b	1.35 a	1.48 b
100gn/vine	2.04 a	2.35 a	1.38 a	1.63 a
With (bio)	1.98 a	2.21 a	1.40 a	1.49 a
Without (bio)	1.84 b	2.19 a	1.25 b	1.45 a

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	Berry length (cm)							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	1.55 h	1.73 g	1.72 g	1.83 f	1.94 h	1.96 h	2.17 e	2.23 de
U (fast)	1.73 g	1.87 ef	1.90 de	2.08 b	1.90 h	2.02 g	2.17 e	2.37 c
PCU (slow)	1.95 de	2.03 bc	2.12 a	2.07 b	2.08 f	2.16 e	2.29 d	2.45 a
SCU (slow)	1.87 ef	2.10 b	2.00 cd	2.05 bc	2.38 c	2.28 d	2.41 b	2.41 b
	Berry diameter (cm)							
	2000				2001			
	40	60	80	100	40	60	80	100
AS	1.15 e	1.15 e	1.25 de	1.30 d	1.25 g	1.25 g	1.30 g	1.55 d
U	1.28 d	1.33 c	1.28 d	1.30 d	1.25 g	1.40 f	1.55 d	1.60 c
PCU	1.28 d	1.20 e	1.42 b	1.43 b	1.50 d	1.50 d	1.45 e	1.65 b
SCU	1.43 b	1.42 b	1.47 a	1.50 a	1.55 d	1.45 d	1.65 b	1.75 a

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

In addition, fertilizing with N- biofertilization enhanced berry length and berry diameter in the two seasons as compared to unfertilized with bacteria.

On the other hand, in the interaction(table 14,B) between nitrogen fertilizers form and nitrogen fertilizers rate shows that the higher rate(80 and 100 g N/vine) of SCU and PCU (slow release N-fertilizers) induced similar the highest values of berry length and berry diameter. Besides, (SCU) surpassed (PCU) in berry diameter while, the contrast lime when berry length were concerned.. Moreover, the lower and higher rates of the fast release N-fertilizers (ammonium sulphate and urea) produced lower values in this corner during 2000 and 2001 seasons. In this point found that also, increasing nitrogen fertilization rate from(80,100g N/vine)induced the positive effect on berry weight and weight of 100 berries.

As for the interaction(table 14,C) between nitrogen fertilizers form and biofertilizer declares that the slow release N-fertilizers (SCU and PCU) induced higher values of berry length and berry width in both seasons particularly (SCU) as compared with the fast release N-fertilizers. Besides, the slow release N-fertilizers with inoculation biofertilizers gave higher values than without biofertilizers.

Additionally, the interaction between nitrogen fertilizers form and biofertilizers showed that the higher or lower rate of N-fertilizers with biofertilizers induce higher values of berry length and berry width as compared with higher or lower rate of N-fertilizers without biofertilizers in both seasons.The highest values of berry length and diameter were showed in fertilized vines with (100 gN/vine)and biofertilization.

Finally, the interaction(table 14,D)between the three studied factors (N-source, N-rates and biofertilizers) demonstrated that, slow release N-fertilizers with higher rate of N-fertilizers inoculated with biofertilizers induce higher values of berry length and berry width as compared with fast release N-fertilizers with higher or lower rate of N-fertilizers with or without biofertilizers in the two seasons. In addition the different form of slow release N- fertilizer barticulary SCU(80 and100g N/vine) and fertilized with bacteria enhanced berry weight and weight of 100 berries than the other treatment under study.

4.4.1.5.Juice volume per 100 berries:,

It is quite evident from Table (15,A) that slow release nitrogen produced higher values of juice volume per 100 berries than those fast release nitrogen in both seasons.

As for the higher rate(80 and100g N/vine) of nitrogen induced higher values of juice volume than the lower rates(40 and 60 g N/vine) rate of nitrogen in both seasons 2000 and 2001.

Moreover, fertilizers with biofertilization enhancing juice volume of 100 berries increase than without biofertilizers particularly in the first season.

Furthermore, interaction(table 15,B) between N-form and N-rates showed that slow release nitrogen (SCU) with higher rate of N-fertilizers (100 g N/vine) gave the highest values of juice of 100 berries volume of Thompson seedless grapevines.

As for interaction(table 15,C) between N-form and biofertilizers recorded that slow release N-fertilizers (SCU and PCU) with biofertilizers increased the values of juice volume of 100 berries than fast release N-fertilizers with or without biofertilizers. Anyhow, the highest values of juice volume of 100

Table (15): Effect of nitrogen fertilizer form rate and biofertlizer on (Juice volume per 100 berries (ml)) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	Juice volume per 100 berries (ml)	
	2000	2001
Fast release		
AS	190.5 a	177.17 d
U	191.8 a	179.54 c
Slow release		
PCU	191.5 a	184.92 b
SCU	191.6 a	196.25 a
40 gn/vine	190.5 a	180.42 d
60gn/vine	190.5 a	182.30 c
80 gn/vine	192.7 a	185.58 b
100gn/vine	191.0 a	189.60 a
With (bio)	191.83 a	184.19 a
Without (bio)	190.5 b	184.75 a

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	Juice volume per 100 berries (ml)							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	188.7 e	187.0 f	193.2 a	190.0 d	171.5 g	175.3 g	178.7 ef	183.2 cd
U (fast)	192.2 b	191.3 c	192.8 b	190.8 c	176.3 fg	177.3 f	179.2 ef	185.3 c
PCU (slow)	190.8 c	192.0 b	194.5 a	188.5 e	181.8 de	179.5 ef	186.2 c	192.2 b
SCU (slow)	190.5 d	191.8 c	190.2 c	194.0 a	192.0 b	197.0 b	198.3 a	197.7 a

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-form	Juice volume per 100 berries (ml)			
	2000		2001	
	With	Without	With	Without
Fast release				
AS	190.1d	189.6 e	176.08 f	178.25 e
U	191.2 c	192.4 b	180.20 d	178.92 e
Slow release				
PCU	192.7 b	190.3 d	183.67 c	186.20 b
SCU	193.4 a	189.8 e	196.83 a	187.67 b

D) The interaction between N application rates and biofertilizers.

Biofertilizer	Juice volume per 100 berries (ml)							
	2000				2001			
	40	60	80	100	40	60	80	100
With	191.17 b	190.33 c	193.22 a	191.92 b	180.00 e	182.40 d	184.33c	190.00 a
Without	189.92 d	190.75 c	191.42 b	190.00 c	180.83 e	182.17 d	186.83b	189.17 a

E) The interaction between three factors N form, rates and biohertilizers.

Juice volume per 100 berries (ml)									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	187.3a	186.7a	194.0a	192.3a	169.0L	175.3jkl	176.7hijk	183.3fgh
	Without	190.00a	187.3a	192.3a	188.7a	174.0kl	175.3jkl	180.7fghij	183.0fgh
Urea	With	189.0a	190.0a	194.3a	191.3a	176.7hijk	177.3ghijk	179.7ghijk	187.0ef
	Without	192.0a	192.7a	191.3a	190.3a	176.0ijk	177.3ghijk	178.7ghijk	183.7fg
PCU	With	194.3a	192.0a	195.3a	189.0a	182.7fghi	179.3ghij	181.7fghi	191.0cde
	Without	187.3a	192.0a	193.7	188.0a	181.0fghi	179.7ghij	190.7de	193.3abcde
SCU	With	194.0a	192.7a	195.3a	195.0a	191.7cde	197.7abc	199.3a	198.7ab
	Without	187.0a	191.0a	188.3a	193.0a	192.3bcde	196.3abcd	197.3abcd	196.7abcd

berries were obtained in SCU nitrogen form and fertilized with bacteria.

Furthermore, interaction(table15,D)between N-rates and biofertilizers showed the higher rates(80 and100g N/vine) of nitrogen supported with biofertilizers gave significantly the increased juice of 100 berries volume than lower rates(40 and 60 g N/vine) of N-applied.

Finally, interaction(table15,E) between three factors studied (N-forms, N-rates and biofertilizers) show release N-fertilizers with higher or lower rate of nitrogen with biofertilizer induced highest values and significantly increased juice volume per 100 berries than fast release N-fertilizers with higher or lower rates of nitrogen with or without biofertilizers during the 2000 and 2001 seasons.The best juice volume per 100 berries were showed with fertilized vines with SCUform(80 and100g N/vine) and fertilized with bacteria.

4.4.2.Fruit chemical properties:

Tables (16) show the effect of N-fertilizers form (fast release and slow release), nitrogen fertilizers rates (40, 60, 80 and 100 g N/vine/year) and biofertilizers as well as their interactionbetween them on some fruit chemical properties i.e., total sugar, total soluble solids, acidity and T.S.S./acid ratio of Thompson seedless grapevines during 2000and 2001seasons.

4.4.2.1.Total sugars:%

Table (16,A) reveals that during 2000 and 2001 seasons the studied slow release N-fertilizers (phosphorus coated urea (PCU) and sulphur coated urea (SCU) vines produced higher values of berry richer in their total sugars % (21.0 and 21.70) in the first season and (19.84 and 21.29%) in the second season

Table (16): Effect of nitrogen fertilizer form rate and biofertlizer on (Total sugars%) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	Total sugars %	
	2000	2001
Fast release		
AS	18.93 d	17.40 d
U	19.66 c	17.95 c
Slow release		
PCU	21.00 b	19.84 b
SCU	21.70 a	21.29 a
40 gn/vine	19.80 b	18.42 d
60gn/vine	20.00 b	18.59 c
80 gn/vine	20.65 a	19.38 b
100gn/vine	20.84 a	20.09 a
With (bio)	20.58 a	19.17 a
Without (bio)	20.06 b	19.07 a

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	Total sugars %							
	2000				2001			
	40	60	80	100	40	60	80	100
AS	17.50 h	19.25 g	19.10 g	19.87 f	16.35 I	16.40 I	17.90 h	18.95 g
U	19.15 g	19.55 g	20.08 e	19.85 f	17.83 h	17.60 h	17.70 h	18.65 g
PCU	20.70 d	20.63 d	20.60 d	22.08 b	19.45 f	19.75 f	19.85 e	20.30 d
SCU	21.85 c	20.57 d	22.82 a	21.55 c	20.05 e	20.60 c	22.05 b	22.45 a

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-form	Total sugars %			
	2000		2001	
	With	Without	With	Without
Fast release				
AS	18.68 f	19.18 e	17.40 e	17.40 e
U	19.99 d	19.33 e	19.95 b	17.87 d
Slow release				
PCU	21.43 b	20.58 c	19.95 b	19.73 c
SCU	22.24 a	21.15 b	20.30 a	19.28 b

D) The interaction between N application rates and biofertilizers.

Biofertilizer	Total sugars %							
	2000				2001			
	40	60	80	100	40	60	80	100
With	20.15 d	20.05 d	20.90 b	21.24 a	18.47f	18.45 f	19.52c	20.22 a
Without	19.45 e	19.95 d	20.40 c	20.43 c	18.37g	18.72 e	19.22d	19.95 b

E) The interaction between three factors N form, rates and biohertilizers.

Total sugars %									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	17.90r	18.70pq	18.30qr	19.80lmn	16.30k	16.40k	17.90I	19.00gh
	Without	17.10s	19.80lmn	19.90klmn	19.93klmn	16.40k	16.40k	17.90I	18.90gh
Urea	With	19.50n	19.70mn	20.37ijkl	20.40ijklm	17.70ij	17.80ij	17.90I	18.70h
	Without	18.80opq	19.40no	19.80lmn	19.30nop	17.97l	17.40j	17.50ij	18.60h
PCU	With	20.90fghi	21.07efgh	21.30efg	22.47b	19.60ef	19.70ef	19.90de	20.60c
	Without	20.50hijk	20.20jklm	19.90klmn	21.70cde	19.30fg	19.80e	19.80e	20.00de
SCU	With	22.30bc	20.73ghij	23.63a	22.30bc	20.30cd	19.90de	22.40a	22.60a
	Without	21.40def	20.40ijkl	22.00bcd	20.80efghi	19.80e	21.30b	21.70b	22.30a

compared with fast release N-fertilizers ($NH_4(SO_4)2$ and urea) ones (18.91 and 19.66%) in the first season and (17.40 and 17.95%) in the second season.

However, the differences of the four N-forms in this respect were obvious to be significant..Furthermore, the application of N-rates by highest rates (80 and 100 g N/vine) succeeded in enhancing fruit content of total sugars percentage than the application N-rate with lower rate (40 and 60 g N/vine) in both season studied 2000 and 2001 season.

In addition, biofertilizer N-fixing bacteria *Azotobacter chroococcum* induce nearly as similar effect on fruit total sugars percentages than treatment without biofertilizers.

Furthermore,(table 16,B)clear that slow release N-fertilizers applied at 80 or 100 g N/vine produced higher positive effect and highest values on fruit total sugars percentage as compared with fast release N-fertilizers with applied high rate or low rate of N (40, 60, 80 and 100 g N/vine) induced similarly the lowest positive effect on fruit total sugar percentage of Thompson seedless grapevines. In this point found that also, SCU N-form with higher rates(80 , 100 g N/vine)increased berry weight and weight of 100 berries in both seasons than the other forms with all rates.

On the other hand, Table (16,C&D) revealed that N-form particularly slow release N-fertilizers showed to be more effective in enhancing fruit total sugars percentage with biofertilizers, but,all N-form with N-fixing *Azotobacter chroococcum* gave best values on total sugars percentage compared with N-form without biofertilizers, where the highest values of total sugar percentage obtained with applied SCU at 80

or 100 g N/vine with *Azotobacter chroococcum* in both seasons, 2000and 2000, respectively.

On the other hand, the interaction (table 16,E)between N-form(fast and slow N-fertilizers), rates of applied nitrogen and biofertilizers exerted that the application of slow release N-fertilizer particularly (SCU)at 80 or 100g N/vine and provided with biofertilizer inoculation gave comparatively the highest values of fruit total sugar percentage. On the contrary fast release N fertilizers applied with most N rate and inoculation with N-fixing bacteria *Azotobacter chroococcum* produced the lowest values of fruit total sugars percentage.

The obtained results of fast release N-fertilizers and their rates regarding fruiting fruit quality of grapevines Thompson seedless. **Colapielra (1989)**, **Ahmed** *et al.* **(1988)**, and **Mervet** (2000) stated that in Flame seedless grapevines with SCU, PCU and urea formaledhyde were very effective in improving the total soluble solids and total sugars percentage.

4.4.2.2. T.S.S. %and acidity%

Table (17,A) illustrated that slow release N-fertilizers of Thompson seedless grapevines were produced fruit richer in their total soluble solids content (20.62, 20.55%) and (23.20 and 23.89%) in the first and second seasons as compared with produced by fast release N-fertilizers (19.61, 19.56%) and (21.90, 21.90%) during the first and second season, respectively. While slow release N-fertilizers decreased generally the acidity in juice berries of vi8nes as compared to fast release nitrogen treatment.

Furthermore, Thompson seedless grapevines received higher N-fertilized rates improved total soluble solids than the corresponding ones of Thompson seedless grapevines that

Table (17): Effect of nitrogen fertilizer form rate and biofertlizer on (TSS% and Acidity%) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	TSS %		Acidity %	
	2000	2001	2000	2001
Fast release				
AS	19.61 b	21.90 c	0.74 a	0.72 a
U	19.56 b	21.90 c	0.71 b	0.70 a
Slow release				
PCU	20.62 a	23.20 b	0.72 b	0.69 a
SCU	20.55 a	23.89 a	0.71 b	0.71 a
40 gn/vine	19.98 b	22.03 c	0.72 b	0.71 a
60gn/vine	20.45 a	22.56 b	0.71 c	0.70 a
80 gn/vine	20.43 a	22.95 b	0.74 a	0.70 a
100gn/vine	19.48 b	23.35 a	0.72 b	0.70 a
With (bio)	20.43 a	22.68 a	0.74 a	0.71 a
Without (bio)	19.74 b	22.76 a	0.71 a	0.69 a

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-Form	TSS %							
	2000				2001			
	40	60	80	100	40	60	80	100
AS (fast)	20.0 b	19.70 c	20.21 b	18.53 d	20.87 j	21.50 h	21.97 i	23.28 d
U (fast)	19.60 c	20.31 b	19.78 c	18.53 d	21.22 h	21.68 h	22.17g	22.52 f
PCU (slow)	19.98 c	21.10 a	20.90 b	20.03 b	23.28 d	23.22 e	23.37 d	22.95 f
SCU (slow)	20.35 b	20.70 b	20.93 b	20.23 b	22.77 f	23.83 c	24.20 b	24.67 a
	Acidity %							
	2000				2001			
	40	60	80	100	40	60	80	100
AS	0.72 a	0.73 a	1.76 a	0.76 a	0.72 ab	0.71 ab	0.72ab	0.72 ab
U	0.71 a	0.70 a	0.72 a	0.71 a	0.68 ab	0.66 b	6.72 ab	0.73 ab
PCU	0.72 a	0.73 a	0.76 a	0.69 a	0.70 ab	0.71 ab	0.67 b	0.67 b
SCU	0.73 a	0.67 a	0.71 a	0.71 a	0.75 a	0.71 ab	0.70 ab	0.68 ab

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-form	TSS %				Acidity %			
	2000		2001		2000		2001	
	With	Without	With	Without	With	Without	With	Without
Fast release								
AS	19.83 b	19.34 b	21.73 d	22.08 c	0.77 a	0.72 ab	0.73 a	0.70 a
U	19.48 b	19.63 b	21.81 d	21.98 d	0.69 ab	0.73 ab	0.70 a	0.69 ab
Slow release								
PCU	21.55 a	19.99 b	23.32 b	23.09 b	0.75 ab	0.70 ab	0.71 a	0.66 b
SCU	21.16 a	19.94 b	23.87 a	23.31 b	0.73 ab	0.68 b	0.70 ab	0.71 a

D) The interaction between N application rates and biofertilizers.

Biofertilizer	TSS %							
	2000				2001			
	40	60	80	100	40	60	80	100
With	20.37 c	20.71 b	21.16 a	19.50 d	22.17 a	22.16 a	22.72a	23.37a
Without	19.60 d	20.20 c	19.71 d	19.45 d	21.89 a	22.66 a	23.17a	23.33a
	Acidity %							
	2000				2001			
	40	60	80	100	40	60	80	100
With	0.73 b	0.75 b	0.76 a	0.72 b	0.73 a	0.69 a	0.70 a	0.71 a
Without	0.72 b	0.67 b	0.72 b	0.72 b	0.69 a	0.69 a	0.70 a	0.68 a

E) The interaction between three factors N form, rates and biohertilizers.

TSS %									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	20.33bcde	19.57defg	20.70bcde	18.73gh	20.67L	21.57kl	21.40kl	23.10defgh
	Without	19.67defg	19.83cdef	19.43defg	18.33h	20.87L	21.43kl	22.53efgh	23.47cdefg
Urea	With	19.77cdef	20.83bcd	20.13cdef	17.20h	21.30kl	21.43kl	22.03ijkl	22.47fghij
	Without	19.43efg	19.80cdef	19.43efg	19.87cdef	21.13l	21.93jkl	22.30ghijk	22.57efghi
PCU	With	20.73bcde	21.33b	21.90a	20.03bc	23.10defg	23.07defg	23.63bcde	23.47cdefg
	Without	19.23fg	20.87bcd	19.70defg	20.17cd	23.47cdef	23.37defg	23.10defgh	22.43fghij
SCU	With	20.63bcde	21.10bc	21.90a	21.03bc	23.24cd	23.77bcde	23.80bcd	24.47bc
	Without	20.07cdef	20.30cdef	19.97ef	19.43efg	22.10hi	23.90bcd	24.77b	24.87a
Acidity %									
N Form	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	0.79a	0.77ab	0.77ab	0.76ab	0.73abcd	0.74ab	0.73abcd	0.74abc
	Without	0.65bc	0.69abc	0.75abc	0.77ab	0.71abcd	0.68bcd	0.72abcd	0.70bcd
Urea	With	0.67abc	0.70abc	0.72abc	0.69abc	0.70bcd	0.65cd	0.72abcd	0.75ab
	Without	0.76ab	0.70abc	0.73abc	0.73abc	0.67bcd	0.67bcd	0.72abcd	0.72abcd
PCU	With	0.72abc	0.79a	0.80a	0.70abc	0.72abcd	0.73abc	0.68bcd	0.71abcd
	Without	0.72abc	0.67abc	0.72abc	0.69abc	0.69bcd	0.68bcd	0.65cd	0.64d
SCU	With	0.72abc	0.72abc	0.74abc	0.74abc	0.79a	0.67bcd	0.67bcd	0.67bcd
	Without	0.75abc	0.62c	0.68abc	0.68abc	0.71abcd	0.74ab	0.72abc	0.68bcd

fertilized with the lower rates.In addition, the biofertilizers (*Aztobacter chrocoocum*) succeeded in enhancing fruit content of total soluble solids than treatments without biofertilizers in both 2000 and 2001 seasons.

On the other hand, the interaction(table 17,B) between nitrogen fertilizer forms, form and rates shows that the combination of slow release N-fertilizers induced statistically higher positive effect than did those of fast release N-fertilizers. Beside, the higher rate of SCU, followed descending by the higher rate PCU, lower rate of both SCU and PCU scored the highest values of total soluble solids and acidity content. The interaction of fast release N-fertilizers induced nearly less similar effect in this respect.

However,(table 17,C) clear that nitrogen applied forms with bacteria improved total soluble solids content rather than without bacteria inoculation. Beside (SCU or PCU) slow release N-fertilizer

with Azotobacter or without induced nearly similar and higher positive effect on fruit total soluble solids content, followed descending by fast release N-fertilizer with Azotobacter in both seasons. On the other hand, the interaction between nitrogen fertilizer source and biofertilizers namely (*Azotobacter chrocoocum*) failed to induce an active effect on fruit on fruit acidity percent content of Thompson seedless grapevines.

On the other side, the interaction(table 17,D) between of nitrogen applied form and biofertilized showed that the application nitrogen higher rates with Azotobacter induced higher positive effect on total soluble content than those application with lower N-rate without *Azotobacter chrocoocum*

particularly in the first season and additionally, the interaction between the method of N-fertilizers rates and biofertilizers (*Azotobacter chrocoocum*) failed to added any complementary effect on fruit acidity percent of Thompson seedless grapevines during both seasons.

Finally, the interaction(table 17,E) between N-forms fast release (ammonium sulphate and urea) and slow release (SCU and PCU), N-applied rate and *Aztobacter chrocoocum* demonstrated that the slow release SCU with higher rate (80 and 100 g N/vine) and *Azotobacter* induced higher positive effect on total soluble solids content than did those of fast release N-fertilizers with or without *Azotobacter* and received higher or lower nitrogen applied rate. The interaction between the three studied factors (N-fertilizers forms, N-fertilizers rate and biofertilizers failed show any additive effect on fruit acidity content of Thompson seedless grapevines in both seasons 2000 and 2001.

4.4.2.3. T.S.S./acid ratio:

It is obvious from Table (18,A) the slow release N-fertilizers vines produced higher TSS/acid ratio (28.94 & 29.31%) and (33.81 & 34.94%) in first and second seasons as compared those received fast release N-fertilizers in (26.41 & 27.17%) and (30.62 & 31.53%) in the first and second seasons.

Furthermore, the lower N-fertilizer applied rate gave similar values of N-fertilizer rate in enhancing fruit TSS/ acid ratio of Thompson seedless grapevines in the first season 2000 as compared with the second season 2001 the higher N-rate surpassed lower N-rate in enhancing fruit TSS/acid ratio of Thompson seedless grapevines. Also, nitrogen biofertilization

Table (18): Effect of nitrogen fertilizer form rate and biofertlizer on (TSS:Acidity ratio) of Thompson seedless grapevines during (2000,2001).

A) Specific effect of N form, rate and biofertilizers.

Treatment	TSS:Acidity ratio	
	2000	2001
Fast release		
AS	26.41 b	30.62 d
U	27.17 b	31.53 c
Slow release		
PCU	28.94 a	33.81 b
SCU	29.31 a	34.94 a
40 gn/vine	27.92 a	31.55 c
60gn/vine	28.79 a	32.76 b
80 gn/vine	27.76 a	32.76 b
100gn/vine	27.36 a	33.67 a
With (bio)	27.84 a	32.32 b
Without (bio)	28.08 a	33.12 a

Means followed by the same letter(s) within each parameter are not significantly different from each other at 5% level.

B) The interaction between N form and application rates.

N-From	TSS:Acidity ratio							
	2000				2001			
	40	60	80	100	40	60	80	100
Fast release								
AS	22.77ab	27.01ab	26.64ab	24.21 b	28.99 g	30.23 g	32.42 d	32.75 d
U	27.45ab	27.26ab	27.46ab	26.53 ab	31.44 ef	32.85 d	30.78 f	31.05 f
Slow release								
PCU	27.97ab	30.22 a	27.37 ab	30.20 a	33.27 c	32.48 de	35.42 b	34.07 c
SCU	28.44ab	30.65 a	29.59 a	28.50 ab	32.52 de	35.49 b	34.96 b	36.81 a

AS= Ammonium sulphate, **U**= Urea, **PCU**= phosphouas coated urea, **SCU**= Sulfas coated urea.
(40,60,80,100g N/vine/year)

C) The interaction between N form and biofertilizer.

N-Form	TSS:Acidity ratio			
	2000		2001	
	With	Without	With	Without
Fast release				
AS	25.63 b	27.18 ab	29.77 e	31.46 d
U	27.60 ab	26.75 ab	34.51 b	31.76 d
Slow release				
PCU	28.96 ab	28.92 ab	32.85 c	34.77 b
SCU	29.16 a	29.46 a	35.38 a	34.51 b

D) The interaction between N application rates and biofertilizers.

Biofertilizer	TSS:Acidity ratio							
	2000				2001			
	40	60	80	100	40	60	80	100
With	28.19 a	27.86a	28.03a	27.28a	31.36h	33.24 b	32.69e	34.33 a
without	27.66 a	29.72a	27.50a	27.45a	31.74g	32.28 f	33.18c	33.00 d

E) The interaction between three factors N form, rates and biohertilizers.

TSS / Acid									
N Source	Bio fertilizer	2000				2001			
		Rate of applied nitrogen g / vine				Rate of applied nitrogen g / vine			
		40	60	80	100	40	60	80	100
Sulphate ammonium	With	25.52de	25.35de	26.98bcde	24.69e	28.60j	29.13j	29.72ij	31.64fghi
	Without	30.02bcd	28.69bcde	26.31bcde	23.73e	29.38j	31.32ghij	31.29ghij	33.85bcd
Urea	With	29.21bcde	27.54bcde	28.24bcde	25.42de	30.86hij	32.96cdefg	30.59hij	30.76hij
	Without	25.69bcde	26.99bcde	26.68bcde	27.65bcde	32.01efgh	32.74cdefg	30.97ghi	31.33ghij
PCU	With	28.89bcde	28.94bcde	27.36bcde	30.67bc	32.53defg	31.58ghij	34.75bcde	32.53defg
	Without	27.07bcde	31.51b	27.38bcde	29.75bcd	34.00bcde	33.37bcde	36.09bc	35.60bcd
SCU	With	29.13bcde	29.61bcde	29.55bcde	28.35bcde	33.47bcde	35.46bcd	35.52bcd	37.07a
	Without	27.87bcde	31.69a	29.64bcde	28.66bcde	31.57ghij	35.52bcd	34.38bcde	36.55b

with bacteria improved TSS/acid ratio in fruits of grapevines thane those unbiofertilized vines.

On the other side, the interaction(table 18,B) between N-fertilizers forms and N-fertilizer applied rate demonstrated that the higher and the lower rate of ammonium sulphate and urea scored similar and higher values in TSS/acid ratio in the first season 2000 and surpassed higher and lower N-fertilized rate of AS and U in both seasons. The best results of TSS/acid ratio were obtained in fruit vines with fertilized with SCU N-form at 100g n/vine raye.

Furthermore, (table 18,C) the inoculation of Thompson seedless grapevines by *Azotobacter chrocoocum* improved fruit TSS/acid ratio in both seasons 2000 and 2001 than uninoculated vines.

On the other hand, the interaction(table 18,D) between N-fertilizers rates and biofertilizers (*Azotobacter chrocoocum*) produced similar in the frist seasons, while the higher rates increased fruit TSS/acid ratio in the second season..

Finally, the interaction(table 18,E) between N-fertilizer form (ammonium sulphate, urea, PCUand SCU), N-fertilizer rate and biofertilizers (N-fixing bacteria *Azotobacter chrocoocum*) demonstrated that slow release N-fertilizers with higher rate and inoculation with *Aztobacter chrocoocum* produced significant effect on fruit TSS/acid ratio compared with fast release N-fertilizers with higher or lower rate of N-fertilizers with biofertilizers which gave the lower values in fruit TSS/acid ratio of Thompson seedless grapevines.

The obtained results of fast release N-fertilizers and their rates regarding fruit quality of Thompson seedless grapevines are

in agreement with the findings of **Abd El Hady (2002), Alia (2002), Jarad (2004)** on grapes.

They mentioned that increasing the rate of traditional nitrogen fertilizers enhanced some fruit quality traits. Besides, increasing the N-application rate from (40-100 g N/vine/year) induced high values of fruit size and fruit quality

Furthermore, the obtained results of slow release N-fertilizers and their rates regarding fruit quality traits are in harmony with the findings of **Mervet (2000)** on grapevines, **Alva** and **Paramasivam (2000)** on citrus, **Alva** *et al.* **(2000)** on orange and. They mentioned that fruit quality traits were greatly enhanced due to the use of slow release N-fertilizers rather than soluble N-fertilizers.

In addition, fruit quality results attributed to biofertilizers are in accordance with those reported by **Faten** *et al* **(2003), Omran (2003), Fawzi (2004)** on grapevines, **Akl** *et al.* **(1997)** on grape, **Harkash** and **Abdel-Nasser (2000)** on grape ,**Mustafa (2002)** on citrus and

They mentioned that *Azotobacter* biofertilization added positive improvement on chemical and physical properties of Thompson seedless grapevine berries .