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EFFECT OF NITROGEN FERTILIZATION AND SUPPLEMENTARY IRRIGATION ON GROWTH, PRODUCTIVITY AND FRUIT QUALITY OF BARRANI C.V GRAPEVINE UNDER MATROUH GOVERNERATE CONDITION, EGYPT.

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ABSTRACT

This study was carried out during two successive seasons (2008 and 2009)on the Barrani grapevine (Vitis Vinifera L.) grown under rainfall conditions of the western coastal zone Matrouh Governorate - Egypt to study the effect of nitrogen fertilization and supplementary irrigation on growth and productivity of "Barranii" cultivar grapevine. The obtained results indicated that, supplemental irrigation increased bud burst and fruit shoots percentage, vegetative growth, number of cluster /vine, cluster weight and yield (kg)/vine and fruit quality except TSS & sugars content that reduced as compared with the control, 100L water/vine gave the highest values in both seasons. Moreover, leaf N and potassium content were increased significantly but supplementary irrigation had no significant effect on leaf phosphorus content were. On the other hand, nitrogen fertilization rates(as a percentage from recommendations) increased growth parameters, yield and fruit quality except TSS & sugars content that reduced in both seasons, while 75% N/vine gave the highest values in both seasons. Moreover, it was found that there was no significant difference between treatments concerning TSS, total sugars and acidity in both seasons. Interaction between nitrogen fertilization and supplemental irrigation indicated that all vegetative growth parameters yield / vine and fruit physical properties were improved, while TSS% and sugar percentage were reduced in both studied seasons.

Keywords: grapevine, Barrani c.v, nitrogen fertilization, supplemented irrigation, bud burst, vegetative growth, yield, fruit quality.

INTRODUCTION

In the world grapevine is to be one of the most important fruits for local consumption and export. The north western coastal zone of Egypt is one of the arid areas; depend on the rains as the main source of water either for human daily use or for Agriculture. Barrani grapevine is one of two cultivars which obtained in Matrouh Governorate, especially in Sedi Barrani ; grapevines in this area were not subjected to any kind of regular management except elimination of the dry arms or cutting off the one year old shoots just for shorting, not as a regular pruning or for architecture.

Increasing population, global climate changes, other non-agricultural water uses, increased demands for irrigation and reduced precipitation have caused pressure on natural resources including water particularly in dry and semi-dry lands. Thus, great emphasis is placed on crop management for dry conditions with the aim of increasing water use efficiency (Othieno, 1978). Drought is one of the most common environmental stresses that limit agricultural production worldwide. Many fruit crops, including grapes, have high water requirements and in most countries, full or supplemental irrigation is necessary for successful fruit production. More frequent irrigation applied from November until March did not increase vegetative growth of third-leaf grapevines compared with non-irrigated ones in the Coastal region.Berry size, juice composition and colour are influenced by the water status of the grapevine, and also have determining effects on wine quality. Smaller berries are produced by grapevines that experience water deficits compared with those produced by continually irrigated grapevines (Myburgh, 2003). Where Chenin blanc grapevines in the Coastal Region were irrigated after flowering, at pea size berries and at véraison, yield increased compared with grapevines that received no irrigation (Van Zyl and Weber, 1981). Furthermore, it was shown that a single irrigation applied either at fruit set, or at véraison, increased yield, whereas a single irrigation at the end of cell division had no effect when compared with non-irrigated grapevines (Van Zyl and Van Huyssteen, 1983). Hence, yield increase appears to be a function of the number of irrigations, as well as the timing of the irrigations. If water is available for additional irrigation at stages other than those mentioned above, there is a degree of uncertainty about the optimum timing of these additional irrigations, particularly during berry ripening, with respect to grapevine response and wine quality. Several approaches to deficit irrigation (DI) have aimed to increase crop water use efficiency, including regulated deficit irrigation (RDI) and partial root-zone irrigation (PRI) or partial root-zone drying (PRD) have been proposed as an agronomic practice for more efficient use of the limited water resources (Elias and Marı., 2007.,Dry and Loveys, 1998., Kang *et al*., 1998., Kang and Zhang., 2004.,Kirda *et al*., 2004., Mingo *et al*., 2004., Zegbe *et al*., 2004).Regulated deficit irrigates the entire root zone with an amount of water less than the potential evapotranspiration and minor stress that develops, has minimal effects on the yield (English *et al*., 1990). Regulated deficit irrigation has proved successfully with a number of fruits. RDI significantly limited leaf growth and this treatment generally resulted in yield reduction in *Vitis vinifera* L. Partial root-zone drying can be applied in two ways, i.e. fixed partial root-zone irrigation (FPRI) where only one side is irrigated and alternate partial root-zone irrigation (APRI) that the opposite sides are irrigated alternatively (Hu *et al*., 2009) on grapes.

Ammonium and NO - can both be utilized as N sources for plant growth, but numerous studies have shown 4 that in many higher plant species, NH_4 + as the sole source of N is deleterious to plant growth (Cruz *et al*., 2006., Roosta and Schjoerring, 2008). Juice total N, ammonia, free amino nitrogen, arginine, and proline concentrations increased linearly with increasing N fertilizer rate (Spayd.et al., 1994). Nitrogen contents of cane, trunk and root increased under water stress at the expense of leaf, indicating accumulation of nitrogen reserves in the vine's permanent organs, and whose remobilization upon rewatering might play a role in promoting budbreak and subsequent growth of the new shoots (Kamande et al 1997). (Sally.J and Robson 1999) found that, the effect of nitrogen supply on the vegetative and reproductive capacity of vines of low nitrogen status. Five rates of nitrogen fertilizer (0, 50, 100, 200, and 400 g N/vine) were applied to irrigated, 12-year-old Cabernet Sauvignon vines. Two-thirds of the nitrogen was applied late budbreak and the rest at two weeks after flowering. Moderate rates of nitrogen fertilization stimulated vine growth and vigor (shoot extension rate) resulting in an increase in canopy density. Prior to flowering, maximum vine vigor was observed upon addition of 100 g N/vine. Those vines supplemented with (100 g) of nitrogen also achieved maximum petiole nitrate concentrations at flowering, growth (shoot length, pruning weight, and leaf area), and canopy density (leaf layer number). However, the petiole nitrate concentration, total leaf area, and canopy density of vines supplied with 200 to 400 g N/vine were no different to those vines supplemented with 100 g N/vine. Additional applications of 200 g and 400 g N/vine increased the yield no further. Higher berry numbers per bunch were associated with the increase in total vine yield. It appeared that moderate rates of nitrogen fertilization can have a beneficial effect on vine productivity in situations where vine nitrogen status is low

MATERIALS AND METHODS

The study was conducted during two successive seasons (2008 and 2009) on grapevine (Vitis vinifera L.) named as Barrani, grown under the environmental conditions of Barrani - Matrouh Governorate Egypt. 96 (Ninety six) vines were selected of untrained orchard and planted at 5x5m between vines and rows. All growers left their plants grow running on the soil surface, and depended on rainfall as the main source for irrigation. Similar size and vigor vines were chosen and the experiment treatments were arranged in a split plot design arrangement with three replicates and two vines per each replicate. The experimented vines were pruned to six canes each contained eight buds (48 buds / vine). All vines were pruning in the last week of December in both studied seasons. Supplementary irrigation was added at 0, 60, 80 and 100 L/vine/year as supplementary. Nitrogen fertilization was added at 0, 25%, 50% and 75%/vine/year from the recommended doses. In the same time both supplementary irrigation and nitrogen fertilization were added Three times (May, June and July) in both studied seasons.

The following parameters were recorded in both seasons:

- **Average percentage of bud burst.**
- **Average percentage of vegetative shoots.**
- **Average percentage of fruiting shoots.**
- **Average shoot length (cm^2):** At the end of the growing season, the length of ten shoots distributed around the vine head was measured and the average was recorded.
- **Average number of leaves /vine:** All the leaves in May were counted.

- **Average leaf area (cm^2):** Twenty leaves from those opposite to the basal cluster were measured according to *Sourial et al* 1985. Using the following formula:

$$\text{Leaf area} = \frac{(\text{diameter})^2 \times 3.14}{4}$$

- **Average total chlorophyll content:** Total chlorophyll content in fresh leaves was measured in the field by using Minolta chlorophyll meter SPAD-502.
- **Average Leaf fresh and dry weight** :At the end of each season, leaf samples were taken and carefully washed with tap water distilled water then the leaf fresh weight was determined then dried at 70 ^{0}C .till a constant weight leaf dry weight was determined.
- **Average yield (kg/tree):** The total yield per tree was recorded in kilogram at harvest time.
- **Average cluster number/vine and cluster weight:** At harvesting time were recorded.
- **Leaf mineral contents:-**leaf content of N, P and K was determined in petioles from leaves opposite to basal clusters, according to methods outlined by Wilde et al.1985.
- **Berries physical and chemical characteristics:** A sample of cluster per each treatment (3clusters from each replicate) was randomly taken and a sample of 100berries was randomly chosen from each replicate to determine berries quality in terms of berry weight (g) and juice volume per 100berries were determined and recorded .Also, total soluble solids (TSS)in juice using hand refractometer ,total acidity in juice as percentage of tartaric acid and total soluble solids/acid ratio was calculated according to *A.O.A.C.*1995. All the obtained data were tabulated and statistically analyzed according to *Snedecor* and Cochran 1998. Using the L.S.D. test at 5% level to recognize the significance of the differences between various treatment means.

Soil physical and chemical characteristics samples were determined. The obtained data are shown in Table (1).

Table (1): Analysis of irrigation water and soil sample.

Water analysis:							
Ec (M.mohs)	pH	K^+ (meq/L)	Ca^{++} (meq/L)	Mg^{++} (meq/L)	Na^+ (meq/L)	Cl^- (meq/L)	B^- (ppm)
1.20	7.48	0.79	4.30	6.27	1.23	8.65	1.32
Soil analysis:							
pH	Ec (M.mohs)	Na^+ (meq-L)	K^+ (meq/L)	Ca^{++} (meq/L	Mg^{++} (meq/L)	Cl^- (meq/L)	$CaCo_3$
7.45	1.23	3.26	0.90	6.78	3.23	6.15	56

RESULTS AND DISCUSSION

Vegetative growth

Data in Table (2) indicated that, bud burst, vegetative shoots and fruiting shoots % significantly affected by supplementary irrigation only or by combination with addition nitrogen rates on barrani grapevine of the two studied seasons 2008 and 2009 however,the percentage of bud burst increased significantly by supplementary irrigation as compared with control and the high values of bud burst obtained with 100L water /vine/year (81.67% - 82.20%) in the first and second seasons, respectively. On the other hand, vegetative shoots percentage was at the maximum with control compared with other supplementary irrigated treatments. While fruiting shoots increased significantly affecting by supplementary irrigation treatments and the higher values of fruit shoots percentage obtained with 100L supplementary irrigation /vine/year (31.18% – 32.89%) in the first and second seasons respectively. Adding nitrogen rates as a percentage from recommended rates were increased significantly affecting on bud burst and fruit shoots percentage and the higher values of both bud burst and fruit shoots percentage obtained with 75% nitrogen from the recommended rate,(76.83% -78.485) and (31.82% - 31.83%) as bud burst and fruit shoots percentage in the first and second seasons, respectively. However, the vegetative shoots percentage gave the higher values with the control compared with other treatments. On the other hand, shoot length ,leaf area ,number of leaves / shoot ,total chlorophyll content, leaf fresh wt. and leaf dry wt. were increased significantly under supplementary irrigation (60,80 and 100L water /vine /year) and nitrogen addition rates(25% ,50% and 75% /vine from the nitrogen recommended rate compared with the control (without irrigation and with out nitrogen) as the data shown in Tables(2,3)in the two studied seasons. the higher values of these parameters obtained with the high supplementary irrigation 100L/vine and high nitrogen addition rate75% N/vine as a percentage from the recommended rate as the compared with control and other treatments in the first and second seasons, respectively [shoot length(191.3-205.8 and 170.4 – 180.3),leaf area(214.0 – 243.4 and 195.3 – 215.7) ,number of leaves / shoot(40.67 – 43.50 and 36.92 – 39.67) ,total chlorophyll content (47.56 -48.50 and 46.12 – 46.63), leaf fresh weight (12.40 – 13.29 and 12.18 – 13.06) and leaf dry weight(5.10 – 5.33 and 4.54 – 4.98)] respectively.

Table(2)Effect of nitrogen fertilization and supplementary irrigation on Vegetative shoots(%),Fruit shoots (%),Bud burst(%),and Shoot length (cm^2) during 2008 and 2009 seasons.

Supplementary irrigation	Bud burst (%)									
	2008 season				Mean	2009 season				Mean
	N-fertilizer rates					N-fertilizer rates				
	0	25%	50%	75%		0	25%	50%	75%	
0	65.77f	70.27e	69.63e	69.53e	68.80C	68.17h	74.28fg	74.27fg	71.57gh	72.07D
60 L/vine	70.93e	73.07d	74.27d	75.13d	73.35B	69.17h	75.80ef	77.20de	78.10cd	75.07C
80 L/vine	79.20bc	78.27c	80.00ab	81.10ab	79.64A	76.13ef	78.30cd	81.87ab	81.30bc	79.40B
100L/vine	81.37ab	81.53a	82.20a	81.57a	81.67A	80.33bc	83.13a	82.37a	82.97a	82.20A
Mean	74.32B'	75.78A'	76.53A'	76.83A'		73.45B'	77.88A'	78.93A'	78.48A'	
	Vegetative shoots (%)									
0	74.97a	67.90cd	68.60bc	68.83bc	70.07A	75.80a	69.43bc	69.37bc	68.73cd	70.83A
60 L/vine	69.83b	69.53b	69.00bc	69.03bc	69.35AB	68.80cd	69.47bc	69.90b	69.37bc	69.38B
80 L/vine	69.80b	69.93b	68.10cd	67.40d	68.81B	68.73cd	70.23b	69.13cd	68.80cd	69.22B
100 L/vine	69.70b	69.27bc	68.83bc	67.47d	68.82B	69.33bc	67.17cd	66.90de	65.03e	67.11C
Mean	71.07A'	69.16B'	68.63B'	68.18B'		70.67A'	69.07B'	68.82BC'	67.98C'	
	Fruiting shoots (%)									
0	25.03c	32.10ab	31.40ab	31.17ab	29.92C	24.53g	30.57de	30.63de	31.27bc	29.25B
60 L/vine	30.17b	30.47b	31.00ab	30.97ab	30.65B	27.53f	30.87cd	30.10de	30.63de	29.78B
80 L/vine	30.20b	30.07b	31.90ab	32.60a	31.19A	29.10ef	28.43ef	30.60de	30.47de	29.65B
100 L/vine	30.30b	30.73ab	31.17ab	32.53a	31.18A	30.67de	32.83bc	33.10ab	34.97a	32.89A
Mean	28.92C'	30.84B-	31.37AB'	31.82A'		27.96C'	30.67B'	31.11AB'	31.83A'	
	Shoot length (cm2)									
0	138.0g	143.0f	144.7f	144.0f	142.4D	142.0g	148.7f	148.7f	148.7f	147.0D
60 L/vine	158.0e	158.7e	163.0de	165.3cd	161.3C	164.0e	170.3d	172.0d	170.7d	169.3C
80 L/vine	168.7c	178.0b	182.0b	179.0b	176.9B	169.3de	184.3c	188.3bc	189.3bc	182.8B
100 L/vine	189.7a	191.0a	191.0a	193.3a	191.3A	192.3b	209.3a	208.7a	212.7a	205.8A
Mean	163.6C'	167.7B'	170.2 A'	170.4A'		166.9B'	178.2A'	179.4 A'	180.3A'	

Means followed by the same letters(s)in each column or row and the interaction are insignificantly different at 5%level.

The interaction between supplementary irrigation and addition nitrogen rates were increased significantly affect on, leaf area, number of leave / shoot, total chlorophyll, leave fresh and leave dry weight in both studied season as compared with control, on the other hand the highest values on the same vegetative parameters were obtained with the high supplementary irrigation (80and100L/vine) and the high nitrogen addition rates (50 % an d 75% N/vine) in both studied seasons as compared with control and other treatments in both studied seasons. The previous results are agreed with those obtained by McCarthy, et al.,(1997) who recorded that in many fruit crops, including grapes have high water requirements and in most countries, full or supplemental irrigation is necessary for successful fruit production. More frequent irrigation applied from November until March did not increase vegetative growth of third-leaf grapevines compared with non-irrigated ones in the Coastal region on grapevine the yield and growth of all vines increased significantly when a small volume of irrigation water (40–160 mm/annum) was applied. (Van Leeuwen 2003) and (María et al., 2007) found that environmental stress, such as water deficit or limited nitrogen availability, reduces water deficit stress has one negative effect (reduction of photosynthesis), and positive effects on shoot growth cessation This can be explained not only by a reduced competition for sugars between shoot growth and fruit ripening, but also by reduced berry size. Meanwhile, studying the effects of irrigation management strategies during ripening on the quality of Spanish field-grown grapevine (*Vitis vinifera* L.). Revealed that ascertain the effect of irrigation on berry development and ripening, and hence on grape vegetative growth. (Sally.J and Robson., 1999).The effect of nitrogen supply on the vegetative and reproductive capacity of vines of low nitrogen status. Five rates of nitrogen fertilizer (0, 50, 100, 200, and 400 g N/vine) were applied to irrigated, 12-year-old Cabernet Sauvignon vines. Two-thirds of the nitrogen was applied late bud break and the rest at two weeks after flowering. Moderate rates of nitrogen fertilization stimulated vine growth and vigor (shoot extension rate) resulting in an increase in canopy density. Prior to flowering, maximum vine vigor was observed upon addition of 100 g N/vine. Growth (shoot length, pruning weight, and leaf area), and canopy density (leaf layer number). Vines receiving 400 g N/vine had shorter shoots and less pruning weight than vines receiving 100 g N/vine, as vigor did not respond to nitrogen fertilizer prior to flowering. However, the petiole nitrate concentration, total leaf area, and canopy density of vines supplied with 200 to 400 g N/vine were no different to those vines supplemented with 100 g N/vine. Similar results were obtained by (Hu *et al*., 2009) on grapevines.

Table (3) Effect of nitrogen fertilization and supplementary irrigation on Leaf area (cm)^2, No. of leaves /shoot, Total chlorophyll content, Leaf fresh weight (%) and Leaf dry weight (%) during 2008 and 2009 seasons.

Supplementary irrigation	Leaf area (cm)2									
	2008 season				Mean	2009 season				Mean
	N-fertilizer rates					N-fertilizer rates				
	0	25%	50%	75%		0	25%	50%	75%	
0	166.7h	172.2g	174.7g	172.5g	171.6D	175.1j	175.3j	177.3j	179.5j	176.8D
60 L/vine	183.4f	186.6ef	185.3ef	189.3de	186.2C	187.9i	189.4hi	195.6fg	199.0f	193.0C
80 L/vine	191.6d	191.2d	196.0c	197.0c	194.0B	193.9gh	212.2e	218.3d	226.6c	212.8B
100L/vine	199.2c	212.0b	222.5a	222.4a	214.0a	224.1c	244.0b	247.9b	257.8a	243.4A
Mean	185.2C'	190.5B-	194.6A'	195.3A'		195.3D'	205.2c	209.8B'	215.7A'	
	No. of leaves /shoot									
0	25.33e	30.33d	31.33d	32.33d	29.83D	26.67g	32.33ef	34.67de	35.00de	32.17D
60 L/vine	32.33d	35.00c	35.67bc	36.33bc	34.83C	32.00f	38.33bc	38.67bc	38.00bc	36.75C
80 L/vine	37.67bc	37.67bc	37.33bc	38.00b	37.67B	37.33cd	39.67bc	39.67bc	40.67b	39.33B
100L/vine	38.00b	41.33a	42.33a	41.00a	40.67A	38.00bc	45.67a	45.33a	45.00a	43.50A
Mean	33.33B'	36.08A'	36.67A'	36.92A'		33.50B'	39.00A'	39.58A'	39.67A'	
	Total chlorophyll content									
0	37.94i	43.15gh	42.23h	44.09fg	41.85D	37.13h	43.26fg	43.83fg	43.71g	41.98C
60 L/vine	43.30gh	42.22h	43.57gh	45.09ef	43.54C	42.49g	42.43g	44.69ef	43.94fg	43.39C
80 L/vine	44.02fg	44.23fg	45.42ef	46.56cd	45.06B	44.77ef	45.66de	46.66bc	46.03cd	45.98B
100L/vine	46.28cd	47.37bc	47.84ab	48.74a	47.56A	47.53ab	48.89a	48.72a	48.85a	48.50A
Mean	42.89C'	44.24B'	44.76B'	46.12A'		42.98B'	45.06A'	45.98A'	45.63A'	
	Leaf fresh weight (g)									
0	11.97de	11.10fg	10.83g	11.07fg	11.24C	11.73e	11.80e	12.57cd	12.00de	12.02D
60 L/vine	11.47ef	11.87de	11.63ef	12.43bc	11.85B	12.20de	12.70bc	12.57cd	13.10ab	12.64C
80 L/vine	11.80de	11.97de	12.07cd	12.50ab	12.08AB	11.97de	13.07ab	13.03ab	13.53a	12.90B
100L/vine	12.00cd	12.73a	12.13bc	12.73a	12.40A	12.37de	13.57a	13.63a	13.60a	13.29A
Mean	11.81B'	11.92AB'	11.67B	12.18A'		12.07B-	12.78A'	12.95A'	13.06A'	
	Leaf dry weight (g)									
0	3.73fg	3.37g	3.73fg	3.33g	3.54D	3.83e	3.37f	4.00de	3.67ef	3.72D
60 L/vine	3.47g	4.03ef	4.10ef	4.83bc	4.11C	3.60ef	4.33d	4.70c	5.07b	4.42C
80 L/vine	4.43de	4.87bc	4.60cd	4.90bc	4.70B	3.97de	5.40b	5.40b	5.23b	5.00B
100L/vine	4.87bc	5.20a	5.20a	5.10ab	5.10A	3.90e	5.83a	5.77a	5.83a	5.33A
Mean	4.12B'	4.37AB'	4.41 A'	4.54 A'		3.82C'	4.73B'	4.98 A'	4.95A'	

Means followed by the same letters(s) in each column or row and the interaction are insignificantly different at 5%level.

Cluster number/vine, cluster weight (g) and yield /vine (kg):

Results in Table (4) reveal that, supplementary irrigation had significantly affect on cluster number /vine, cluster weight (g) and yield/vine (kg) in both studied seasons as compared with control. All treatments of supplementary irrigation surpassed the control and increased cluster number /vine, cluster weight and yield in two studied seasons. In this respect ,100Lsupplementary irrigation led to higher values of cluster number/vine ,cluster weight and yield /vine as compared with control and other treatments(9.35 -9.60) , (487.4 – 493.4) and (5.53 – 5.92)in the first and second seasons ,respectively. On the other hand, nitrogen addition (25%, 50% and 75% as percentage from recommended nitrogen rate) had significantly affects cluster number /vine, cluster weight and yield /vine in both studied seasons as compared with control. Besides, 75% N percentage from the recommended rate surpassed the control and other treatment and gave the highest values of cluster number/vine (8.18 – 8.47), cluster weight (448.6 – 455.6) and yield /vine (4.48 – 4.77) in the first and second seasons, respectively.

Interaction between different supplementary irrigation and nitrogen percentage addition was significant. Therefore, it is clear that the increase in cluster number/vine, cluster weight and yield/vine characters was positively correlated with increasing supplementary irrigation and nitrogen percentage rates. Generally, the highest values of cluster number/vine, cluster weight and yield/vine were obtained with high supplementary irrigation (100L/vine) and high nitrogen percentage addition (75%N/vine) in both studied seasons as compared with control and other treatments.

These results are in harmony with those obtained by Diego and Castel (2010) who cleared that vines benefit more of the irrigation supplied in years of high yield levels, McCarthy et al (1997) on grapevine The yield and growth of all vines increased significantly when a small volume of irrigation water (40–160 mm/annum) was applied and(Van Zyl & Weber, 1981)who found that, Chenin blanc grapevines in the Coastal Region were irrigated after flowering, at pea size berries and at véraison yield increased compared with grapevines that received no irrigation. Sally.J and Robson. (1999) found that, effect of nitrogen supply on the reproductive capacity of vines of low nitrogen status. Five rates of nitrogen fertilizer (0, 50, 100, 200, and 400 g N/vine) were applied to irrigated, 12-year-old Cabernet Sauvignon vines over three seasons. Two-thirds of the nitrogen was applied late bud break and the rest at two weeks after flowering. The highest yield came from vines receiving 100 g N/vine in the second season. Additional applications of 200 g and 400 g N/vine increased the yield no further. Higher berry numbers per bunch were associated with the increase in total vine yield. It appeared that moderate rates of nitrogen fertilization can have a beneficial effect on vine productivity in situations where vine nitrogen status is low. Similar results were obtained by (Tayel et al., 2008. Stewart et al., 2005., and Myburgh, 2003) on grapevine.

Fruit physical properties:

Data presented in Table (4) indicated that, supplementary irrigation led to improving on berry weight and 100berriers weight and surpassed the control in this respect in both studied seasons. the high values of berry weight (2.28g – 2.37g)and 100berriers weight (251.6g – 254.0g)were obtained when adding 100L water/vine as supplementary irrigation in both studied seasons as compared with control and other treatments. However berry weight and 100berriers weight showed a significant increase with all nitrogen addition rates compared with control in two studied seasons. on the other hand, the interaction between supplementary irrigation and nitrogen addition rates significantly affect and the maximum values were obtained with 80 and 100L/vine supplementary irrigation and 50% and 75%N/vine compared with control and other treatments.

Fruit chemical properties:

Results in Table (5) indicated that, supplementary irrigation by 60, 80 and 100L / vine significantly affect juice volume as compared with control and the high values of juice volume were obtained with 100L/vine (198.2 – 198.5) compared other treatments in this respect, while, the same treatments led to decrease in total soluble solids percentage and total sugars percentage as compared with control. On the other hand, supplementary irrigation with the same addition rates had no significant effect on total acidity and TSS/ acid ratio in both studied seasons. In this respect, the control surpassed all treatments and gave the higher values of TSS% and total soluble solids. Moreover, nitrogen addition rates of 25%, 50%and 75% from the recommended rates significantly affect in juice volume in both studied seasons as compared with control.

In this respect, each treatment gave the same trend and not surpassed the other especially in the second seasons, while the same treatments with total soluble solids and total sugars percentage decreased as compared with the control. N-addition rates with total acidity percentage and TSS/ acid ratio had no significant effect in both seasons. Finally, the interaction between supplementary irrigation and nitrogen addition rates had significant affect juice volume in two seasons but with total sugars percentage and total soluble solids were decreased as compared with control in both studied seasons. The interaction between supplementary irrigation and nitrogen addition had no significant effect on acidity percentage and TSS/ acid ratio.

The obtained results are in agreement with those found by(Williams and Matthews, 1990 That berry size, juice composition and color are influenced by the water status of the grapevine, and also have determining effects on wine quality).Smaller berries are produced by grapevines that experience water deficits compared with those produced by continually irrigated grapevines Myburgh, (2003), Van Zyl and Weber, (1981) found that, Chenin blanc grapevines in the Coastal region were irrigated after flowering, at pea size berries and at véraison increased compared with grapevines that received no irrigation. Similar results were obtained by (Tayel et al., (2008)., Stewart et al, (2005).

Leaf mineral content:

Results in Table (6) showed the effect of supplementary irrigation and nitrogen addition rates on leaf mineral content of barrani grapevine .In this respect, supplementary irrigation increased significantly leaf nitrogen and potassium contents as compared with control and the higher values of leaf N and K content were obtained with 100Lwater/vine/year (1.83 -1.83) and (1.41 – 1.41) as compared with the control and other treatments in both seasons, respectively.

While, leaf phosphorus content had no significant affect. Besides, N-addition rates (25%, 50% and 75%) were increased significantly in leaf N and K content. In this respect, each treatment gave the same trend and not surpassed the others especially in the second seasons.

Table (4) Effect of nitrogen fertilization and supplementary irrigation on Cluster weight (g), Cluster number, Berry weight (g), Yield /vine (kg) and 100berries weight (g) during 2008 and 2009 seasons.

Supplementary irrigation	2008 season N-fertilizer rates				Mean	2009 season N-fertilizer rates				Mean
	0	25%	50%	75%		0	25%	50%	75%	
					Cluster number /vine					
0	5.50	5.73d	5.87cd	5.89cd	5.75D	5.81f	6.19ef	6.46e	6.39e	6.21D
60 L/vine	6.43c	8.01b	8.02b	7.99b	7.61C	6.38e	8.40cd	8.31cd	8.38cd	7.87C
80 L/vine	8.27b	7.89b	9.07a	9.19a	8.60B	8.48cd	8.03d	9.03b	9.19b	8.69B
100L/vine	9.94a	9.50a	9.52a	9.45a	9.35A	8.77bc	9.79a	9.92a	9.93a	9.60A
Mean	7.27C	7.78B	8.19A	8.13A		7.36 C	8.10 B	8.43 A	8.47 A	
					Cluster weight (g)					
0	269.3f	387.1e	384.9e	392.4de	358.4D	269.4e	399.1d	396.6d	404.0d	367.3D
60 L/vine	388.9e	406.7d	405.3d	444.3c	411.3C	392.0d	439.6c	440.4c	448.4c	430.1C
80 L/vine	466.0b	466.3b	470.2b	469.8b	468.1B	478.2ab	468.6b	477.6ab	476.8ab	475.3B
100L/vine	487.4a	486.7a	487.5a	488.0a	487.4A	489.6ab	493.1a	497.7a	493.2a	493.4A
Mean	402.9C	436.7B	437.0B	448.6A		407.3B	450.1A	453.1A	455.6A	
					Berry weight (g)					
0	1.68e	1.89d	1.92d	2.00cd	1.87C	1.75h	1.95g	2.01fg	2.06fg	1.92B
60 L/vine	1.96cd	2.02cd	2.02cd	2.12b	2.03B	1.97fg	2.13de	2.07fg	2.08fg	2.06B
80 L/vine	2.12b	2.03cd	2.07bc	2.24a	2.11B	2.11ef	2.24cd	2.33bc	2.27bc	2.24A
100L/vine	2.28a	2.27a	2.27a	2.28a	2.28A	2.27bc	2.42a	2.41a	2.36ab	2.37A
Mean	2.01 B	2.05 B	2.07 B	2.16 A		2.03 B	2.19 A	2.20 A	2.19 A	
					100berries weight (g)					
0	190.4g	195.6f	197.8f	198.2f	195.5D	195.6h	199.9gh	201.0gh	202.7g	199.8C
60 L/vine	199.1f	214.2e	229.1d	236.4c	219.7C	198.9gh	229.0f	231.0f	237.4e	224.1B
80 L/vine	243.3b	247.4ab	249.8a	247.5ab	247.0B	244.5d	249.0cd	250.7bc	250.2bc	248.6A
100L/vine	251.1a	252.0a	251.6a	251.6a	251.6A	251.2bc	255.1ab	256.7a	252.8bc	254.0A
Mean	221.0C	227.3B-	232.1A	233.4A		222.6B	233.3A	234.8A	235.8A	
					Yield /vine(kg)					
0	1.85h	2.62g	3.14f	3.28f	2.72D	1.85e	3.01d	3.17d	3.28d	2.83D
60 L/vine	3.30f	3.23f	3.73e	3.90e	3.54C	3.36d	3.97c	4.22c	4.26c	3.95C
80 L/vine	4.08de	4.44cd	4.63bc	4.96b	4.53B	4.29c	5.24b	5.50b	5.39b	5.11B
100L/vine	5.41a	5.43a	5.50a	5.79a	5.53A	5.41b	5.97a	6.15a	6.14a	5.92A
Mean	3.66D	3.93C	4.25B	4.48 A		3.73C	4.55B	4.76 A	4.77 A	

Means followed by the same letters(s) in each column or row and the interaction are insignificantly different at 5%level.

Table(5) Effect of nitrogen fertilization and supplementary irrigation on Juice volume(cm3),TSS(%),acidity(%),Total sugars (%) and TSS: acid ratio during 2008and 2009 seasons.

Supplementary irrigation	Juice volume(cm3)									
	2008 season				Mean	2009 season				Mean
	N-fertilizer rates					N-fertilizer rates				
	0	25%	50%	75%		0	25%	50%	75%	
0	169.2f	176.7de	173.6ef	176.2e	173.9D	168.9h	178.0fg	182.2ef	179.2fg	177.1D
60 L/vine	177.5de	185.7c	182.0cd	185.7c	182.7C	177.4g	187.8d	188.3d	187.7d	185.3C
80 L/vine	184.1c	194.0ab	192.8b	192.4b	190.8B	184.9de	196.3ab	193.1c	194.3bc	192.1B
100L/vine	199.1a	197.6ab	197.0ab	199.0a	198.2A	197.5ab	199.1a	199.0a	198.4ab	198.5A
Mean	182.4B'	188.5A'	186.3A'	188.3A'		182.2 B'	190.3A'	190.6A'	189.9A'	
	TSS (%)									
0	23.02a	21.54bc	22.30ab	21.64bc	22.13A	23.87a	21.60bc	21.98bc	22.37b	22.46A
60 L/vine	20.92bc	21.65bc	21.00bc	21.11bc	21.17B	21.67bc	20.56de	20.86cd	20.86cd	20.99B
80 L/vine	20.68cd	21.20bc	20.94bc	21.64bc	21.10B	20.98cd	21.75bc	21.02bc	21.80bc	21.39B
100L/vine	21.15bc	19.62de	19.46de	19.11e	19.83C	21.83bc	19.65ef	18.82f	18.84f	19.79C
Mean	21.44A'	21.00A'	20.93A'	20.86A'		222.09A'	20.89B'	20.67B'	20.97B'	
	Acidity (%)									
0	0.44a	0.43ab	0.39ab	0.41ab	0.42 A	0.43a	0.43a	0.41a	0.44a	0.43 A
60 L/vine	0.43ab	0.42ab	0.41ab	0.39ab	0.41AB	0.43a	0.44a	0.40a	0.40a	0.42AB
80 L/vine	0.41ab	0.39ab	0.38ab	0.38ab	0.39AB	0.40a	0.39a	0.39a	0.39a	0.39B
100L/vine	0.39ab	0.38ab	0.37b	0.37b	0.38B	0.40a	0.38a	0.38a	0.38a	0.39B
Mean	0.42 A'	0.41AB'	0.39 B'	0.39 B'		0.41 A'	0.41 A'	0.40 A'	0.40 A'	
	TSS/acid ratio									
0	51.61bc	49.81c	56.25a	49.08c	51.69AB	56.01a	50.34ab	54.02ab	51.44ab	52.95AB
60 L/vine	48.85c	49.90c	50.47bc	53.65bc	50.72B	50.42ab	47.29b	51.75ab	51.80ab	50.32C
80 L/vine	50.51bc	53.90bc	54.20bc	55.94ab	53.64A	53.00ab	55.84a	54.45ab	56.02a	54.83 A
100L/vine	52.48bc	50.79bc	51.80bc	50.75bc	51.46AB	52.45ab	52.11ab	49.53ab	50.08ab	51.04bC
Mean	50.86A'	51.10A'	53.18A'	52.36A'		52.97 A'	51.40A'	52.44A'	52.33A'	
	Total sugars (%)									
0	19.91a	19.56a	19.61a	19.15ab	19.56A	20.70a	19.07bc	19.07bc	19.19b	19.51 A
60 L/vine	19.13ab	18.45bc	18.42bc	18.23bc	18.56AB	19.26b	18.00bc	18.32bc	18.62bc	18.55B
80 L/vine	18.06cd	18.23bc	17.87cd	17.75de	17.98bC	18.28bc	18.45bc	17.78cd	18.22bc	18.18BC
100L/vine	18.39bc	16.70e	16.99de	16.70e	17.20C	18.88bc	17.06de	16.62e	16.58e	17.28C
Mean	18.87A'	18.24B'	18.22B'	17.96B'		19.28 A'	18.15B'	17.94B'	18.15B'	

Means followed by the same letters(s)in each column or row and the interaction are insignificantly different at 5%level.

Table (6) Effect of nitrogen fertilization and supplementary irrigation on leave nitrogen (%), phosphorus (%) and potassium (%) during 2008and2009seasons.

Supplementary irrigation	N (%)									
	2008 season				Mean	2009 season				Mean
	N-fertilizer rates					N-fertilizer rates				
	0	25%	50%	75%		0	25%	50%	75%	
0	1.39h	1.56g	1.55g	1.57g	1.52D	1.43h	1.55g	1.64ef	1.62f	1.56D
60 L/vine	1.61fg	1.64e	1.67e	1.70e	1.65C	1.63f	1.66ef	1.69de	1.73d	1.68C
80 L/vine	1.68e	1.76cd	1.76cd	1.79bc	1.75B	1.68de	1.79bc	1.80ab	1.80ab	1.77B
100L/vine	1.86a	1.82ab	1.82ab	1.83ab	1.83A	1.79c	1.82ab	1.85ab	1.86a	1.83A
Mean	1.63B'	1.70A'	1.70A'	1.72A'		1.63C'	1.71B'	1.74A'	1.75A'	
	P (%)									
0	0.11a	0.12a	0.12a	0.12a	0.12A	0.11a	0.13a	0.12a	0.11a	0.12A
60 L/vine	0.11a	0.11a	0.12a	0.12a	0.12A	0.11a	0.12a	0.12a	0.12a	0.12A
80 L/vine	0.11a	0.11a	0.12a	0.13a	0.12A	0.11a	0.12a	0.13a	0.12a	0.12A
100L/vine	0.11a	0.13a	0.13a	0.13a	0.12A	0.12a	0.14a	0.14a	0.14a	0.13A
Mean	0.11A'	0.12A'	0.12A'	0.12A'		0.11A'	0.13A'	0.12A'	0.12A'	
	K (%)									
0	1.31e	1.33de	1.35de	1.35de	1.34B	1.33c	1.33c	1.36c	1.36c	1.34B
60 L/vine	1.34de	1.35de	1.35de	1.35de	1.35B	1.34c	1.37ab	1.36bc	1.36bc	1.36B
80 L/vine	1.34de	1.35de	1.37cd	1.38bc	1.36B	1.34c	1.40ab	1.40ab	1.42ab	1.39aB
100L/vine	1.36de	1.42ab	1.43ab	1.44a	1.41A	1.39bc	1.45a	1.34c	1.44ab	1.41A
Mean	1.34B'	1.37A'	1.38A'	1.38A'		1.35B'	1.39A'	1.36B'	1.39A'	

Means followed by the same letters(s) in each column or row and the interaction are insignificantly different at 5%level.

Finally, the interaction between supplementary irrigation and nitrogen addition rates significantly affect leaf N and K content but with phosphorus they had no significant affect in both studied seasons. The previous results are in agreement with those obtained by (Hu et al., 2009) on grapes (Sipiora et al., 2005), Kamande et al., 1997 recorded that, Nitrogen contents of cane, trunk and root increased under water stress at the expense of leaf, indicating accumulation of nitrogen reserves in the vine's permanent organs, and whose remobilization upon rewatering might play a role in promoting budbreak and subsequent growth of the new shoots.

Conclusion:

Under the rainfall conditions , supplemental irrigation treatments at 60 L ,80 L and 100 L/vine /year improved bud burst , fruiting shoots percentage ,vegetative growth , yield and fruit quality parameters by all rates especially 100L/vine supplemental irrigation additions with nitrogen addition rates of 25% ,50% and 75% N as a percentage from the recommended rate in both seasons compared with control. N- Addition rates increased significantly vegetative growth, yield and fruit quality compared with control in the two studied seasons. In this respect 75% N/vine gave the highest values of grapevines Barrani vegetative growth, yield and fruit quality in both studied seasons as compared with control and other treatments. The interaction between supplementary irrigation and N- addition percentage significant affect in both studied seasons. On the other hand, TSS, total sugars, acidity in berries juice did not significantly affected.

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تأثير التسميد النتروجينى والرى التكميلى على النمو والانتاجية وجودة الثمارفى صنف العنب برانى تحت ظروف محافظة مطروح بمصر

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اجريت هذه الدراسة لمدة موسمين متتاليين ناجحين 2008و2009على العنب (برانى) والنامى تحت الظروف المطرية بالساحل الشمالى الغربى بمدينة برانى – محافظة مطروح وذلك لدراسة تأثير التسميد النتروجينى والرى التكميلى على نمو وانتاجية العنب صنف برانى .

النتائج المتحصل عليها دلت على ان الرى التكميلى بمعدلاتة المختلفة (0و60و80و100لتر/كرمة/سنة) ادى الى زيادة معنوية فى النسبة المئوية للبراعم المتفتحة والنسبة المئوية للبراعم الثمرية وقياسات النمو الخضرى وعدد العناقيد ووزن العنقود الثمرى والمحصول وكذلك صفات جودة الثمار خلال موسمى الدراسة ما عدا المواد الصلبة الكلية والسكريات فقد قلت فى نسبتها المئوية بالمقارنة بالكنترول . وفى هذا الصدد تفوقت المعاملة 100لتر رى تكميلى/كرمة على باقى معاملات الرى بالمقارنة بالكنترول وأعطت افل النتائج فى كل القياسات، بينما وجد من النتائج المتحصل عليها ان محتوى الأوراق من النتروجين والبوتاسيوم قد زاد معنويا بالمقارنة بالكنترول ،ولكن محتوى الأوراق من الفوسفور فلم يكن للرى التكميلى اى تأثير معنوى عليه فى كلا الموسمين.

ومن ناحية اخرى اوضحت النتائج ان التسميد النتروجينى المضاف(0 و25% و50% و75% / كرمة/سنة) كنسبة مئوية من المعدل الموصى به لتسميد كرمة العنب فى الموسم ادى الى زيادة فى قياسات النبة المئوية للبراعم المتفتحة والبراعم الثمرية وقياسات النمو الخضرى والمحصول وكذلك جودة الثمار فى كلا موسمى الدراسة، بينما انخفضت نسبة المواد الصلبة الكلية والسكريات الكلية بالمقارنة بالكنترول فى كلا موسمى الدراسة. ومن ناحية اخرى تفوقت المعاملة(75%نتروجين/كرمة) من المعدل الموصى به على الكنترول وعلى باقى المعاملات فى جميع القياسات ما عدا المواد الصلبة الكلية والسكريات.

وجد ان محتوى الأوراق من النتروجين والبوتاسيوم قد ارتفع معنويا مع اضافة معدلات النتروجين بالمقارنة بالكنترول على العكس من محتوى الأوراق من الفوسفور فقد انخفض بالمقارنة بالكنترول فى كلا موسمى الدراسة ولم يكن للتسميد النتروجينى اى تأثير معنوى عليه.

اوضحت النتائج هن التفاعل بين معاملات الرى والتسميد النتروجينى على العنب صنف برانى قد ادى الى تحسن وزيادة النسبة المئوية للبراعم المتفتحة والنسبة المئوية للبراعم الثمرية وقياسات النمو الخضرى وعدد العناقيد ووزن العنقود الثمرى والمحصول وكذلك صفات جودة الثمار خلال موسمى الدراسة.

واخيرا بالنسبة للحموضة كنسبة مئوية و النسبة بين المواد الصلبة الكلية والحموضة وكذلك محتوى الأوراق من الفوسفور فلم يكن للمعاملات اى تأثير معنوى عليها.