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Effect Of Differenet Temperatures On Cucumber Production Under Glasshouse Conditions

Bekhiet,R.S[1]. , Merghany,M.M[1]. ,Medany,M.A[2]. ,Ghada-Usama,R[2].

1-Vegetable crops Dept., Fac. of Agric., Cairo University ,Giza
2- Central Laboratory for Agricultural Climate(CLAC) ,Agricultural Research center ,Ministry of Agriculture and Land Reclamation.

Abstract

This experiment was carried out at the Central Laboratory for Agricultural Climate (CLAC), Agriculture Research Center, Egypt during the two successive summer seasons of 2006 and 2007 under greenhouses condition, to study the effect of different air tempreature (shade, 29 ºC &31ºC) on growth and yield of cucumber plant (**Cucumis sativus L**). Data were recorded after 40, 65 and 90 days from transplanting on the plant growth parameters, in terms of: plant height, number of leaves, total leaf area, %Chlorophyll, and both fresh and dry roots, stems and leaves, as well as fruit yield parameters in terms of fruit numbers, fruit diameter, fruit weight, total fruits weight / plant and total yield. Results showed that, the highest recorded parameters were obtained in conditioned greenhouse at stable temperature greenhouse degree (29 C), exclusively for plant height, leaves area, number of leaves /plant, fresh& dry weight of roots, stems& leaves and Chlorophyll content. Such trend may also be noticeable for diameter of fruits (DOF), fresh weight of fruits, number of fruits /plant and the total yield of cucumber.

It could be concluded that, the stable glasshouse temperature at 29 ºC has the priority, then followed by stable glasshouse temperature at 31ºC, and the latest was shaded treatment, except in the cases of: fresh &dry weight of leaves, plant height and reproductive cucumber parameters (DOF, NOF) which showed that, shade was better by reviewing it's results than stabled greenhouse temperature at 31ºC.

Key words: Cucumber, Greenhouses, Shade, net screen, Conditioned glasshouse, Transplanting, Root, Stem, Leaves, Yield, fruit, Chlorophyll, and Plant height

Introduction

Cucumber is generally a thermophillic species**.** Therefore, it has high climatic demands especially in relation to temperature. Moreover, humidity, air temperature and UV light intensity are the main factors affecting cucumber crop quality and quantity. According to the results of **Janina Gajc *et al.* (2008),** shading increased the relative humidity of atmosphere. In addition, the greenhouse structure and possible shading system reduced the amount of solar radiation reaching the top of the plant canopy.

Relative humidity increases according to the density of shading (more shade density means higher relative humidity) as mentioned by (**Saleh, 1992).** The plant itself supports much higher temperature (>40°C) as long as the light is not too intense **(Moysan, 1985).**

Cucumber survival, as affected by the different shading densities in the summer season, was obtained from applying the shading treatment of the density 35% followed by 51% then at last 63% shade. In other words useing more thick shading density led to less plant survival **(El-Abd *et al*., 1994).**

Giacomelli *et al* . (2005) , suggested that experiences and research studies within each of differnet areas of production system that included production of plant vegetative or reproductive tendency with a combination of root zone and aerial microclimates;improving fruit market quality,climate control and greenhouse structure**,** will be so important.They stated that the greenhouse structure design must be variated for improved cooling and reduced water utilization.

They added that, the structure system must also offer air exchange capacity ,shading ,and evaporative cooling, to help maintaining the desired air temperature and relative humidity for crop production.Also minimize the potentially harsh diurnal fluctuating of low air humidity , high solar radiation and water quality with high salts. **Janina Gajc *et al* . (2008)** compared between using wood fibre medium and substrate composting of perlite and peat moss in ratio of 1:1 and found that the highest yields were obtained by using the last media substrate**..** During the last 30 years great changes have undergone in greenhouse cover materials **(Pandopoulos and Grafiadellis, 1990).**

In the cooling compartment , the cooling system was capable of maintaining air temperature below the maximum set point without any need for shading or ventilation .

Increasing temperature during the first two hours of the photoperiod was almost effective in stimulating stem elongation as the day temperature is

going to increase during the day hours **(Erwin, 1998)**.

Moreover, Medany *et al.* (1991), **Barrose *et al.* (1999), Kittas *et al.* (2003), El-Dolify (2005), Luo *et al.* (2005), Salman *et al.*,(2005) , Kittas *et al.* (2009) and El-Sayed(2009)** reported that the vegetative growth , i.e., plant height, leaf number,leaf fresh and dry weight, early and total yeild were improved by using shade, cool/or cladding covers.

This view was supported by **Sumathi *et al.* (2008),** who reported that the shade and fertigation had positive influence on growth parameters and anatomical changes of cucumber leaves by modifying the size of cells and a positive sign of increasing the growth.

Al-moshileh *et al* .,(2003),mentioned that shading by green shades of date palm leaves decreased both Chlorophyll content and percentage of tuber dry mater of potato plant. It should be kept in mind that low intensity of irradiation in the green house was a significant cause of much lower yielding as compared to un shaded greenhouses **(Janina Gajc *et al.* ,2008**). It should be shed light upon that, there was a prospective positive corralation between the forementioned(intensity of irradiation during the green house) and the cholorophyll content**.**Measurement Studies showed an increase in carbon assimilation over a parallel time period **(Graxodale and Omasa, 1990).** Chlorophyll concentration increased in the shaded plants than non shaded plants **(Anderson *et al.*, 1991 and Brand, 1997).**

Generally the plant growth parameter decreased with increasing light level during summer season. Some plant species adapted to conditions of the low light by manifesting such as an altered leaf angle, larger and thinner leaves with higher chlorophyll content, altered chloroplast orientation, reduced root / shoot ratio, decrease light compensation point and finally dark respiration rate **(Anderson *et al*., 1991).**

The application of different high (25ººC-32ºC) temperatures gives the highest effect on: N and K percent in roots compared to shade treatment**.** Whereas, the most favourable treatment for increasing P % were 29º C to32º C **(De Groot *et al.* 2002).** It could also be concluded that the application of (29ºº C - 32ºC treatments) resulted in the highest values of N, P and K percent in roots of cucumber plants with the exception of P % in leaves and stems after 40 days of transplanting. In other words, these treatments reduced the temperatures of air, nutrient solution and root media during the summer season compared to other treatments which might be reflected on the absorption of the determined nutrients. This effect was reflected on stimulating the plant growth.

Cucumber has high climatic demands especially in relation to temperature **(Janina Gajc *et al* ,2008)** .They stated that humidity ,air temperature and UV light intensity are main factors affecting cucumber crop quality and quantity.This view was supported by **Soleimani *et al* (2009)**, and they revealed that number of fruit were affected by performance of cucumber cultivars.

Janina Gajc *et al.* (2008) reported that cucumber fruits obtained from summer cultivation were characterized by the highest content of dry mater (g/100g**). Tazuke and Sakiyama (1986)** investigated the effect of temperature in controlled chambers at temperature ranging from 5 º C to 30º C, they stated that the relative growth rate (RGR) of fruits and fruit volume are almost leniary related to fruit temperature**.** Therefore, the study was aimed to investigate the effect of shade, 29ºC and 31ºC on growth and yield of cucumber.

Materials and Methods

This study was conducted during the two summer successive growing seasons of 2006 and 2007 in the Experimental Protected Cultivation site at Dokki, Central Laboratory for Agricultural Climate, Agricultural Research Center, Ministry of Agriculture and Land Reclamation, Giza Governorate, Egypt .The study was aimed to investigate the effect of shade, 29º C and 31 ˚ C on growth and yield of cucumber.

1. Plant and growing media substrate

Transplants of Cucumber (**Cucumis sativus L. cv. Jaguar F1 hybrid**) were used in the present study. Seeds were planted on 17 and 20 June, in 2006 and 2007, respectively. when the plants reached three to four true leaf stage , approximately three weeks from seeding **(Charles,1995)**. Transplants were planted into black polyethylene container of 0.42 m length x 0.28m diameter, filled with 8 liters mixture of perlite and peatmoss in a ratio of 1:1 w⁄w that was similary to media substrate used by **Janina Gajc *et al* . (2008),** who used same media substrate. Bag culture arttificial media , was used for one year and discarded

2.Glasshouses structure and composition :

2.1. Three Glasshouses

Three typical glasshouses of 5 m width x 5 m length x 2.5 m height were used. Each glasshouse contained two tables that were divided into triple-rows, and the distance between each two rows was 0.6 m with 0.5 m space between the containers within the row. Each table surface had 15 plants. Excess nutrient solution was drained through holes in the bottom of each container base. The first Glasshouse was shaded partially, just on the roof by black net (sieran made), while the second glasshouse was conditioned at 29˚ C . The third one was conditioned at 31˚ C. These were done to study the

effect of partial shading on cucumber plant yield (as a control ,which compared by the other two green houses tempratured treatments.

2.2. Physical and chemical properties of Peat and Perlite mixture(1:1) Physical and chemical properties of Peat and Perlite mixture (1:1 w/w) were analyzed and tabulated in Table (1).

Table 1. Physical and chemical properties of Peat and Perlite mixture(1:1)

Properties / Substrate Mixture	Physical			Chemical*			
Peat:Perlite mix.(1:1)	B.D g/l	T.P.S %	W.H.C %	E.C m mhos/cm	P^H	C.E.C Meq / 100g	O.M %
	264.4	64.4	30.97	0.45	7.6	7.4	19.8

B.D: Bulk density
T.P.S: Total pore space
W.H.C: Water holding capacity
E.C: Electrical conductivity
C.E.C: Cation exchange capacity
O.M:Organic mater

3.3. Recorded climatic data during cucumber growth season

Daily climatic data were collected by fixed sensors of relative humidity (%), average air temperatures (C˚), wind speed (km ⁄ hr) installed in the middle of the greenhouse. Four tensiometers were placed at random in the different treatments.

3.4. Nutrient solution

Nutrient solution was used four times / day (6 and 9 at morning and 4 and 7 at evening). Every time 400 ml nutrient solution was used for 8 minutes. This means that the rate of fertigation was 50 ml / min and each plant obtained 1.600 cm^3 / day. The nutrient solution was pumped from 120 liters tanks with submersible pumps and delivered to plants via calibrated emitters located in each pot one emitter per plant.

The composition of the nutrient solution used in the experiment was described by **El-Behairy (1994)** as shown in **Table (2).** The electrical conductivity (EC) of the nutrient solution was maintained in range 2.5-3.0 m.mhos.cm-1 for each treatment by using digital EC meter and the pH was maintained by using digital pH meter at 5.8-6.0. The pH was adjusted by using a nitric and phosphoric acid mixture (3/1). The nutrient solution was completely renewed twice a week by adding the stocks tap water up to the recognized marked in the tank. The composition of the nutrient solution was represented in **Table (2).**

Table 2. Element concentrations in the nutrient solution

Element	Concentration (ppm) *
N	200
P	70
K	300
Ca	190
Mg	50
Fe	5.0
Mn	1.0
Cu	0.039
Zn	0.044
B	0.17
Mo	0.1

***According to **El-Behairy (1994)**

3.5. Conditioning glasshouse

Glasshouse was conditioned by using Union air apparatus. The apparatus's capacity was three horses power, which working for twenty four hours per day. One glasshouse was conditioned to 29◌̊ C and the other was conditioned to31◌̊C, then the thermostat of the conditioning of the apparatuses sets were adjusted to the aforementioned two temperature degrees.

3.6. Plant Growth parameters:

All growth parameters were measured three times, after 40, 65 and 90 days from transplanting date

3.6.1. Plant height:

Plant height was measured from cotyledon node to the terminal bud three times.

3.6.2. Total leaf area

Total leaf area for all leaves of the plant was measured three times by using a digital portable leaf area meter **(LI-300 area meter produced by LI-COR, Lincoln, Nebraska, USA).**

3.6.3. Number of leaves

Fully expanded leaves were counted and recorded three times.

3.6.4. Total chlorophyll (%)

Total chlorophyll (%) was measured three times, for the recently mature leaf, in the two experimental seasons, using **Minolta Chlorophyll Meter SPAD-501**. Ten leaves were measured from each experimental plot.

3.6.5. Fresh and dry weight (roots, stems and leaves)

Fresh and dry weights of the whole plant were recorded from three plants from each plot, three times in each season. The plants were taken off carefully and fresh weight was determined for roots, stems and leaves, using electronic balance. The plant parts were dried individually at 70ºC in an oven for two days, and dry weight of whole plant was

determined for roots, stems and leaves, by electronic balance.

3.6.6. Total fruit weight and number of fruits

Total fruit weight was calculated as a summation of all the fruit pickings per plant during the season. Fruits were picked four to five times every week. The fruit weight and number of fruits were measured from each experimented plot and the average was estimated **(Hashem *et al.*, 2011**).

3.6.7.Fruit diameter

Fruit diameter was measured by standard role (in cm), at the geometric middle cutter in the cucumber fruit.

3.8. Statistical analysis

Data of the experiment was subjected to proper statistical analysis of variance according to **Snedecor and Cochran (1980).** L.S.D test was used to verify means.

Results and Discussion

4.1 Cucumber growth parameters

4.1.1 Plant height

The Effect of different treatments (shade, 29° C and 31 ° C) on cucumber plant height is shown in **Table 3.** Data showed that ,increasing temperature from 29°C to 31°C and shading treatment, led to significant decreases in cucumber plant heights for all cucumber growth stages (40, 65 and 90 days from transplanting).

On the other hand the highest value was obtained at 29° C treatment for all growth stages, while the lowest one was obtained at 31° **C** treatment.

The statistical analysis revealed that, the differences between the three treatments seem to be significant in the first experimental season **(2006),** but in the second season **(2007)**, there was no significant differences between the treatment 31°C and shading.

These results are in harmony with those of **Barroso *et al*. (1999)**, The present results are in accordance with the investigators **; El-Sayed (2009) and Salman *et al.,*(2005)** who reported that the vegetative growth, i.e., plant height, leaf number ,leaf, fresh and dry weight, early and total yield were improved by using shade, cool/or cladding cover. **El-Gizawy *et al*. (1993), Wadid *et al*. (2000), Hamamoto *et al*. (2000), Adam *et al*. (2002), Liu *et al.* (2002), Kittas *et al*. (2003), El-Dolify (2005), Luo *et al*. (2005), Kittas *et al*. (2009) and Medany *et al*. (2009) came also to such results.**

Table 3. Effect of different temperatures on cucumber plant height (cm).

Treatments	Days after transplanting		
	40	65	90
Temperatures(C°)°	First season(2006)		
29	129.63	172.62	215.34
31	94.88	132.06	169.66
Shade(28)	99.70	137.54	175.41
LSD(at 0.05)	0.43	0.55	0.55
	Second season(2007)		
29	123.65	170.23	212.36
31	93.61	130.34	161.69
Shade(25)	95.10	135.65	172.97
LSD(at 0.05)	3.04	8.95	9.44

Table 4. Effect of different Temperatures on leaves area (cm2)

Treatments	Days after transplanting		
	40	65	90
Temperatures(C°)		First season(2006)	
29	239.23	407.46	487.06
31	218.37	378.09	605.23
Shade(28)	167.40	301.78	625.79
LSD(at 0.05)	0.78	42.28	10.76
		Second season(2007)	
29	236.02	402.16	477.95
31	208.07	373.11	576.91
Shade(25)	159.51	298.42	617.41
LSD (at 0.05)	11.10	40.48	32.26

4.1.2. Leaves area.

The effects of different treatments on cucumber plant leaves area (cm2) were listed at **Table (4).**

It was noticed that increasing of temperature in the greenhouse from 29°C to 31°C and shading, was always accompanied by a reducing of the cucumber plant total leaves area (cm^2), for all growth stages (40, 65 and 90 days from transplanting).

It should be kept in mind that the highest results obtained by 29° C treatment for both of first and second seasons, while the lowest results were recorded by shading treatment.

Apparent manifestations among the treatments were noticed and being significant during the two successive seasons (2006 and2007).

The results were supported by **Pervez *et al.*, (2009),** who found that number of leaves (which had always direct correlation with leaf area) and number of fruit per plant showed significant results toward drought stress, shade and greenhouse temperature.

This view was supported by **Sumathi *et al.* (2008) who** reported that the shade and fertigation had positive influence on growth parameters and anatomical changes of cucumber leaves by modifying the size of cells and a positive sign of increasing the growth. These results are also in harmony with those of **Kittas *et al.* (2009).**

4.1.3 Number of leaves.

Data in **Table (5)**, showed the effect of (shade, 29° C and 31 ° C) on cucumber plant leaves number. It was noticed that increasing of temperature in the glasshouse from 29 to 31 and shading accompanied by a reducing number of cucumber plant leaves, for all growth periods (40, 65 and 90 days from transplanting).

Table 5. Effect of different temperatures on number of leaves.

Treatments	Days after transplanting		
	40	65	90
Temperatures(C◦)		First season	
29	26.66	28.66	30.66
31	21.66	23.66	26.00
Shade(28)	16.66	19.66	22.66
LSD	0.87	0.87	0.43
		Second season	
29	25.41	28.29	30.26
31	21.38	22.55	25.66
Shade(25)	16.45	19.41	21.60
LSD	1.96	1.28	2.15

Data revealed that the highest results were obtained by 29°C treatment for both seasons, while the lowest values were recorded by using shading treatment. Concurrently, at the last growth stage (90 days), data elicited that subsequently increasing for number of leaves**.** Apparent manifestations among the treatments were noticed and being significant during the two studied seasons (2006 and2007). Similarly. The vegetative growth, i.e., number of leaves was improved by using shade, cool/or cladding cover on cucumber plant **(El-Sayed, 2009).**

4.1.4 Chlorophyll content.

Chlorophyll content was affected strongly by the used treatments (shade, 29° C and 31 ° C) as shown in **Table (6).** To shed light upon the relation between the use of different temperatures and the Chlorophyll content, data indicated that increasing of both temperature (29° C to 31°C) and /or growth stages (40, 65 and 90 days from transplanting),always accompanied by a reducing in Chlorophyll content. It should be kept in mind that the highest results were obtained by 29 C treatments for both of first and second seasons, while the lowest values were recorded by shading treatment.

Apparent manifestations among the treatments were noticed and being significant during the two studied seasons. It should be noticed that low intensity of irradiation inside the glasshouse was a significant cause of much lower yielding as compared to un shaded greenhouses **(Janina Gajc *et al*, 2008)** It should be shed light upon that, there was a prospective positive correlation between the fore mentioned (intensity of irradiation during the green house) and the chlorophyll content.

Also **Al-moshileh *et al.* (2003)** reported that the shading under 80% irrigation level gave the highest leaf area of potato plants and chlorophyll content.

4.1.5 Fresh and dry weight of roots (g):

Data in **Table (7)** revealed that increasing temperatures from 29 °C to 31° C and shading treatment, led to a decrease in fresh and dry root's weight. Therefore, the highest figures were obtained by 29° C treatments in the all growth stages, therewithal, the lowest values were obtained by shade treatment in 2006. Similar trend was observed in the second season 2007.

The statistical analysis of the obtained data revealed that, the differences between the treatments were considerable.

The obtained results are in harmony with those of **Boulard *et al.* (1997)**, **Barroso *et al.* (1999)**, who stated that in the countries suffering from high temperature in summer , the glasshouse must be cooled to improve the plant production and cucumber yield (specially with cucumber cultivated from June to September) ,in the cooling compartment , the cooling system was capable of maintaining air temperature below the maximum set point without any need for shading or ventilation , (such as in our experiment , in which using conditioned glasshouse at two stabilized temperatures 29° C and 31° C without shading and or / ventilation). They also added that cooling system increased cucumber yield both in quantity and quality. Also they mentioned that cooling affected plant structure and dry matter partitioning: the dry weight of fruits, leaves, total biomass and harvest index increased, whereas the leaf weight ratio decreased.

They also added that cooling affected dry matter and the dry weight of biomass and leaves. Our results are in agreement with the results obtained by **Janina Gajc *et al* (2008)**, they reported that cucumber fruits obtained from summer cultivation were characterized by the highest content of dry mater (g/100g at 30◌̊C).

Table 6. Effect of different temperatures on chlorophyll content (SPAD)

Treatments	Days after transplanting		
	40	65	90
Temperatures(C◦)	First season(2006)		
29	39.66	38.39	35.78
31	32.89	30.99	27.21
Shade(28)	30.59	27.90	25.51
LSD(at 0.05)	0.09	0.33	0.11
	Second season(2007)		
29	37.83	37.85	35.28
31	31.34	30.58	26.85
Shade(25)	30.19	26.59	25.17
LSD(at 0.05)	2.96	1.39	2.12

Table 7. Effect of different temperatures on fresh &dry weight of roots (g).

Treatments	Days after transplanting					
	40		65		90	
	first season					
Temperatures(C◦)	fresh	dry	fresh	dry	Fresh	dry
29	25.81	5.98	29.05	6.24	32.29	6.47
31	15.84	4.46	19.19	5.09	22.72	5.53
Shade(28)	12.06	4.22	13.95	4.43	15.84	4.43
LSD(at 0.05)	0.14	0.14	0.17	0.32	0.16	0.21
	second season					
29	24.59	5.91	28.66	5.93	31.86	6.39
31	15.09	4.41	18.94	4.85	22.41	5.46
Shade(25)	11.89	4.18	13.29	4.37	15.64	4.21
LSD(at 0.05)	0.95	0.95	1.52	0.54	1.34	0.35

4.1.6 Fresh and dry weight of stems (g):

With respect to the effect of different temperatures on fresh and dry weight of stem (g), data in **Table (8)** revealed that increasing temperatures from 29 ◌̊C to 31 ◌̊C and shading treatment, caused a noticeable decreases in fresh and dry stem's weight. Such statement was assured by reviewing the data, from which the highest results were obtained by 29◌̊ C treatments for all growth stages.

Besides, the lowest values were obtained by using shade treatment at 2006. This trend remained constant in the second season 2007.

The statistical analysis of the obtained data revealed, considerable differences between the treatments..

This view was supported also by **(Salman *et al*.,2005),** who revealed the effectiveness of global solar radiation and air temperature on plant height [length of stem(L.O.S.)],leaf number, leaf fresh and dry weights and early yield.

4.1.7 Fresh and dry weight of leaves (g):

Data in **Table (9)** revealed that increasing temperatures from 29◌̊ C to 31 ◌̊C led to noticeable decrease in fresh and dry weight of leaves.

Some what small changes between shade treatment and 31° C treatment, but with small discrepancy than the discrepancy between 29° C and both of 31° C treatment / or shade treatment. Such statement was assured by reviewing the data, from which the highest figures obtained by 29° C treatments for all growth stages.

Also **Al-moshileh *et al.,*(2003),**reported that the shading under 80% irrigation level gives the highest leaf area of potato plants and chlorophyll content. Therewithal, the lowest value was obtained by 31° C treatment at 2006. This trend remains constant in the second season 2007.

Without prolixity, the statistical analysis of the obtained data revealed that, there was a considerable difference between the used treatments at all different stages of growth.

This view was supported also by **(Salman *et al.*,2005)**, who declared effectiveness of global solar radiation and air temperature on leaf number, leaf fresh and dry weights, plant height [length of stem(L.O.S.)], and early yield.

The cooling system allowed the vents to be kept closed and a high CO2 concentration maintained , except for a few midday house on the hottest summer days .

An *et al* .,(2004) recorded that, an interferences and interacting high relation for : solar light intensity (U.V. permeability),illumination ,cucumber leaf membrane permeability and the plant growth. They stated that all the above affecting leaf area(decreases),dry weight and plant height.

The obtained results are in harmony with those of **Barroso *et al.* (1999)**, and **El-Dolify (2005)**.

Table 8. Effect of different temperatures on fresh and dry weight of stem (g).

Treatments	Days after transplanting					
	40		65		90	
	first season					
Temperatures(C◦)	Fresh	dry	fresh	dry	Fresh	Dry
29	104.25	9.25	120.00	10.21	135.74	11.17
31	50.63	6.68	59.94	7.37	69.27	8.02
Shade(28)	37.27	5.43	47.39	6.28	57.51	7.17
LSD(at 0.05)	0.71	0.16	0.77	0.05	0.84	0.11
	second season					
29	99.34	8.83	118.34	10.06	134.00	11.01
31	49.95	6.61	59.16	7.01	66.01	7.91
Shade(25)	36.77	5.19	46.77	6.18	54.8	7.05
LSD(at 0.05)	4.33	0.34	1.8	0.17	9.12	0.46

Table 9. Effect of different temperatures on fresh& dry weight of leaves (g).

Treatment	Days after transplanting					
	40		65		90	
	first season					
Temperatures(C◦)	Fresh	dry	fresh	dry	Fresh	Dry
29	88.7	11.14	98.77	11.92	108.86	13.40
31	38.76	7.47	29.05	8.59	32.29	10.17
Shade(28)	40.26	7.16	48.63	8.68	58.5	10.41
LSD(at 0.05)	0.57	0.14	0.72	0.19	0.74	0.08
	second season					
29	87.51	11.00	97.48	11.77	103.74	12.75
31	36.94	7.13	28.66	8.46	31.86	10.03
Shade(25)	39.73	7.07	47.77	8.57	59.18	9.91
LSD(at 0.05)	4.02	0.56	5.98	0.52	5.28	0.56

4.2 Cucumber fruit characters and total yield:

Data in **Table (10),** revealed that increasing temperatures from 29° C to 31° C caused noticeable decreases in each of: fruit diameter (cm), fruit fresh weight (g),

With respect to shade treatment, fluctuation appeared as ascending order in all fruit characters and yield than at 31° C treatments.

Such results were assured by reviewing the data in **Table (10)** thereupon; the highest figures were obtained by 29° C treatments for all growth stages. The lowest value was obtained by 31 °C treatments at 2006.This trend remained constant in the second season 2007.

Tazuke and Sakiyama (1986) investigated the effect of temperature in controlled chambers at temperature ranging from 5◦C to 30◦C and they stated that the relative growth rate (RGR) of fruits and fruit volume are almost leniary related to fruit temperature. Thus explaining why always the DOF and NOF were higher in our controlled experiment

(at 29◦C and 31◦C) than at shade green house data reviewing in **Table (10)**

Data in **Table (10)** indicated that, total yield of cucumber fruits was significantly influenced by the studied factors. The highest total yield was resulted significantly from stable greenhouse temperature at 29◦C treatment, in decreasing order, followed by shading and the least one was by Stable greenhouse temperature on 31◦ C.

Such results are in agreement with the results obtained by **Janina Gajc *et al* (2008) ,** who reported that cucumber fruits obtained from summer cultivation were characterized by the highest content of dry mater (g/100g**).**

Cucumber has high climatic demands especially in relation to temperature **(Janina Gajc *et al* ,2008)** .They stated that humidity ,air temperature and UV light intensity are the main factors affecting cucumber crop quality and quantity.

Table 10. Effect of different temperatures on fruit characters and yield

temperatures(C°)	Diameter of fruit(cm) (DOF)		Fruit fresh weight (g/plant)		No . of fruits/ plant (NOF)		Total yield (kg/30 plant)	
Year	2006	2007	2006	2007	2006	2007	2006	2007
29	3.5	3.7	123.3	125.3	20	19	73.980	71.421
31	2.9	2.9	109.4	109.3	12	12	39.384	39.348
Shade(control	3.4	3.3	115.1	112.0	18	17	58.701	60.48
L.S.D.at(0.05)	0.06	0.17	2.16	4.03	0.33	0.58	2.10	3.06

Conclusion

It could be concluded from this study that the application of different temperatures(29◦ C and 31◦ C compared by using theran shading as a control, lead to that , it will be advisable to use conditioned greenhouse at stable 29◦ C , due to it will give the most favorable treatment for all total plants growth parameters such as : plant height , leaves area , number of leaves , chlorophyll content , fresh and dry weight of roots , stems and leaves , element content of the cucumber plant (roots , stems and leaves) , and also improved all cucumber fruit characters and it's total yield such as : fruit diameter ,fruit fresh and dry weight , number of fruit per plant and yield of cucumber. It is very important to use such treatment(29 ◦ C) , under plastic houses during the summer season(specially at June and July months) .

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تأثير درجات الحرارة المختلفة على إنتاج الخيار تحت ظروف الصوب الزجاجيه

رأفت صادق بخيت، مرغنى محمد مرغنى ، محمود عبد الله مدنى ،غاده اسامه رضوان

أجريت هذه الدراسه بالمعمل المركزي للمناخ الزراعى مركز البحوث الزراعيه بالجيزة خلال الموسم الصيفي لعامى 2006 و2007 تحت ظروف البيوت المحميه لدراسة تأثير درجات الحراره المختلفه على نمو وإنتاجية محصول الخيار (***Cucumis Sativus L***) .

وسجلت البيانات بعد 40و65 و90 يوم من الشتل لدراسة تأثيرمعاملات الدراسه (الظل و29 ْم و31ْم) في الصوب الزجاجيه على صفات النمو الخضري من حيث : إرتفاع النبات وعدد الأوراق والمساحه الكليه للورقه والنسبه المئويه للكلوروفيل و الوزن الطازج والجاف للساق والجذر والأوراق ، و سجلت القياسات الثمريه من حيث : عدد الثمار ، وقطر الثمره ،ووزن الثمرة ،وزن الثمار / النبات والمحصول الكلى .

وأظهرت النتائج أن أعلى القياسات تم الحصول عليها عند درجة الحرارة29 ْم من حيث طول النبات ، وعدد الاوراق/ النبات والوزن الطازج والجاف للجذور والسيقان والأوراق ومحتوى الكلوروفيل و قطر الثمرة و الوزن الطازج للثمار و عدد الثمار / النبات والمحصول الكلى للخيار.

ويمكن الاستنتاج من هذه الدراسة أن تعريض نباتات الخيار لدرجه حراره الصوبه الزجاجيه29 ْم له الأفضليه و تليها درجة الحراره 31ْم واقلهم كانت معاملة التظليل. ومن واقع القياسات الاخرى المقدرة فإن الوزن الطازج والجاف للأوراق وطول النبات وقطر الثمرة وعدد الثمار اظهرت النتائج أن الظل كان افضل من استخدام الصوبه الزجاجيه 31ْم .