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# Production of eggplant and pepper yields under surface and subsurface drip irrigation systems in sandy soil

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**Abstract:** Two different drip irrigation systems (surface and subsurface systems); four irrigation rates and two emitter spacings were considered in respect to the production of eggplant and pepper in sandy soil. The highest early yield of eggplant and pepper increased with increasing the irrigation rate under subsurface built in dripline (SSGR) compared with surface on line dripper (SD) and surface built in dripline (SGR). The highest early yield of eggplant and pepper of 1.77 and 1.53 kg/m$^2$ were remarked at 0.3m emitter spacing under $SSGRT_4$, but the lowest values were 0.7 and 0.64 kg/m$^2$ at 0.5 m emitter spacing under $SGRT_1$. Plant production and mass per fruit of eggplant and pepper increased by increasing emitter spacings in the same row from 0.3 to 0.5 m and irrigation rates from $T_1$ (509 and 569 mm/season) to $T_4$(815 and 911mm/season). The highest total yield of eggplant and pepper were 13.63 and 13.17 ton/fed. at 0.3m emitter spacing under $SDT_3$. At the minimum irrigation rates (509 and 569 mm), the total yield (eggplant and pepper) increased at SSGR (8.12 and 6.86 ton/fed.) compared with SGR (7.56 and 6.3 ton /fed.) and SD (7.28 and 6.56 ton/fed.) SGR. The highest values of WUE and YER were 200.33kg/cm of water and 91.82 kg/kW.h for eggplant and 175.84kg/cm of water and 76.32 kg/kW.h for pepper at 0.3m emitter spacing under $SDT_2$ respectively. The minimum costs of unit production were 23.4 and 24.22 LE/ton for eggplant and pepper at 0.3m emitter spacing under $SDT_3$.

## INTRODUCTION

In sandy soil, water resources are sometimes limited. It is extremely important to introduce modern irrigation techniques to save water for cultivating new areas. Surface and subsurface drip irrigation systems are rapidly being developed in the arid regions of the world, with the advantage of saving the amount of irrigation and reducing the effect of salt damage to crop. Subsurface irrigation is the application of water under the soil surface moving by capillary phenomon and gravity into the root zone of the plant.

Yaron et al. (1973) found that the yield of chile peppers obtained under drip irrigation system were 33, 36, 32 , 25 and 7.8 ton/ha. for soil water tensions (cm $H_2o$) equal to 100 , 200 , 250 , 300 and 400 respectively.

Bernstein and Francois (1973) found that the annual bell pepper yield was 34.7 ton/fed.. under drip irrigation.

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Gornat et al. (1976) reported that the yields of pepper under trickle irrigation were 3.7 and 3.8 ton/donum for first and second seasons.

El-Gindy (1984) found that the drip irrigation method increased the pepper yield by 64% over than furrow method with high water use efficiency.

Phene et al. (1987) found that the yield of tomatoes increased by 10.3 and 29.2% in the high and low frequency subsurface drip treatment compared with surface drip treatment and water use efficiency increased by 9% in subsurface drip treatment compared with surface drip treatment.

Awady et al. (1990) found that the water use in electrification treatment increased fruit yield of sweet pepper by 20.16% and the water use efficiency increased from 1.2 to 1.45 kg/m$^3$ compared with tap water under trickle irrigation.

Hanafy and Nasr (1993) found that the highest yield of eggplant was 15.67 ton/fed.. and water use efficiency was 219.8 kg/cm of water for treatment 0.8 ETO. But the lowest values were 6.53 ton/fed. and 80.1 kg/cm of water for treatment 1.4 ETO under drip irrigation.

Gomaa (1996) found that the values of cantalope yield and water use efficiencies were 10, 6 and 4 ton/fed.. and 2.89 , 1.74 and 1.15 kg/m$^3$ under surface drip irrigation and 10 , 8 and 7 ton/fed. and 3.86 , 3.0 and 2.7 kg/m$^3$ under subsurface drip irrigation for first, second and third seasons respectively.

**The objectives of this study:-**

1- Selecting the proper drip irrigation systems (surface and subsurface) for irrigating eggplant and pepper yield under sandy soil conditions.
2- Investigating the effect of irrigation rate and emitter spacing on early yield, total yield production and water use efficiency under the two drip irrigations.
3- Computing the total energy consumption and cost per unit production.

## MATERIALS AND METHODS

The field experiment was conducted in an area of 0.42 feddan at El-Khattara Experimental Farm, Faculty of Agriculture, Zagazig University, Sharkia Gavernorate, to study the response of two drip irrigation systems (surface and subsurface); four irrigation rates and two emitter spacings in the same row on improving the quantity of eggplant and pepper. The experiments were conducted in sandy soil (95.5% sand, 2.0% silt and 2.5% clay). The drip irrigation system included either surface lateral built in dripline (GR system) and on line dripper (vortex emitter). The subsurface lateral built in dripline (GR system) was installed at 15 cm depth from soil surface. The lateral lines were connected to submain lines with a flexible PVC hose above the soil surface ground by 50 mm. The surface and subsurface laterals were used in line turbulent flow emitters (GR system) with a flow rate of 11.4 and 7.8 Lph/m spaced at 0.3 and 0.5 m along the laterals and lateral on line dripper carried orifices 0.3 and 0.5m apart with dripper vortex of flow rate of 3.8 Lph at operating pressure of 0.8 bar. The laterals were spaced at 0.6m from each other, 20m long and 16 mm diameter. The experimental design used was split – split plot, where the drip

irrigation systems (surface and subsurface) were considered as the main plot. The irrigation rates were assigned as subplots. The emitter spacings was taken as the sub – subplots. Each subplot consists of three rows 20m long and 1.8m wide. The total area of the smallest experimental unit was 36 $m^2$. All experimental unit received equal amounts of farm manure (20 $m^3$/fed..), calcium superphosphate (15.5% $p_2O_5$) at rate of 150 kg/fed.. as mixed with the soil before cultivation. Both nitrogen and potassium fertilizers of ammonium sulphate (20.6% N) at rate of 250 kg/fed.. and potassium sulphate (48.5% $k_2O$) at rate of 100kg/fed.. were spilitted and applied at 30 day intervales beginnig 15 day after transplanting.

Seeds were thrown in an open nursery in 20th April 1999. The transplanting process of eggplant and pepper was carried out in 13 May 1999. Emitters were located as one emitter per plant at the two different spacings 0.3 and 0.5m. Four irrigation rates were determined twice a week under two drip irrigation systems for eggplant and pepper. These treatments were percentage of the water consumptive use (ET crop) for eggplant and pepper in the study area which are 679 and 759 mm/season (2852 and 3188 $m^3$/fed.). The treatments are as follows:
$T_1$=75%, $T_2$ = 90%, $T_3$ = 105% and $T_4$ =120% of water consumptive use for eggplant and pepper.

**The treatments are as follows:-**

$SGRT_1$ : Surface built in dripline (GR system) with irrigation rate of $T_1$
$SGRT_2$ : Surface built in dripline (GR system) with irrigation rate of $T_2$
$SGRT_3$ : Surface built in dripline (GR system) with irrigation rate of $T_3$
$SGRT_4$ : Surface built in dripline (GR system) with irrigation rate of $T_4$
$SSGRT_1$ : Subsurface built in dripline (GR system) with irrigation rate of $T_1$
$SSGRT_2$ : Subsurface built in dripline (GR system) with irrigation rate of $T_2$
$SGRT_3$ : Subsurface built in dripline (GR system) with irrigation rate of $T_3$
$SSGRT_4$ : Subsurface built in dripline (GR system) with irrigation rate of $T_4$
$SDT_1$ : Surface on line dripper with irrigation rate of $T_1$
$SDT_2$ : Surface on line dripper with irrigation rate of $T_2$
$SDT_3$ : Surface on line dripper with irrigation rate of $T_3$
$SDT_4$ : Surface on line dripper with irrigation rate of $T_4$

The first harvestings (picking) of eggplant and pepper were carried out at 18th August 1999.

**Irrigation system, irrigation rate and emitter spacing were evaluated using the following:-**

1- Weight of early yield and mass per fruit. 2- Total yield.
3- Water use efficiency by crop (eggplant and pepper) expressed in kg yield per cm of irrigation water. It was calculated according to Begg and Turner (1976) as follows:-

$$WUE = \frac{\text{Total yield (kg/fed.)}}{\text{Total water use (cm/fed.)}}$$

4- Energy consumption

Work is required to lift water out of a well and amount of water delivered per unit time can be related to power by the following formula:

$$Bp = \frac{Q \times H_D \times Y_w}{Ei \times Epx\ 1000}$$

**Where :**

Bp : Brake power (kW)

Q : Discharge ($m^3$/sec)

$H_D$ : Total dynamic head (m)

$E_p$ : Pumps efficiency

$Y_w$ : Water specific weight (9810N / $m^3$)

Ei : Irrigation efficiency

Consumed energy = Brake power X operating hours of irrigation

$$\text{Yield Energy Ratio(YER)} = \frac{\text{Total yield (kg/fed.)}}{\text{Consumed energy (kW.h /fed.)}}$$

## RESULTS AND DISCUSSION

### 1- Effect of irrigation system, irrigation rate and emitter spacing on early yield.

**a- Eggplant**

The data in fig.(1) show that the mean values of early yield increased at SSGR (1.47 and 1.28 kg/$m^2$) compared with SD (1.42 and 1.25 kg/$m^2$) and SGR (1.34 and 1.14 kg/$m^2$) under the two emitter spacings (0.3 and 0.5 m). Increasing the irrigation rate from 509 to 815 mm/season, the early yield increased from 0.9 to 1.69 kg/$m^2$ and from 0.7 to 1.48 kg/$m^2$ at emitter spacings 0.3 and 0.5m under SGR. Increasing the emitter spacing from 0.3 to 0.5 m, the early yield decreased from 1.6 to 1.45 kg/$m^2$ under $SDT_3$.

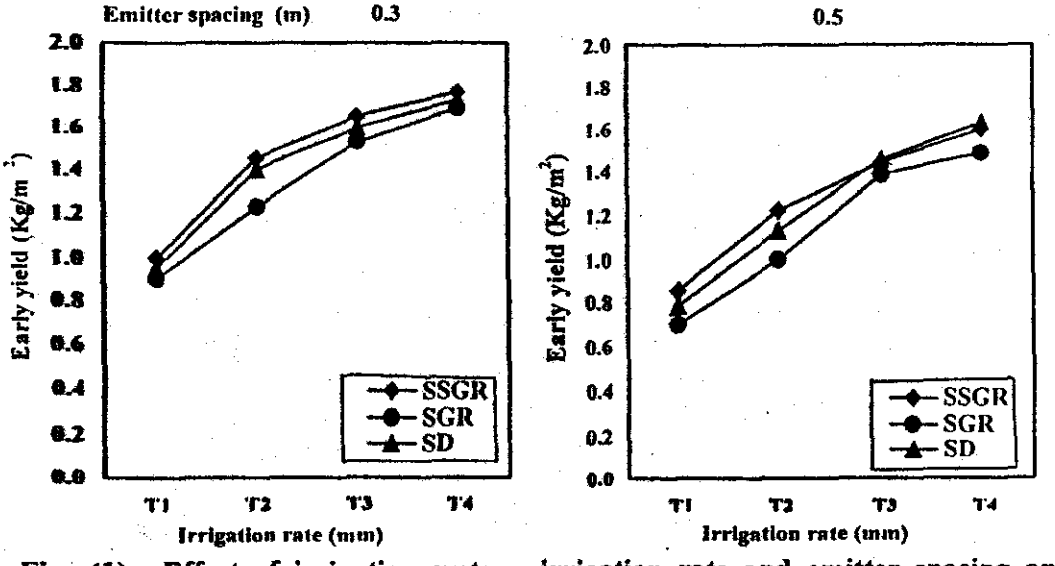


**Fig (1): Effect of irrigation system, irrigation rate and emitter spacing on early eggplant yield.**

The highest early yields were obtained at $SSGRT_4$ of 1.77 kg/m$^2$ at 0.3m emitter spacing, but the lowest value was 0.7 kg/m$^2$ under $SGRT_1$ at 0.5 m emitter spacing.

Early yield of eggplant increased with increasing irrigation rate from 509 to 815 mm/season, at the same emitter spacing under SSGR compared with SD and SGR.

**b- Pepper:**

Data registered in fig. (2) show that the mean values of early yield increased at SSGR (1.30 kg/m$^2$) compared with SD (1.26 kg/m$^2$) and SGR (1.2 kg/m$^2$) under 0.3m emitter spacing. Increasing the irrigation rate from 569 to 911 mm/season, the early yield at 0.3 m emitter spacing increased from 0.82 to 1.42 kg/m$^2$ under SGR. Decreasing emitter spacing from 0.5 to 0.3m, the early yield increased from 1.15 to 1.40; from 1.26 to 1.44 and from 1.21 to 1.42 kg/m$^2$ under $SGRT_3$, $SSGRT_3$ and $SDT_3$ respectively.

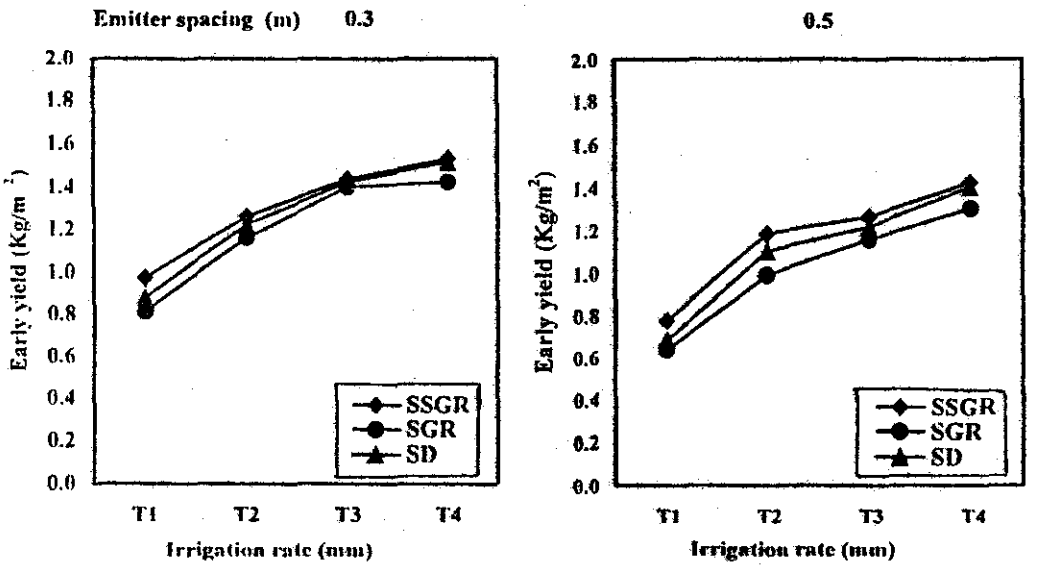


**Fig (2): Effect of irrigation system, irrigation rate and emitter spacing on early pepper yield.**

Early yield of pepper increased with increasing irrigation rate from 569 to 911mm/season at the same emitter spacing under SSGR compared with SD and SGR.

## 2- Effect of irrigation system, irrigation rate and emitter spacing on growth parameters (mass per fruit and plant production)

**a- Eggplant**

It can be noticed from fig.(3) that the mean values of mass per fruit were 109.24,105.94 and 101.24g/fruit for 0.3m emitter spacing and 111.8, 105.5 and 103.89g/fruit for 0.50m emitter spacing under SSGR, SD and SGR respectively.

Increasing the irrigation rate from 509 to 815 mm/season, the mass per fruit increased from 97.3 to 107.6 g/fruit for SGR; from 98.99 to 120.51g/fruit for SSGR and from 94.98 to 116.65 g/fruit for SD under 0.3m emitter spacing. Increasing the emitter spacing to 0.5m, the mass per fruit increased from 96.47 to 104.89 g/fruit for $SGRT_2$.

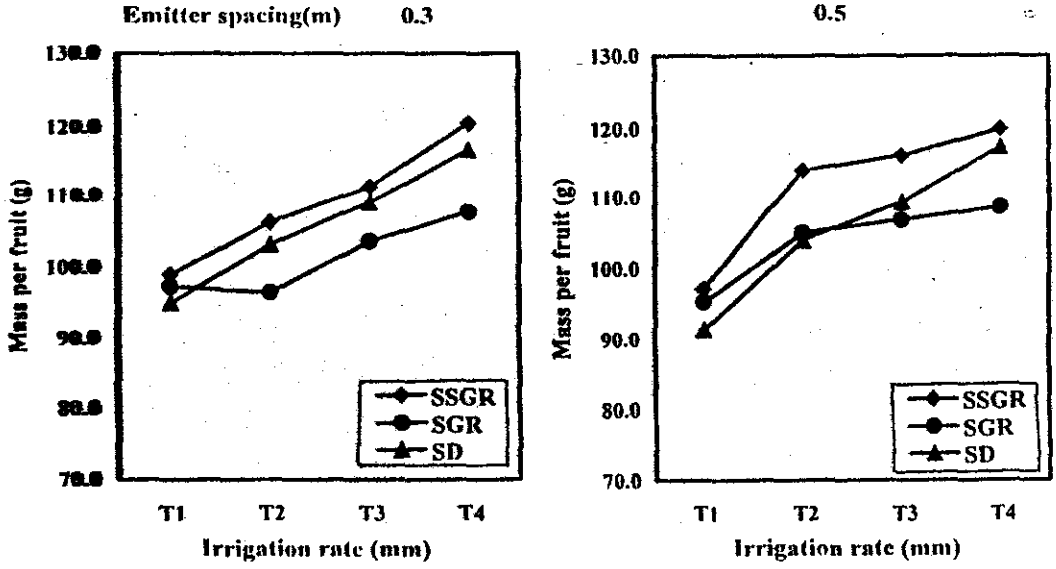


**Fig (3): Effect of irrigation system, irrigation rate and emitter spacing on mass per eggplant fruit.**

Increasing the irrigation rate and emitter spacing, the mass per fruit increased.

The plant production per plant increased by increasing the emitter spacing from 0.3 to 0.5m and irrigation rate from 509 to 713 mm/season. The highest value of plant production of 0.59 and 0.89 kg/plant was obtained at emitter spacings of 0.3 and 0.5m under $SDT_3$, but the lowest value were 0.38 and 0.52 kg/plant under $SDT_1$. This is due to increasing the plant area to let aeration.

**b- Pepper:**

The data in fig. (4) indicate that the mean values of mass per fruit were 14.76, 14.20 and 13.23 g/fruit at 0.3m emitter spacing and 15.32 ,14.99 and 14.75 g/fruit at 0.50m emitter spacing under SD, SSGR and SGR respectively. Increasing irrigation rate from 569 to 911 mm/season, the mass per fruit at 0.3m emitter spacing increased from 12.40 to14.49 g/fruit for SGR; from13.10 to 15.40 g/fruit for SSGR, and from 13.40 to 16.47 g/fruit for SD. When the emitter spacing increased to 0.50m, the mass per fruit increased from 13.29 to15.99 g/fruit for SGR; from 13.69 to 15.97 g/fruit for SSGR and from 13.40 to16.74 g/fruit for SD.

The highest value of plant production of 0.57 and 0.75 kg/plant at 0.3 and 0.5m emitter spacings were obtained under $SDT_3$, but the lowest value were 0.36 and 0.45 kg/plant under $SGRT_1$.

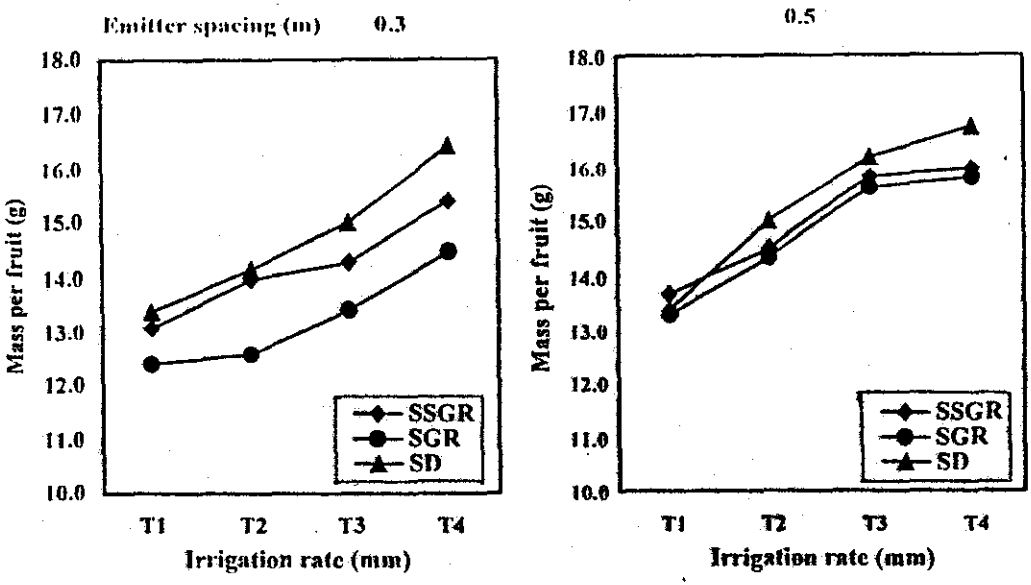


**Fig (4): Effect of irrigation system, irrigation rate and emitter spacing on mass per pepper fruit.**

**3- Effect of irrigation system, irrigation rate and emitter spacing on total yield and water use efficiency.**

a- Eggplant :

Data registered in fig. (5 and 6) show the total yield and water use efficiency under different irrigation rates, emitter spacings and irrigation systems. The mean values of total yield and water use efficiency were 11.11 and 169.97; 11.57 and 177.69

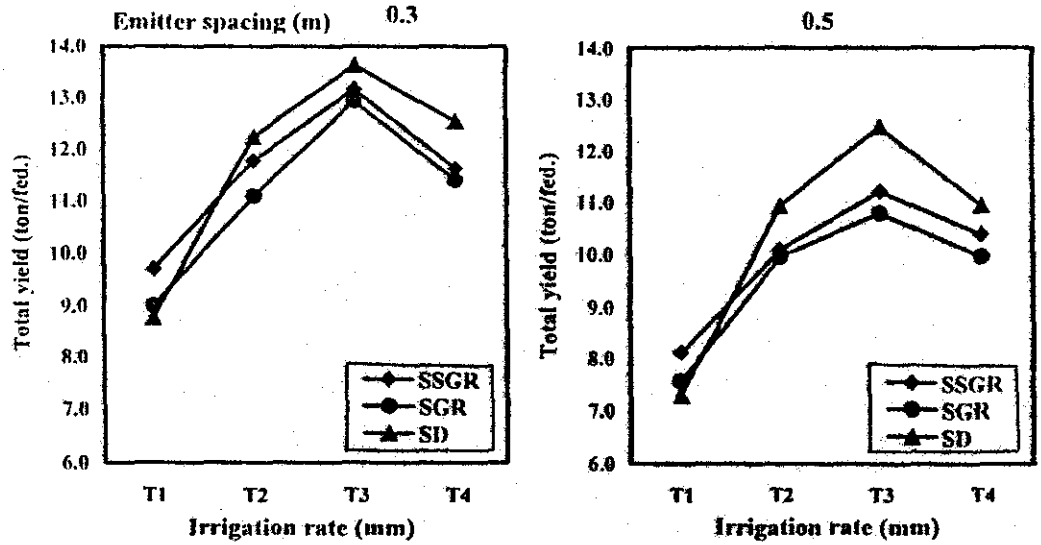


**Fig (5): Effect of irrigation system, irrigation rate and emitter spacing on total yield of eggplant.**

and 11.80 ton/fed. and 179.48 kg/cm of water at 0.3 m emitter spacing and 9.56 and 146.15; 9.95 and 157.16 and 10.40 ton/fed. and 157.69 kg/cm of water at 0.5m emitter spacing under SGR, SSGR and SD respectively. The highest values of total yield at 0.3 and 0.5m emitter spacings were 13.63 and 12.46 ton/fed. for $SDT_3$. Meanwhile the lowest values of production of 8.78 and 7.28 ton/fed. were remarked under $SDT_1$.

At the minimum value of irrigation rate (509 mm/season), the total yield increased at SSGR (8.12 ton/fed.) compared with SGR (7.56 ton/fed.) and SD (7.28 ton/fed.). The average value of total yield increased at 0.3m emitter spacing compared with 0.5m spacing. These results may be attributed to increased number of plants/fed. in case of 0.3m emitter spacing.

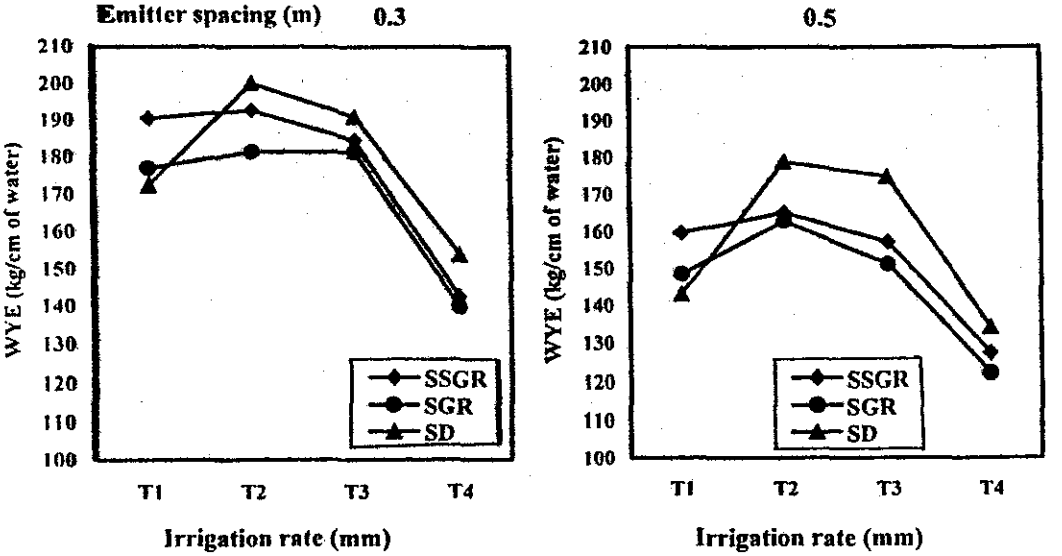


**Fig (6): Effect of irrigation system, irrigation rate and emitter spacing on water use efficiency of eggplant.**

The highest values of water use efficiency at 0.3 and 0.5m emitter spacings were 200.33 and 178.72 kg/cm of water for $SDT_2$, but the lowest values were 139.88 and 122.21 kg/cm of water for $SGRT_4$.

**b- Pepper:**

It can be seen from fig. (7 and 8) that the mean values of total yield and water use efficiency for SD was higher than SGR and SSGR under the two emitter spacings. The mean values of total yield and water use efficiency at SD, SGR and SSGR were 11.32 and 152.97; 10.63 and 143.65 and10.50 ton/fed.. and 141.89 kg/cm of water at 0.3m emitter spacing.

Increasing the irrigation rate from 569 to 797 and to 911 mm/season at 0.5 m emitter spacing, the mean values of total yield increased from 6.30 to 9.80 ton/fed. and decreased to 8.12 ton/fed. for SGR

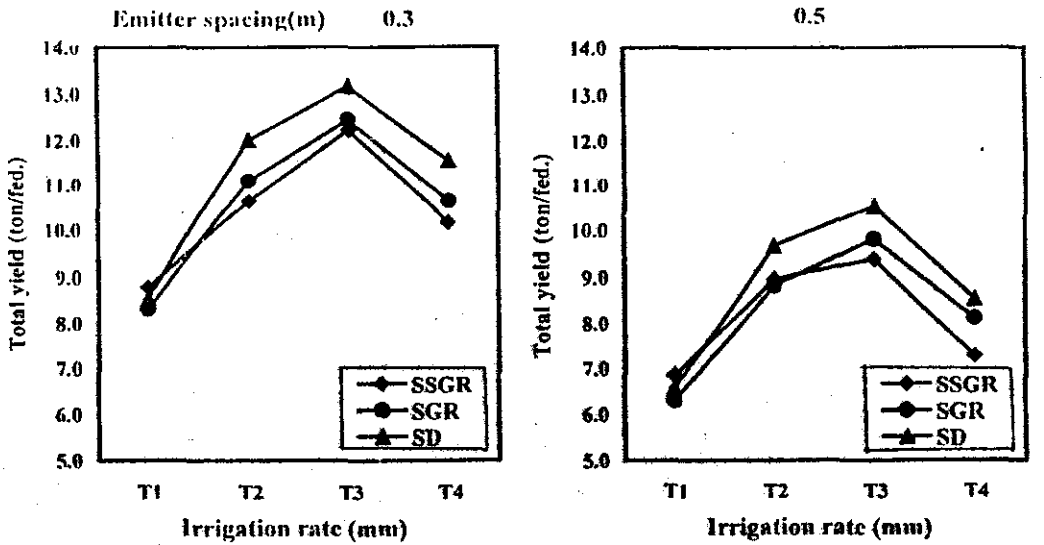


**Fig (7): Effect of irrigation system, irrigation rate and emitter spacing on total yield of pepper.**

The highest values of water use efficiency at 0.3 and 0.5m emitter spacings were 175.84 and 141.44 kg/cm of water for $SDT_2$, but the lowest values were 107.06 and 76.71 kg/cm of water for $SSGRT_4$.

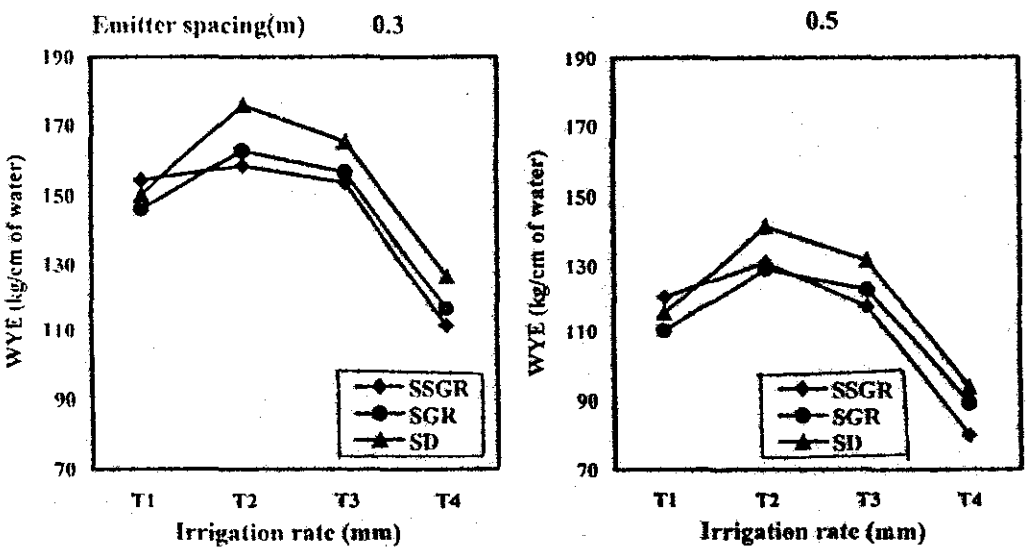


**Fig (8): Effect of irrigation system, irrigation rate and emitter spacing on water use efficiency of pepper.**

**4- Energy consumption:**

Data in fig. (9) show that the mean values of yield energy ratio (YER) for eggplant increased at SD (82.25 and 72.18 kg/kW.h) compared with SSGR (81.43 and 69.48 kg/kW.h) and SGR (77.88 and 66.71 kg/kW.h) under the two emitter

spacings (0.3 and 0.5m). It was remarked that the maximum values of (YER) for eggplant of 83.15, 88.27 and 91.82 kg/kW.h, at 0.3m emitter spacing and 74.66, 75.71 and 81.80 kg/kW.h at 0.5 m emitter spacing were required under $SGRT_2$, $SGRT_2$ and $SDT_2$. Meanwhile, the minimum values were 64.09, 65.4 and 0.59 kg/kW.h, at 0.3m emitter spacing and 55.68, 58.03 and 61.61 kg/kW.h, at 0.5m emitter spacing under $SGRT_4$, $SSGRT_4$ and $SDT_4$ respectively.

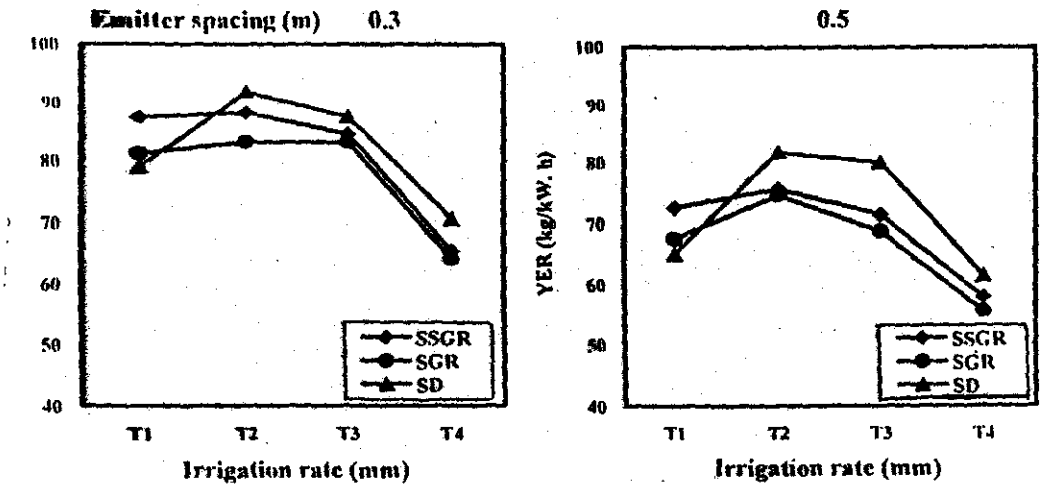


**Fig (9): Effect of irrigation system, irrigation rate and emitter spacing on yield energy ratio of eggplant.**

Data in fig. (10) show that the highest values of (YER) for pepper of 76.32, 70.49 and 68.28 kg/kW.h at 0.3m emitter spacing were remarked under $SDT_2$, $GRT_2$ and $SSGRT_2$. Meanwhile, the lowest values were 38.99, 34.96 and 41.31 kg/kW.h, at 0.5m emitter spacing under $SGRT_4$, $SSGRT_4$ and $SDT_4$.

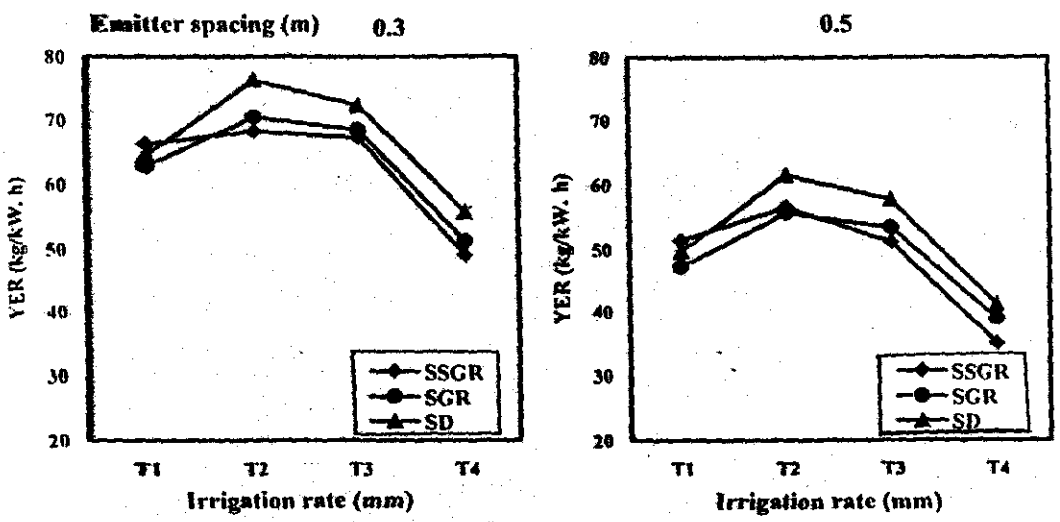


**Fig (10): Effect of irrigation system, irrigation rate and emitter spacing on yield energy ratio of pepper.**

**5- The cost of unit production:**

Data registered in fig. (11 and 12) showed that the minimum values of cost of unit production for eggplant and pepper of 23.40 and 24.22 LE/ton, at 0.3m emitter spacing and 25.6 and 30.38 LE/ton, at 0.5m emitter spacing were obtained under $SDT_3$.

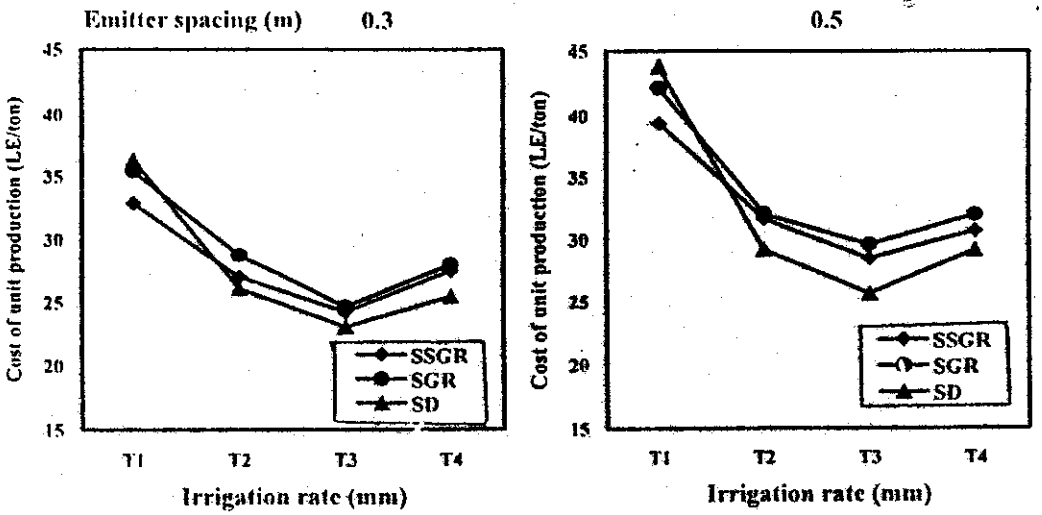


**Fig (11): Effect of irrigation system, irrigation rate and emitter spacing on cost of unit production of eggplant.**

Meanwhile, the maximum values of 36.33 and 38.34 LE/ ton, at 0.3 m emitter spacing and 43.82 and 50.64 LE/ton, at 0.5m emitter spacing were remarked under $SDT_1$ and $SGRT_1$.

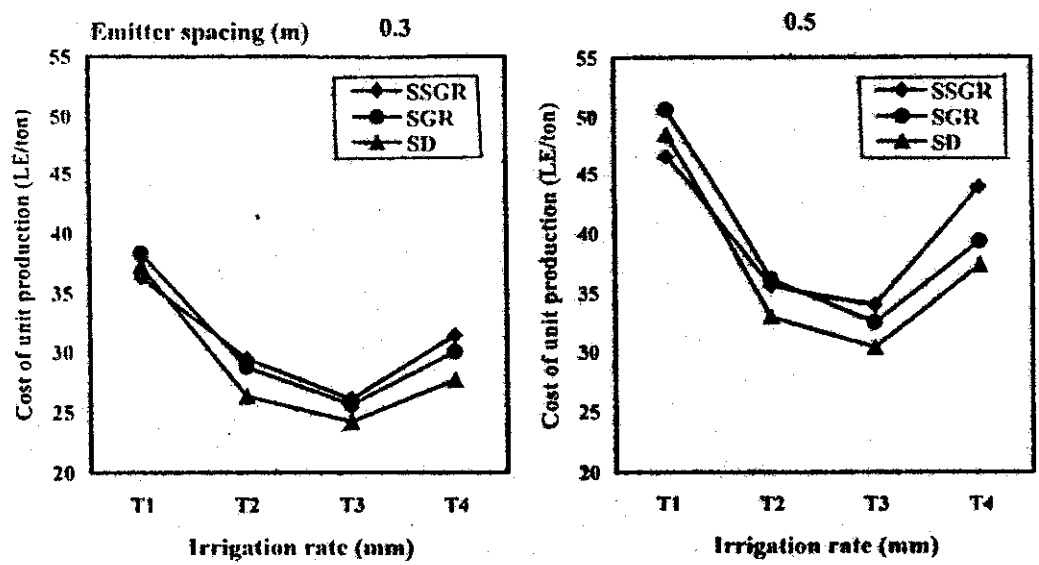


**Fig (12): Effect of irrigation system, irrigation rate and emitter spacing on cost of unit production of pepper.**

## Summary and Conclusions

This study was carried out to evaluate the effect of irrigation system, irrigation rate and emitter spacing on early yield, total yield production of eggplant and pepper, energy consumption and costs of unit production.

The results obtained can be summarized as follows:

1- Subsurface drip irrigation gave the highest early yield of eggplant and pepper compared with surface drip irrigation, the average values of early yield at 0.3m emitter spacing were 1.47, 1.42 and 1.34 kg /$m^2$ for eggplant and 1.30, 1.26 and 1.2 kg/$m^2$ for pepper under subsurface built in dripline (SSGR), surface on line dripper (SD) and surface built in dripline (SGR).

2- Surface on line dripper with the irrigation rates of 713 mm/season (eggplant) and 797mm/season (pepper) gave the highest yield production were 13.63 and 13.17 ton/fed. compared with subsurface built in dripline (13.17 and 12.24 ton/fed.) and surface built in dripline (12.94 and 12.47 ton/fed..) under 0.3 m emitter spacing.

3- The highest values of water use efficiency and yield energy ratio at 0.3m emitter spacing were 200.33, 192.82 and 181.51 kg/cm of water and 91.82, 88.27 and 83.15 kg/kW.h for eggplant and 175.84, 158.42 and 162.37 kg/cm of water and 76.32, 68.28 and 70.49 kg/kW.h for pepper under $SDT_2$, $SSGRT_2$ and $SGRT_2$ respectively.

4- The minimum values of costs per unit production was 23.40 and 24.22 LE/ton at 0.3 m emitter spacing for eggplant and pepper under $SDT_3$.

Finally, it could be concluded that, under similar conditions, using surface on line dripper system and irrigation rate of 611 mm/season for eggplant and 683mm/season for pepper at 0.3m emitter spacing may be recommended for achieving the best early yield, total yield, high water use efficiency, high yield energy ratio and minimum costs of unit production.

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## إنتاج محصولى الباذنجان والفلفل تحت نظامى الرى بالتنقيط السطحى وتحت السطحى فى الأرض الرملية

* السادات إبراهيم عبد العال

تعتبر كمية مياه الرى المحدد الرئيسى لأى سياسة للتوسع الزراعى الافقى فى مصر لذا كان من الضرورى ترشيد استخدام مياه الرى والعمل على رفع كفاءة الرى لذلك اتجه التفكير فى هذا البحث إلى دراسة مدى استجابة محصولى الباذنجان والفلفل عند إضافة معدلات رى مختلفة بهدف اختيار أنسبها لكل من المحصولين من خلال نظامى الرى بالتنقيط السطحى وتحت السطحى ، مع أنسب مسافة بين النقاطات فى نفس الصف .

فقد تم استخدام ٤ معدلات رى لكل محصول من المحصولين فى الموسم وهى :

$T_1$ (٥٠٩مم) ، $T_2$ (٦١١ مم) ، $T_3$ (٧١٣ مم) ، $T_4$ ( ٨١٥مم/ موسم ) لمحصول الباذنجان ، $T_1$ (٥٦٩مم) ، $T_2$ (٦٨٣مم) ، $T_3$ (٧٩٧مم) ، $T_4$ (٩١١مم/موسم) لمحصول الفلفل مع اختيار مسافتين بين النقاطات هما ٠,٣ – ٠,٥ متر .

وقد أوضحت نتائج الدراسة ما يلى :

تزداد كمية المحصول المبكر من الباذنجان من ١,٠٠ إلى ١,٧٧ كج /م٢ والفلفل من ٠,٩٧ إلى ١,٥٣ كج/م٢ بزيادة معدل الرى من ٥٠٩ إلى ٨١٥ مم/موسم للباذنجان ، ومن ٥٦٩ إلى ٩١١ مم/موسم للفلفل مع نظام الرى بالتنقيط تحت السطحى مقارناً بالرى السطحى وذلك عند مسافة ٠,٣ م بين النقاطات.

يزداد متوسط إنتاج النبات الواحد لمحصولى الباذنجان والفلفل من ٠,٥ إلى ٠,٧١ كج ، ومن ٠,٤٥ إلى ٠,٥٨ كج ووزن الثمرة من ١٠٩,٢٤ إلى ١١١,٨ جرام ، ومن ١٤,٢ إلى ١٤,٩٩ جرام بزيادة

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المسافة بين النقاطات من ٠,٣ إلى ٠,٥ م مع نظام الرى تحت السطحى وذلك لزيادة المساحة التى يشغلها النبات .

أعطى نظام الرى بالتنقيط باستخدام النقاطات (surface on line dripper ) أعلى كمية محصول نهائى من الباذنجان والفلفل وهى ١٣,٦٣ ، ١٣,١٧ طن/فدان مع استخدام معدل رى $T_3$ (٧١٣ ، ٧٩٧مم/موسم) على مسافة ٠,٣ م بين النقاطات مقارنة بالمسافة ٠,٥ م (١٢,٤٦ ، ١٠,٥ طن/فدان) وذلك لزيادة عدد النباتات فى الفدان . كما أوضحت الدراسة أعلى قيمة لكفاءة استخدام المياه ٢٠٠,٣٣ ، ١٧٥,٤٨ كج/سم ونسبة المحصول إلى الطاقة ٩١,٨٢ ، ٧٦,٣٢ كج/كيلووات. ساعة لمحصولى الباذنجان والفلفل تحت المعاملة $SDT_2$ مع مسافة ٠,٣ م بين النقاطات لكل منهما على الترتيب. وبالنسبة لتكاليف إنتاج الطن من المحصولين كانت أقل تكاليف لإنتاج الطن ٢٣,٤ ، ٢٥,٦ جنيه لمحصول الباذنجان ، ٢٤,٢٢ ، ٣٠,٣٨ جنيه لمحصول الفلفل تحت المعاملة $SDT_3$ عند مسافة ٠,٣، ٠,٥ م بين النقاطات على الترتيب .

ولذلك توصى الدراسة باستخدام نظام الرى بالتنقيط باستخدام النقاطات ( surface on line dripper) بمعدل رى ٦١١مم/موسم لمحصول الباذنجان ، ٦٨٣ مم/موسم لمحصول الفلفل على مسافة ٠,٣ م بين النقاطات للحصول على أعلى محصول مبكر ونهائى وأعلى كفاءة لاستخدام المياه ونسبة المحصول إلى الطاقة مع اقل تكاليف لإنتاج الطن من المحصولين .