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MAXIMIZING THE PRODUCTIVITY OF LIMON CROP UNDER THE INFLUENCE OF WATER MANAGEMENT AND DIFFERENT IRRIGATION SYSTEM IN BADR CITY

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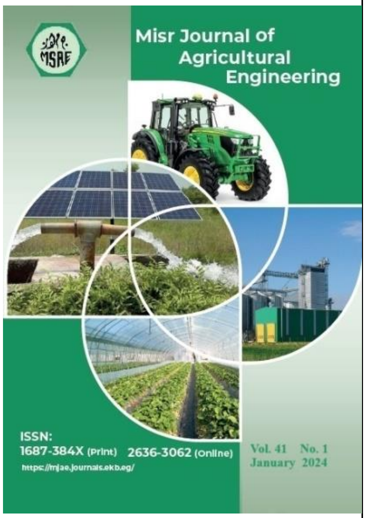

Keywords:
Limon; Badr city; Drip; Bubbler; Travelling sprinkler.

ABSTRACT

The entire experimental field was located in Limon farm in Badr City, EL Buheira, in Egypt at 30°40'49.8"N 30°33'27.3"E. These treatments attempt to maximizing the productivity of limon crop, and investigate the impact of pressurized irrigation methods utilized on cultivated plants. The experiment was designed using a drip irrigation system (inline drip hosses 8 l/h, a circle with a flow rate 120 l/h (15 Drippers)) and a bubbler irrigation system (Bubbler 110 l/h) at 100% and 80% water requirement. A total plot area of 216 m² for drip and bubbler irrigation systems was selected, carried out the experiments, and divided into twelve submain plots, each with its own area of (6×6) m², and comparing them to the current irrigation system (travelling sprinkler), which 's area of Plot (12×12) m². Three types of emitters were used: an inline dripper (8 l/h), Bubbler 110 l/h, and impact sprinkler ¾" flow rate 1580 l/h. Results indicated that the flow rates for emitters (dripper, bubbler) were (6.8, and 104.8) L/h, respectively. Emission uniformity was (93.98% – 97.53%), respectively. The cumulative clogging ratio ranged between of (0.8, 16.47), and (0.42, 6.92), respectively. The best productivity was 11.37 ton/fed/year when using a drip irrigation system with a 100% water requirement, and the lowest productivity was 7.55 ton/fed/year when using a sprinkler irrigation system. The total cost of constructing an irrigation network per fed was 25550 L.E. for the drip irrigation system, 25774 L.E. for the bubbler irrigation system, and 12415 L.E. for the sprinkler irrigation system.

INTRODUCTION

Limon is considered one of the important types of Egyptian Citrus, as the area cultivated with limon in Egypt reached about 42,705 fed., and its annual production is estimated at about 338 thousand tons. The amount of Egyptian exports amounted to about 159 thousand tons **(FAO, 2021).** The total area cultivated with salty, fruitful Limon in Buheira Governorate amounted to 16,500 fed. This area is divided into lands inside the valley with an area of 3309 fed including Al-Dalanjat, Hosh Issa, and Kom Hamada, and outside the valley, its area is 13191 fed, representing about 79.95% of the total area cultivated with limons within the governorate, including West Nubaria, Al-Bustan, Bard City, and Wadi Al-Natrun City, where the area was (4648, 4240, 4103, and 200) fed, respectively **(Hisham et al, 2021).**

Previous studies confirmed that citrus fruits are one of the main sources of VC for humans and that citrus fibers have better functional properties than dietary fibers from other sources such as grains **(Zhang et al., 2020),** and it is known that having citrus fruits contributes to reducing the risk of cancer, cardiovascular disease, and diabetes. The World Health Organization also encourages the provision of high-quality products to the markets of developed countries **(Joanna Lado et al., 2018).**

The Christiansen uniformity **(Christiansen, 1942)** (CU) is used to evaluate sprinkler uniformity. requires that CU be no less than 85% for a traveling sprinkler system or 75% for a fixed sprinkler irrigation system. It is one of the most important factors in designing a sprinkler system that affects crop productivity. Therefore, the researchers focused on calculating the spray uniformity value to improve the accuracy of water distribution**.** Researchers identified factors affecting the standardization coefficient, including environmental factors (wind, temperature, geomorphology, etc.) and controllable internal factors (system characteristics, working pressure, nozzle spacing and layout, etc.) **(Hia et al., 2007),** and crop yield is significantly affected by the redistribution of water in the soil rather than the uniformity of the sprinkler **(Yan et al., 2020).**

The use of drip irrigation systems leads to an increase in water use efficiency of 60-200%, water savings of 20-60%, fertilizer savings of 20-33%, and crop production with higher quality and increased economic return (7-25%) compared to conventional irrigation **(Kaushal et al., 2012).**

The regular distribution of water affects the variation in the amount of water that reaches the plant from the uniformity coefficient values (CU). An irrigation system with an efficiency of not less than 85% is considered suitable for the standard design requirements**.** However, the distribution uniformity (DU) and the uniformity coefficient (CU) are functions of the hydraulic head and slope of lateral and submain lines. The coefficient of uniformity generally follows a linear relationship either with head or slope. The CU and DU decrease substantially at sub-main slopes steeper than 30% **(Ella et al., 2009).**

The effect of three different irrigation methods (bubbler, basin, and sprinkler) on the response of date palm was studied. it was found that the bubbler irrigation system was the best, followed by basin irrigation, then sprinkler irrigation, and there was an expansion in growth with an increment in water **(Ibrahim YM et al., 2019).**

According to (**Ahmed & Jamal, 2019**), the bubbler irrigation system consumes 24,288 m^3/h which saves 9000 m^3/h compared to the flood irrigation system, and the surface drip irrigation system consumes 19,946 m^3/h which saves 4,332 m^3 compared to the bubbler irrigation system over a year. The drip irrigation system saves water by 18% compared to the bubbler irrigation system.

The aim of the research:

1- Optimizing the available open water resources (Nubaria Canal).

2- Rationalizing water usage in modern irrigation systems (sprinkler irrigation, localized irrigation (drip irrigation system, bubbler irrigation system)).

3- Increasing the yield of the limon crop in Buheira Governorate.

MATERIALS AND METHODS

All experimental fields were located at a farm at El- Nagah village, Badr Center, EL Buheira Governorate in Egypt, at 30°40’49.8” N and 30°33’27.3”E. Laboratory experiments were carried out in the Irrigation Laboratory, Agriculture Engineering Department, Faculty of Agriculture, Ain–Shams University. Shoubra El-Khaima, Qalyubia Governorate. Experiments were conducted when the wind speed was 15 km/h, the direction was north-west, the relative humidity was 75%, and the temperature was 35˚C. It was conducted from October to March.

A. *The materials.*

1- Soil analysis.

Soil samples were taken at depths (0:20), (20:40) and (40:60) cm to carry out some physical and chemical properties, soil physical and chemical properties were presented in table (1,2).

Table (1): Some physical properties for soil.

Depth, cm	Texture	Bulk density, g/cm^3	Field capacity, %	Wilting point, %	Available water, %
0-20	sandy	1.32	12.8	7.2	5.6
20-40	sandy	1.32	8.24	3.9	4.34
40-60	sandy	1.34	5.6	3.2	2.4

Table (2): Some chemical characteristics for soil.

Depth, cm	EC (DS/m)	TDS (ppm)	Cations				Anions			
			Ca^+	Mg^{2+}	Na^+	K^+	Cl^-	$CO_3^=$	HCO_3^-	$SO_4^=$
0:20	0.33	211.2	1.6	0.8	0.6	0.3	2	0	1	0.3
20:40	0.31	198.4	1.4	0.8	0.6	0.3	1.8	0	1	0.3
40:60	0.36	23.4	1.6	1	0.7	0.3	2	0	1.4	0.2

2- Irrigation water analysis.

The Nubaria Canal water was used for irrigation, A water sample was taken to carry out some chemical properties, which are presented in Table (3).

Table (3): Some chemical Characteristics of water.

EC (DS/m)	PH	Cations				Anions				Micro			
		Ca^{2+}	Mg^{2+}	Na	K^+	Cl	$CO_3^=$	HCO_{3-}	$SO_4^=$	Fe	Zn	Mn	Cu
0.48	7.8	0.8	2.2	1.6	0.2	2.4	0	2	0.4	0	0	0	0

3- Irrigation network.

- U.P.V.C Pipes 110mm – 10 bar for mainline pipes, 63mm -10 bar for riser of valves pipes, and 32mm – 10 bar for lateral pipes.
- Polyethylene (P.E.) hoses, outer diameter 16 mm.

- (P.E.) Dripline, outer diameter 16 mm, wall thickness 40 ml, discharge 8 l/h.
- Pressure-compensating full-circle bubbler, inlet 1/2” female pipe thread, flow is not adjustable for increased vandal resistance, and operating range (flow: 110 l/h).
- Impact sprinkler ¾”, Nozzle diameter 4.5mm × 2.3 mm, discharge 1584 l/h.
- Flow meter, discharge rate 3:20 m^3/h, operating pressure 16 bar and maximum, permitted error ± 2%.
- Y-type screen desk filter ¾” male thread connection, 120 mesh/130micron, range flow rate 4:6 m^3/h.

4- Plant.

Limon (*Citrus aurantifolia L.*) it is a perennial tree up to 50 years old with more than 100 of years lasting greenery. It is grafted on the sour orange tree due to its strong resistance to gum disease and root rot. The tree seldom grows more than 5 meters high and, if not pruned, becomes shrublike. Its branches spread and are irregular, with short, stiff twigs, small leaves, and many small sharp thorns. The evergreen leaves are pale green, and the small white flowers are usually borne in clusters. The fruit is usually about 3 to 4 cm in diameter, oval to nearly globular in shape, often with a small apical nipple, and the peel is thin and greenish yellow when the fruit is ripe. The pulp is tender, juicy, and yellowish green in color, and the number of lobes range from 9–10 lobes. The seeds in the fruit are 4–6 seeds, and the fruit is juicy and its acidity is 7-9%. It was planted at a distance of 6m×6m.

Fig. 1: Limon (*Citrus aurantifolia L.)*

B. The methods and calculations.

Measurements were recorded twice a month for six months of irrigation system and calculated once for plants and soil at the end of the experiment (six months).

1. Measurements for localized irrigation system.

Efficiency of any localized system depends on the emitters chosen, and is affected by some characteristics as:

1-1 Measuring of discharge (Q).

Discharge was measured taken water which collected in catch cans under different pressures (75, 100, 150-, and 200) kPa for calibration.

1-2 Emission uniformity (EU).

To calculate emission uniformity (EU) the following formula was used (**Keller and Karmeli, 1974):**

$$EU = 100.\ (q_{n} / q_{a}) \ldots\ldots\ldots.. (1)$$

Where:

EU = Emission uniformity, %.

q_n = Average low quarter of flow rate of the data emitter, l/h.
q_a = Average flow rate of all the data emitter, l/h.

1-3 Manufacturing coefficient (CV).

The following formula was used to calculate manufacturing coefficient (CV) (**ASAE, 1998**):

$$CV = Sd/q_n \quad \text{..........} (2)$$

Where:
CV = Manufacturing coefficient.
Sd = Standard deviation, l/h.
qa = Average flow rate of all the data emitter, l/h.

When: $$Sd = \sqrt{\frac{q_1^2 + q_2^2 + q_3^2 + \text{.........} q_n^2 - n q_a^2}{n-1}} \quad \text{.........(3)}$$

1-4 Sensitive for clogging.

Emitter nozzles were designed with a diameter ranging from (0.25mm - 2.5mm) and this resulted in clogging. (**Al-Amoud, 1997**).

The following formula was used to calculate clogging ratio:

$$(\frac{q_1 - q_2}{q_1}) \times 100 \quad \text{.........} (4)$$

Where:
q_1 = Average flow rate at start up operating, L/h.
q_2 = Average flow rate at the end operating, L/h.

2. Measurements of sprinkler irrigation system.

2-1 Coefficient of uniformity (CU) calculation.

To calculate coefficient of uniformity (CU) was used Christiansen's formula as the following:

$$CU = 100 \left[1 - \frac{\sum(X - \bar{X})}{n \bar{X}}\right] \text{...} (5)$$

Where:
CU = Coefficient of uniformity, %.
X = Precipitation rate at every point, mm/h.
$\bar{X}$ = Average precipitation rate, mm/h.
n = Number of points.

2-2 Precipitation rate (Rs), mm/h calculation.

To calculate Precipitation rate (Rs) the following formula was used:

$$Rs = \frac{q}{Sm * Sn} \quad \text{..........} (6)$$

Where:
Rs = Precipitation rate, mm/h.
q = Discharge of sprinkler, l/h.
Sm = Distance between the lines of sprinklers, m.
Sn = Distance between sprinklers on the line, m.

When using catch cans, water was not collected because of the density of tree leaves. Therefore, square cans were manufactured with dimensions 1m×1m to cover the largest possible area for water collection to conduct the experiment, as shown in Figure (2). The distance between the sprinklers was 12m ×12m, the distance between cans was 4m, and the number of cans was 9 cans.

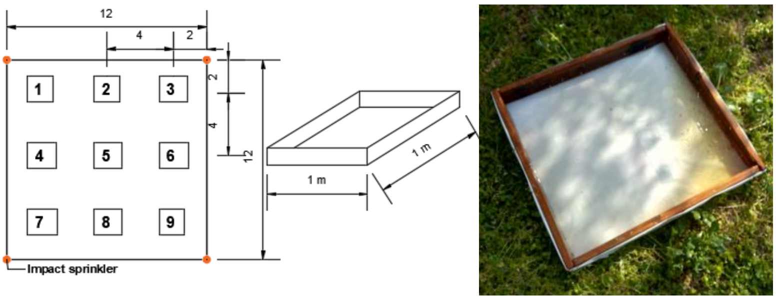

Fig. (2): Distribution catch cans design.

In table 4 indicate that Precipitation rate was 12mm/h and Coefficient of uniformity was 72.8%.

Table (4): The amount of water collected in the precipitation rate calculation experiment.

Number of cans	1	2	3	4	5	6	7	8	9	Total	Average
precipitation rate, mm/h	5.07	7.31	18.64	12.28	11.85	15.17	13.7	14.98	9.15	108.15	12.02
Absolute deviation	6.95	4.71	6.62	0.26	0.17	3.15	1.68	2.96	2.87	29.37	3.26

C. ***Experimental design.***

A total plot area of 216 m² for drip and bubbler irrigation systems was selected, carried out the experiments, and divided into twelve submain plots, each with its own area of (6×6) m², and comparing them to the current irrigation system (travelling sprinkler irrigation system), which 's total plot area of 432 m², and divided into three submain plots, each with its own area of (12×12) m².

1- Experiments variables.

a. Irrigation networks (drip line **(D.I.S)**, bubbler **(B.I.S)**, and impact sprinkler(control) **(S.I.S)**).
b. Water requirements **(W.R)** (100% of requirements (43 m³/ fed / season) – 80% of requirements (34.4 m³/ fed/ season)).

2- Experimental treatments.

- Water is transmitted to the system through the mainline of UPVC pipes outside diameter 110mm to the lateral lines of UPVC pipes outside diameter 32mm to the emitters (drip line (circle with a length of 8m-120 l/h), bubbler 110 l/h).
- Where the final exits in the network of irrigation system were installed, an irrigation system area of 216m² was installed at the experimental site and divided into six plots; the area of each part is 6×6 m².
- Sprinkler irrigation system water is transmitted to the system through the mainline of UPVC pipes outside diameter 110mm to Polyethylene hoses 1" to the impact sprinkler, 3/4" Flow rate: 1584 l/h, distance between sprinklers: 12m ×12 m as shown in Fig (3).

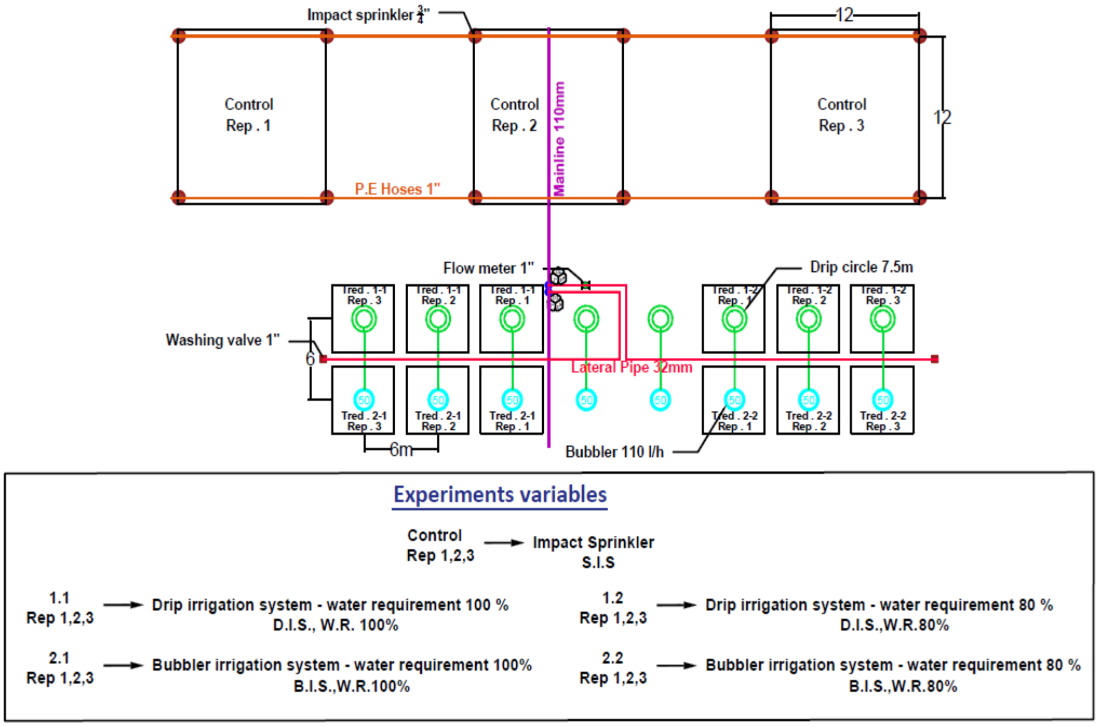

Fig. (3): The prototype of design for experiment.

D. Cost study.

A model was made for an irrigation network for the area of the farm in which the experiment was conducted, 5 fed for each irrigation system used (impact sprinkler, drip, and bubbler) to compare the construction cost of each system, and this cost included: (main line pipes, lateral pipes, desk filters, flow meter, fertilization unit, valves (isolation, control, and washing), emitters (impact sprinkler, dripline hoses, and Bubbler), and (all items, including all fitting needs for installation.).

E. Measurements for Cultivated plants.

It was measured productivity by the crop/fed/year, were measured at the end of the experiment by using different irrigation system used in the experiment and compare with control.

RESULTS AND DISCUSSION

Results of localized irrigation system.

1. Calibration emitters.

The relationship between pressure (KPa) and flow rate (l/h) at (25-26°C) as shown in Figures 4(a, b, c), showed an increase in flow rate by increasing pressure, where at 100 KPa the values of flow rate for emitters (inline drippers 8 l/h, and bubblers110 l/h) were (7.66, and 109.81) l/h, respectively. And when pressure increased to 200 KPa, flow rate increased to (11.46, 117.82) l/h, respectively. For impact sprinkler at 150 Kpa, flow rate was 1170 l/h, and when pressure increased to 300 KPa flow increased to 1759 l/h.

The result of the field experiment to analyze the drip hydraulic performance showed that the rate of discharge increases with the increase in the pressure of the distributors and the coefficient of difference increases with the decrease in pressure, which this means that the pressure directly affects the rate of discharge of the distributors, **(Pranav Mistry et al., 2017).**

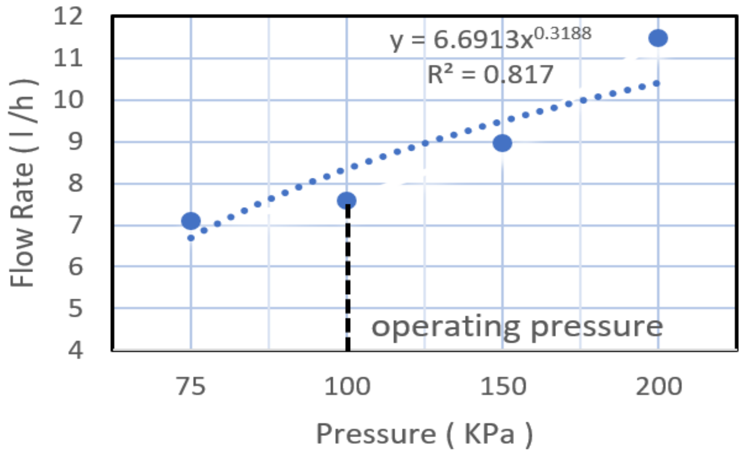

Fig. (4a): Relationship between pressure and flow rate of drippers.

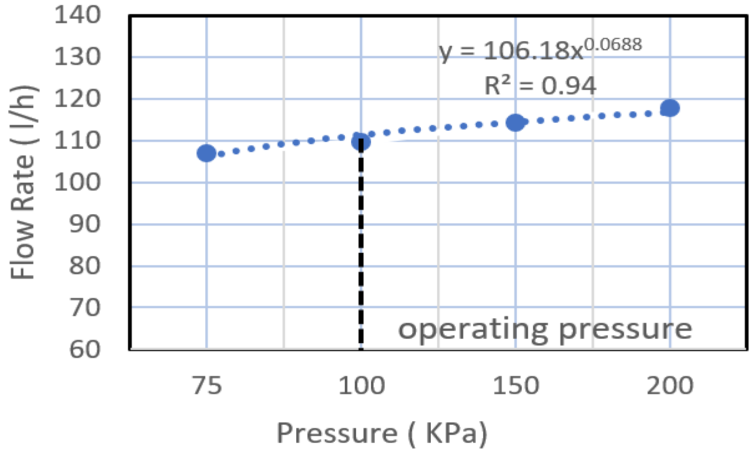

Fig. (4b): Relationship between pressure and flow rate of bubblers.

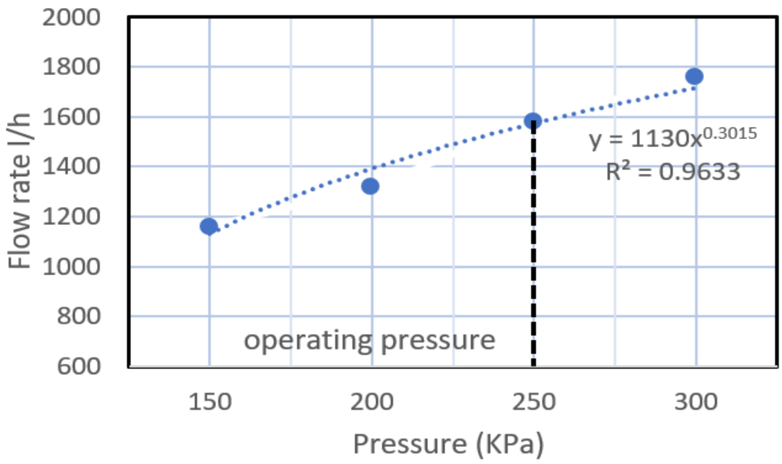

Fig. (4c): Relationship between pressure and flow rate of impact sprinkler.

2. <u>Manufacturing coefficient (CV).</u>

Figure 5 (a, b) describes the manufacturing coefficient (CV) which ranged between (0.028, 0.077) for drippers, (0.015, 0.04) for bubblers, and (0.046, 0.081) for impact sprinklers. This disparity in the value of (CV) for self-emitters is due to the materials used in manufacturing.

For the limits of manufacturing coefficient, the result showed that the best limits for the operation of emitters were 100 KPa for inline drippers and bubblers and 250 KPa for impact sprinklers which was less than 0.05 (Fig. 5) for emitters under study.

The hydraulic performance of irrigation drippers showed that the flow rate increases with increasing pressure, and the manufacturing coefficient (CV) increases with decreasing pressure. It is excellent when operating time does not affect the hydraulic performance of the emitters, The variation of (CV) depends on the manufacturer's variation, caused by pressure and heat instability during emitter production and due to a heterogeneous mixture of the local materials used in the production of the emitter., the results indicated that at pressure 2 bar, (CV) was 0.015, and at pressure 2.5 bar, (CV) was 0.06 **(Khokan et al.,2019).**

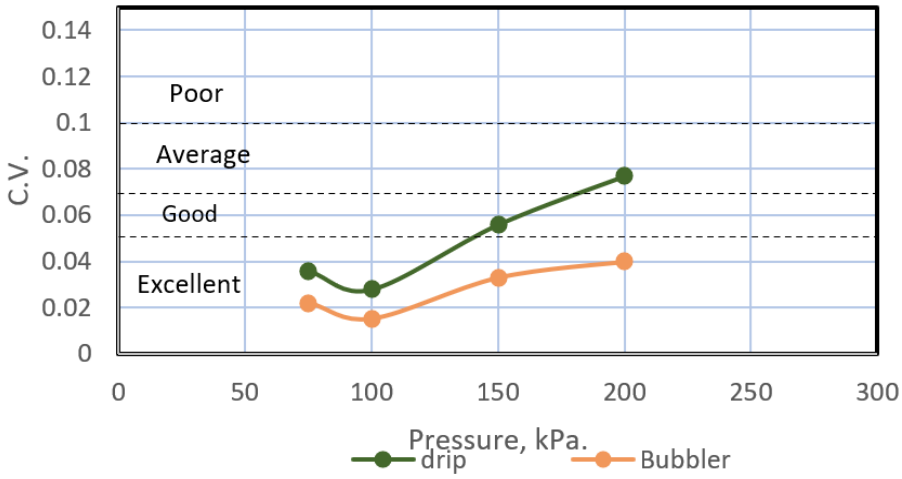

Fig (5a): Manufacturing coefficient (CV) for drippers and bubblers.

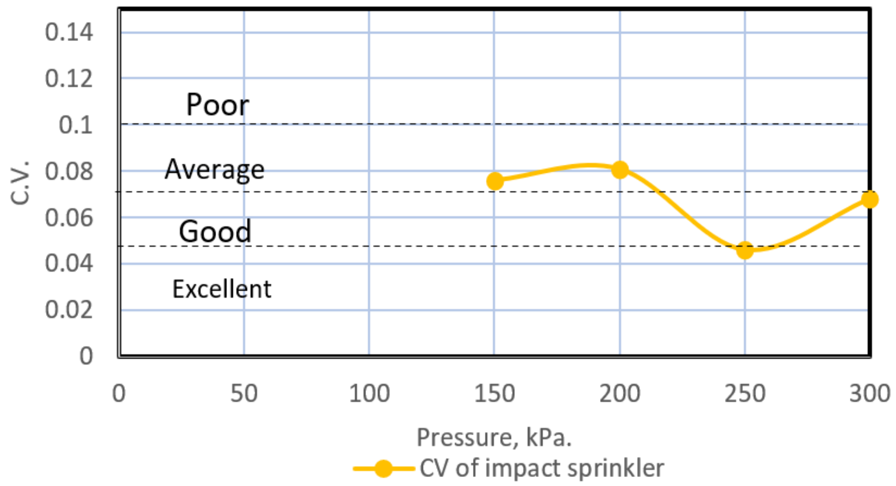

Fig (5b): Manufacturing coefficient (CV) for impact sprinkler.

3. <u>Performance rate.</u>

The relation between flow rate (l/h) and (two weeks) is shown in Fig 6 (a, b). It's shown a decrease in flow rate by time, where after a week the operation flow rate for drippers and bubblers was (7.66, 109.81) l/h, respectively. After twenty-four weeks of operation, the flow rate for drippers and bubblers was (6.75, and 104.79) l/h, respectively.

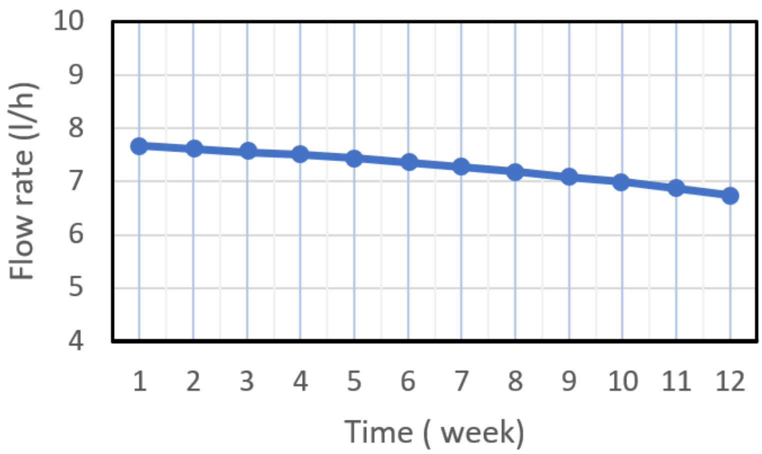

Fig. (6a): Relationship between flow rate and time for drippers.

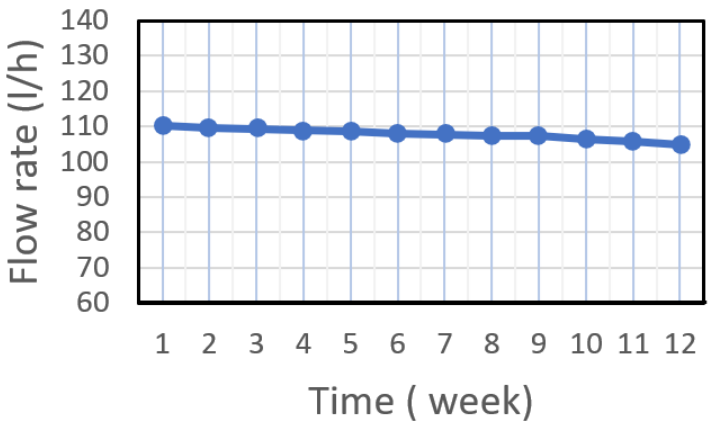

Fig. (6b): Relationship between flow rate and time for bubblers.

4. <u>Emission uniformity (EU).</u>

Figure (7) described emission uniformity (EU). After a week the operation flow rate for drippers and bubblers was (99.09, and 99.9) %, respectively. After twelve weeks of operating for drippers and bubblers was (93.98, and 97.53) %, respectively. This difference in emission uniformity (EU) is due to total suspended solids.

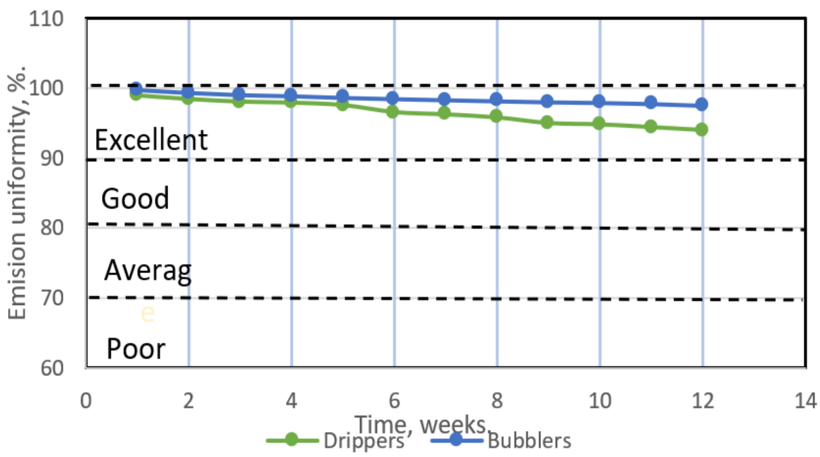

Fig. (7): Emission uniformity.

5. Clogging ratio.

Discharge was measured once every two weeks for 6 months for drippers and bubblers Figure (8) described accumulative clogging ratio which ranged (0.8, and 16.47), and (0.42, and 6.92) respectively, Hence, the accumulative clogging ratio of drippers was higher than bubblers.

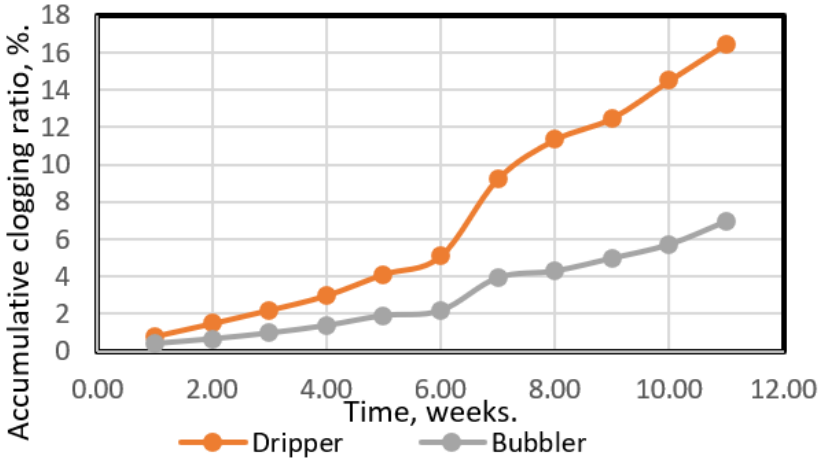

Fig. (8): Accumulative clogging ratio.

6. Limon crop productivity.

At the end of the season, the crop productivity was measured, and the result was as shown in Figure 9: (7.55, 11.37, 11.02, 8.53, and 8.35) ton/fed/year for the variables used in the experiment ((S.I.S (control)), (D.I.S., W.R. 100%), (D.I.S., W.R. 80%), (B.I.S., W.R. 100%), and (B.I.S., W.R. 80%)), respectively. Average productivity per tree is (65.1, 98, 95, 73.5, and 72) Kg/tree/year. However, the highest productivity system was the drip irrigation system with 100% water requirements and the less productivity was sprinkler irrigation system, where the drip irrigation system was higher than the sprinkler irrigation system by up to 50%. When using drip irrigation system, and bubbler irrigation system with water requirements 100% the productivity was (11.37, 8.53) ton/fed/year, respectively. When water requirements ٨0% the productivity was (11.02, 8.35) ton/fed/year, respectively. The productivity of drip irrigation system, and bubbler irrigation system decreased by (3 ,2.1) %, respectively.

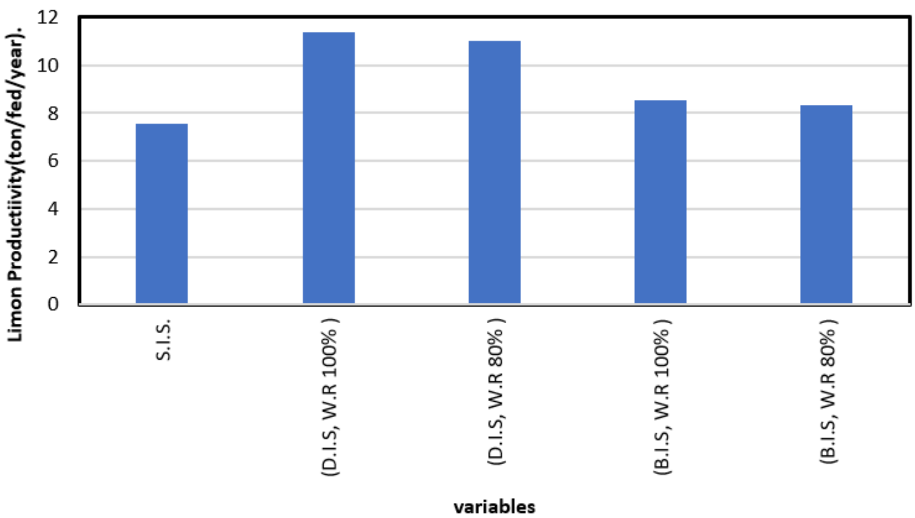

Fig. (9): Productivity of limon at year/fed

7. Cost study.

By comparing the cost of constructing an irrigation network for a sector of five feds for each of drip irrigation system, bubbler irrigation system, and sprinkler irrigation system. The average construction cost of the irrigation network was calculated for each irrigation system used as shown in Tables (5,6), which was 25550 L.E. for drip irrigation system, 25774 L.E. for bubbler irrigation system, while was 12415 L.E. for sprinkler irrigation system.

Table (5): Cost study for drip irrigation system and bubbler irrigation system L.E/ 5fed, these prices are for the year 2023.

Type	Unit	Quantity	Price, L.E.	Total	Quantity	Price, L.E.	Total
		Drip irrigation system.			Bubbler irrigation system.		
1-U.P.V.C pipe.							
110 mm, 10 bar.	m	192	90.2	17318	192	90.2	17318
90 mm, 6 bar.	m	6	62.15	372.9	6	62.15	372.9
63 mm, 6 bar.	m	132	31	4092	132	31	4092
50 mm, 6 bar.	m	78	23.25	1813.5	78	23.25	1813.5
32 mm, 10 bar.	m	1740	14.52	25265	1740	14.52	25265
U.P.V.C fitting.				7329.2			7329.2
2-Valves.							
Butterfly valve 4".	No.	1	3940	3940	1	3940	3940
Single union ball valve 2".	No.	6	600	3600	6	600	3600
Washing valve 2" for mainline pipes.	No.	1	255	255	1	255	255
Washing valve 1" for lateral pipes.	No.	6	67	402	6	67	402
Flow meter 2".	No.	6	3295	19770	6	3295	19770
Brass pressure gauge 400 KPa.	No.	2	275	550	2	275	550
Disc filter 2".	No.	6	820	4920	6	820	4920
A fertilization unit 1".	No.	1	4623	4623	1	4623	4623
3- Emitters.							
GR hoses 16mm-50cm-8l/h.	m	4400	5	22000			
Bubbler 110l/h.	No.				576	45	25920
Soled hoses 16mm.	m	2000	3.75	7500	2000	3.75	7500
P.E. fitting.				4000			1200
Total.				127751			128871

Table (6): Travelling sprinkler irrigation system L.E/ 5fed, these prices are for the year 2023.

Type	Unit	Quantity	Price, L.E.	Total
Sprinkler irrigation system.				
1-U.P.V.C Pipe.				
110 mm, 10 bar.	m	228	90.2	20566
32 mm, 10 bar.	m	30	14.52	435.6
U.P.V.C fitting.				3150.2
2-Valves.				
Butterfly valve 4".	No.	1	3940	3940
Single union ball valve 2".	No.			
Single union ball valve 1".	No.	19	324	6156
Washing valve 2" for mainline Pipes.	No.	1	255	255
Brass pressure gauge 400 KPa.	No.	2	275	550
Disc filter 2".	No.			
A fertilization unit 1".	No.	1	4623	4623
3- Emitters				
Impact sprinkler 3/4"- Part circle	No.	19	600	11400
P.E hoses 32 mm with all connection fitting	m	1000	11	11000
Total				62075

CONCLUSION

Results indicated that the best limits for the operation of the emitters (inline dripper 8l/h, and bubbler 110 l/h) were at 100 KPa and for impact sprinkler ¾" was 250 KPa. At The end of experiment flow rate for emitters (inline drippers 8 l/h, and bubbler 110 l/h) was (6.75, 104.79) l/h respectively. Emission uniformity was (93.98, 97.53) %, respectively. Accumulative clogging ratio ranged (0.8, 16.47), and (0.42, 6.92) respectively. Precipitation rate was 12 mm/h. Coefficient of uniformity was 72.8 %, the crop productivity was measured the result was (7.552, 11.368, 11.020, 8.732, and 8.496) ton/fed/year for the variables used in the experiment ((S.I.S (Control)), (D.I.S., 100% W.R.), (D.I.S., 80% W.R.), (B.I.S., 100% W.R.), (B.I.S., 80% W.R.)), respectively. However, the highest productivity system was drip irrigation system with 100% water requirements and the less productivity was sprinkler irrigation system. By comparing between drip irrigation system, bubbler irrigation system and sprinkler irrigation system, a calculating total structural cost per fed was 25550 L.E. for drip irrigation system, 25774 L.E. for bubbler irrigation system, while was 12415 L.E. for sprinkler irrigation system.

Recommendation: From the previous results, the drip irrigation system at 100% water requirements was the best irrigation system used. Although the bubble irrigation system was better in terms of Manufacturing coefficient and clogging ratio, and the construction costs of the irrigation network for the two systems were close, the drip irrigation system had the highest productivity, impact sprinkler irrigation system is the least system in terms of performance rate, regularity of distribution, and less productivity.

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تعظيم إنتاجية محصول الليمون تحت تأثير إدارة المياه وأنظمة الري المختلفة في مركز بدر

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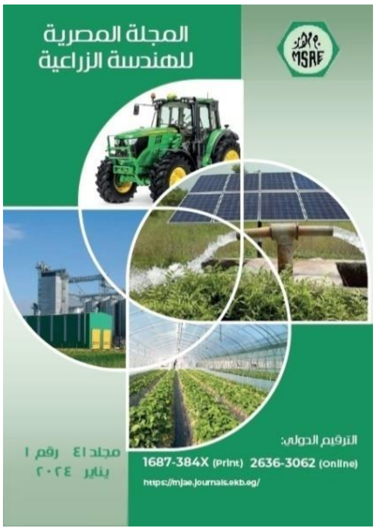

الكلمات المفتاحية:
الليمون ؛ مركز بدر؛ التنقيط ؛ البابلر؛ الرش المتحرك

الملخص العربي

تم إجراء تجربة حقلية فى محافظة البحيرة مركز بدر قرية النجاح، على محصول الليمون البلدى نظرا لاهمية الاقتصادية عالميا ومحليا . وتهدف هذة التجربة تعظيم الاستفادة من موارد المياة المتاحة (ترعة النوبارية)، و تعظيم إنتاجية محصول الليمون بمحافظة البحيرة ودراسة تأثير أنظمة الرى الضغطى المستخدمة . تم تصميم التجربة باستخدام نظام الرى بالتنقيط (خراطيم ذاتية التنقيط ٨ لتر/ساعة دائرة حول الشجرة باجمالى تصرف ١٢٠ لتر/ساعة (١٥ نقاط)، ونظام الرى الفقاعى باستخدام بابلر ١١٠ لتر/ساعة ، باحتياجات مائية ١٠٠% و ٨٠%. وكانت اجمالى المساحة التجريبية ٢١٦ م^2 قسمت الى اثنتى عشرة قطعة فرعية بمساحة ٦م × ٦م ، ومقارنتها بنظام الرى الحالى (الرى بالرش المتنقل) بمساحة ١٢م × ١٢م. أشارت النتائج فى نهاية التجربة معدل التصرف للموزعات (خط التنقيط، البابلر) كان (٦,٨، ١٠٤) لتر/ساعة، على التوالى. وإنتظامية التوزيع كان (٩٣,٩٨، ٩٧,٥٣)%، على التوالى. وتراوحت نسبة الانسداد التراكمى بين (٠,٨ – ١٦,٤٧) و (٠,٤٢ – ٦,٩٢)، على التوالى. وافضل إنتاجية كانت ١١,٣٧ طن/فدان/سنة باستخدام نظام الرى بالتنقيط باحتياجات مائية ١٠٠%، وأقل إنتاجية كانت ٧,٥٥طن/فدان/سنة باستخدام نظام الرى بالرش. وبلغت التكلفة الإنشائية لشبكة الرى للفدان الواحد لنظم الرى (الرى بالتنقيط، الرى الفقاعى، الرى بالرش) كانت (٢٥٥٥٠، ٢٥٧٧٤ و ١٢٤١٥) جنيهاً مصرياً، على التوالى.