Plant Archives Vol. 20, Supplement 1, 2020 pp. 119-123 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

EFFECT OF IRRIGATION LEVELS AND SOIL MOISTURE PRESERVATIVES ON SOME SNAKE CUCUMBER (*CUCUMIS MELO VAR. FLEXUOSUS*) TRAITS

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Abstract

This study was conducted in the field of the College of Agriculture and Marsh University of Dhi-Qar for the spring season 2018-2019, to study the effect of irrigation levels and soil moisture preservatives in some snake cucumber traits (*Cucumis melo var. Flexuosus*). The first two factors are irrigation levels of 25, 50 and 75%. The second factor is preservatives which are nylon, organic matter and zeolite in addition to comparison. Preservatives were placed below the soil surface with a depth of 0.30 cm, the experiment consisted of 36 experimental units of 3 m length and 40 widths, the experiment was factorial according to Randomized Completely Block Design (RCBD), with three replicates. Irrigation was done by specifying an irrigation interval, from one irrigation to another five days depending on the daily water consumption of the plant. NPK fertilizer was added according to fertilizer recommendation for cucumber crop and for all treatments evenly. The results showed that: The treatment of nylon preservative showed a significant increase in the amount of production per plant and total yield, Contributed to significant increase in vegetative growth, plant height, leaf area and qualitative yields, as well as increasing productivity at both levels 50 and 75%, the treatment of nylon with 75% irrigation level gave the highest yield for the total yield, it averaged 21,451.39 kg, at the level of 50% 21451.39 kg, the lowest rate at 25% was 6693.33 kg.

***Keywords*:** irrigation, soil moisture preservatives, snake cucumber (*Cucumis melo var. Flexuosus*).

Introduction

Snake cucumber (*Cucumis melo var. Flexuoses Naud*), one of the family crops pumpkin, which produces separate male and female flowers but on the same plant with a single home, the varieties in the cucumber including Musli soft and coarse conductor Baghdadi, American and local grown in the southern areas (Hassan, 1994). It is also an important crop in Iraq, which is grown in different soil, including sandy, which suffers from the inability to catch water and preserve the nutrients needed by the plant during the period of growth. Because of the growing water scarcity, especially in sandy soils that occupy large areas, which is good at growing vegetables, many farmers from different countries have turned to modern irrigation methods, methods have been used in many countries, to reduce the waste of water and water losses during the watering period, therefore, interest in the method of subsurface irrigation or drip irrigation, use of subsurface water retention technologies contributes to holding it for as long as possible, one of them is the SWRT technique, in which plastic films are used in the root zone, improve soil qualities, reduces water waste and retains moisture content, increases the ability of the soil to supply the plant with nutrients (Al-Shami, 2018). Some media have also used zeolite as a soil moisture preservative by mixing it with the soil, or placed under the root zone has improved the physical properties of the soil through total porosity, ready water, soil water absorption and water conductivity to the level of 4%, a significant increase in the rate of root growth, as well as scheduling irrigation, increasing water productivity and raising the readiness of nutrients (Abdel Hassan, 2018). Organic matter was also used as a soil moisture preservative in the root zone. Reducing the amount of water added to all irrigation treatments when organic matter was added (Al-Jubouri, 2015). The use of technologies in open and protected agriculture increases the capacity of the soil to conserve water, depending on the nature of agriculture, it also improves the root environment and the availability of nutrients in the root zone, which is reflected in increased soil and water productivity (Smucker et al., 2011). The aim of this study is to investigate the effect of irrigation levels and soil moisture preservatives on some snake cucumber traits (*Cucumis melo var. Flexuosus*).

Materials and Methods

Experiment Location: The experiment was carried out in the research station of the College of Agriculture and Marshes in Dhi Qar University in Dhi-Qar governorate during the spring agricultural season 2019, soil texture was Loamy sand,. Soil samples were collected before planting from the surface layer with depth (0-30 cm) for different locations of the study field, Mix the samples well to obtain a composite sample, it was air dried, sifted from a 2 mm sieve, analyzes of some chemical, physical and biological properties were performed (Table 1).

Table 1: Chemical, Physical and Biological Properties of Soil Samples before Sowing.

Parameters		Unit	Amount
pH			7.43
ECe		$ds.m^{-1}$	3.64
CEC		$Cmol.Kg^{-1}$	6.34
O.M		%	0.75
$CaCO_3$		%	36.01
Dissolved ions	**Calcium**	mmol/*l*	27.01
	Magnesium		16.3
	Sodium		5.16
	Potassium		1.31
	Bicarbonate		2.51
Available nitrogen		$ml.kg^{-1}$	28.01
Available phosphorus			3.90
Available potassium			223.12

Preparing the land for agriculture: The land of experiment plowed perpendicular tillage with mulching plow, the harrowing and leveling process was then carried out, which was an area of (430) m2 with dimensions (43 × 10) meters. The length of the furrows was three meters and the width (40) centimeters with a (2.5) meters between furrows, then irrigation terminating was performed, Cucumber seeds were

sown local variety (the seeds were planted for cucumber for the season on (20/3| 2019), (11) holes per furrow, 30 cm between holes, plants were sprayed with foliar fertilizer type Prozol (10_52_10) and (1: 1) ratio of one spray each week, The plants were fertilized with NPK fertilizer (20-20-20) according to the recommendations of the Ministry of Agriculture 1991 by two batches one month after planting and the second after 15 days from the first, the preventive program included plant protection against insect infections, fungal diseases and other pathogens using the FASTIN 1 ml L^{-1} fungicide after three weeks of planting and to prevent insect infestations sprayed with SK247 1 ml. L^{-1}.

Applied steps for adding soil moisture preservatives: Soil moisture preservatives were added as follows:

Nylon (SWRT): has been placed 30 cm below the surface of the soil intended for planting in the form of a letter (U) with dimensions of 30 cm for the base and 15 cm height from each side.

Organic matter (O.M): has been laid as a layer 4 cm high and 40 cm wide along the center under the surface of the soil intended for planting. At a rate of (3 kg) equivalent to 25 $t.ha^{-1}$.

Zeolite: was added in the form of a layer 4 cm high and 40 cm wide along the length of the center and at a rate of (1.5 kg) equivalent to 12.5 $t.ha^{-1}$.

Indications of vegetative growth: Length of plant (cm): At the end of the season, the length of the plant was measured from the soil stalk contact area to developing plant summit by metric tape.

Leaf area (dcm^2. $plant^{-1}$): The total leaf area and five leaves of five plants were randomly taken from each experimental unit at the end of the season, the scanner (CI-202 LASER AREA METER) was used.

Leaf content of chlorophyll: Determination of chlorophyll content in leaves by Chlorophyll meter SPAD-502, by reading five plants from each experimental unit at random then the rate was extracted (Salhi, 2002), and measured in units SPAD units, and then converted the unit ($gm.cm^{-2}$) according to Monje and Bugbee (1992), the formula includes:

Chlorophyll ($mg.cm^{-2}$) = SPAD reading × 10.40 + (- 80.05) and then divide the product by 10000

Total yield components (kg / experimental unit): The total output of the experimental unit was calculated, by collecting the product in the experimental unit area of (1.2) m, then weighing and dividing it by the number of plants to stabilize the yield of one plant as average for each collection, then collect the sum and divide them by the number of collect during the season to obtain the sum of one fairy on average, then converted to hectares for total productivity.

Plant yield (kg): The cumulative yield was recorded from the beginning of the harvest to the last collect for each experimental unit, then divided by the number of plants in the experimental unit

$$\text{Per plant yield (kg)} = \frac{\text{Pilot unit weight (kg)}}{\text{Number of plants in the experimental unit}}$$

Statistical Analysis

Data were collected and analyzed statistically using the split-plot arrangement according to Randomized Completely Block Design (RCBD), with three replicates, using SPSS program3, the mean of the treatments was compared using the lowest significant difference LSD at a probability level of 0.05.

Results and Discussion

Plant Length (cm)

Table 2 show the effect of irrigation levels and treatments on plant height, the level of 75% showed a significant superiority of 169.79 cm. $Plant^{-1}$ on the level of irrigation 25%, which recorded the lowest rate of 72.50 cm., while there was no significant differences between him and the level of 50%, which recorded an average of 169.48 cm. $plant^{-1}$ and by increasing the length of the plant in the treatment of nylon with the level of 50% on the comparison treatment at the same level of 5.43%, the level of irrigation 75% with nylon compared to control at the same level was the amount of increase 4.88%, as for the soil moisture preservatives, nylon treatment was superior to all other treatments as the highest plant length was 141.47 cm, However, there were no significant differences between the other treatments as they averaged 136.04, 135.74 and 135.52 cm. This may be due to the superiority of nylon treatment in average plant lengths over other treatments due to the role of nylon preservative in improving aquatic conditions by retaining water, reducing wastage, reducing water losses and homogenizing moisture distribution in the root zone, the nylon treatment also retained high amounts of nutrients within the root zone, which is reflected in the improvement of the root and vegetative total, increased growth compared with other treatments for the absence of membranes holding and conserving water and nutrients (Al-Rawi, 2016). The interaction between irrigation levels and preservatives is noticeable differences as the highest average length of plant in nylon treatment was 50%. The average treatment of zeolite with decreased with the level of irrigation 25%, the reason for the low plant length can also be attributed to the rest of the treatments, may be due to different water balance in the soil, which affected the processes of absorption and the transfer of elements and this affects the growth of the plant and its height, it is the result of the difference between the study coefficients, the absence of barriers to the movement of water under the roots of the plant, increases soil water retention (Al-Shami, 2018).

Leaf area (dm^2):

Table (3) indicated that there were significant differences between the rates of leaf area characteristic shown by the effects of irrigation levels and the studied treatments and their interaction, the level of irrigation showed 75% higher than the rate of 20.84 $dm^2.Plant^{-1}$, which significantly exceeded the level of irrigation 25%, recorded the lowest rate at 13.92 $dm^2.Plant^{-1}$, while it did not differ significantly with the level of 50, which recorded an average of 20.68 $dm^2.Plant^{-1}$. Perhaps the reason for the superiority of level 75 and 50 is to find good moisture content in which the plant was not exposed to stress, which reflects on the root total and thus increase vegetative growth and increase leaf area. As for the treatments, the treatment of nylon preservative achieved a significant superiority over all other

treatments, with an average of 20.21 dm^2.$Plant^{-1}$. zeolite and organic matter and comparison recorded rates of 17.95 and 17.9-17.82, respectively. The increase in the leaf area of nylon treatment may be mainly due to the availability of sufficient moisture content in the root zone as well as increased water readiness and nutrient readiness compared to other treatments, positively affects the growth of the plant and its total vegetation and increase the leaf area of the plant, whereas the decrease of leaf area values for other treatments is due to the effect of water readiness in the different stages of plant growth (Issa, 2016). The interaction showed significant differences as the treatment of nylon with 75% irrigation level showed the highest rate of 23.18 dm^2.$Plant^{-1}$. While the treatment of organic matter recorded the lowest rate of 13.61 dm^2.$Plant^{-1}$.

Total yield kg / experimental unit

Table 4. showed the effect of irrigation levels and soil moisture preservatives on the total yield as there were significant differences between the irrigation levels, where the level of 75% recorded the highest rate of 2.574 kg/experimental $unit^{-1}$ significant difference on the level of irrigation 50%, treatment of nylon recorded the highest rate of 3.076 $tons.ha^{-1}$ and thus significantly outperformed all other treatments, which recorded the treatment of zeolites the lowest rates, reaching 2.376 kg. Experimental unit. Irrigation levels did not show any significant differences, while level 75 recorded the highest rate of 2.578 while the level 25 gave the lowest rate of 2.510 kg. Experimental unit. Interaction between irrigation levels and treatments showed significant differences in total yield, 50% with nylon treatment recorded the highest rate of 3.183 kg. Experimental unit, showed a significant superiority over the rest of the rates except for level 75 with nylon treatment, recorded an average of 3.146 kg. Experimental unit, 50% with organic matter treatment and control recorded the lowest rates of this trait at 2.370 kg. Experimental unit. The difference in the total yields due to the effect of preservative treatments which differed significantly as nylon treatment was significantly superior, it may be due to the amount of irrigation water added, the survival of the root zone with an effective moisture content and the ability of this treatment to prevent water penetration away from root absorption, as well as the availability of nutrients and plant growth is the result of the overlap of physiological and environmental growth factors (Smucker *et al*., 2010).

Yield plant g.plant^{-1}

Table 5 indicate that there were significant differences between the rates of irrigation levels, the level of irrigation exceeded 75% on both levels 50% and 25% and recorded the highest rate of 233.42 g. $Plant^{-1}$, the level of irrigation exceeded 50% over the level of 25% with a rate of 209.68 g. $Plant^{-1}$, while the 25% recorded the lowest average rate of 70.29 g.$Plant^{-1}$. The level above 75% and 50% may be due to the amount of water added which has contributed to the moisture content in the root zone and the plant is not exposed to stress, which increased the vegetative growth and thus increase the yield of the plant as well as the nylon treatment in the preservation of moisture content and nutrients (Mushabab and Al-Masraf, 2019). The treatments of preservatives gave nylon treatment a significant superiority over all treatments, reaching an average of 219.68 g.$Plant^{-1}$, while the other treatments showed zeolite and organic matter and comparison rates 156.08, 156.01 and 152.75 g.$Plant^{-1}$ respectively. The reason for the significant differences between preservative treatments and the superiority of nylon treatment may be due to the amount of irrigation water added and the extent to which the root zone has an effective moisture content and the ability of this treatment to prevent water penetration away from root absorption, as well as the availability of nutrients and plant growth is the result of the overlap of physiological and environmental growth factors of the plant neutral, which reflected on the highest yield per plant under the influence of nylon treatment (Smucker *et al*., 2010). As for the interaction, there were significant differences as nylon treatment with 75% irrigation level gave the highest rate of interference at 289.00 g.$Plant^{-1}$, while the comparison with irrigation treatment gave 25% the lowest rate was 59.09 g.$Plant^{-1}$. The reasons for the superiority may be attributed to the role of nylon membranes in water conservation and nutrients that have a fundamental role in the growth and vegetative growth. The low rate at 25% is due to the small amount of water added and the exposure of the plant to water stress.

Chlorophyll content: Table (6) show a significant differences between irrigation levels and the studied treatments in the characteristic of chlorophyll ratio, the 50% level was 0.0255 $mg.cm^{-2}$, thus, it was significantly higher than the level shown by 25% with an average of 0.0178 $mg.cm^{-2}$, on the other hand, the level of chlorophyll was 0.0254 $mg.cm^{-2}$, this indicates that the irrigation level of 50% may have provided a good growth rate and nutrient transport which contributed to a better chlorophyll content than other levels, the highest nylon treatment was 0.0248 $mg.cm^{-2}$, the lowest treatment (control) was 0.0219 $mg.cm^{-2}$. The interaction between the irrigation levels and the studied treatments showed no significant differences and the highest level of 50% with nylon treatment was 0.0282 $mg.cm^{-2}$, and 0.0281 $mg.cm^{-2}$for level 75% with nylon treatment, while the level of 25% with comparative treatment the highest rate of this characteristic was 0.0176 $mg.cm^{-2}$, this may be due to the availability of nutrients that contributed to the treatment of nylon, which in turn provides appropriate nutrition for the plant, which contributed to the increase of vegetative growth and thus increase the amount of chlorophyll in the leaves.

Table 2 : Effect of irrigation levels and soil moisture preservatives on plant height cm.$plant^{-1}$.

Irrigation Levels	Treatment				Mean
	Nylon	Zeolite	organic matter	control	
75%	175.44	168.20	168.27	167.27	169.79
50%	175.90	168.20	166.87	166.97	169.48
25%	73.87	71.71	72.10	72.33	72.50
Mean	141.74	136.04	135.74	135.52	137.26
L.S.D0.05	**irrigation levels** 16.333		**Treatment** 19.456	**irrigation× Treatment** 33.492	

Table 3 : Effect of Irrigation Levels and Soil Moisture Preservatives on leaf area $dm^2.Plant^{-1}$.

Irrigation Levels	Treatment				Mean
	Nylon	Zeolite	Organic matter	Control	
75%	23.18	20.05	20.13	20.01	20.84
50%	23.05	19.99	20.07	19.62	20.68
25%	14.39	13.82	13.61	13.84	13.92
Mean	20.21	17.95	17.94	17.82	18.48
L.S.D0.05	irrigation levels 0.667		Treatment 0.894	irrigation× Treatment 1.311	

Table 4 : Effect of Irrigation Levels and Soil Moisture Preservatives on Total yield Kg. experimental unit.

Irrigation levels	Treatment				Mean
	Nylon	Zeolite	Organic Matter	Control	
75%	3.183	2.373	2.370	2.370	2.574
50%	3.147	2.032	2.034	2.026	2.310
25%	0.928	0.757	0.761	0.767	0.803
Mean	2.419	1.721	1.722	1.721	1.896
L.S.D0.05	Irrigation levels 0.1332		Treatment 0.157	Irrigation× Treatment 0.2011	

Table 5 : Effect of Irrigation Levels and Soil Moisture Preservatives on yield Plant $g.Plant^{-1}$.

Irrigation levels	Treatment				Mean
	Nylon	Zeolite	Organic matter	Control	
75%	289.00	215.00	214.67	215.00	233.42
50%	285.67	184.45	184.45	184.17	209.68
25%	84.37	68.80	68.91	59.09	70.29
Mean	219.68	156.08	156.01	152.75	171.13
L.S.D0.05	Irrigation levels 21.334		Treatment 32.112	irrigation× Treatment 56.277	

Table 6 : Effect of irrigation levels and soil moisture preservatives on total chlorophyll content in leaves $mg.cm^{-2}$.

Irrigation levels	Treatment				Mean
	Nylon	Zeolite	Organic matter	Control	
75%	0.0281	0.0247	0.0247	0.0243	0.0254
50%	0.0282	0.0247	0.0252	0.0239	0.0255
25%	0.0180	0.0177	0.0179	0.0176	0.0178
Mean	0.0248	0.0224	0.0226	0.0219	0.0229
L.S.D0.05	irrigation levels 0.0053		Treatment N.S	irrigation× Treatment N.S	

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