SINAI Journal of Applied Sciences (ISSN: 2314-6079) Vol. (7) Is. (3), Dec. 2018 221-230

SINAI Journal of Applied Sciences

ARU-EGYPT SJAS Trust Science | It Creates

EFFECT OF IRRIGATION WATER DEFICIT ON SOIL PROPERTIES AND COWPEA PRODUCTION IN EL-ARISH REGION

Ashraf G.A. Osman[1], M.S. El-Kassas[2*] and A.A. El-Sebsy[2]

1. Gen. Admin. Ground Water, Minist. Water Res. and Irrigation, North Sinai Govern., Egypt.
2. Dept. Soil and Water, Fac. Environ. Agric. Sci., Arish Univ., Egypt.

ABSTRACT

Two field experiments were carried out at the Experimental Farm, Faculty of Environmental Agricultural Sciences, Arish University, North Sinai, Egypt during two successive seasons, 2015 and 2016. The experiments aimed to study the effect of deficit irrigation water on soil properties and cowpea production (*Vigna unguiculata* (L) Walp.) *cv.* " Tiba" grown under loamy sand soil conditions using drip irrigation system. The experiment included three irrigation treatments which were 50, 75 and 100% of irrigation water requirements (IWR). Cowpea seeds were sown on 28th April in first and second seasons. The results showed that the highest decrease percentage from the initial value of soil salinity was obtained with application of 100% irrigation treatment, while the lowest reduction value of soil salinity was found with application of 50% irrigation treatment. The highest value of water use efficiency (WUE) observed was obtained with 50% irrigation level, whereas, the lowest value was with 100% irrigation level. The highest actual evapotranspiration (ETa, mm) was obtained with applying 100% irrigation level during both seasons. Also, the highest value of (WUE) was obtained with 100% irrigation level during 2015 and 2016 seasons. Significant effects were recorded due to irrigation deficit on all vegetative growth traits of cowpea plant in both seasons; *viz*, plant height (cm), number of branches/plant, number of leaves /plants, fresh and dry weight/plant (g) and leaflet area of 3rd leaf. Decreasing the irrigation level resulted in lower values of all studied traits in both seasons. Irrigation levels caused significant effects on all studied yield and its components traits; *viz*, seed yield per fed., weight of 100 seeds, pod length, and number of seeds per pod in both seasons. The highest values of all traits were recorded with application of the irrigation level of 100%, while, the lowest value was recorded with 50% irrigation level in both seasons.

Key wards: irrigation water deficit, actual evapotranspiration, cowpea plant.

INTRODUCTION

Water resources in Egypt have become limited in view of the necessisity to reclaim new lands; *i.e.* horizontal agriculture expansion. In such new reclaimed lands, which are located in arid and semi-arid regions, the limiting factor for maximizing the benefit of cultivation is water. Cowpea (*Vigna unguiculata* (L) Walp.) is one of the important vegetable legumes in Egypt. Nutritionally, it is a major source of plant proteins content and B vitamins for human and is equally important as nutritious fodder for livestock **(Singh *et al.*, 2003; Singh, 2003).** Also, Cowpea (*Vigna unguiculata* L.) is an important source of protein, phosphorus, minerals and certain soluble vitamins in human diet **(Karigouder and Angadi, 2005).** Cowpea provides soil and subsequent plant (in rotation) with atmospheric nitrogen. It can grow well in sandy soils due to its deep root and higher tolerant to drought than other legumes.

* **Corresponding author**: **Tel**: +201271500239
Email: elkaasass2003@yahoo.com

The effect of water deficit on cowpea growth and yield depend upon the degree of stress and the development stage at which the stress occurs **(Hsiao and Acevedo, 1974). De Souza *et al.* (1997)** studied the effect of water deficit on cowpea leaf characteristics and concluded that severe drought accelerated leaf senescence by reducing leaf nitrogen (N) and chlorophyll contents. **Turk *et al.* (1980)** showed that cowpea is highly sensitive to water stress during the flowering and pod-filling stages. Also, **(Shouse *et al.*, 1981**) reported that the most sensitive growth stages of cowpea to drought were flowering and pod filling, with yield reduction of 35 to 69% depending on the timing and length of the drought treatment. Seed yield of cowpea was found to be linearly related to an integrated water stress indicator based on the predawn measurement of leaf water potential.

Major increases in water use efficiency may be achieved by withholding irrigation from plant emergence to the first appearance of macroscopic floral buds, providing a moderate supply of water is present in the soil profile and no precipitation occurs **(Zeiska and Hall, 1982).** The variation of deficit irrigation timing and amount along the growing of different growth stages might increase yield because it results in change with dry matter between vegetative and reproduction organs **(Ong, 1984). Andrade *et al.* (1993**) found a cowpea crop coefficient for use with Penman reference ET (K_{cn}) was 1.6 at 42 days after planting for a determinate variety. Root zone water storage after millet harvest was sufficient to maintain a long duration cowpea cultivar that was able to make use of water that otherwise would have been lost to drainage during dry season **(Grema and Hess, 1994).**

Watanabe *et al.* (1997) reported some genotypic differences in the ability of cowpea to survive imposed drought beginning in the vegetative stage. **Souza *et al.* (2005)** in a 69 days season using lysimeters, found the average (K cm) = 1.27 at the flowering stage of cowpea. The (K cm) increased steadily from the beginning up to flowering and peaked at 1.35 on 50 days after planting, it then decreased rapidly until harvest time. Water use of cowpea can be reduced while maintaining seed yield by planned-water deficit irrigation. **Hsiao and Xu (2000),** reported that a decrease in soil water potential can markedly affect root hair and retard nodule growth and nitrogen fixation. According to **Gomesda *et al.* (2001)**, extensive root development allows extraction of water from a large volume of soil or from a deep water table.

Larcher (2003) reported that as water becomes limiting, certain plants show a decrease in cell sap osmotic potential, thus increasing the water potential gradient between soil and roots, thereby allowing water uptake to continue despite declining soil water content. Also, it has been reported by **Gomesda *et al.* (2001),** that water stress has a significant effect on the growth and biological nitrogen fixation of the crop. The effect of drought on biological nitrogen fixation has been widely reported and is considered to be far the most important environmental factor resulting in crop yield losses **(Marino *et al.*, 2007).** North Sinai is a newly reclaimed area with poor soil fertility, high pH, low water quantity and quality, especially, salinity. So, this study aimed to use the proper water level for producing cowpea under such conditions.

MATERIALS AND METHODS

Two field experiments were carried out at the Experimental Farm, Faculty of Environmental Agricultural Sciences, Arish University, North Sinai, Egypt during two successive seasons, 2015 and 2016. The experiments aimed to study the effect of deficit irrigation on soil properties and cowpea (*Vigna unguiculata* (L) Walp.) cv. "Tiba" grown under loamy sand soil conditions using drip irrigation system. The chemical composition of the irrigation water for both seasons are given in Table (1a). Some initial physical and chemical properties of the soil used in the experiments are presented in Table (1b).

Soil parameters determined before conducting the experiments were particles size distribution and bulk density **(Piper, 1950),** soil pH value, total carbonate, calcium and magnesium, electrical conductivity, EC, **(Jackson, 1967).** Carbonate and bicarbonate, soluble potassium, sodium and chloride **(Richard's, 1954).** Soluble sulfate was estimated by the difference between the summation of soluble cations and anions. Soil moisture content was determined by the weighing method, after and before irrigation **(Richard's, 1954).**

The field experiments were assigned for cultivating cowpea (*Vigna unguiculata* (L) Walp.) *cv.* " Tiba" plants. The experiment included three irrigation treatments which were 50, 75 and 100 % of irrigation water requirements (IWR). Cowpea seeds were sown on 28th April in the first and second seasons. Drip irrigation system was used, each plot had one dripper line and two rows of plants.

The distance between the hills and the line was 10 cm, while the distance between plants in the same row was 20 cm. Each hill was thinned on two plants. The experimental unite area was 12 m^2 (12 m length and 1 m width), plant density was 20 plants/m^2. Seeds of cowpea were inoculated with N-fixer (*Rhizobium* spp.) as recommended. Rhizobia was obtained from General Organization for Agriculture Equalization Fund, Ministry of Agriculture and Land Reclamation, Agriculture Research Center.

The irrigation water was saline ground water (about 3648 - 3840 ppm) pumped from a local well. Irrigation treatments started 30 days after sowing for all plots on 26th May and ended on 30th August. The experimental design was randomized complete block (RCBD) with three replications.

Data recorded

Soil salinity (dSm^{-1}) and bulk density (gcm^{-3})

Water relationships

A) Water consumptive use (CU)

Water consumptive use (CU) was calculated using the equation given by **Israelson and Hansen (1962)** as follows:

$$CU. = D \times AD \times \frac{ez - ei}{100}$$

Where:

CU = Consumptive use in cm.

D = Irrigated soil depth in cm.

AD = Bulk density, g cm.$^{-3}$, of the chosen irrigated soil depth.

ez = Soil moisture content, percent after irrigation.

ei = Soil moisture content, percent before the next irrigation.

B) Water use efficiency (WUE)

The consumed water by cowpea plants was calculated according to **Yaron *et al.* (1973)** as follows:

$$WUE = \frac{Y}{ETa}$$

Where:

Y = Crop yield in kg fed^{-1}

ETa = Evapotranspiration in m^3 fed^{-1}

Table (1a): Chemical composition of irrigation water.

pH	EC		Soluble ions, meq. l^{-1}							
	dSm^{-1}	ppm	Cations				Anions			
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	Cl^{-}	HCO_3^{-}	CO_3^{--}	SO_4^{--}
2015										
7.02	5.70	3648	20.90	17.71	18.13	0.26	46.40	2.76	--	7.84
2016										
7.32	6.00	3840	21.51	19.32	18.94	0.23	48.71	2.98	--	8.31

Table (1b): Some initial soil physical and chemical properties of the investigated cultivated area.

Soil property	Seasons					
	2015			2016		
	Depth(cm.)					
	0-15	15-30	30-45	0-15	15-30	30-45
Mechanical analysis						
Sand (%)	82.04	81.22	80.70	82.56	81.92	80.41
Silt (%)	2.06	2.53	3.85	2.19	1.84	3.72
Clay (%)	15.90	16.25	15.45	15.25	16.24	15.87
Soil texture	Loamy sand	Loamy sand	Loamy sand	Loamy sand	Loamy sand	Loamy sand
Bulk density (g.cm^{-3})	1.52	1.55	1.57	1.54	1.53	1.55
Chemical analysis (soluble ions in 1:5 extract)						
Ca^{++} (meq.l^{-1})	2.64	3.12	2.78	3.06	3.61	2.66
Mg^{++} (meq.l^{-1})	2.51	2.81	2.42	2.37	2.13	2.60
Na^{+} (meq.l^{-1})	1.61	1.96	1.989	1.97	2.44	1.49
K^{+} (meq.l^{-1})	0.34	0.31	0.31	0.40	0.22	0.35
CO_3^{--} (meq.l^{-1})	-	-	-	-	-	-
HCO_3^{-} (meq.l^{-1})	2.16	2.71	2.41	2.60	2.40	1.90
Cl^{-} (meq.l^{-1})	2.25	2.80	2.36	2.88	3.61	2.64
SO_4^{--} (meq.l^{-1})	2.69	2.69	2.63	4.32	3.39	2.56
Total N (ppm)	19.50	17.98	16.54	17.24	15.42	16.40
Total P (ppm)	46.55	47.22	46.52	45.21	43.01	42.61
Total K (ppm)	89.56	90.60	91.51	97.20	95.30	94.06
EC (dS m^{-1})	0.71	0.82	0.74	0.78	0.84	0.71
pH in (1:2.5) extract)	8.23	8.21	8.20	8.02	8.04	8.10
$CaCO_3$ (%)	5.95	9.67	13.15	6.45	10.65	14.16
OM (%)	0.13	0.12	0.07	0.14	0.13	0.08
CEC (meq/100g)	6.12	5.36	5.20	7.04	6.35	4.97

The actual evapotranspiration, ETa, is assumed to be synonymous to the calculated consumptive use of water (CU). Consequently, daily and monthly consumptive use of water were calculated, for specified soil depths, for all treatments.

Vegetative Growth Characters

After 40 and 60 days from sowing, samples of three plants from each experimental unit were randomly taken and the following parameters were recorded: plant height (cm), number of branches/ plant, number of leaves /plants, fresh and dry weight/plant (g) and leaflet area to 3rd leaf. All plant parts were dried at 70^0 till constant weight, then, dry weight of plant organs was determined.

Yield and its Components

At harvest the following data were recorded: number of pods/plants, number of seeds/pod, seed index (weight of 100 seed, g), pod length (cm) and dry seed yield (ton/fed.).

Statistical Analysis

Analysis of variance was used to test the degree of variability among the obtained data. Duncan's Multiple rang test was used for the comparison among treatment means **(Duncan, 1955).** MSTATC program was used for the statistical analysis.

RESULTS AND DISCUSSION

Effect of Irrigation Levels

Soil salinity (EC)

Results in Table 2 show the percentage of decrease from the initial value of soil salinity as affected by irrigation levels. The highest percentage of decrease from the initial value of soil salinity (0.14) was observed with application of 100% irrigation treatment, while the lowest percentage of decrease from the initial value of soil salinity (0.06) was obtained with application of 50% irrigation treatment.

Actual evapotranspiration (ETa)

Data in Table 3 show that, the highest ETa (mm) was obtained with the applying of 100% irrigation level during both seasons (599.78 mm and 561.21mm, respectively). The lowest values (418.97 mm and 358.95mm) were recorded with 50%irrigation level in the first and second season, respectively.

These results agree with **Aboamera (2010)**, who found that the higher crop evapotranspiration (ETc) value was observed after 35 days from planting with fully irrigation.

Water use efficiency (kgm^{-3})

Data in Table 4 clear that, the highest value of (WUE) was obtained with the 100% irrigation level during 2015 and 2016 seasons, the quantities were o.52 and 0.55 kgm^{-3}, respectively. The lowest values were with 50% of irrigation level through the two seasons, (0.15 and 0.16kgm^{-3}, respectively). These results are in harmony with **Aboamera (2010)** who stated that, the increasing of deficit percent of water application resulted in progressively lower water use efficiency, where, at 80% of soil moisture content at field capacity, WUE was 0.68 kgm^{-3}.

Similar results were obtained by **Ahmed and Suliman (2010)** who concluded that, water stress had significant effect on water use efficiency, this may be attributed to the strong sensitivity of cowpea stomata to water stress with reduction in photosynthetic capacity.

Vegetative growth parameters

Data in Table 5 show significant effects due to irrigation levels on all vegetative growth traits of cowpea plant in both seasons; *viz*, plant height (cm), number of branches/ plant, number of leaves /plant, fresh and dry weight/plant (g) and leaflet area of 3rd leaf. Decreasing the irrigation

Table 2. EC (dSm^{-1}) values as affected by the irrigation levels.

Parameter / Irrigation level (100% of water requirements)	EC Initial value (dSm^{-1})	EC Value at the end of the first season (2015) (dSm^{-1})	EC Value at the end of the second season (2016) (dSm^{-1})	EC Mean value of both seasons (dSm^{-1})	EC Percentage of decrease from the initial value (%)
100	0.71	0.65	0.5	0.58	-0.14
75	0.71	0.7	0.53	0.62	-0.10
50	0.71	0.74	0.56	0.65	-0.06

Table 3. ETa ($mm.season^{-1}$) as affected by the irrigation levels.

Parameter / Irrigation level (100% of water requirements)	First season (2015)	Second season (2016)
100	599.78	561.21
75	504.80	433.78
50	418.97	358.95

Table 4. Water use efficiency ($kg\ m^{-3}$) values as affected by the irrigation levels.

Parameter / Irrigation level (100% of water requirements)	First season (2015)			Second season (2016)		
	Yield (Kg $fed.^{-1}$)	ETa ($m^3\ fed.^{-1}$)	WUE (kg m^{-3})	Yield (Kg $fed.^{-1}$)	ETa ($m^3\ fed.^{-1}$)	WUE (kg m^{-3})
100	1318.57	2519.09	0.52	1308.57	2357.08	0.55
75	941.43	2120.17	0.44	911.42	1821.88	0.50
50	268.57	1759.67	0.15	241.43	1507.59	0.16

Table 5. Vegetative growth parameters of cowpea plant as affected by the irrigation levels.

Parameter / Irrigation level (100% of water equirements)	Stem length (cm)		No. of branches $plant^{-1}$		No. of leaves $plant^{-1}$		FW $plant^{-1}$ (g)		DW $plant^{-1}$(g)		Leaflet area of 3rd leaf (cm^2)	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
100	41.67A	40.12A	4.95A	4.73A	21.78A	21.06A	119.95A	117.86A	29.98	29.06A	52.56	49.72A
75	33.31B	32.09B	3.96B	3.72B	17.42B	16.80B	95.96B	94.28B	23.98	23.25B	42.05	39.77B
50	24.91C	24.07C	2.98C	2.81C	13.07C	12.60C	71.97C	70.72C	17.99	17.44C	31.54	29.83C

level resulted in lower values of all studied traits in both seasons. These results are agree with **Onuh and Donald (2009) and Scholz *et al.* (2002)** who reported that roots of plants growing in water stress condition tend to be excessive and longer than their counterpart that grew with the natural rainfall condition. So; this effect was attributed to the fact that plants growing in a water stress condition will tend to elongate their roots around the growth environment in the bid to capture moisture, the stem and roots become elongated and hence longer than normal.

Also, **Zeinab *et al.* (2015),** stated that, decreasing the irrigation water levels than the commonly applied level (100%) markedly reduced all studied growth characters (plant height; leaves number per plant).

Yield and its components

Data in Table 6 clear that irrigation levels caused significant effects on all studied yield and its components traits; *viz*, seed yield per fed., weight of 100 seeds, pod length, and number of seeds per pod in both seasons. The highest values of all traits were recorded with application of irrigation level of 100%, while, the lowest value was recorded with 50% irrigation level in both seasons.

These results may be due to the effect of water deficit on vegetative growth and flowering of cowpea plant and hence resulted in low productivity. In the same direction, **Ahmed and Suliman (2010) and Eugene *et al.* (2010)** reported that water stress is attributed to the abscission of the reproductive structures of cowpea plant.

Table 6. Yield and its components of cowpeaplant as affected by the irrigation levels.

Parameter / Irrigation level (100% of water requirements)	Seed yield (kg fed.$^{-1}$)		Weight of 100 seed (g)		Pod length (cm)		Number of seeds pod^{-1}	
	2015	2016	2015	2016	2015	2016	2015	2016
100	1318.57A	1308.57A	14.68A	14.52A	19.19A	19.38A	12.78A	12.85A
75	941.43B	911.42B	11.74B	11.61B	15.35B	15.51B	10.22B	10.28B
50	268.57C	241.43C	8.81C	8.77C	11.51C	11.63C	7.67C	7.71C

REFERENCES

Aboamera, M.A. (2010). Response of cowpea to water deficit under semiportable sprinkler irrigation system. Misr J. Agric. Eng., 27(1): 170-190.

Ahmed, F.E. and Suliman, A.H. (2010). Effect of water stress applied at different stages of growth on seed yield and water use efficiency of cowpea. Agric. and Biol. J. North Ame., ISSN Print, 2151-7517, ISSN Online: 2151-7525.

Andrade, C.L.T.; Silva, A.A.G.; Souza, I.R.P. and Conceicao, M.A.F. (1993). Crop coefficients and irrigation coefficients for cowpea. EMPRAPA-CNPAI, Teresina, 6. Comunicadotecnico, 9 (in Portuguese with abstract in English).

De Souza, P.I.; Egli, D.B. and Bruening, W.P. (1997). Water stress during seed filling and leaf senescence in soybean. Agron. J., 89:807-812.

Duncan, D.B. (1955). Multiple Range and Multiple F. Tests. Biometrics, 11: 1-42.

Eugene, N.N.; E. Jacgues; Desire, T.V. and Paul, B. (2010). Effect of same physical and chemical characteristics of soil on productivity and yield of cowpea (*vigna unguiculata* L-Walp.) in coastal region (Cameroon). Afr. J. Environ. Sci. and Technol., 4 (3): 108-114.

Gomesda, S.J.A.; Ja Costa, R.C. and Oliveira, J.T.A. (2001). Drought-induced effects and recovery of nitrate assimilation and nodule activity in cowpea plants inoculated with *brad rhizobium* spp. under moderate nitrate level, Brazilian J. Microbial., 32 (3).

Grema, A.K. and Hess, T.M. (1994). Water balance and water use of pearl millet-cowpea intercrops in north east Nigeria. Agric. Water Manage, 26: 169-185.

Hsiao, T.C. and Acevedo, E. (1974). Plant response to water deficit, water use efficiency, and drought resistance. Agric. Meteorol., 14: 59 – 84.

Hsiao, T.C. and Xu, L.K. (2000). Sensitivity of growth of roots versus leaves to water stress: Biophysical analysis and relation to water transport. J. Exp. Bot., 51: 1595-1616.

Israelson, O.W. and Hansen, V.C. (1962). Irrigation Principles and Practices. 3rd Edit. John Wiley and Sons Inc. New York, 40-253.

Jackson, M.L. (1967). Soil Chemical Analysis. Prentice Hall, Inc., Engle wood Cliff, N.J.

Karigoudar, A.S. and Angadi, S.S. (2005). Influence of seed rate, row spacing and fertility levels on yield and quality of field bean for forage production. Karnataka J. Agric. Sci., 18 (2): 489-491.

Larcher, W. (2003). Physiological Plant Ecology. Ecophysiology and Stress Physiology of Functional Groups. 4th Ed. Springer Verlay Berlin

Marino, D.; Frendo, P.; Gonzalez, E.M.; Puppo, A. and Arrese, C. (2007). NADPA recycling systems in oxidative stressed nodules: a key role for the NADP depend entice citrate dehydrogenase. Planta, 225: 413-421.

Ong, C.K. (1984). The influence of temperature and water deficits on the partitioning of dry matter in groundnut (*Archis hypogaea* L.). J. Exp. Bot., 35: 746-755.

Onuh, M.O. and Donald, K.M. (2009). Effects of water stress on the rooting, nodulation potentials and growth of cowpea. Sci. World J., 4 (3): 31-34.

Piper, C.S. (1950). Soil and Plant Analysis. The Univ. Adelaide (Australia), 59-74.

Richard's, L.A. (1954). Diagnosis and Improvement of Saline and Alkaline Soils. USDA. Handbook No. 60.

Scholz, F.G.; Bucci, S.J.; Goldsteem, G.; Meihzer, F.C. and Tranco, A.C. (2002). Hydraulic redistribution of soil water by neotrpical savanna trees. Tree Physiol., 22: 603-612.

Shouse, P.; Desberg, S.; Jury, W.A. and Stolzy, L.H. (1981). Water deficit effects on water potential, yield and water use of cowpeas. Agron. J., March-April, 73: 333-336.

Singh, B. (2003). Improving the production and utilization of cowpea as food and fooder. Field Crop Res., 84: 150-169.

Singh, B.B; Ajeigbe, H.A.; Tarawali, S.A.; Rivera, S.F. and Abubakar, M. (2003). Improving the production and utilization of cowpea as food and fodder. Field Crops Res., 84: 169-177.

Turk, K.J.; Hall, A.E. and Asbell, C.W. (1980). Drought adaptation of cowpea. 1. Influence of drought on seed yield. Agron. J., 72: 413-420.

Watanabe, S.; Hakoyama, S.; Terao, T. and Singh, B.B. (1997). Evaluation Methods for Drought Tolerance of Cowpea. In: Advances in cowpea research, B. B. Singh et al. (Eds). IITA/ JIRCAS, IITA, Ibadan, Nigeria, 87-98.

Yaron, B.; Shalhevet, J. and Shimishi, D. (1973). Patterns of salt distribution under trickle irrigation. Ecological Studies; analysis and syntheses, Springer-Verlay, Brlin, 4: 389-394.

Zeinab, M. Kalil; Azza, T. Salem and Fadia M. Sultan (2015). Water stress tolerance of fodder cowpea as influenced by variance added levels of potassium sulphate. J. Soil Sci. and Agric. Eng., Mansoura Univ., 6 (2): 213-231.

Zesika, L.H. and Hall, A.E. (1982). Seed yields and water use cowpea (*Vigna unguiculata* (L.) Walp) subjected to planned–water deficit irrigation. Irrig. Sci., 3: 237 - 245.

الملخص العربي

تأثيـــر نقـص مـــاء الـــري علـــى خـــواص التـــربـــة وإنتـــاجيـــة اللـــوبيـــا فـى منطقـــة العـــريش

أشرف جابر السيد عثمان[١]، محمد سعد عبدالحميد القصاص[٢]، عطية عبدالوهاب السبسي[٢]

١- الإدارة العامة للمياه الجوفية، وزارة الموارد المائية والري، محافظة شمال سيناء، مصر.

٢- قسم الأراضي والمياه، كلية العلوم الزراعية البيئية، جامعة العريش، مصر.

نفذت تجربتين حقليتين في مزرعة كلية العلوم الزراعية البيئية جامعة العريش بشمال سيناء، مصر خلال موسمي ٢٠١٥ و٢٠١٦، كان الهدف من هذه التجارب هو دراسة تأثير نقص المياه على اللوبيا صنف "طيبة" والتي زرعت في أرض رملية طميية تحت نظام الري بالتنقيط، اشتملت التجربة على ثلاث معاملات للري (٥٠، ٧٥ و١٠٠% من الإحتياجات المائية لنبات اللوبيا)، وقد أوضحت النتائج أن أعلى معدل نقص لملوحة التربة في نهاية الموسم مقارنة بملوحة التربة قبل بداية التجربة كان مع معاملة الري ١٠٠%، بينما كانت أقل قيمة مع معاملة الري ٥٠%. كما أوضحت النتائج أن أعلى نقص في الكثافة الظاهرية في نهاية الموسم بالنسبة للكثافة الظاهرية للتربة قبل بداية التجربة كان مع معاملة الري ٥٠% وأقلها كان مع معاملة الري ١٠٠%، وقد كان أعلى معدل للنتح بخر الفعلي عند استخدام معاملة الري ١٠٠%، كما كانت أعلى كفاءة لإستخدام المياه عند استخدام معاملة الري ١٠٠%، وكانت هناك إختلافات معنوية لتأثير الخفض المائي على جميع قياسات النمو الخضري لنبات اللوبيا، وقد أدى زيادة الخفض المائي إلى إنخفاض جميع قيم قياسات النمو الخضري، أدى الخفض المائي إلى وجود تأثير معنوي على المحصول ومكوناته وسجلت أعلى قيم للمحصول ومكوناته مع معاملة الري ١٠٠% وأقلها مع معاملة الري ٥٠% في كلا الموسميين.

الكلمات الإسترشادية: الخفض المائى، ماء الرى، معامل النتح بخر، نبات اللوبيا.

المحكمـــون:

١- أ.د. فتـــح الله محمـــد فـرج أستاذ الأراضي والمياه المتفرغ، كلية الزراعة، جامعة قناة السويس، مصر.

٢- أ.د. على إبراهيم القصاص أستاذ الخضر المتفرغ، كلية العلوم الزراعية البيئية، جامعة العريش، مصر.