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DRIP FERTIGATION OF SOME VEGETABLE CROPS GROWN ON BAHARIYA OASIS SOIL

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ABSTRACT

A pot experiment was carried out at Sakha Agricultural Research Station during winter season of 2008 to study the suitability of Bahariya Oasis soils for producing vegetable crops under drip fertigation system. Three factors were arranged (crop kinds, lettuce, onion and pea ; Organic fertilization, unfertilized and fertilized with farmyard manure; NPK levels, without NPK, 50%, 100% and 150% of recommended dose) in randomized complete block design with three replicates.

Organic matter fertilization increased shoot dry weight by 159.1% with lettuce, 160.7 % in onion whereas this increase amounted by15.6 only in pea plants.

under 0.0 organic addition shoot dry weight were increased with increasing mineral fertilization dose up to 150 % of recommended dose. This increase represents 5.51, 3.35 and 1.46 fold of unfertilized treatment. The same trend was also obtained under organic fertilization condition but with a lower rate of increase.

Under 100% of mineral recommended dose , organic fertilization increased lettuce and onion nitrogen content of shoots from 2.13 to 3.24% (52.11% increase) and from 2.33 to 4.03% (72.69% increase) and the lowest increase was achieved in pea shoot nitrogen content(1.18% increase).

It is worthy to note that, in general nitrogen concentrations in roots are very low comparing to it's content in shoots .

Phosphorus concentration of organic fertilized lettuce, onion and pea shoots represent 156.59,149.77 and 171.57 % of that of organic unfertilized lettuce, onion and pea shoots , respectively.

Mineral fertilization increased phosphorus content of the studied crops even with addition of organic fertilizer up to the highest level used (150% of the recommended dose) and it's effect was abundant under 0.0 organic fertilizer treatments.

Organic matter addition increased potassium concentration in lettuce shoot, onion shoots and pea shoots by 19.78, 38.46 and 45.21%, respectively compared with 0.0 organic manure addition .So both mineral fertilization with organic manure and without organic manure increased potassium concentration in lettuce shoot, onion shoots and pea shoots to a large extent.

Little effect was found on potassium concentration of roots due to organic manure addition, where organic fertilized lettuce, onion and pea treatments mean is very closed to that of unfertilized one.

Utilization rate of applied nitrogen It was increased from 24.72 to 48.60% (mineral fertilization treatments mean), from 20.24 to 45.37% and from 29.58 to 55.38% due to organic matter addition to lettuce, onion and pea , respectively.

Nitrogen utilization was increased with a lower rate in absence of organic matter.

Utilization rate of applied phosphorus was increased from 12.28 to 21.11% (mineral fertilization treatments mean), from 9.86 to 19.52% and from 12.16 to 24.20% due to organic matter addition to lettuce, onion and pea , respectively.

Utilization rate of applied potassium was increased from 26.26 to 44.41% (mineral fertilization treatments mean), from 23.55 to 41.36% and from 29.81 to 57.11% due to organic matter addition to lettuce, onion and pea , respectively.

Keywords: Bahariya Oasis, NPK fertigation treatments, vegetable crops, organic manure FYM.

INTRODUCTION

Bahariya depression is located nearly in the middle of the Western desert of Egypt with a total area 2250 km^2, approximately. The area falls under the arid condition as the total rainfall is (3-6) mm/year. Springs and wells are the main two groundwater resources for irrigation and civic purposes (Salem, 1987). Rizk (2003) stated that the physicochemical analysis indicated that the Bahariya Oasis soils are coarse in texture, poor in organic matter content with a moderate alkaline reaction mostly exhibiting high content of both CaCO3% and total soluble salts. Total B content in soil is widely varying being lowest in the marshes and man-made terraces, and highest in the fine textured soils, at the north eastern area. The moderate quantities of B were found in the loamy textured Entisols.

Fertigation is the frequent application of appropriate amounts of dissolved fertilizers through irrigation system. By this system fertilizers can be added at a time of crops needs in a suitable position for plant roots (Ibrahim, 1997). Therefore, drip fertigation improves water and nutrient use efficiency then maximize plant production and minimize the effect on groundwater quality (Ajdary *et al.* ,2007) where minimizing mineral leaching and nutrient losses (Leonardi *et al.*, 2005). Therefore, this investigation was carried out to study the suitability of Bahariya Oasis soils for producing some vegetable crops under drip fertigation system.

MATERIALS AND METHODS

A pot experiment was laid out at the Agricultural Research Station in Sakha during winter season of 2008 to study the suitability of Bahariya soils for producing some vegetable crops under drip fertigation system. Surface soil samples (0-30 cm) were collected from El-Heiz region which located in Bahariya Oasis. Some physical and chemical properties of that soil are shown in Table 1.

Table 1: Some physical and chemical properties of the studied soil.

Coarse Sand%	Fine Sand%	Clay%	Silt%	Texture	OM%	$CaCO_3$ %	SP%	EC dSm^{-1}	pH	Available Nutrients (mg kg soil-1)			Soluble cations (meq/l)				Soluble anions (meq/l)			
										N	P	K	Ca^{+2}	Mg^{+2}	K^{+}	Na^{+}	$CO^{3=}$	HCO^{3-}	Cl^{-}	SO^{-4}
11.58	39.02	19.40	28.0	Sandy loam	0.54	9.40	26.50	5.91	7.71	17	7.0	119	9.0	14.2	1.1	24.7	00.0	8..5	32.4	18.1

A pottery pots of 33cm diameter, 40 cm length were used . Each pot was filled with 15 kg of soil mixed with or without organic fertilizer .

The studied factors were :

Crop kinds: three crop spices were used in this study , pea (Pisum sativum, L.) cv. Master P, onion (Allium cepa, L.) cv. Giza 20 and lettuce (Lactuca sativa, L.) cv. Local Romaine.

Organic fertilization , unfertilized and fertilized with 400 g pot-1 of farmyard manure (C :N ratio 12.41, N 1.2 %, P 0.25 and K 0.4%). Organic fertilizer was added two weeks before crops cultivation to the appropriate pots.

Mineral fertilization, four NPK fertigation levels were used, 0.0,50, 100 and 150% of recommended dose.

Agricultural Ministry recommendations for NPK fertilization as follow: 60,100 and 100 Kg N $Fed.^{-1}$ for Pea, Onion and lettuce respectively. 15, 25 and 20 Kg P_2O_5 $Fed.^{-1}$ for Pea, Onion and lettuce respectively. 48,100 and 100 Kg K_2O Fed^{-1} for Pea, Onion and lettuce respectively.

Randomized complete block design with three replicates was performed for the studied factors. The count of the experimental units were (3 x 2 x 4 x 3) 72. Urea ammonium nitrate liquid, 32% N was used as a Nitrogen source. Pota Delta liquid (40% K_2O) was used as a Potassium source . Phosphoric acid liquid (60% P_2O_5) was used as a phosphorus source.

On January, 28th of 2008 season, lettuce, onion seedlings were transplanted and pea seeds were sowing. Within 15 days later irrigation water was added three times(up to field capacity point) without NPK, then in the time "Between" February 15th to April 1st it was injected 10 times with appropriate amount of NPK fertilizers and then the irrigation water was used (5 times) without NPK fertigation until April 15th. Five days later lettuce and pea were harvested and onion was harvested 20 days later.

Two plants of each unite were taken at the final growth stage. Samples were directly transferred to the laboratory, cleaned with distilled water wetted cotton to get it free from any adherent dust. Lettuce and peas plant samples were separated into two parts (tops and roots) , so onion plant samples were separated into two parts, tops (bulbs + leaves) and roots. Drying was done in an electric oven at $70^{o}C$ up to constant weight, dried material of tops and roots were ground to a fine powder and kept in closed glass bottles. 0.1 g of plant samples were wet digested using a mixture of sulfuric and perchloric acids.

Nitrogen was determined by using Kjeldahl method as mentioned by Hesse, (1971). Phosphorus was determined calorimetrically at wavelength of 720 nm using spectrophotometer (Model SPEKOL 11 CARLZEISS JENA), (Schouwenburg and Waling, 1967). Potassium was estimated using Gallen Kamp Flame photometer as described by Jackson (1967).

Utilization rate (U.R.) of N, P and K fertilizerswere calculated according to Finck (1982) using the following formula:

$$UR\ \% = \frac{\text{Total removed* – removed from soil reserves**}}{\text{Nutrient amount of fertilizer***}} \times 100$$

Where;* Total removal from both fertilizer and soil reserves is plant uptake from fertilized plot.

** Removal from soil reserves (the uptake of control treatment).
*** Quantity of applied fertilizer.

RESULTS AND DISCUSSION

Data in Table 2 illustrate that organic fertilization increased shoot dry weight from 10.01 gm pot^{-1} to 25.94 gm pot^{-1} (159.1% increase) with lettuce , 160.7 % in onion whereas this increase amounted by15.6 only in pea plants. These results are in agreement withthat of Premuzic and Vilella (2002) they showed that mineral fertilization with organic fertilization gave the best yield of lettuce, dry matter and quality, associated with a lower content of nitrates in the environment.

Data in the same Table also reveal that under 0.0 organic addition, shoots dry weights were increased with increasing mineral fertilization dose up to 150 % of recommended dose . this increase represents 5.51 , 3.35 and 1.46 fold of unfertilized treatment. The same trend was also obtained under organic fertilization condition but with a lower rate of increase, 1.36, 1.33 and 1.46 fold with lettuce, onion and peas , respectively

Table 2: Shoot dry weight of the studied crops (g pot^{-1}) at harvesting stage as affected by organic manure and NPK fertigation treatments.

Treatments	Crop type					
	Lettuce		Onion		Pea	
	Without OM	With OM	Without OM	With OM	Without OM	With OM
Without NPK fert.	2.62	14.79	3.22	15.31	3.77	4.89
50% of rec. NPK	7.88	23.53	7.41	19.35	6.94	6.70
100%of rec. NPK	12.50	30.54	11.81	24.74	8.16	10.90
150% of rec. NPK	17.05	34.89	14.02	35.73	11.02	12.01
Mean	**10.01**	**25.94**	**9.12**	**23.78**	**7.47**	**8.63**
Average	**17.98**		**16.45**		**8.05**	

Data in Table 3 illustrate organic and mineral fertilization effects on roots dry weight of lettuce , onion and peas, where a similar trend of it on shoot dry weight was obtained. Organic matter addition increases lettuce root dry weight from 5.77 gm pot^{-1} to 8.69 gm pot^{-1} (50.6 % increase) . onion root dry weight was also increase from 1.57 gm pot^{-1} to 3.14 gm pot^{-1} (100% increase) . The similar increase in root dry weight of pea was 20.2 % only .

Table 3: Root dry weight of the studied crops (g pot^{-1}) at harvest stage as affected by organic manure and NPK fertigation treatments.

Treatments	Crop types					
	Lettuce		Onion		Pea	
	Without OM	With OM	Without OM	With OM	Without OM	With OM
Without NPK fert.	2.30	5.33	0.69	1.74	1.18	1.31
50% of rec. NPK	5.94	6.51	0.82	3.10	1.81	1.99
100%of rec. NPK	6.48	9.23	1.81	3.60	2.11	2.71
150% of rec. NPK	8.37	9.69	2.96	4.10	2.82	3.49
Mean	**5.77**	**8.69**	**1.57**	**3.14**	**1.98**	**2.38**
Average	**7.23**		**2.36**		**2.18**	

Increasing mineral fertilization dose from recommended dose to 1.5 fold of it increased root dry weight of lettuce by 29.17 % and 4.98 % under organic unfertilized and fertilized treatments, respectively . Similar increases with onion plant were 63.53 %and 13.89 %, so pea plant root increases were 33.64 % and 28.78 under organic unfertilized and fertilized treatments respectively .

As shown in Table 4 the highest value of N concentrations in shoots were 3.68, 4.47 and 4.80 % were obtained with 150% of recommended NPK in concomitant with organic fertilized lettuce, onion and pea, respectively . Meanwhile, the lowest values of N concentrations in shoots were obtained from untreated lettuce (1.83%), onion (2.05%) and pea (3.02%).

Data also reveal that N concentrations of organic fertilized treatment means were higher (56.04, 66.52 and 9.37 %) than that of unfertilized treatment means with lettuce, onion and peas , respectively. These results are in agreement with that of Rodrigues and Casali (1999) they found that organic matter application with mineral fertilizer resulted in higher foliar N concentrations of lettuce plant (%) compared with mineral fertilizer application alone.

Under 100% of mineral recommended dose , organic fertilization led to increase lettuce and onion nitrogen content from 2.13 to3.24%(52.11% increase) ,and from 2.33 to 4.03% (72.69% increase) , respectively. The lowest increase was achieved in pea nitrogen content(1.18% increase) .

Table 4: Nitrogen concentration (%) in shoots of the studied crops at harvest stage as affected by organic manure and NPK fertigation treatments.

Treatments	Crop types					
	Lettuce		Onion		Pea	
	Without OM	With OM	Without OM	With OM	Without OM	With OM
Without NPK fert.	1.83	2.95	2.05	3.41	3.02	3.02
50% of rec. NPK	1.95	3.05	2.18	3.62	3.34	3.25
100%of rec. NPK	2.13	3.24	2.33	4.03	3.38	3.42
150% of rec. NPK	2.38	3.68	2.75	4.47	3.48	4.8
Mean	**2.07**	**3.23**	**2.33**	**3.88**	**3.31**	**3.62**
Average	**2.65**		**3.11**		**3.47**	

Data of the same Table pointed out that mineral fertilization led to increase shoot nitrogen content of lettuce, onion and pea, where the highest value of it for each crop was obtained with the highest level of mineral fertilization dose (150 %) .

It is worthy to note that, in general nitrogen concentrations in roots of the studied crops are very low comparing to it's content in shoots . Nitrogen content of lettuce roots represent 4.19% of that of it's shoot, in onion nitrogen concentration of roots amounted by 3.63% of that of it's shoots . in pea N concentrations of roots represent 4.19% of that of it's shoot. Data of Table 5 shows also that the highest value of N concentration was (0.202 %) produced with 150% of recommended NPK dose jointly with organic fertilizer in pea roots. Meanwhile, the lowest one was (0.071%) obtained with unfertilized lettuce.

Table 5: Nitrogen concentration (%) in roots of the studied crops at harvest stage as affected by organic manure and NPK fertigation treatments.

Treatments	Crop types					
	Lettuce		Onion		Pea	
	Without OM	With OM	Without OM	With OM	Without OM	With OM
Without NPK fert.	0.071	0.104	0.073	0.105	0.092	0.129
50% of rec. NPK	0.103	0.113	0.092	0.119	0.119	0.156
100%of rec. NPK	0.119	0.125	0.118	0.128	0.128	0.188
150% of rec. NPK	0.123	0.131	0.133	0.135	0.139	0.202
Mean	**0.104**	**0.118**	**0.104**	**0.122**	**0.119**	**0.169**
Average	**0.111**		**0.113**		**0.144**	

Data of Table 6 reveal organic matter and mineral fertilizers effect on P concentration in shoots of the studied crops .Data clearly show that the highest values of P concentration in shoots of each crop was obtained as a result of 150% of recommended NPK dose combined with organic fertilizer and the lowest one for each crop was obtained with unfertilized treatments. These results are in harmony with those obtained by Yamamoto *et al.,* (2001).

Phosphorus concentration of organic fertilized lettuce, onion and pea shoots represent 156.59,149.77 and 171.57 % of that of organic unfertilized lettuce, onion and pea shoots , respectively.

As shown in the table mineral fertilization increases phosphorus content of the studied crops even with addition of organic fertilizer up to the highest level used (150% of the recommended dose) .Mineral fertilization effect was abundant under 0.0 organic fertilizer treatments.

Mineral fertilization increases phosphorus concentration of lettuce shoots from 0.182 to 0.26% as average of without and with organic fertilizer treatments. Similar increased in onion and pea shoots were from 0.232 to 0.266% and from 0.169 to 0.267%, respectively .

Table 6: Phosphorus concentration (%) in shoots of the studied crops at harvest stage as affected by organic manure and NPK fertigation treatments.

Treatments	Crop types					
	Lettuce		Onion		Pea	
	Without OM	With OM	Without OM	With OM	Without OM	With OM
Without NPK fert.	0.091	0.272	0.173	0.290	0.103	0.234
50% of rec. NPK	0.216	0.310	0.204	0.316	0.225	0.340
100%of rec. NPK	0.243	0.321	0.236	0.338	0.228	0.373
150% of rec. NPK	0.268	0.380	0.238	0.331	0.233	0.404
Mean	**0.205**	**0.321**	**0.213**	**0.319**	**0.197**	**0.338**
Average	**0.260**		**0.266**		**0.267**	

Data of Table 7 illustrate The P concentration (%) in roots at harvest stage as affected by organic manure and NPK treatments. Organic and mineral fertilizer affects phosphorus concentration in lettuce , onion and pea roots , but in general P concentrations in roots are very low comparing to it's

content in shoots . P content of lettuce roots represent 7.69% of that it's shoot, in onion P concentration of roots amounted by 7.52% of that of it's shoots . In pea P concentrations of roots represent 8.24% of that of it's shoot

Data of the Table shows also that the highest value of P concentration was (0.031 %) obtained with 150% of recommended NPK dose jointly with organic fertilizer in pea roots. Meanwhile, the lowest one was (0.007%) obtained with unfertilized lettuce.

Table 7: Phosphorus concentration (%) in roots of the studied crops at harvest stage as affected by organic manure and NPK fertigation treatments.

Treatments	Crop types					
	Lettuce		Onion		Pea	
	Without OM	With OM	Without OM	With OM	Without OM	With OM
Without NPK fert.	0007	0.016	0.009	0.014	0.014	0.016
50% of rec. NPK	0.012	0.019	0.014	0.019	0.018	0.019
100%of rec. NPK	0.020	0.029	0.019	0.028	0.024	0.026
150% of rec. NPK	0.029	0.030	0.025	0.030	0.028	0.031
Mean	**0.016**	**0.024**	**0.017**	**0.023**	**0.021**	**0.023**
Average	**0.020**		**0.020**		**0.022**	

Data in Table 8 reveals organic and mineral fertilizers effect on K concentration in shoots of the studied crops. As shown in the Table organic matter addition increases potassium concentration in lettuce shoot, onion shoots and pea shoots by 19.78, 38.46and 45.21%, respectively, compared with 0.0 organic fertilizer addition .So both mineral fertilization without organic fertilizer and with organic fertilizer increased potassium concentration in lettuce shoot, onion shoots and pea shoots to a large extent.

Potassium concentrations of studied crop shoots were increased with increasing mineral fertilization up to the highest level used. Under 0.0 organic fertilizer addition potassium lettuce shoots, potassium onion shoots and potassium pea shoots were increased by 95.12, 175.0 and 80.74% due to mineral fertilization increase from 0.0 to 150% of recommended dose . Under organic fertilizer addition similar increases with the same crops in the same order were 96.05, 28.16 and 53.14% due to mineral fertilization increase from 0.0 to 150% of recommended dose .

The highest value of K concentration was recorded in pea shoots (3.17 %) with 150% of recommended NPK dose jointly with organic fertilizer. Meanwhile, the lowest one was recorded in lettuce shoots (1.23%) with untreated lettuce (0.0 organic + 0.0 mineral fertilization)

Table 8: Potassium concentration (%) in shoots of the studied crops at harvest stage as affected by organic manure and NPK fertigation treatments.

Treatments	Crop types					
	Lettuce		Onion		Pea	
	Without OM	With OM	Without OM	With OM	Without OM	With OM
Without NPK fert.	1.23	1.52	1.12	2.45	1.35	2.07
50% of rec. NPK	1.44	1.92	1.51	2.87	1.63	2.68
100%of rec. NPK	2.19	2.31	2.52	3.05	2.13	2.94
150% of rec. NPK	2.40	2.98	3.08	3.14	2.44	3.17
Mean	**1.82**	**2.18**	**2.08**	**2.88**	**1.88**	**2.73**
Average	**2.00**		**2.48**		**2.31**	

It is worthy to point out that, little effect was found on potassium concentration of roots due to organic manure addition, where organic fertilized lettuce, onion and pea treatments mean is very closed to that of unfertilized one(0.44 and 0.43% for lettuce, 0.31 and 0.37% for onion and 0.30 and 0.31% for pea) .

Table 9: Potassium concentration (%) in roots of the studied crops at harvest stage as affected by organic manure and NPK fertigation treatments.

Treatments	Crop types					
	Lettuce		Onion		Pea	
	Without OM	With OM	Without OM	With OM	Without OM	With OM
Without NPK fert.	0.35	0.36	0.23	0.30	0.24	0.26
50% of rec. NPK	0.41	0.41	0.29	0.36	0.30	0.29
100%of rec. NPK	0.52	0.46	0.32	0.39	0.32	0.34
150% of rec. NPK	0.47	0.50	0.39	0.42	0.34	0.40
Mean	**0.44**	**0.43**	**0.31**	**0.37**	**0.30**	**0.32**
Average	**0.43**		**0.34**		**0.31**	

Mineral fertilization effect on that trait was more pronounced than That organic fertilizer effect.

Utilization rate of applied nitrogen as affected by organic manure and NPK treatments are shown in Table 10. It was increased from 24.72 to 48.60% (mineral fertilization treatments mean), from 20.24 to 45.37% and from 29.58 to 55.38% due to organic matter addition to lettuce, onion and pea , respectively. This increase mainly duo to the N content of organic matter ,so its improving effect of plant root growth conditions, enable the roots to absorb more Nitrogen . Nitrogen utilization crop average were 36.66, 32.81 and 42.48 % for lettuce, onion and pea , respectively.

Table 10: Utilization rate (%) of applied nitrogen as affected by organic manure and NPK fertigation treatments.

Treatments	Crop type					
	Lettuce		Onion		Pea	
	Without OM	With OM	Without OM	With OM	Without OM	With OM
50% of rec. NPK	24.63	43.90	16.34	29.41	32.83	48.04
100%of rec. NPK	24.66	48.42	21.80	45.99	27.21	49.95
150% of rec. NPK	24.87	53.48	22.55	60.72	28.69	68.16
Mean	**24.72**	**48.60**	**20.24**	**45.37**	**29.58**	**55.38**
Average	**36.66**		**32.81**		**42.48**	

As it is clear in the Table nitrogen utilization was increased with a lower rate in absence of organic fertilization , where the rate of increase was higher in presence of organic fertilization**.**

Data also reveals that the highest utilization rate of applied nitrogen was obtained (68.16 %) with organic fertilized pea jointly with 150% of NPK recommended dose. On the other hand, the lowest value was obtained (16.34 %) with 50% of NPK recommended dose with absence of organic matter .

Utilization rate of applied phosphorus as affected by organic fertilization and NPK treatments are shown in Table 11, where it was increased from 12.28 to 21.11% (mineral fertilization treatments mean), from 9.86 to 19.52% and from 12.16 to 24.20% due to organic matter addition to lettuce, onion and pea , respectively. This increase mainly duo to the N content of organic matter ,so its improving effect of plant root growth conditions, enable the roots to absorb more phosphorus. phosphorus utilization crop average were 16.70, 14.69 and 18.18 % for lettuce, onion and pea , respectively.

Table 11: Utilization rate (%) of applied phosphorus as affected by organic manure and NPK fertigation treatments.

Treatments	Crop type					
	Lettuce		Onion		Pea	
	Without OM	With OM	Without OM	With OM	Without OM	With OM
50% of rec. NPK	13.00	20.21	8.81	14.68	15.04	23.97
100%of rec. NPK	12.14	20.55	11.11	21.04	10.94	24.08
150% of rec. NPK	11.70	22.56	9.67	22.67	10.51	24.54
Mean	**12.28**	**21.11**	**9.86**	**19.52**	**12.16**	**24.20**
Average	**16.70**		**14.69**		**18.18**	

Utilization rate of applied potassium as affected by organic manure and NPK treatments are shown in Table 12, where it was increased from 26.26 to 44.41% (mineral fertilization treatments mean), from 23.55 to 41.36% and from 29.81 to 57.11% due to organic matter addition to lettuce, onion and pea , respectively.

As it is clear in the Table potassium utilization was increased with a lower rate in absence of organic matter , where the rate of increase was higher in presence of organic matter.

. potassium utilization crop average were 35.34, 32.46 and 43.46 % for lettuce, onion and pea , respectively.

Data of Table 12 also reveals that the highest utilization rate of applied potassium was obtained (59.29 %) with organic fertilized pea jointly with 150% of NPK recommended dose. On the other hand, the lowest value was obtained (15.07 %) with onion under 50% of NPK recommended dose with absence of organic matter treatment .

Table 12: Utilization rate (%) of applied potassium as affected by organic manure and NPK fertigation treatments.

Treatments	Crop type					
	Lettuce		Onion		Pea	
	Without OM	With OM	Without OM	With OM	Without OM	With OM
50% of rec. NPK	23.33	38.72	15.07	32.58	27.38	53.79
100%of rec. NPK	28.05	43.12	27.60	42.83	30.07	58.26
150% of rec. NPK	27.41	51.39	27.98	48.68	31.99	59.29
Mean	**26.26**	**44.41**	**23.55**	**41.36**	**29.81**	**57.11**
Average	**35.34**		**32.46**		**43.46**	

Conclusion

It could be concluded that Baharia oasis soil can be used to produce lettuce, onion and pea plants . The highest increases which were found in dry matter, NPK contents and NPK utilization rates as a result of increasing fertilization dose above the recommended meaning that these recommended doses are not suitable for these crops under these conditions . Organic fertilization must be used with a higher quantities, so the soil water content must be near the field capacity point to reduce soil salinity hazard on crops.

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إضافة الأسمدة مع الري لبعض محاصيل الخضر النامية علي أراضي الواحات البحرية

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****قسم بحوث تغذية النبات- معهد بحوث الأراضي والمياه والبيئة-مركز البحوث الزراعية-الجيزة**

أقيمت تجربة أصص بمحطة البحوث الزراعية بسخا خلال موسم شتاء 2008 لدراسة مدي ملائمة أراضي الواحات البحرية لإنتاج بعض محاصيل الخضر (الخس والبسلة والبصل) تحت نظام التسميد مع الري بالتنقيط تحت مستويات من التسميد العضوي (بدون تسميد عضوي ومُضاف ٌسماد عضوي) ومستويات من التسميد المعدني NPK المُضافه من خلال نظام الري بالتنقيط (بدون تسميد معدني و50% من جرعة التسميد المعدني الموصي بها حسب كل محصول و100% من جرعة التسميد المعدني الموصي بها حسب كل محصول و150% من جرعة التسميد المعدني الموصي بها حسب كل محصول) على الوزن الجاف وتركيز النتروجين والفسفور والبوتاسيوم (%) في كل من المجموع الخضري والجذور عند الحصاد وكذلك كفاءة الاستفادة من السماد النتروجيني والفوسفاتي والبوتاسي المضاف ، وفيما يلي عرض لملخص النتائج المتحصل عليها:

- التسميد العضوى أدى إلى زيادة الوزن الجاف للجزء النامى فوق سطح الأرض بما يعادل 159.1% فى الخس و 160.7% فى البصل وبما يعادل 15.6 % فقط فى البسلة .
- معدل الزيادة فى الوزن الجاف للمحاصيل الثلاثة نتيجة إضافةة أعلى معدل من السماد المعدنى أعلى ما يمكن فى عياب التسميد العضوى وبلغت نسبة الزيادة 5.51 ، 3.35 ،1.46 ضعف المتحصل عليه فى حالة عدم وجود تسميد .
- فى المعاملات التى تضمنت 100% من التسميد المعدنى أدت إضافة السماد العضوى إلى زيادة النسبة المئوية للنيتروجين تقدر بـ 52.11 ، 72.69 فى الخس والبصل وكانت الزيادة أقل مايمكن فى البسلة (1.18% فقط).
- تركيز النيتروجين فى الجذورأقل كثيرا عن مثيله فى المجموع الخضرى .

- المحتوى الفوسفورى للمجموع الخضرى لكل من الخس والبصل والبسلة كمتوسط لمعاملات المادة العضوية يمثل 156.59 ، 149.77 ، 171.57 % لمثيلاتها التى لم تسمد عضويا .
- تركيز الفوسفور فى المجموع الخضرى للمحاصيل الثلاثة زاد بدرجة كبيرة بزيادة التسميد المعدنى حتى آخر معدل تسميد معدنى مستخدم وكان تأثير تلك المعاملات أكثر وضوحا فى غياب المادة العضوية.
- إضافة المادة العضوية أدت إلى زيادة المحتوى البوتاسيومى للخس والبصل والبسلة بما يعادل 19.78 ، 38.46 ، 45.21 % كما أدى التسميد المعدنى أيضا إلى زيادة المحتوى البوتاسيومى لتلك المحاصيل بدرجة كبيرة .
- تأثير المادة العضوية على محتوى الجذور من البوتاسيوم لم يكن واضحا حيث كان متوسط المعاملات التى سمدت عضويا قريب جدا من متوسط المعاملات التى لم تسمد عضويا .
- كفاءة استخدام المحاصيل الثلاثة للنيتروجين المضاف زادت بإضافة المادة العضوية من 18.54 إلى 36.45 % مع الخس ومن 15.17 إلى 34.03% مع البصل ومن 22.41 إلى 41.54 % مع البسلة .
- كفاءة استخدام السماد النيتروجينى زادت بمعدلات بسيطة بزيادة معدلات السماد المعدنى المضاف فى غياب المادة العضوية وزادت بمعدلات أكبر فى وجود المادة العضوية .
- كفاءة استخدام الأسمدة الفوسفاتية المضافة زادت بإضافة المادة العضوية من 12.28 إلى 21.11 % مع الخس ومن 9.86إلى 19.52 % مع البصل ومن 12.16 إلى 24.20% مع البسله .
- كفاءة استخدام الأسمدة البوتاسية المضافة زادت بإضافة المادة العضوية من 26.26 إلى 44.41 % مع الخس ومن 23.55 إلى 41.36% مع البصل ومن 29.81 إلى 57.11% مع البسلة.

الإستنتاج

من النتائج المتحصل عليها يتضح أن هناك امكانية لإنتاج محاصيل الخس والبصل والبسلة فى أراضى منطقة الحايز بالواحة البحرية إلا أن الزيادة الكبيرة فى المادة الجافة والمحتوى المعدنى وزيادة كفاءة الإستخدام لأسمدة النيتروجين والفوسفور والبوتاسيوم نتيجة زيادة التسميد المعدنى إلى مابعد الموصى به يعكس عدم مناسبة الموصى به لتلك المحاصيل فى ظروف تلك الأراضى ، كما أن تأثير المادة العضوية كبير جدا على كل من انتاج المادة الجافة والمحتوى من النيتروجين والفوسفور والبوتاسيوم لذلك يوصى بإضافتها وإن زادت كميتها و الأهم من ذلك أن ملوحة التربة تقتضى وجود محتوى عالى من الرطوبة الأرضية باستمرار (قريب جدا من السعة الحقلية) وذلك لتخفيف أثر الملوحة على النباتات النامية .

قام بتحكيم البحث

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