RESULTS AND DISCUSSION

4. RESULTS AND DISCUSSION

4.1. Effect of water regime and soil conditioners on tomato growth and its chemical composition:

Results of the tomato experiment will be discussed first, followed by results of the cucumber experiment. This is done since (1) tomato crop was planted succeeding the cucumber crop; two the effect of conditioners and the water stress would be of a vital importance for the tomato crops. (2) the yield is of a great economic importance in Egypt.

4.1.1. Plant growth:

The effect of water regime and applied soil conditioners on dry weight of tomato plants is given in Table (4) and illustrated in Fig. (1).

All conditioners under study gave more plant growth at all different levels of water regimes. Dry weights of stem where no conditioner was used were 101.8, 54.3, and 22.7 g/plant at 100 %, 66 % and 33 % water regimes, respectively. Comparable values of stem for treatments receiving conditioners were 115.7, 75.0, and 35.4 g/plant for the same water regimes, respectively. Weights of leaves where no conditioners was used were 216.3, 136.3, and 57.4 g/plant at the aforementioned water regimes, respectively. Where, conditioners were used ,weights were substantially greater, being 422.6, 306.5, and 140.9 at the respective water regimes. Weights of the dry matter of tomato fruits where no conditioners was used were 330.7, 234.8, and 130.3 g/plant at 100 %, 66 % and 33 % water regimes, respectively. Comparable values of fruits for treatments receiving conditioners were 579.9, 432.3, and 229.1 g/plant for the same water regimes, respectively.

Thus, addition of soil conditioners (polyacrilic acid, composite and chicken manure) increased dry weight of stem,

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leaves and fruits of tomato plants. Increasing the rate of applied conditioners was associated with a progressive and significant increase in the dry weight of leaves and fruits of tomato plants, reflect their positive effect on soil improvement. Ambrust and Dickerson (1971) found that the growth of tomato plants was increased by treating the soil with polyacrylamide. Al-Harbi et al. (1994) reported that addition of gel conditioner increased the growth of tomato shoots. In the current study, the greatest dry weight of stem was obtained by using the low rates of the studied conditioners along with the 100 % of water regime. To compare between the different conditioners, data indicate that the application of chicken manure was more effective in increasing the dry weight of stem, leaves and fruits of tomato plants than polyacrlic acid or the composite conditioners. The main effect shows the following order: chicken manure > composite conditioner > polyacrilic acid.

At 100 % water regime, increases in dry weight of stem, leaves and fruits upon application of polyacrilic acid were 9.2, 87.3 and 69.2 % for each component, respectively. Increases due to the composite conditioner were 10.9, 93.8 and 75.23 % in the same order. Increases due to chicken manure were 20.8, 104.8 and 81.7 %, respectively.

At 66 % water regime, the increases in the dry weight of stem, leaves and fruits due to application of polyacrilic acid were 28.73 114.2 and 78.5 %, respectively. Increases due to the composite conditioner were 36.1, 123.5 and 83.9 %, respectively.

Comparable increases due to chicken manure were 49.5, 137.0 and 89.9 % for stem leaves and fruits, respectively.

At 33 % water regime, increases in stem, leaves and fruits upon application of polyacrilic acid were 30.0, 138.7 and 75.4

RESULTS AND DISCUSSION

Table (4)	t): Effect	Table (4): Effect of water regime and some Rate of application (R) Fruits	egime a			Rate of	Rate of application (R)	n (R)			Fruits	Its	
	Materiar (M)		Stem	_			Leaves	401	Mean	Low	Medium	High	Mean
2000	()	Low	Medium	High	Mean	Low	Medium	l.		m	581.0	631.9	559.6
1000/	(4)	116.0	113.0	104.5	111.2	284.2	401.4 2.004			484.3	590.2	664.0	579.5
W (1)	((a	121.5	105.0	112.3	112.9	310.1	4 - 9.0			475.6	620.5	706.3	800.8
2	ĵΟ O	131.8	107.3	130.0	123.0	4. / 1.8	429.1			475.3	597.2	667.4	5/8.9
Mean	•8	123.1	108.5	115.6	7.00	200.0	294.5	376.6		335.4	447.9	1.4/4	19.4
%99	(A)	71.7	70.3	07.7	73.9	223.3	306.9	383.6	304.6	350.9	460.3	530.7	445.8
(W2)	(a)	7 Q	000	1 8	81.2	225.6	334.6	408.8	323.0	342. I	457.1	496.9	432.3
	သွ	ο α ο α	67.9	74.7	75.0	217.8	312.0	389.7	300.0	162.0	238.2	284.4	228.5
Mean	, ,	0 7.0	0 00	34.6	29.5	95.9	140.1	1/2.0	0.00	175.0	222.1	287.1	228.3
33%	£ (7 + 6	36.7	46.4	38.3	102.1	145.6	1 / 1	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 0 0	219.7	305.9	230.5
(M3)	<u>a</u> (37.7	35.2	42.2	38.3	101.7	156.4	179.3	0.047	168.2	226.7	292.4	229.1
200	2	31.2	33.9	41.1	35.4	6.66	9.9 147.4 17.	t.C.1-)				,
Nical						Mes	270 B	360.7	278.1	321.4	422.4	463.4	402.4
	(A)	70.6	71.1	0.69	70.2	194.9	0.000	361.3	287.9	337.0	424.2	478.6	413.3
	(a	77.3	69.1	78.6	75.0	211.8		27.7	303.9	327.9	434.5	514.8	425.7
	2 (89.1	8.69	83.7	80.9	214.9		26.6	290.0	328.8	426.9	485.6	413.8
	G mean		70.0	77.1	75.4	201.2		R=13		W=3.2	M=3.2	R=3.2	
LSDoor	- A	1	R=0.7			WM=2.2	- 2	>	7	WM=5.5	MR=5.5	WR=5.5	
	WM=1.	1 MK=1.1				WMR=	3.9			NINIA			
	WMK= Z.O	0.7 =	ditionore.							330 7			
Treatm	Treatments receiving	nng no cond	no conditioners.			216.3	egal I			234.8			
		543				136.3				130.3			
7 K		22.7				t	1 .outonite. 1	(\lambda/\lambda)		(C) = Chi	(C) = Chicken manure	ıre	
(A)	olvacrilic	acid	C(B) = C	omposite	(polyacrii	ic acid + L	(B) = Composite (polyacrille acid + Composite (polyacrille acid + R= rate of applica	pplication		0000	ad GOOD fo		
M = W	ner regime Aedium. H	We water regime $M=$ conditional minor $M=$ 000 for A; 500, 1000 and 1500 for B; and 2000, 5000 and 5000 for $M=$ 1 ow Medium. High = rates "in g/m^2 " (100, 200 and 300 for A; 500, 1000 and 1500 for B; and 2000, 5000 and 5000 for $M=$	$M = conc$ "in g/m^2 "	(100, 200	and 300	for A; 500	, 1000 and	1500 for E	s; and zor	JU, 3000 a	2000	ì	

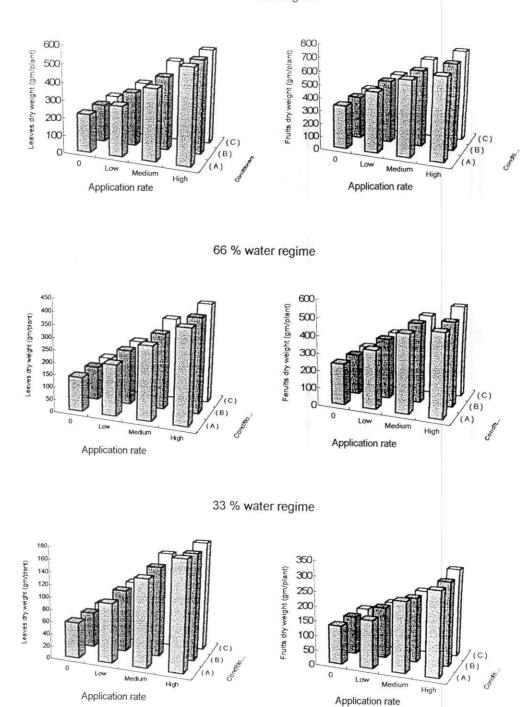


Fig.(1): Effect of water regime and soil conditioners on dry weight (g/plant) of tomato organs.

%, respectively; increases due to composite conditioner were 68.7, 143.7 and 75.2 %, respectively; and increases due to chicken manure were 68.7, 154.0 and 76.9 %, respectively. The dry weights of stem, leaves and fruits after application of chicken manure was relatively high followed by the composite then by the polyacrilic acid. This is mainly due to that chicken manure is a rich source of plant nutrients. These results support the conclusion of Abdel-Aziz et al. (1996) who found that chicken manure gave higher yield of sunflower than some synthetic conditioners.

Data also reveal that the dry weights of stem, leaves and fruits showed a gradual and significant decrease with the increase in water stress. This decrease was more pronounced at the 33 % water regime than at 66 % water regime. The main effects show that the percentage of the decreases in the dry weights of stem, leaves and fruits at the 33 % water regime relative to the 100 % water regime were 69.4, 66.7 and 60.5 %, respectively. This reflects the the adverse effect of water stress on plant growth and the processes of metabolism (Osvald and Osvaled, 1991). These results are in agreement with those reported by Taha et al. (1984) who reported that fresh and dry weights of the tomato seedling were decreased with decreasing the available soil moisture. Hara and Saha (2000) pointed out that the sensitivity of tomato seedlings to soil moisture stress was reflected by a significant reduction in fresh and dry matter under severe water stress conditions.

The superiority of chicken manure over the other two conditioners was particularly significant, where the moisture was enough i.e. at the 100 % water regime, this condition was shown for plant stem growth in particular. Under conditions of the severe water stress (i.e. at 33 % water regime), chicken manure and the composite conditioner were similar in effect in

producing stem growth. Also, the composite conditioner was not superior to polyacrilic acid under conditions of the high water stress in producing fruits. With regard to fruits, all conditioners under the high water stress showed the same effect giving nearly the same fruit yield. The decrease due to water stress was occurred either amended or unamended conditions.

4.1.2. Yield of tomato:

Effects of the different treatments of soil conditioners combined with the levels of water stress on the yield of tomato expressed as kg/plant are given in Table (5) and Fig. (2).

All studied soil conditioners gave greater yield at all different levels of the water regimes as compared with no application of conditioners. Fruit yields given by treatments receiving no conditioners were 3.99, 2.79 and 1.24 kg/plant as opposed to averages of 6.99, 5.22 and 2.76 kg/plant given by treatments receiving conditioners at water regimes of 100 %, 66 % and 33 %, respectively.

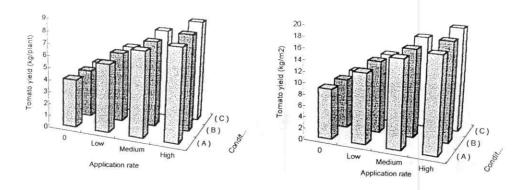
Therefore, addition of conditioners increased the yield of tomato. The greatest yield was obtained at the highest rate of addition. These results are consistent with those of Wallace et al. (1986) using synthetic conditioners and Gaffar et al. (1992) using natural conditioners.

The main effect of conditioners show that addition of chicken manure was more effective in increasing the yield of tomato than polyacrilic acid which was more effective than the composite conditioner. The increase in the yield after application of polyacrilic acid was 68.9, 81.0 and 121.8 % at the 100 %, 66 % and 33 % water regimes, respectively. With the composite conditioner, the relative increase in the yield was 74.93, 87.81and 121.8 % at the 100 %, 66 % and 33 % water regimes, respectively. With chicken manure increases were 98.0, 92.5 and 129.2 % at 100 %, 66 % and 33 % water regimes,

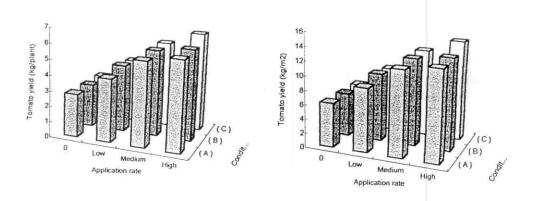
Table (5): Effect of water regime and soil conditioner materials on fresh tomato fruit yield (kg/plant).

Water	Material		Rate of appli	cation (ix)	
regime	(M)	Low	Medium	High	Mean
(W)	())	5.61	7.00	7.61	6.74
100%	(A)	5.84	7.11	8.00	6.98
(W1)	(B)		7.48	8.51	7.24
	(C)	5.72	7.19	8.04	6.99
Mean		5.72		5.71	5.05
66%	(A)	4.04	5.39	5.84	5.24
(W2)	(B)	4.32	5.55		5.37
	(C)	4.12	5.58	6.41	5.22
Mean	3 - 3 (2)	4.16	5.51	5.99	
33%	(A)	1.96	2.87	3.43	2.75
	(B)	2.12	2.68	3.46	2.75
(W3)		1.98	2.64	3.67	2.78
	(C)	2.02	2.73	3.52	2.76
Mean		2.02	Means of	materials	
	V (V)	0.07	5.09	5.58	4.85
	(A)	3.87	5.11	5.77	4.99
	(B)	4.09		6.20	5.13
	(C)	3.95	5.23		4.99
	G. mean	3.97	5.14	5.85	7.00
LSD 0.05	W=0.03	M=0.03	R=0.03		
LOD 0.0.	WM=0.05	MR=0.05	WR=0.05		
	WMR=	0.09			

Treatments receiving no conditioners: W1 = 3.99; W2 = 2.79; W3 = 1.24* To convert kg/plant into kg/m², multiply by 2.22



66 % water regime



33 % water regime

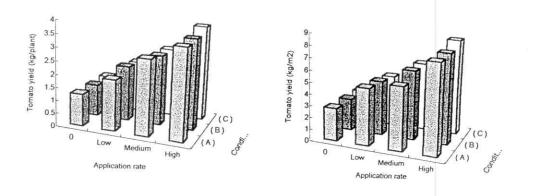


Fig.(2): Effect of water regime and soil conditioners on tomato yield (kg/plant & kg/m2).

respectively. These results indicate that chicken manure was higher in its increasing effect on the yield of tomato than that of polyacrilic acid and composite. Chicken manure was reported to have improved physical, chemical and biological characteristics of the sandy soil as well as being a source of nutritional elements (Hussein and Abdel-Aziz, 1992).

Data indicate that increasing water stress had a marked significant effect on the yield of tomato. The greatest yield was recorded at 100 % water regime, while the lowest was recorded at 33 % water regime. The main effect shows that the relative decrease in tomato yield at 33 % water regime was 36.3 % and the decrease at 66 % water regime was 58.1 %. Huang (1978) found that reduction in yield of tomato due to moisture stress was mainly due to reduction in fruit numbers and to a less extent due to low fruit weight.

The extent of decrease due to water stress was most pronounced where chicken manure was used under different water regime conditions.

As the case with plant growth, the superiority of chicken manure over the other two conditioners was particularly significant where the moisture was enough i.e. at the 100 % water regime. Under conditions of the high water stress (i.e. at 33 % water need), all conditioners were similar in effect in producing tomato yield. The decrease due to water stress occurred under treatments of all conditioners, it also occurred under conditions of no addition of conditioners.

4.1.3. Chemical composition of tomato plants:

4.1.3.1. Nitrogen content:

Data of N content in tomato plants as affected by applied soil conditioners under different stress of water are given in Table (6) and illustrated in Fig. (3).

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All conditioners gave more N content in different plant organs at all water regimes as compared with no application of conditioners. N content given by treatments receiving no conditioners were 1.38, 1.42 and 1.41% for stem; 3.08, 3.14 and 3.23% for leaves and 1.08, 1.18 and 1.24% for fruits as opposed to 1.63, 1.67 and 1.72% for stem; 4.02, 4.11 and 4.22% for leaves and 1.46, 1.55 and 1.62% for fruits given by treatments receiving conditioners; each values for each organ concern water regimes of 100%, 66% and 33%, respectively.

Concerning the effect of applied soil conditioners, data show that N contents in stem, leaves and fruits were favorably affected by application of conditioners. When the soil was treated with polyacrilic acid at high rate, the relative increases in N content at 100 % water regime were 10.9, 31.5 and 38.0 % for stem, leaves and fruits, respectively. At 66 % water regime, the relative increases in N content of stem, leaves and fruits were 10.6, 30.6 and 43.5 % over control, respectively. Increases regarding the 33 % water regime were 12.1, 37.6 and 32.3 % for stem, leaves and fruits, respectively. At the highest rate of the composite conditioner, the relative increases in N content in stem, leaves and fruits were 19.5, 34.7 and 42.5 %, respectively at 100 % water regime; and 21.8, 36.9 and 40.7 %, respectively at 66 % water regime; and 25.5, 37.5 and 34.7 %, respectively at 33 % water regime. Chicken manure at highest rate gave relative increases in N content for stem, leaves and fruits of 38.4, 41.6 and 53.7 %, respectively at 100 % water regime and 39.4, 43.9 and 43.2 %, respectively at 66 % water regime, and 40.4, 38.4 and 38.7 %, respectively at 33 % water regime.

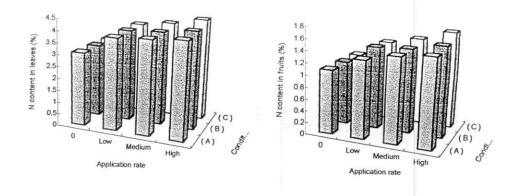
Chicken manure exerted the most beneficial effect on N content compared to polyacrilic acid and composite. This occurred at all rates of the applied conditioners. The highest content of N in stem, leaves and fruits in the chicken manure treatment reflects the improved physical properties of the

1.58 1.51 1.54 1.46 1.55 1.55 1.55 1.61 1.61 1.62 Mean 1.46 4 R=0.01 WR=0.01 1.56 1.62 1.69 1.62 1.72 1.54 1.66 1.55 1.65 1.63 1.63 1.67 High Fruits MR=0.01 M=0.01 1.58 1.53 1.51 Medium 1.53 1.58 1.60 1.62 Table (6): Effect of water regime and soil conditioner materials on nitrogen content (%) in tomato organs. 1.48 1.52 1.59 1.43 .45 WMR= 0.02 WM=0.01 W=0.01 1.48 1.49 1.48 1.48 1.49 1.52 1.50 1.61 1.59 1.59 1.48 1.40 1.36 Low 4.02 4.21 4.15 4.26 4.11 4.26 4.11 3.96 Mean 4.02 4.11 4.11 WR=0.01 R=0.01 4.29 4.45 4.30 4.16 4.10 4.30 4.31 4.31 4.44 4.47 4.41 4.15 4.36 4.19 High Means of materials MR=0.01 Leaves M=0.01 4.18 3.98 Medium 4.20 4.20 4.25 4.07 4.08 3.99 WMR= 0.02 WM=0.01 W=0.01 3.97 3.93 4.01 3.08 3.14 3.23 4.12 4.07 3.88 3.89 3.88 3.90 4.01 3.98 4.06 4.04 Low 1.85 1.51 1.64 1.70 1.88 1.72 Mean 1.63 1.49 1.86 1.67 1.57 1.58 1.58 1.72 1.96 1.75 1.98 1.70 1.57 1.98 1.76 1.64 High .91 WR=0.01 Stem R=0.01 1.50 1.63 1.85 1.66 Medium 1.86 1.56 .82 .63 .44 1.63 1.86 1.64 .57 Treatments receiving no conditioners:

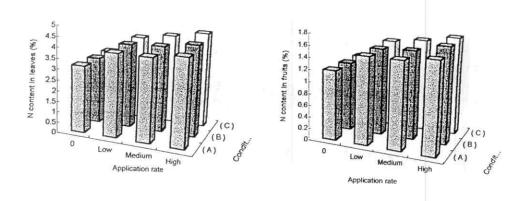
W1 = 1.38

W2 = 1.42

W3 = 1.41 MR=0.01 M=0.01 1.47 1.58 1.76 1.60 1,65 1.45 1.58 1.75 1.59 1.50 1.81 1.72 1.57 Low WMR= 0.02 WM=0.01 G. mean W=0.01 (0.0)Material QBO $\widehat{A}\widehat{B}\widehat{O}$ S OMA LSD ans Mean Mean regime 33% (W3) Mean %99 Water 100% (W2) (M) S



66 % water regime



33 % water regime

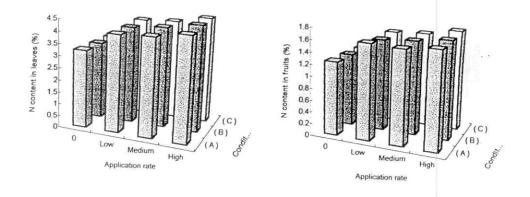


Fig.(3): Effect of water regime and soil conditioners on N content (%) in tomato organs.

sandy soil. Thus superiority of chicken manure over polyacrilic acid and composite in this concern is mainly attributed to the composition of chicken manure itself. These results are similar to those obtained by Abo-Srea (1994).

Regarding the effect of water stress, the values expressed as % indicate that N content in tomato stem, leaves and fruits tended to increase with increasing water stress. N contents increased from being 1.63 to 1.72 %; 4.02 to 4.22 % and 1.46 to 1.62 % in the stem, leaves and fruits, respectively when the water regime changed from being 100 % to 33 %. The increased N content due to severe water stress is a reflection of reduced plant growth.

For N content, the superiority of chicken manure over the other two studied conditioners as well as the superiority of the mixed conditioners over polyacrilic acid was particularly significant where the moisture was enough i.e. at the 100 % water regime. This was shown with each of the three organ categories of stem, leaves and fruits. However, under conditions of the severe water stress (i.e. at 33 % water regime), chicken manure gave higher N content than the two conditioners, but polyacrilic acid and the composite conditioner were similar in their effects on N content in fruit.

4.1.3.2. Nitrogen uptake:

Data of N uptake by tomato plants as affected by applied soil conditioners under different regimes of water are given in Table (7) and illustrated in Fig. (4).

All studied soil conditioners gave more N uptake by the different plant organs at all different water regimes as compared with no application of conditioners. N uptake by different organs given by the 100 %, 66 % and 33 % water regimes for the treatments receiving no conditioners were 1.40, 0.77 and 0.32

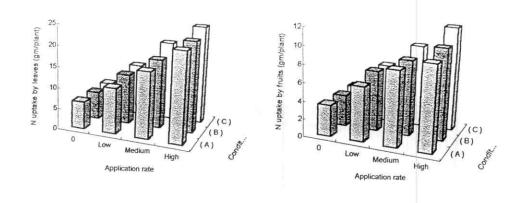
g/plant, respectively for stem; 6.66, 4.27 and 1.85 g/plant, respectively for leaves and 3.57, 2.87 and 1.57 g/plant, respectively for fruits. Comparable values for the conditioner treatments averaged 1.89, 1.25 and 0.61 g/plant by stem for the same water regimes; 17.11, 12.72 and 5.98 g/plant for leaves and 8.52, 6.74 and 3.73 g/plant for fruits for the same water regimes.

Concerning the effect of applied soil conditioners, data show that N uptake by stem, leaves and fruits were favorably affected by the application of conditioners. When the soil was treated with polyacrilic acid at highest rate, the relative increases for N uptake in stem, leaves and fruits were 13.6, 222.5 and 163.5 %, respectively at 100 % water regime; and 37.7, 261.5 and 155.7 %, respectively at 66 % water regime; and 75.0, 308.6 and 196.8 %, respectively for the three organs at 33 % water regime. Comparable values for the highest rate of the composite conditioner were 32.1, 229.3 and 186.2 %, respectively at 100 % water regime and 72.7, 286.2 and 178.3 %, respectively at 66 %water regime; and 156.3, 311.9 and 205.0 %, respectively at 33 % water regime in the same order. Comparable values for the highest rate of chicken manure were 77.1, 256.8 and 228.2 % for stem, leaves and fruits, respectively at 100 % water regime and 102.6, 332.6 and 213.2 %, respectively at 66 % water regime; and 159.4, 333.0 and 235.0 %, respectively at 33 % water regime.

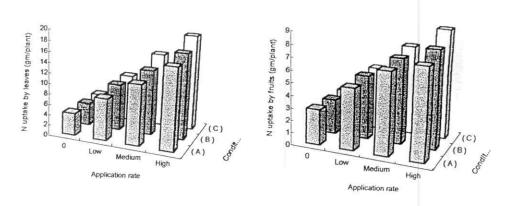
Chicken manure exerted the most beneficial effect on N uptake compared to polyacrilic acid and the composite conditioner. This occurred at all rates of the applied conditioners. This is a reflection of improving physical and fertility properties to the soil. Thus superiority of chicken manure is mainly to its chemical composition.

As regards water stress, data reveal increased uptake with providing enough water with increased water from 33 % to 100

Mean	7.94 88.48 89.16 89.16 6.31 6.74 6.30 6.72 6.30 6.72 6.33	
High	9.41 10.22 11.72 10.45 7.34 7.34 7.34 7.39 8.99 8.11 4.66 4.79 5.26 4.90 7.14 7.67 8.65 7.14 7.67 8.65 7.82 R=0.61	
Fruits	8.30 8.43 9.24 8.66 6.62 6.99 7.36 6.99 3.76 3.55 3.56 3.55 3.56 3.56 3.62 6.23 6.23 6.23 6.23 6.32 6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.44 6.42	
	6.78 6.51 6.46 6.46 6.46 6.51 6.46 6.51 5.13 2.62 2.62 2.74 2.63 2.63 4.75 4.78 4.78 4.75 W=0.61 WM=1.06 WMR=1.06	
0 60 (111)	16.08 16.86 17.11 17.11 12.72 5.96 6.25 5.96 6.25 11.81 11.93	
Ke(g/pia	High N 21.48 1 23.76 1 22.39 1 15.44 16.49 16.49 16.49 16.49 16.80 7.56 7.62 8.01 7.73 14.82 15.35 16.75 15.35 16.75 15.35 16.75 15.64 NR=1.49	
soil conditioner materials on nitrogen uptake(g/plant) by tomes assistant soil conditioner materials on nitrogen uptake(g/plant) by tomes as a soil conditioner materials on nitrogen uptake(g/plant) by tomes as a soil conditioner materials on nitrogen uptake(g/plant) by tomes as a soil conditioner materials on nitrogen uptake(g/plant) by tomes as a soil conditioner materials on nitrogen uptake(g/plant) by tomes as a soil conditioner materials on nitrogen uptake(g/plant) by tomes as a soil conditioner materials on nitrogen uptake(g/plant) by tomes as a soil conditioner materials on nitrogen uptake(g/plant) by tomes as a soil conditioner materials of application (R)	Low Medium 10.97 15.80 12.03 16.62 12.34 19.02 11.78 17.15 7.98 11.48 8.88 12.46 9.04 14.22 8.63 12.72 3.87 6.11 4.19 6.56 4.07 6.14 4.19 6.56 4.07 8.35 11.73 8.52 13.27 8.16 M=0.86 W=0.86 M=0.86 W=0.86 M=0.86 W=0.86 M=1.49 MR=1.49 WM=1.49 MR=1.49 WM=1.49 MR=1.49 WM=1.49 MR=2.58	
rials on nate of appl	10.97 12.03 12.34 11.78 7.98 8.88 9.04 8.63 3.87 4.14 4.19 4.07 Means of m 7.60 8.35 8.52 8.52 8.52 8.52 8.52 8.52 8.52 8.5	A.17.4
ner mate	Mean 1.65 1.78 2.23 1.89 1.03 1.21 1.25 0.46 0.65 0.65 1.05 1.25 1.25 1.25 1.25 1.25 1.25 1.25 1.2	
conditio	High 1.59 1.85 2.48 1.97 1.06 1.33 0.56 0.82 0.83 0.74 1.07 1.07 1.33 1.62 1.34 NR=0.23	
ne and soil	Low Medium: 1.68 1.68 2.26 1.95 1.93 1.01 1.24 1.07 1.71 1.24 1.33 1.10 0.36 0.46 0.51 0.65 0.58 0.58 1.02 1.05 1.20 1.11 1.20 1.15 1.20 1.15 1.20 1.15 1.20 1.15 1.20 1.15 1.20 1.15 1.20 1.11 1.20 1.15 1.20 1.15 1.20 1.11 1.20 1.15 1.20 1.11 1.20 1.11 1.20 1.11 1.20 1.11 1.20 1.11 1.20 1.11 1.20 1.11 1.20 1.11 1.20 1.11 1.20 1.11 1.20 1.11 1.20 1.11 1.20 1.11 1.20 1.11 1.20 1.11	
Table(7):Effect of water regime and Water Material	50	***
Effect of v	(M) (A) (B) (C) (C) (B) (C) (C) (B) (C) (C) (C) (C) (C) (C) (C) (C) (C) (C	
Table(7):E	regime (W1) 100% (W1) Mean 66% (W2) Mean 33% (W3) Mean Treatmet W1 = W1 = W2 =	1



66 % water regime



33 % water regime

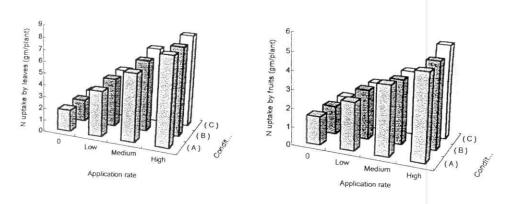


Fig.(4):Effect of water regime and soil conditioners on N uptake (gm/plant) by tomato organs

%, the uptake of N by stem, leaves and fruits increased from 0.61 to 1.89 in stem; 5.98 to 17.11 in leaves and 3.73 to 8.52 g/plant in fruits. The low N uptake caused by water stress in fact reflects the considerable decrease in plant growth and yield caused by water stress. In this concern, Tanguilig et al. (1987) reported that nutrient uptake under water stress conditions is a function of decreased capacity of the roots to absorb nutrients. These results are in agreement with those obtained by Hara and Saha (2000) who found that total N uptake by tomato was markedly enhanced with increased availability of soil moisture.

With regard to N uptake, the superiority of chicken manure over the other two studied conditioners was at each of 100, 66 and 33 % water regimes, particularly with stem. Under conditions of the severe water stress (i.e. at 33 % water regime), all studied conditioners were similar in their effects on N uptake by leaves and fruits. The decrease due to water stress was occurred under treatments of all studied conditioners, as well as under conditions of no conditioners.

4.1.3.3. Phosphorus content:

The results presented in Table (8) and Fig. (5) show P contents in plant tissues as affected by water regimes and soil conditioners.

All studied soil conditioners gave more P content in the different plant organs at all water regimes as compared with no application of conditioners. P content given by treatments receiving no conditioners at 100 %, 66 %, and 33 % water regimes were 0.20, 0.18 and 0.18 %, respectively in stem; 0.46, $0.42\,$ and $0.40\,$ %, respectively in leaves and $0.05,\,0.03\,$ and $0.03\,$ %, respectively in fruits. Comparable values for treatments receiving conditioners (averages) were as follows: 0.31, 0.27 and 0.26 %, respectively for the aforementioned water regimes in stem; 0.54, 0.50 and 0.43 %, respectively in leaves and 0.09, 0.06 and 0.05 %, respectively in fruits.

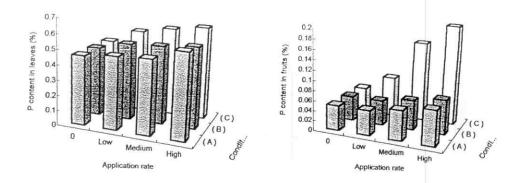
As regards to the effect of soil conditioners, data obtained revealed that P content in different organs of tomato increased progressively and significantly due to adding conditioners to soil and the increase was more obvious by increasing the rate of the applied conditioner. The highest P content in different organs of tomato was obtained at the highest rate of conditioners application. For polyaclic acid values of P content in stem, leaves and fruits at the 100 % water regime were 0.28, 0.51 and 0.06 %, respectively; at 66 % water regime values were 0.25, 0.48 and 0.04 %, respectively and 0.25, 0.47 and 0.04 %, respectively for each of the respective organs. Values for composite conditioner were 0.28, 0.52 and 0.06; 0.25, 0.48 and 0.05; and 0.25, 0.32 and 0.04 % at 100 %, 66 % and 33 % water regimes, respectively. Soil treated with chicken manure, showed mean values for P content as follows (at 100 %, 66 %, and 33 %, respectively): in stem: 0.35, 0.59 and 0.15; in leaves: 0.30, 0.52 and 0.10; and in fruits: 0.28, 0.49 & 0.07 %.

High P content in different organs of tomato caused by conditioners is a reflection of improved plant growth due to improving soils conditions by the applied conditioners.

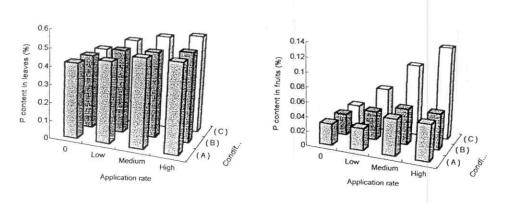
Chicken manure was the most effective; due to its nature. Abdel-Aziz et al. (2000) found that farmyard manure was superior shale on the content of P in wheat grains.

Also, data reveal that P content in tomato plants was greater as water applied was greater. The values of P content in treatments of 33 % and 100 % were as follows: stem: 0.26 and 0.31 %; leaves: 0.43 and 0.54 %; and fruits: 0.05 and 0.09 %. This increase with increase of applied water is mainly attributed

0.05 0.11 0.04 0.05 0.10 0.06 0.04 0.04 0.05 0.15 90.0 90.0 Mean WR=0.0 R=0.0 0.08 0.06 0.14 0.13 0.05 0.05 0.08 0.06 0.20 0.11 0.05 0.05 High 0.07 Fruits MR=0.01 M=0.01 Medium 0.05 0.05 0.11 0.07 0.06 0.06 0.09 0.09 0.05 0.05 0.05 0.05 0.05 WMR= 0.02 Table (8): Effect of water regime and soil conditioner materials on phosphorus content (%) in tomato organs. WM=0.01 W=0.01 0.03 0.05 0.07 0.04 0.03 0.05 0.08 0.06 0.03 0.04 0.04 0.03 Low 0.49 0.44 0.53 0.32 0.48 0.52 0.50 0.47 0.32 0.49 0.51 0.52 0.59 0.54 0.48 WR=0.01 R=0.01 0.43 0.57 0.49 0.50 0.55 0.51 0.46 0.26 0.53 0.56 0.54 0.62 0.57 Leaves materials MR=0.01 Rate of application (R) M=0.01 0.42 0.54 0.48 0.49 0.48 Medium 0.45 0.52 0.59 0.53 0.49 0.53 0.50 WMR= 0.02 Means of WM=0.01 W=0.01 0.48 0.50 0.48 0.48 0.45 0.46 0.47 0.46 0.42 0.40 0.49 0.47 0.48 0.51 0.55 0.55 0.45 0.47 0.26 0.26 0.31 0.28 0.25 0.28 0.26 0.25 0.25 0.30 0.27 0.25 0.28 0.35 0.31 WR=0.01 R=0.01 0.27 0.28 0.33 0.29 0.31 0.34 0.34 0.27 0.27 0.28 0.28 0.29 MR=0.01 Stem M=0.01 0.26 0.26 0.32 0.28 Medium 0.28 0.35 0.35 0.26 0.25 0.27 0.27 0.29 WMR= 0.02 Treatments receiving no conditioners. WM=0.01 V=0.01 0.24 0.28 0.26 0.26 0.26 0.28 0.28 0.25 0.25 0.25 0.25 0.25 0.20 0.18 0.18 Low mean Θ Material A B O V m V E O B > Ö Mean Mean Water regime Mean 33% (M3) 11 11 100% %99 (W2) 11 W1) 3 ¥8 83 83 83



66 % water regime



33 % water regime

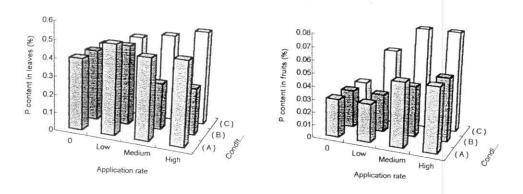


Fig.(5) Effect of water regime and soil conditioners on P content (%) in tomato organs.

to improved plant growth caused by increasing the available water. These results are agreement with those reported by Hegde and Srinivas (1990) who reported that P concentration in tomato decreased with the decrease in irrigation intervals.

With regard to the interaction, the superiority of chicken manure over the other two studied conditioners was particularly significant, where the moisture was enough i.e. at the 100 % water regime. Under conditions of the high water stress (i.e. at 33 % water regime), chicken manure was superior only with leaves, while but was similar to them with stem and fruits.

4.1.3.4. Phosphorus uptake:

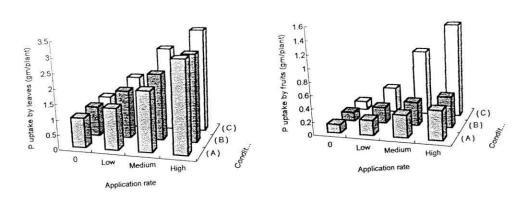
Data in Table (9) and Fig. (6) show the uptake of P by tomato plants affected by soil conditioners and water stress.

All studied soil conditioners gave more P uptake by different plant organs at all water regimes as compared with no application of conditioners. P uptake at water regimes of 100, 66, and 33 % respectively, given by treatments receiving no conditioners, were 0.21, 0.09 and 0.05 g/plant for stem; 0.99, 0.57 and 0.23 g/plant for leaves and 0.13, 0.07 and 0.09 g/plant fruits. Comparable values (averages) for conditioners treatment were 0.36, 0.20 and 0.09 g/plant for stem; 2.31, 1.53 and 0.59 g/plant for leaves and 0.54, 0.28 and 0.12 g/plant for fruits.

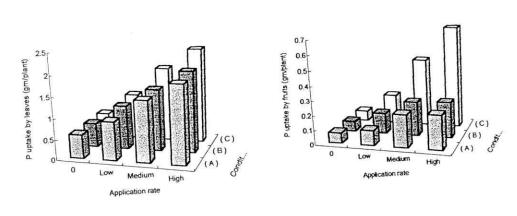
Decreased applied water caused a decrease in P uptake. Mean uptake values at 100, 66, and 33 % water regimes were as follows for the polyacrilic acid treatment; stem: 0.31, 0.17 and 0.07; leaves: 2.10, 1.40 and 0.63; and fruits: 0.34, 0.18 and values for the mixed conditioner g/plant. Mean (composite) are as follows: stem: 0.32, 2.20 and 0.35; leaves: 0.18, 1.48 and 0.20; and fruits: 0.09, 0.72 and 0.09 g/plant at

RESULTS AND DISCUSSION

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tments receiving no conditioners: 0.21 0.09 0.057 0.057 0.057		5	_	3	80.0-24			WM=0.35	MR=0.35	WR=0.35		VV=0.11	M=0.11 MR=0.19	R=0.11	
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0.09 0.57 0.05 0.03	W .			0.21											
0.05	W2 =			0.09				66.0				0.13			
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66 % water regime



33 % water regime

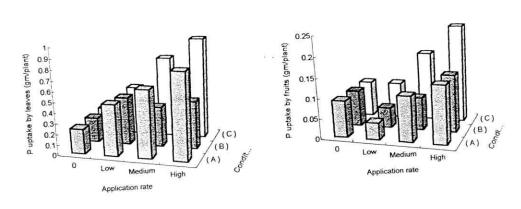


Fig.(6):Effect of water regime and soil conditioners on P uptake (gm/plant) by tomato organs.

100 %, 66 % and 33 % water regimes, respectively. Mean values for chicken manure were: stem: 0.43, 2.62 and 0.92; leaves: 0.24, 1.70 and 0.46; and fruits: 0.10, 0.72 and 0.17 g/plant at 100 %, 66 % and 33 % water regimes, respectively. Awad (1996) applied synthetic soil conditioners to a sandy soil and a calcareous soil and obtained increased uptake of P. El-Ghazoli (1998) showed that the application of organic manures increased P uptake by wheat plants.

Water stress was associated with lower P uptake. Increase water given to plants from 33 % to 100 % water regime showed the following mean values: stem: 0.09 to 0.36; leaves: 0.59 to 2.31; and fruits: 0.12 to 0.54 g/plant. Such trend reflects improved conditions for plant growth with application of enough water.

With regard to the interaction, the superiority of chicken manure over the other two conditioners was significant where the moisture was enough i.e. at the 100 % water regime. P uptake by stem, leaves and fruits was particularly significant at the 100 % water regime when chicken manure applied to the soil compared to the other two conditioners. Under conditions of the high water stress (i.e. at 33 % water regime), all conditioners were similar in their effects on P uptake by stem, leaves and fruits. The decrease due to water stress occurred under treatments of all conditioners, it also occurred under conditions of no addition of conditioners.

4.1.3.5. Potassium content:

Values of K content in tomato organs grown on the sandy under application of different conditioners and water regimes are presented in Table (10) and Fig. (7).

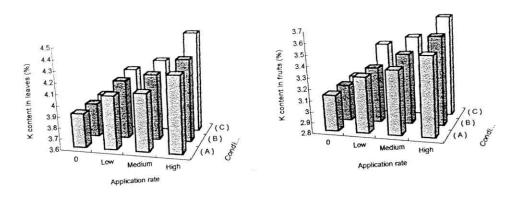
All conditioners gave more K content in different plant organs at all water regimes as compared with no application of conditioners. For 100, 66 and 33 %, K content given by treatments receiving no conditioners in the respective order of water regimes were as follows: 2.73, 3.00 and 3.30 % for stem; 3.91, 4.00 and 4.13 % for leaves and 3.13, 3.29 and 3.50 % for fruits. Comparable values for the conditioner tratmnts (averages) were as follows: 3.26, 3.45 and 3.64 % for stem; 4.22, 4.34 and 4.47 % for leaves and 3.46, 3.66 and 3.79 % for fruits.

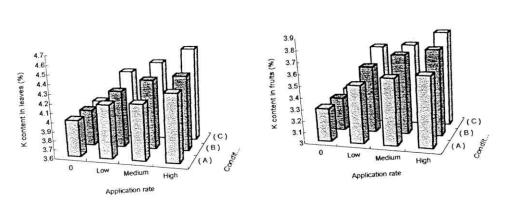
Conditioners thus increased the content of K in plant. This increase was more obvious by increasing the rate of the applied conditioner. With stem at 100 %, the 3 conditioner of polyacrilic acid, composite conditioner and chicken manure gave K contents (averages) as follows: 3.17, 3.24 and 3.36 %; at 66 % water regime values were 3.36, 3.48 and 3.51 %; comparable values for the 33 % water regime were 3.59, 3.60 and 3.72 % for each conditioners, respectively.

With leaves at 100 % water regime, application of polyacrilic acid, composite conditioner and chicken manure gave values of 4.15, 4.22 and 4.30; at 66 % water regime values were 4.23, 4.32 and 4.47; and at 33 % water regime values were 4.39, 4.47 and 4.55 for each of the 3 conditioners, respectively.

With fruits at 100 % water regime, application of polyacrilic acid, composite conditioner and chicken manure showed values of 3.39, 3.44 and 3.56, respectively; at 66 % water regime values were 3.56, 3.67 and 3.74; and at 33 % water regime values were 3.72, 3.77 and 3.90 % for each conditioner, respectively. These results are agreement with those reported by Awad (1996) and Aly (1999).

LSD oos W=0.04 M=0.04 R=0.04 W=0.02 M=0.02 W=0.07 WR=0.07 WR=0.07 WR=0.07 WR=0.07 WR=0.07 WR=0.04 MR=0.04 MR=0.04





33 % water regime

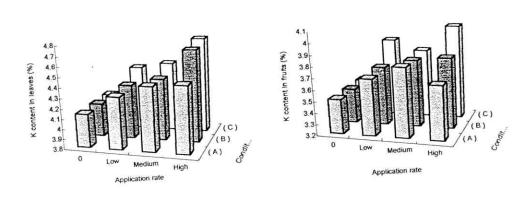


Fig.(7):Effect of water regime and soil conditioners on K content (%) in tomato organs.

Data also revealed that chicken manure exerted the most beneficial effect on K content compared to polyacrilic acid and composite. This was true at all rates of applied conditioners. This superiority of chicken manure reflects its high nutritonal value for plants.

Increasing water input from 33 % to 100 % was associated with a decrease in K content in different organs. This reflects a "dilution effect" with marked increase in growth to the extent of leading to decreased K % in plant tissues. K content at the lowest water input decreased from being 3.64 % in stem to become 3.26 % at the highest water input. Comparable values for leaves were 4.47 % decreasing to 4.22 %; those for fruits were 3.79 decreasing to 3.46 %. Such a finding confirm the results of Hegde and Srinivas (1990) who reported that K concentration in tomato decreased with increased irrigation.

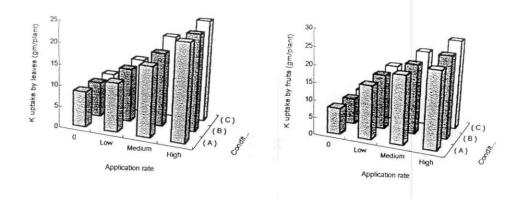
4.1.3.6. Potassium uptake:

Values of K uptake by tomato are presented in Table (11) and Fig. (8).

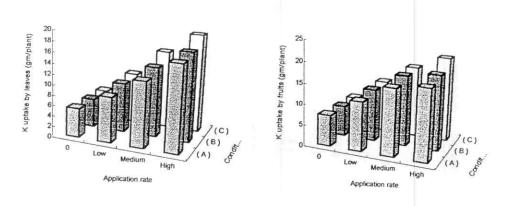
All conditioners gave more K uptake by different plant organs at all water regimes as compared with no application of conditioners. K uptake given at 100 %, 66 %, and 33 % water regimes by treatments receiving no conditioners were 2.77, 1.62 and 0.75 g/plant for stem 8.45, 5.45 and 2.37 g/plant for leaves and 7.51, 7.31 and 3.91 g/plant for fruits. Comparable values for conditioners (averages) were 3.77, 2.59 and 1.29 g/plant for stem; 17.95, 13.38 and 6.33 g/plant for leaves and 20.16, 15.84 and 8.71 g/plant for fruits.

Polyacrilic acid gave the lowest of the three conditioners; composite conditioner was of medium effect and chicken manure was the greatest in K uptake. At 100 % water regime, polyacrilic

Fruits High Mean High Mean High Mean High Mean High Mean High Mean 19.02 8 20.24 23.83 20.02 8 20.24 23.83 20.02 2 21.84 26.13 21.46 2 20.55 24.02 20.16 2 20.55 17.06 14.93 1 5.99 18.12 16.71 1 6.98 20.32 16.71 1 6.98 18.12 16.71 1 6.98 18.12 1 6.98 18.12 1 6.98 18.13 1 7.18 20.32 1 6.98 18.13 1 7.18 20.32 1 7.18 20.32 1 7.18 20.32 1 7.29 9.03 1 7.29 9.03 1 7.29 10.94 9.03 1 7.29 17.63 14.84 1 6.20 17.63 14.84 1 6.20 17.63 14.84 1 6.20 17.63 14.84 1 6.20 17.63 14.84 1 7.51 7 7.51 7 7.51 7 7.51 7 7.51 7 7.51
15.9 15.9 15.9 15.9 17.1 17.9 17.9 17.9 17.9 17.9 17.9 17
Seil conditioner materials on potassium uptake Stem Glum High Mean Low Mean Glum High Mean Low Mean 3.46 3.52 11.59 11 3.55 3.46 3.52 12.81 11 3.55 3.77 3.65 12.81 11 2.29 2.30 2.36 9.26 2.31 2.45 1.06 4.13 1.09 1.24 1.06 4.13 1.09 1.24 1.06 4.13 1.09 1.24 1.06 4.13 1.09 1.24 1.08 4.42 1.33 1.69 1.62 4.13 1.42 4.50 2.36 2.34 2.31 8.09 2.36 2.34 2.31 8.09 2.36 2.37 2.99 2.80 8.77 2.36 2.99 2.80 8.77 2.36 2.99 2.80 8.77 2.36 2.68 2.55 8.77 2.36 2.99 2.80 8.77 2.37 2.99 2.80 8.77 2.36 2.99 2.80 8.77 2.37 2.99 2.80 8.77 2.36 2.99 2.80 8.77 2.37 2.99 2.80 8.77 2.36 2.99 2.80 8.77 2.37 2.99 2.80 8.77 2.37 2.37 2.37 2.37
Table (11): Effect of water regime and soil conditioner materials on potassium uptake (g/plant) by tomato organis. Valer Material Stem Stem Leaves High Wean Leaves High Wean Leaves High Wean Low Medium High Mean Low Look Loo



66 % water regime



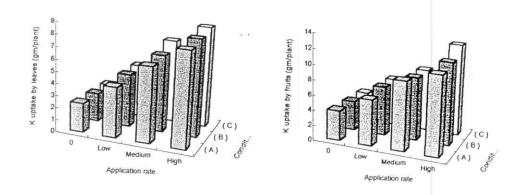


Fig.(8):Effect of water regime and soil conditioners on K uptake (gm/plant) by tomato organs.

acid, composite, and chicken manure conditioners showed the following uptake in stems respectively 3.52, 3.65 and 4.13; at 66 % comparable values for stems were 2.35, 2.56 and 2.85; values at 33 % were 1.06, 1.38 and 1.42 g/plant, for the three mentioned conditioners, respectively.

Uptake values for leaves after application of polyacrilic acid, composite and chicken manure were as follows: at 100 % water regime: 16.91, 17.76 and 19.18; at 66 %: 12.40, 13.22 and 14.53; at 33 %: 6.03, 6.29 and 6.66 g/plant for each conditioner, respectively.

Uptake by fruits after application of polyacrilic acid, composite and chicken manure were as follows: at 100 % water regime: 19.02, 20.02 and 21.46; at 66 %: 14.93, 15.89 and 16.71; at 33 % 8.48, 8.61 and 9.03 g/plant for each of the three conditioners, respectively. These results are agreement with those reported by Awad (1996) and Aly (1999). Chicken manure exerted the most beneficial effect.

K uptake increased with increased water input. When water input increased from 33 % to 100 % uptake increased from 1.29 to 3.77g/plant in stem; 6.33 to 17.95 g/plant in leaves and 8.71 to 20.16 g/plant in fruits.

As interaction between soil conditioners and water regimes, data show that chicken manure was superior to polyacrilic acid and composite conditioner particularly where moisture was sufficient i.e. at the 100 % water regime.

4.2. Effect of water regime and soil conditioners on cucumber growth and its chemical composition:

4.2.1. Plant growth:

The effect of water regime and applied soil conditioners on fresh and dry weights of cucumber plants is given in Tables (12) and (13) and illustrated in Figs. (9) and (10).

All studied soil conditioners gave more plant growth at all water regimes. Fresh weights of stem where no conditioner was used were 611, 516, and 0.00 (plants did not survive) g/plant at 100, 66 and 33 % water regimes, respectively. Comparable values of stem for treatments receiving conditioners were 1131.32, 992.91, and 737.67 g/plant for the same water regimes, respectively. Fresh weights of leaves where no conditioners was used were 85, 74, and 0.00 g/plant at the aforementioned water regimes, respectively. Where, conditioners were used ,weights were substantially greater, being 169.88, 137.69, and 95.37 at the respective water regimes. Fresh weights of cucumber fruits where no conditioners was used were 1430, 1164, and 0.00 (plants gave no fruits) g/plant at 100, 66 and 33 % water regimes, respectively. Comparable values of fruits for treatments receiving conditioners were 2328.20, 1678.17, and 1094.21 g/plant for the same water regimes, respectively.

Dry weights of stem where no conditioner was used were 60.67, 49.18, and 0.00 g/plant at 100 %, 66 % and 33 % water regimes, respectively. Comparable values of stem for treatments receiving conditioners were 118.8, 98.30, and 73.00 g/plant for the same water regimes, respectively. Dry weights of leaves where no conditioners was used were 4.70, 3.65, and 0.00 g/plant at the aforementioned water regimes, respectively. Where, conditioners were used ,weights were substantially greater, being 9.00, 7.29, and 5.05 at the respective water

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regimes. Dry weights of cucumber fruits where no conditioners was used were 42.90, 34.92, and 0.00 g/plant at 100 %, 66 % and 33 % water regimes, respectively. Comparable values of fruits for treatments receiving conditioners were 69.84, 57.41, and 32.83 g/plant for the same water regimes, respectively.

Therefore, addition of soil conditioners enhanced plant growth. The low rate of conditioners did not help plants to withstand the high moisture stress. These results are accordance with that obtained by Al-Harbi et al. (1996) who showed a significant increase in vegetative growth of cucumber by adding polymer conditioners. Argerich et al. (1999) found that total weight as well as its fruit yields increased by addition of poultry manure giving 25 % in fruit yield of cucumber.

Comparison between different conditioners, may be stated in terms of percentage response. Data indicate that, at 100 % water regime, the mean values of percent increase in fresh weight for each the 3 plant components due to application of polyacrilic acid were 43.1, 75.8 and 42.5 %, respectively. The corresponding values after application of the composite conditioner were 82.2, 92.1 and 48.3 % in the same order; values regarding application of chicken manure were 130.1, 131.7 and 97.6 % for stem, leaves and fruits, respectively.

At 66 % water stress, increases in fresh weight of stem, leaves and fruits after application of polyacrilic acid were 74.0, 62.8 and 44.0 %, respectively. Values after application of the composite conditioner were 81.4, 71.3 and 25.2 % in the same order and those due to chicken manure were 121.9, 124.2 and 63.3 %, respectively.

At 33 % water regime, increases due to polyacrilic acid were 663.1, 85.03 and 941.99 g/plant for stem, leaves and fruits, respectively; increases due to the composite conditioner were

672.99, 82.03 and 977.33 g/plant, respectively; and increases due to chicken manure were 876.92, 119.06 and 1094.21 g/plant, respectively. Superiority of chicken manure was is due to its being a rich source of nutrients for plant. These results support those of Abdel-Aziz et al. (1996) who found that chicken manure was higher in increasing the yield of sunflower than some synthetic raisen materials.

Data also reveal that the fresh and dry weight of stem, leaves and fruits showed a gradual and significant decrease with the increase in water stress. This decrease in fresh and dry weight of different organs of cucumber plants was shown by the low plant growth and yield at the 33 % water regime than at 66 % or 100 % water regimes. The main effect show that percentage decrease in the fresh weight of stem, leaves and fruits at 33 % water regime relative to the 100 % water regime was 34.8, 43.9 and 53.0 % for stem, leaves and fruits (fresh), respectively. The corresponding values of the dry weights of the same components were 38.6, 43.9 and 52.9 % in the same order.

Thus decreased available water led to an a decrease in plant growth. The relative high water stress caused a wilting of the plants which were grown in soil receiving more or the lowest dose of conditioners. Wilting was occurred after eight weeks from transplanting.

However, plants grown in soil receiving the medium and the high doses of conditioners did not wilt and survived till harvest. Therefore applying conditioners at medium to high dose protected plants from wilting and proved a useful practice for moisture conservation in sandy soils in particular. Cummins and Kretchman (1975) and Ortega and Kretchman (1982) reported that growth rate of cucumber fruits severely reduced under water stress.

1901 1678 WR=511 R=295 1720 Table (12): Effect of water regime and soil conditioner materials on fresh weight (g/plant) of cucumber organs Fruits M=295 MR=511 1854 Medium WMR= 885 WM=511 W=295 Low 124 160 134 WR=7 Leaves MR=7 Means of materials Medium WMR= 12 VM=7 WR=209 R=121 High application (R) Stem Mr=209 M=121 Treatments receiving no conditioners: Medium WMR= 363 WM=209 W=121 P0 € G. mean (A) <u>а</u> Material (300)A m O OBY LSD 0.05 Mean W1 = Water regime Mean 33% (M3) Mean %99 (W2) 100% (M1) S

* Note: Plants receiving no conditioners as well as these receiving low rate of conditioner did not survive.

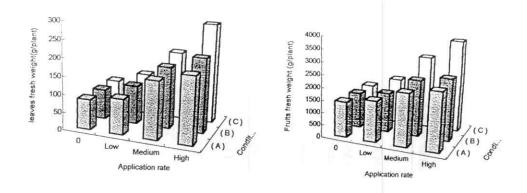
(C)=Chicken manure

(B)=Composite

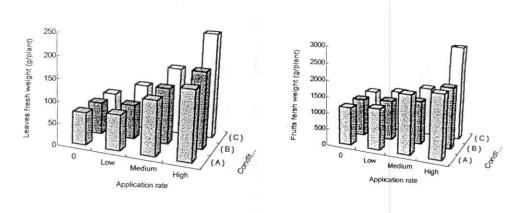
(A)=Polyacrilic acid

W2 =

to



66 % water regime



33 % water regime

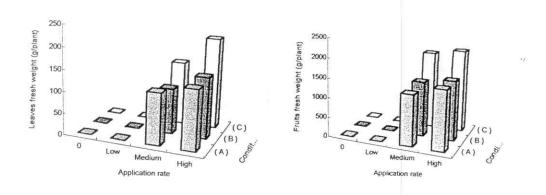
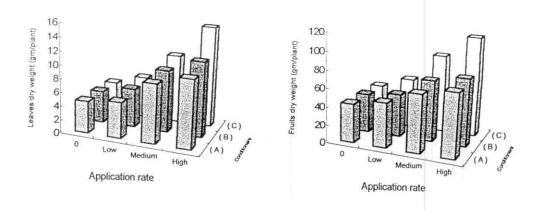


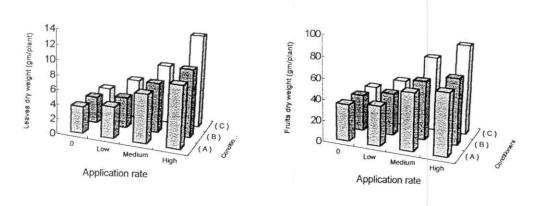
Fig.(9):Effect of water regime and soil conditioners on fresh weight of cucumber organs

								-														
000	61.15	63.63	84.75	69.84 50.29	53.54	68.39	28.26	29.32	40.90	32.83	46.57	48.83	64.68		SO							
	HIGH 70 47			85.69	63.42	87.42	69.85	45.90	63.30	51.66	58.32	61.44	87.44	69.07	MR=2.50							
Fruits	Medium	63.00	87.39	73.08	56.67	72.45	61.18	39.00 42.06	59.40	46.82	52.36	55.64	73.08	60.36		3 91					entryive.	
		49.32	47.70	50.76	37.74	45.30	41.19	0.00	0.0	0.00	20 00	10.00	33.52	30.65	W=1.30	WM=2.26	11111		42.90	34.92	evivenes to the	111111111111111111111111111111111111111
	Mean	7.92	8.65	9.00	6.38	6.72 70	7.29	4.51	4.34	6.31 5.05	0	0.71	6.57 8.51	7.12		7						Commence of the Commence of
	High	9.91	11.09	14.99	8.33	9.21	12.76	7.24	7.48	11.18			9.26	12.98	R=0.22	WR=0.37						
and soil conditioner inaction (R) Rate of application (R)	Madium	65.8	9.16	10.19	6.56	6.77	8.13	6.28	5.55	7.75	Means of materials	7.14	7.16	8.69	00.7	_	220				*_	
Rate of ap	-	MOL	5.20	6.13	5.70	4.17	5.49	4.64	0.0	0.0	o.oo Mean	2 17	3.29	3.87	3.45	W=0.22	WMR=		i .	3.65	*00.0	
congino		Mean	106.8	139.2	118.8	900.0	113.4	98.3	65.6 6.00	86.8 86.8	73.0		- 0 0 0		96.7	(ກຸ					
o lios pu		High	135.3	140.7 209.3	161.8	113.7	167.4	134.0	105.6	158.9	123.6		118.2	178.6	139.8	1	WR=5.9					
regime a	Stem	Medium	115.7	117.1	122.1	97.2	100.7	103.9	91.4	93.7	95.5		101.4	103.9	107.2	M=3.4		= 10.2	ditioners:			•
of water		Low	69.4	72.9	72.4	55.9	56.3	58.7 56.9	0.0	0.0	0.0		41.8	43.1	0.44		WM=5.9	WMR=	ייים ייי הייי	60.67	49.18	11111111
): Effect	Material	((a)	(A)	(B)	3	(A)	(B)	ပ်	(4)	(a)	<u> </u>		(A)	(B)	(၁	G. mean			Standitioners:	ents receiv		
		regime	(00)	W13	20074	Mea:	(W2)		Mean	33% (W3)	000	Near				G3.	LSD 0.03			Treatm	W1 = W2 =	

* Note: Plants receiving no conditioners as well as these receiving low rate of conditioner did not survive.



66 % water regime



33 % water regime

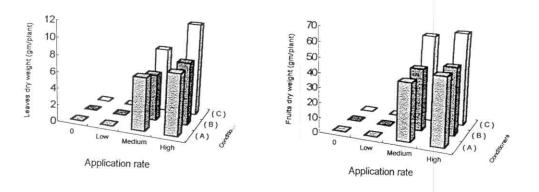


Fig. (10): Effect of water regime and soil conditioners on the dry weight of cucumber.

The superiority of chicken manure over the other two conditioners was shown at all water regimes. Under conditions of the high water stress (i.e. at 33 % water regime), chicken manure was for superior than the others, but composite conditioner and polyacrilic acid were nearly identical in their effects particularly with the dry weight of plant parts. Absense of plant growth caused by water stress (33 % water regime) took place where no conditioner was applied, as well as where the lowest rate of conditioners was applied. Treatments under water stress which received medium to high rate of conditioners gave plants which survived wilting, the effect was more pronounced with chicken manure.

4.2.2. Plant height:

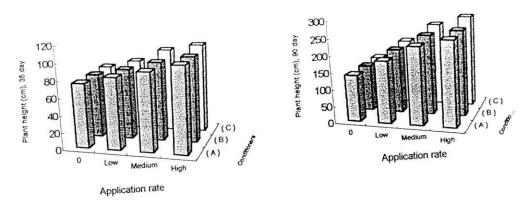
Data in Table (14) and Fig. (11) represent the effect of water regime and soil conditioners on plant height of cucumber grown in sandy soil after 35 and 90 days.

All conditioners stimulated the plant height of at all water regimes as compared with no cucumber application of conditioners. At 35 days, plant height for the treatments receiving no conditioners were 75.00, 71.00 and 60.00 cm as opposed to 91.67, 83.00 and 73.11 cm for the of all (averages conditioners receiving treatments conditioners and all rates) at water regimes of 100 %, 66 % and 33 %, respectively. The corresponding values at 90 days were 137.00, 86.00 and 0.00 at each of the 3 water regimes for the no conditioners as opposed to 226.67, 175.00 and 104.44, respectively for the treatments receiving conditioners in the same order. Therefore, water stress at 33 % water regime caused plants to wilt and die, thus giving light of 0.0

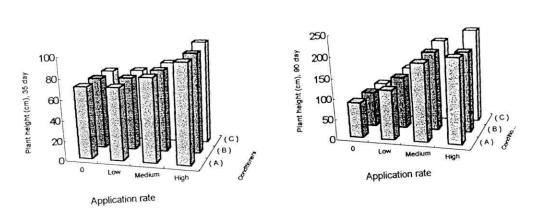
Table (14): Effect of water regime and soil conditioner materials on plant height (cm) of cucumber after 35 and 90 days from transplanting.

Water		al		Rate of ap	plication	n (R)			
regime	(M)		35 days		product	(19)	90 days		
(W)		Low	Medium	High	Mear	1 Low	Medium	n High	Mean
100%	(A)	83.00	90.00	98.00	90.33		227.00	3	
(W1)	(B)	82.00	91.00	98.00	90.33		235.00		225.00
	(C)	83.00	97.00	103.00	94.33		245.00	270.00	236.00
Mean		82.67	92.67	99.67	91.67		235.67	255.67	226.67
66%	(A)	71.00	81.00	95.00	82.33		186.00	200.00	
(W2)	(B)	72.00	80.00	96.00	82.67	10.0	191.00	193.00	168.67
	(C)	72.00	80.00	100.00	84.00		200.00	227.00	170.67
Mean		71.67	80.33	97.00	83.00	126.00	192.33	206.67	185.67
33%	(A)	63.00	72.00	81.00	72.00	0.00	142.00		175.00
(W3)	(B)	65.00	71.00	82.00	72.67	0.00	155.00	147.00	96.33
	(C)	65.00	72.00	87.00	74.67	0.00	161.00	160.00	105.00
Mean		64.33	71.67	83.33	73.11	0.00	152.67	175.00	112.00
				Means			132.07	160.67	104.44
	(A)	72.33	81.00	91.33	81.56	101.00	185.00	100.00	
	(B)	73.00	80.67	92.00	81.89	106.00		198.00	161.33
	(C)	73.33	83.00	96.67	84.33	107.67	193.67	201.00	166.89
	G. mean	72.89	81.56	93.33	82.59	104.89	202.00	224.00	177.89
SD 0.05		W=0.12	M=0.12	R=0.12	02.00	W=3.24	193.56	207.67	168.71
		WM=0.21	MR=0.21	WR=0.21			M=3.24	R=3.24	
		WMR=	5.61	**11-0.21	17	WM=5.61 WMR=	MR=5.61	WR=5.61	
Freatment	s receiving	g no conditi	oners:			V V I V I I	9.12		
W1 =		75.0				137.0			
V2 =		71.0							
V3 =						86.0			
		60.0				0.0			

RESULTS AND DISCUSSION



66 % water regime



33 % water regime

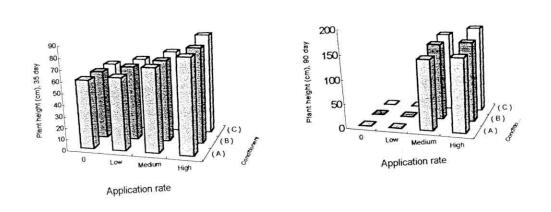


Fig. (11): Effect of water regime and soil conditioners on plant height of cucumber

cm at day 90 after planting. This effect occurred when no conditioner was used in particular. However, the rate of manure showed an interaction with water stress. Data show that the severe water stress caused wilting of plants so that at day 90 plants of the 33 % water regime were dead and this occurred with no conditioner or with the lowest rate of any of the conditioners. At the medium as well as the high rates there was no wilting of plants, and plants survived. This shows that medium to high rates of conditioners improved retention of water for crops. Abo-Srea (1994)

demonstrated that application of conditioners increased plant height.

Data also reveal that the application of chicken manure was more effective in increasing the plant height than that of polyacrilic acid and composite. Such effect reflects the nature of the chicken manure conditioner and its composition. At 100 % water regime values of relative increase in plant height after 35 days from transplanting were 20.4, 20.4 and 25.8 % for polyacrilic acid, composite and chicken manure, respectively. At 66 % water regime the corresponding values were 15.9, 16.4 and 18.3 % in the same order. At 33 % water regime values of relative increase were 20.0, 21.1 and 24.5 % for polyacrilic acid, composite and chicken manure, respectively. After 90 days from transplanting, the corresponding values at 100 % water regime were 59.9, 64.2 and 72.3 % for each of the three conditioners, respectively. At 66 % water regime values were 96.1, 98.5 and 115.9 %. At 33 % water regime values were 96.3, 10.0 and 112.0 cm for polyacrilic acid, composite and chicken manure, respectively. Thus plant height after 35 and 90 days from transplanting was markedly decreased with

increasing of water stress. The decrease in plant height was more marked after 90 days from transplanting than 35 days. Plant height after 35 days at 33 % water regime as compared to the height at 100 % water regime was 20.2 %, and 53.9 % after 90 days.

4.2.3. Yield of cucumber:

Effects of the different treatments of soil conditioners combined with the levels of water regimes on the yield of cucumber expressed as kg/plant or kg/m2 are given in Table (15) and Fig. (12).

There was no yield where water regime of 33 % (the severe water stress) was used. This occurred in the no conditioner treatment as well as the treatments where conditioners were used at the lowest rate. This occurred due to the lack of enough water for plant growth to survive till the end of its season.

Application of conditioners at the medium and high rates gave greater yield at all water regimes as compared with no application of conditioners. Application at the low rate gave yields only at 100 % and 66 % water regime. Fruit yields given by treatments receiving no conditioners were 1.43, 1.16 and 0.00 kg/plant at water regimes of 100 %, 66 % and 33 % respectively as opposed to 2.30, 1.91 and 1.14 given by treatments receiving conditioners kg/plant (averages) at water regimes of 100 %, 66 % and 33 %, respectively. The corresponding values expressed as kg/m² were 3.18, 2.58 and 0.00 by treatments receiving no conditioners as opposed to 5.06, 4.21 and 2.47 given by treatments receiving conditioners in the same order.

Yield was, generally, increased with increasing the rate of addition. These results are consistent with those of Nissen (1994) for synthetic conditioner and Gouda (1984) for natural conditioner.

Chicken manure was more effective in increasing the yield of cucumber than that of polyacrilic acid and composite. The latter conditioners were similar in effect. Increase in yield due to polyacrilic acid was 42.7 and 44.8 % over that of of no conditioner at 100 % and 66 % water regimes, respectively. At 33 % water regime, with no or low rate of conditioner, no yield was obtained due to wilting of plants. For the composite conditioner, the relative increase in the yield was 42.7 and 53.4 % at 100 % and 66 % water regime, respectively. For the chicken manure the increase due to its application was 97.2 and 96.6 % at 100 % and 66 % water regimes, respectively. Therefore chicken manure was the most effective while polyacrilic acid and the composite were rather similar. Chicken manure is an organic materials containing plant nutrients, and it improves physical, chemical and biological characteristics of sandy soils in particular (Hussein and Abdel-Aziz, 1992). These results are in agreement with those obtained by Abdel-Aziz et al. (1996).

Water stress showed a marked negative effect on the yield of cucumber. The greatest yield was recorded at 100 % water regime, while the lowest was recorded at 33 % water regime. In some cases (where no conditioner as well as where the lowest rate of conditioner was applied) plants wilted, giving no yield. These results agree with those of Singh (1997).

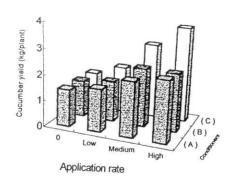
Table (15): Effect of water regime and soil conditioner materials on fresh cucumber yield (kg/plant).

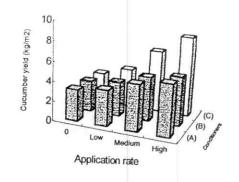
Water	Material	•	Rate of	application (N)
regime	(M)	Low	Medium	High	Mean
(W)		1.64	2.12	2.35	2.04
100%	(A)		2.17	2.25	2.04
(W1)	(B)	1.59		3.72	2.82
127	(C)	1.84	2.91	2.77	2.30
Mean		1.69	2.43		1.68
	(A)	1.26	1.82	1.96	
66%	127527764	1.35	1.89	2.11	1.78
(W2)	(B)	1.51	2.42	2.91	2.28
	(C)		2.04	2.33	1.91
Mean		1.37	1.30	1.53	0.94
33%	(A)	0.00		1.83	1.08
(W3)	(B)	0.00	1.40	2.21	1.40
X	(C)	0.00	1.98		1.14
Moon		0.00	1.56	1.86	1.17
Mean			Means of ma	aterials	10 are
	(0.97	1.75	1.95	1.55
	(A)	0.98	1.85	2.06	1.63
	(B)		2.44	2.95	2.17
	(C)	1.12		2.32	1.78
	G. mean	1.02	2.01		
LSD 0.0	15	W=0.03	M=0.03	R=0.03	
0.0	13	WM=0.05	MR=0.05	WR=0.05	
		WMR=	0.09		

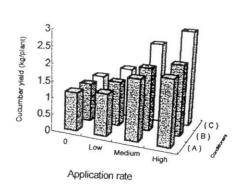
Treatments receiving no conditioners:

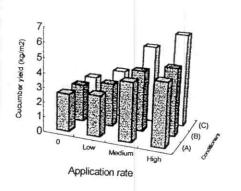
3.99 W1 =2.79 W2 =0.00

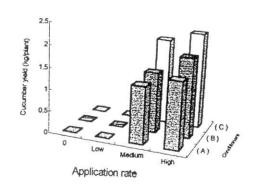
^{*}To convert kg/plant into kg/m², multiply by 2.22











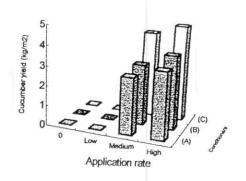


Fig. (12): Effect of water regime and soil conditioners on cucumber fresh yield.

4.2.4. Chemical composition of plants:

4.2.4.1. Nitrogen content:

Data of N content in cucumber plants as affected by applied soil conditioners under different stress of water are given in Table (16) and illustrated in Fig. (13).

All studied soil conditioners gave more N content in the different plant organs as compared with no application of conditioners. At 100 %, and 66 %water regimes, N content given by treatments receiving no conditioners were 1.85 and 1.83 respectively for stem; 3.19 and 2.19 for leaves and 1.67 and 1.55 for fruits. No plants survived at 33 % water regime with no conditioner. At 100 %, 66 % and 33 % water regimes for the conditioner treatments average values of N contents were 2.22, 2.06 and 1.28 % for stem; 4.49, 3.51 and 2.51 % for leaves and 1.98, 1.78 and 1.13 % for fruits at the aforementioned water regimes of 100 %, 66 % and 33 %, respectively.

Concerning the effect of applied soil conditioners, data clear that N contents increased by application of conditioners. At 100 % water regime the polyacrilic acid at the high rate, showed a relative increase in N content of 13.5, 17.7 and 14.9 % in stem, leaves and fruits, respectively. At 66 % water regime, the relative increases for the same conditioners were 8.2, 3.3 and 10.3 %, respectively.

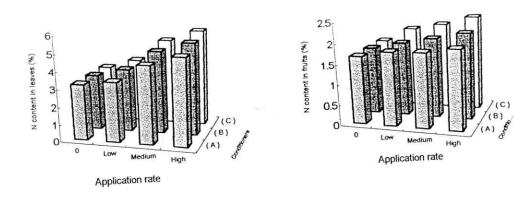
For the composite conditioner, at 100 % water regime, relative increases in stem, leaves and fruits were 30.3, 24.8 and 25.7 %; at 66 % water regime values were 25.7, 14.8 and 24.5 %, respectively.

For the chicken manure at 100 % water regime, the relative increases in N content for stem, leaves and fruits reached 43.8, 31.5 and 39.5 %, at 66 % water regime values were 39.9, 8.3 and 37.4, respectively.

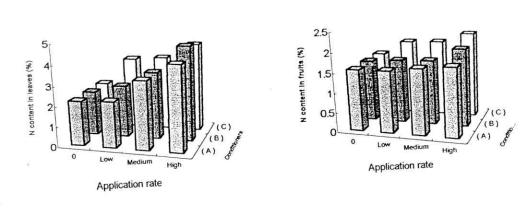
RESULTS AND DISCUSSION

Table (16): Effect of water regime and soil conditioner materials on nitrogen content (%) in cucu

			Mean	1 84	1.96	2.15	1.98	1.72	1.98	1.78	1.13	1.26	5.73	1.49	1.60	1.79	1.63					
1*		Fruits	High	1.92	2.10	2.33	1.77	1.93	2.13	8.1	1.87	1.91	70.1	1.77	1.98	2.12	R=0.03	WR=0.05				
ion (R)		FF	Medium	1.81	1.95	7.13 1.96	1.64	1.62	1.91	1.29	1.51	1.55	8	1.58	1.69	1.75	M=0.03	MR=0.05 \	000			vive.
ın cucun			Low	1.80	7.82	1.87	1.55	1.60	1.68	0.00	0.00	0.00		1.12	- 6	1.18	W=0.03	WMR=	1	1.67	0.00	d not sur
cnt (%)			Mean	4.25	4.71	4.49	3.23	3.83	3.51	2.43	2.58	2.51	9	3.50	3.71	3.50	-	>				oner di
(R)		- 1	ugil	5 63	5.51	5.22	4.12	4.32	4.34	4.27	4.21	4.26	4 44	4.70	4.68	4.61	K=0.11 WR=0.19					of conditi
application (R)		Medium	4 43	4.73	4.93	4.69	3.30	3.63	3.42	3.21	3.55	3.26 f materials		3.75	4.04	3.79	_ თ					and the second of the second o
Rate of		Low			3.70		2.55	3.53	0.00	0.00	0.00	Weans of	2	2.05	14.0	W=0 11	- 6	WMR= 0	3.19	2.19	0.00	ciecelvin
		Mean	1.96	2.21	2.50	1.80	2.07	2.32	1.14	1.27	4. C	9	1.63	7.85	20.7		_				as the	5
	E		2.10	2.41	2.39	1.98	2.30	2.28	1.75	1.91	1.37		1.94	2.51	2.22	R=0.05	WR=0.09				rs as well	
	Stem	Medium	2.93	2.53	2.19	1.85	2.00	2.04	1.66	1.89	1.85	7	2.01	2.29	2.03	M=0.05	MK=0.09	mers:			conditione	
	- 1	LOW 1 RE	2.10	2.31	2.09	1.83	2.08	1.87	0.00	00.00	0.00	4	1.33	1.46	1.32	W=0.05	VMR= 0.15	Treatments receiving no conditioners.	1.83	*00.0	* Note: Plants receiving no conditi	
Materia	(IVI)	(A)	(B)	0	<	(m	0		(A	0		(A)	(B)	0	. mean		777	receiving			lants rec	
Water	W S	100%	(W1)		Mean 66%	(W2)		Mean 33%	(W3)		Mean			(9	NO.0 CISC.		Treatments W1 =	W2 =	W3 =	* Note: P	



66 % water regime



33 % water regime

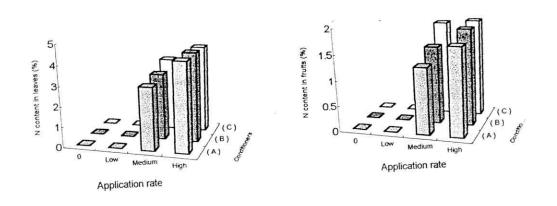


Fig. (13): Effect of water regime and soil conditioners on N content in cucumber.

Comparisons relating application of conditioners at 33 % water regime were not made since the no conditioner treatment at this regime gave no plants.

The increased content of N in plant tissues reflect the increased fertility of the soil due to conditioner application, particularly chicken manure. The superiority of chicken manure over polyacrilic acid and composite in this concern reflects its high fertility status. These results as comparable to those obtained by Abo-Srea (1994).

Water stress was associated with lower N content. This is most certainly an indicate of reduced plant growth. The plants which survived at 33 % water regime were those receiving medium and high rates of conditioners. Mean N contents in plants of the 33 % and the 100 % water regimes were 1.28 and 2.22 % in stem; 2.51 and 4.49 % in leaves and 1.13 and 1.98 % in fruits.

4.2.4.2. Nitrogen uptake:

Data of N uptake by cucumber plants as affected by applied soil conditioners under different stress of water are given in Table (17) and illustrated in Fig. (14).

All conditioners gave more N uptake by different plant organs as compared with no application of conditioners. At 100 %, and 66 %water regimes, N uptake given by treatments receiving no conditioners were 1.12 and 0.90 g/plant respectively for stem; 0.15 and 0.08 g/plant for leaves and 0.72 and 0.54 for fruits. No plants survived at 33 % water regime with no conditioner. At 100 %, 66 % and 33 % water regimes for the conditioner treatments average values of N uptake were 2.72, 2.10 and 1.43 g/plant for stem; 0.42, 0.27 and 0.19 g/plant for leaves and 1.41, 1.04 and 0.65 g/plant for fruits at the

aforementioned water regimes of 100 %, 66 % and 33 %, respectively.

Concerning the effect of applied soil conditioners, data show that N uptake increased by application of conditioners. At 100 % water regime the polyacrilic acid at the high rate, showed a relative increase in N uptake of 153.6, 157.9 and 87.5 % in stem, leaves and fruits, respectively. At 66 % water regime, the relative increases for the same conditioners were 139.4, 100.0 and 85.2 %, respectively.

For the composite conditioner, at 100 % water regime, relative increases in stem, leaves and fruits were 202.7, 205.3 and 119.4 %; at 66 % water regime values were 195.7, 147.1 and 125.9 %, respectively.

For the chicken manure at 100 % water regime, the relative increases in N uptake for stem, leaves and fruits reached 397.3, 331.6 and 261.1 %. At 66 % water regime, increases were 356.4, 223.5 and 244.4 %, respectively.

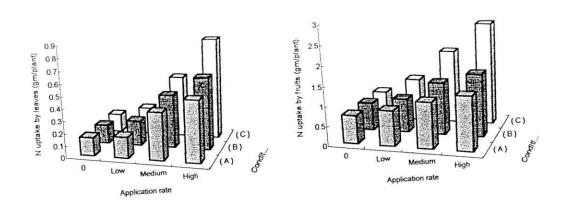
Comparisons relating application of conditioners at 33 % water regime were not made since the no conditioner treatment at this regime gave no plants.

The increased uptake of N in plant tissues reflect the increased fertility of the soil due to conditioner application, particularly chicken manure. The superiority of chicken manure over polyacrilic acid and the composite conditioner in this concern reflects its high fertility status. These results as comparable to those obtained by Abo-Srea (1994).

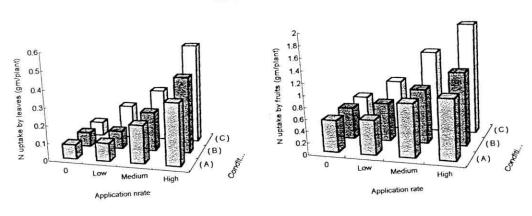
Water stress was associated with lower N uptake. This is most certainly an indication of reduced plant growth. The plants which survived at 33 % water regime were those receiving medium and high rates of conditioners. Mean N uptake in plants of the 33 % and the 100 % water regimes were 1.43 and

Table (17): Effect of water regime and soil conditioner materials on nitrogen uptake (gm/plant) by cucumber organs.

		1.13	1.26	1.41	0.93	1.04	0.49	0.65	0.79	0.89	1.33					
	Fruits	1.35	1.58	1.84	1.22	1.36	0.86	0.94	1.04	1.22	1.38	R=0.45	8/.0=24			
	Medium	1.15	1.86	0.89	1.38	1.06	1.10	0.74	0.85	1.85	1.08	MR=0.45				
er organs.	Low	0.89	1.10	0.58	0.85	0.00	0.00	0.00	0.49	0.65	0.55 W=0.45	0		-11	0.72	0.54
	Mean	0.34	0.52	0.21	0.34	0.10	0.24	0.1	0.24	0.37	0.29	>				
on (R)	High	0.49	0.82	0.34	0.55	0.30	0.47		0.38	0.61	0.47 R=0.19	WR=0.34				
applicati	Medium	0.43	0.50	0.21	0.29	0.19	0.27	of	0.26	0.35	- 1	MR=0.34 \				
Rate of	Low 0.17	0.20	0.20	0.00	0.13	0.00	0.00	Means	0.00	0 0	W=0.19	VVIVI=0.34	2011		0.15	0.00
	Mean 2.12	3.56	2.72	1.95	2.10	1.12	1.90	1 62	1.90	2.09	1	>				
Stem	1 1	3.39	3.93	2.78	3.7	2.03	2.52	2.31	2.73	3.19	R=1.3 WR=2.3	i				
	Medium 2.23	3.38	2.70	2.01	2.14	1.77	1.78	1.83	2.09	2.21	M=1.3 MR=2.3	4.1	oners:			
a	1.28	1.72	1.51	1.07	1.06	0.00	0.00	0.73	0.86	0.86		WMR=	no conditic	1.12	0.90	0.00
er Material e (M)	(A	00	Q ((C)	(A)	(C)		Q (်ပ် ထ	G. mean			Treatments receiving no conditioners:			
Water	(VV) 100% (W1)	Mean	899	(200)	33%	(W3)	Mean			LSD			Treatments	W ==	W2 ==	W3 =



66 % water regime



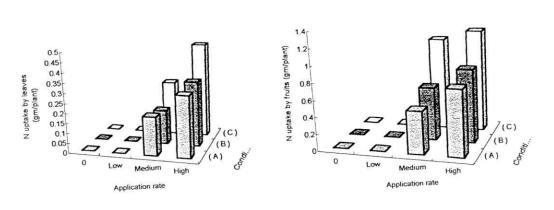


Fig.(14):Effect of water regime and soil conditioners on N uptake by cucumber organs.

2.72g/plant in stem; 0.19 and 0.42 in leaves and 0.65 and 1.41 in fruits. Hara and Saha (2000) found that total N uptake by plants was remarkable enhanced with increased availability of soil moisture.

4.2.4.3. Phosphorus content:

The results presented in Table (18) and Fig. (15) reveal the P content in cucumber plants was affected by soil conditioners and water regimes.

P content in the no conditioner treatments at 100 % and 66 % water regime were as follows: stem: 0.52 and 0.45 %; leaves: 0.89 and 0.71 %; and fruits: 0.57 and 0.51 %.

There were no plants surviving at the 33 % moisture regime. On the other hand, treatments which received conditiners showed the following average P % values in each organ at the 100 %, 66 % and 33 % water regimes, respectively: stem: 0.72, 0.61 and 0.42 %; leaves: 1.22, 1.03 and 0.72 %; and fruits: 0.66, 0.56 and 0.38 %. Therefore, P content decreased as the water stress was severe.

As regards the effect of soil conditioners, data obtained reveal that P content in different organs of cucumber increased progressively and significantly due to adding conditioners to soil and the increase was more obvious by increasing the rate of the applied conditioner. The highest P content in different organs of cucumber was obtained at the highest rate of conditioners application. For polyacrilic acid application at its highest rate caused the following relative increases in P in stem, leaves, and fruits, respectively: At 100 % water regime: 55.7, 43.4, and 21.1

%. At 66 % water regime: 20.4, 127.0, and 2.0 %. At 33 % water regime there was no plants surviving in the no conditioner.

For the composite conditioner at its highest rate, the following relative increases in P of stem, leaves and fruits were: At 100 % water regime: 57.7, 43.0 and 15.8%. At 66 % water regime: 20.4, 127.0 and 13.7 %. At 33 % water regime there were no plants surviving in the no conditioner.

For chicken manure at the highest rate the following relative increases in P of stem, leaves and fruits were:

At 100 % water regime: 65.4, 78.7 and 21.1 %. At 66 % water regime: 66.7, 57.7 and 17.6 %. At 33 % water regime: there were no plants surviving in the no conditioner.

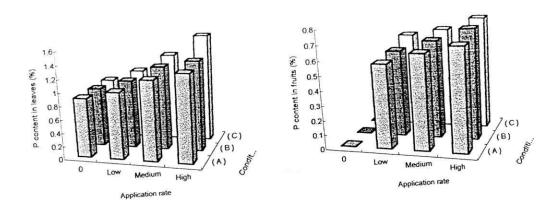
High P content in different organs of cucumber caused by conditioners is a reflection of improved plant growth due to improving soils conditions by the applied conditioners.

Chicken manure was the most effective; due to its nature. Abdel-Aziz et al. (2000) found that farmyard manure was superior shale on the content of P in wheat grains.

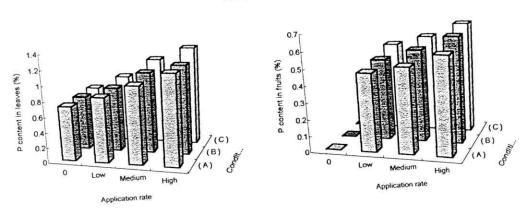
Also, data reveal that P content in cucumber plants was greater as water applied was greater. The average values of P content in the conditioner treatments under 33 % and 100 % water regimes were as follows: stem: 0.41 and 0.72 %; leaves: 0.72 and 1.22 %; and fruits: 0.38 and 0.66 % for each of the 2 water regimes, respectively. This increase with increase of applied water is mainly attributed to improved plant growth caused by increasing the available water.

Superiority of the chicken manure over the other two conditioners was particularly marked where the moisture was enough i.e. at the 100 % water regime.

0.50 0.53 0.56 0.53 0.74 0.73 0.73 0.65 0.65 0.65 0.65 0.65 0.65 0.65 WR=0.0 High 0.69 0.61 0.66 0.69 0.65 R=0.0 Fruits Medium M=0.01 MR=0.0 0.66 0.68 0.51 0.55 0.55 0.50 0.64 0.55 0.55 0.58 0.60 0.58 WMR= 0.02 WM=0.01 W=0.01 0.57 0.59 0.64 0.60 0.47 0.49 Low 0.00 0.35 0.36 0.39 0.37 0.57 0.51 0.00 Table (18): Effect of water regime and soil conditioner materials on phosphorus content (%) in cucumber organs. Mean 1.13 1.22 1.00 1.00 1.03 0.72 0.75 0.76 0.95 0.98 1.06 0.99 WR=0.04 High R=0.02 1.33 1.39 1.16 1.15 1.17 1.08 1.12 1.20 1.36 1.24 1.21 1.14 Leaves Rate of application (R) Medium MR=0.04 Means of materials 25. 26. 27. 28. 29. M=0.021.05 90. 0.97 1.05 1.08 1.03 1.05 1.11 WMR= 0.07 WM=0.04 W=0.02 1.02 1.05 1.05 0.84 0.88 0.08 0.00 0.00 0.00 0.00 Low 0.61 0.62 0.64 0.63 0.71 0.00 Mean 0.66 0.71 0.72 0.55 0.59 0.61 0.61 0.42 0.44 0.53 0.57 0.63 0.58 4 WR=0.01 0.81 0.82 0.83 0.83 0.65 0.65 0.64 0.65 0.72 R=0.01 0.70 99 0.77 Stem Medium MR=0.01 0.60 0.52 0.73 0.74 0.60 0.60 0.60 0.60 0.60 M=0.010.55 0.64 0.69 0.63 WMR= 0.02 Treatments receiving no conditioners. WM=0.01 0.50 0.52 0.52 0.52 0.00 0.00 0.00 W=0.01Low 0.35 0.42 0.52 0.45 0.00 mean Ŝ OMP V M V O m > OMP O regime 100% (M1) Mean S Mean %99 Mean LSD one (W2) 33% (W3) 3 W2



66 % water regime



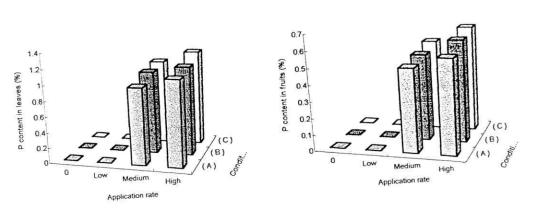


Fig.(15):Effect of water regime and soil conditioners on P content (%) in cucumber organs.

4.2.4.4. Phosphorus uptake:

Values of K uptake by cucumber are presented in Table (21) and Fig. (18).

All studied soil conditioners gave more P uptake by different plant organs at all water regimes as compared with no application of conditioners. P uptake at 100 and 66 % water regimes were as follows: for stem: 0.32 and 0.23 g/plant respectively; for leaves: 0.04 and 0.03 g/plant respectively; for fruits: 0.25 and 0.18 g/plant respectively for each water regime. No plants survived at 33 % water regime when no conditioner was applied.

For the conditioner treatments average for P uptake under water regimes of 100, 66, and 33% were as follows for each organ: for stem: 0.89, 0.62, and 0.45 g/plant; for leaves: 0.11, 0.08, and 0.06 g/plant; for fruits: 0.47, 0.32, and 0.18 g/plant.

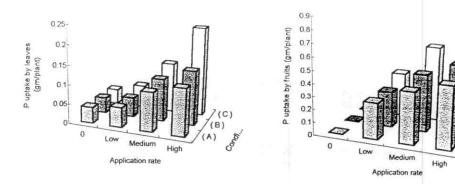
Concerning the effect of soil conditioners, P uptake increased considerably by their application, particularly at the highest rate. Assessment of the magnitude of the increase in P uptake at the highest rate of conditioner (compared with the no conditioner treatments) show the followings regarding each conditioner at the 100 and 66 % water regimes (the 33 % water regime with no conditioner gave no surviving plants).

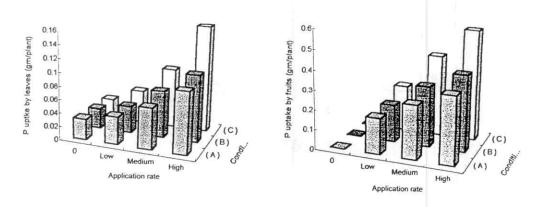
For polyacrilic acid, the magnitudes for stem, leaves and fruits were as follows respectively. At 100 % water regime: 178.3, 125.0, and 56.0 %. At 66 % water regime: 117.4, 133.3, and 44.4 %.

For composite conditioner, the magnitudes for stem, leaves and fruits were as follows respectively. At 100 % water regime: 153.1, 150.0, and 72.0 %. At 66 % water regime: 108.7, 133.3, and 66.7 %.

RESULTS AND DISCUSSION

DIC (17)	Matorial				29	ום מו מאלים	Haber Manager				Fruits		
			Stem				Leaves	doi:	Mean	Low	Medium	High	Mean
regime			Madium	High	Mean	Low	Medium	ußıL		800	0.40	0.48	0.39
S			Vicaluli		0 73	0.05	0.10	0.12	0.0	0.40	0.45	0.55	0.43
100%	(A)	0.38	0.71		2 0	0.05	0.11	0.14	0.10	0.20	0 0	0.85	0.60
11/1/1	(B)	0.43	0.84		- (900	0.13	0.23	0.14	0.35	0.0	0.0	0 47
(14	10	0.51	1.05	1.80	1.12	90.0	5.00	0.17	0.11	0.30	0.48	0.0	5 0
		0.44	0.87		0.89	0.00		60 0	0.07	0.18	0.27	0.34	0.00
Medi	/ / /	0.27	0.50		0.50	0.0	0.0	010	0.07	0.19	0.31	0.38	2 4
%99	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	9 0	08.0		0.57	0.04	0.0	0 0		0 24	0.42	0.57	4
(W2)	(R	0.20	20.0		0.79	0.05	0.09	0 0	ο α - C	000	0.33	0.43	0
	(ပ	0.34			0.62	0.04	0.08	0.17	5 6	010	0.19	0.25	0
Mean		0.29	0.00	0.0	0.37	00.00	90.0	0.08	0.00	9 6		0.28	0.16
33%	(A)	0.0	0.45	0.0	5 6	000	0.06	0.08	0.05	0.00	 	0 4 0	0 24
2/12/	ď	0.00	0.56	0.69	4. 6	9 6	800	0.13	0.07	0.00	0.32	0 0	2 0
(644)	0	0.00	0.63	1.1	0.58	9.0	0.07	60.0	90.0	0.00	0.24	- 0.0	
Mean)	0.00	0.55	0.82	0.40	Means of	Means of materials			8	0	0	0.26
						2000	800	0.10	0.07	0.15	67.0	0 0	0 0
		000	0.56	0.83	0.54	0.0	9 6	7,	0.07	0.16	0.32	4.0	5 (
	£ (20.0	0.67	0.89	0.60	0.03	0.0		010	0.19	0.44	0.61	4.
	n e	0.43	0000	1.39	0.83	0.04	0.10		ο α - C	0.17	0.35	0.46	0.33
	ပ်	0.20	20.0	104	4.01	0.03	60.0	0.13	0.0	α F ()-/ V /	M=0 18	R=0.18	
	G. mean	0.24	0.00	97.010		W=0.05	M=0.05	R=0.05	9	VV-0.10	-	WR=0.32	
LSD 0.05		W=0.46	M=0.46 MR=0.81	WR=0.81		WM=0.08		WR=0.08	m	WINI-U.32 WMR=			
		WMR=				YIMM	0.0						
Treatmen	us receivi	Treatments receiving no conditioners:	ioners:							0.25			
		4				0.0							
= %		0.32				60				0.18			
W2 =		0.23				0.03		ů.		0.00			
l		0				0.00							
W3 =		00.00											





33 % water regime

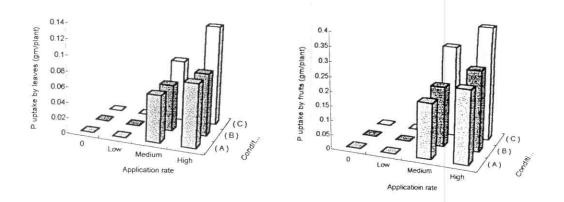


Fig.(16):Effect of water regime and soil conditioners on P uptake by cucumber organs

For chicken manure, the magnitudes for stem, leaves and fruits were as follows respectively. At 100 % water regime: 250.0, 250.0, and 140.0 %. At 66 % water regime: 243.5, 233.3, and 127.8 %.

Therefore, conditioners caused a considerable increase in P uptake. The most effective conditioner in this respect was the chicken manure which more than doubled P uptake by plant, particularly where soil moisture was adequate. The least effective conditioner was polyacrilic acid. Conditioners when applied under water stress (of 33 % water regime) were not effective unless their rates were medium or high. These results agree with those by Azzam et al. (1983) using polyacrylamide on pepper and Montasser (1987) using farmyard manure on tomatoes.

Uptake of P increased with increased water input. When water input increased from 33 % to 100 %, uptake of P increased from 2.58 to 4.82g/plant in stem; 0.12 to 0.26 g/plant in leaves and 0.58 to 1.34 g/plant in fruits.

4.2.4.5. Potassium content:

Values of K content in cucumber organs under application of different conditioners and water regimes are presented in Table (20) and Fig. (17).

All conditioners gave more K content in different plant organs at all water regimes as compared with no application of conditioners. There were no plants surviving under the noconditioner plants of the 33 % water regime. K contents in plants of no-conditioner receiving 100 % and 66 % water regimes were as follows (for each organ and for the respective water regimes): stem: 2.98 and 2.63 %; leaves: 2.11 and 1.91 %; fruits: 1.12 and 1.01 %.

On the other hand, treatments receiving conditioners showed the average K % values in each organ at the 100 %, 66 %, and 33 % water regimes respectively: stem: 3.94, 3.49, and 2.32 %; leaves: 2.79, 2.55, and 1.57; fruits: 1.85, 1.64, and 1.17 %. Therefore, as occurred with contents of N, as well as contents of P, there was a decrease in contents of K in plant tissues as water stress increased (i.e. as water regime progressed towards decreased water scarcity in soil.

Conditioners thus increased the content of K in plant. This increase was more obvious by increasing the rate of the applied conditioner.

Assessment of the magnitude of the increase in K content at the highest rate of conditioner (compared with the no-conditioner treatment) show the followings regarding each conditioner at the 100 % and 66 % water regimes.

For polyacrilic acid, the magnitude of K increase relative to the no-conditioner was as follows (for stem, leaves and fruits respectively): at 100 % water regime: 45.3, 48.3, and 80.4 %. At 66 % water regime: 42.6, 44.5, and 78.2 %.

For the composite conditioner, the proportion of increase was as follows: at 100 % water regime: 44.3, 46.3, and 88.4 % for each plant parts respectively. At 66 % water regime: 40.7, 46.6, and 98.0 %.

For the chicken manure, the proportion of increase was as follows: at 100 % water regime: 50.0, 46.9, and 106.3 %. At 66 % water regime: 48.3, 46.6, and 126.7 %.

Therefore, conditioners caused considerable increases in K contents in plant tissues, particularly in fruit tissues. Chicken manure was the most effective in this respect.

Mean 1.71 1.87 1.85 1.39 1.39 1.19 1.10 1.19 1.19 1.17 1.15 1.15	
High N 2.02 2.12 2.31 2.31 2.00 2.29 2.03 1.92 1.92 1.92 1.92 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.0	
Fruits Medium 1.71 1.92 2.00 1.88 1.26 1.72 1.84 1.61 1.09 1.61 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.3	
1.41 1.58 1.61 1.53 1.10 0.00 0.00 0.00 0.00 0.00 0.99 0.99	1.12 1.01 0.00
Mean 2.69 2.79 2.99 2.79 2.59 2.59 1.60 1.60 1.57 1.57 2.38 2.38 2.38 2.38	
in cucumbe High N 3.13 3.10 3.10 3.10 3.11 2.76 2.80 2.80 2.29 2.45 2.50 2.77 2.78 2.78 2.77 R=0.04 VNR=0.08	
Soil conditioner materials on potassium content (%) in cucumber organs. Rate of application (R) Leaves	
Agte of applicate	2.11 1.91 0.00
Mean 3.84 3.88 3.45 3.88 3.45 3.38 3.45 2.21 2.21 2.32 2.44 2.32 2.32 3.39 3.25 3.39 3.25	
A.33 A.33 A.43 A.47 A.47 A.37 A.37 A.37 A.37 A.37 A.37 A.37 A.3	
Stem Medium 3.82 3.83 4.14 3.93 3.36 3.48 3.48 3.22 3.42 3.22 3.42 3.28 3.46 3.46 3.46 3.57 3.57 3.57 3.57 3.57 3.57	ditioners:
3.36 3.36 3.50 3.50 3.50 3.51 3.04 3.18 3.36 3.19 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	2.98 2.63 0.00
Table (20):Effect of water regime and vater Material Low Med (W) 100% (A) 3.36 3.8 (W1) (B) 3.50 3.69 4.1 (C) 3.51 3.04 3.69 4.1 (C) 3.18 3.18 3.18 3.18 3.36 (W2) (B) 3.36 3.36 (W3) (B) 0.00 3.38 (A) 0.00 3.38 (A) 0.00 3.38 (B) 0.00 3.38 (C) 0.00 3.38 (Treatments receiving no conditioners: W1 = 2.98 W2 = 2.63 W3 = 0.00
Table (20): Water N regime (W) 100% (W1) Mean 66% (W2) Mean 33% (W3) Mean	Treatm W1 = W2 = W3 =

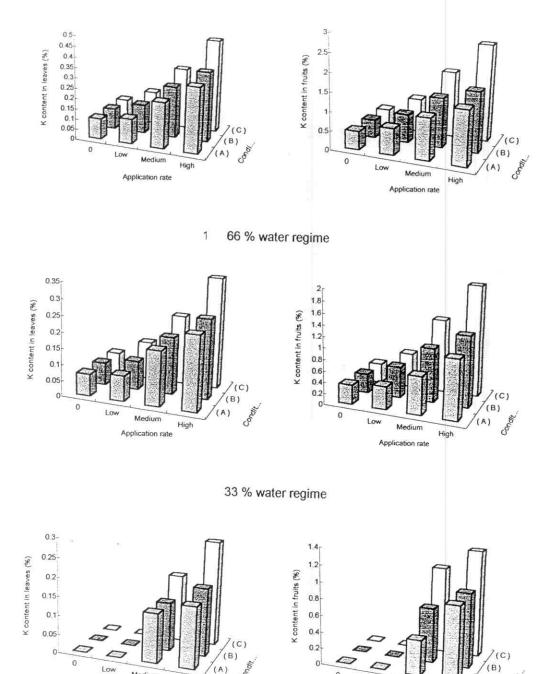


Fig.(17):Effect of water regime and soil conditioners on K content (%) in cucumber organs.

Low

Medium

Application rate

High

0.2

Low

High

Application rate

Awad (1996) and Aly (1999) reported increased K contents resulting from the use of conditioners. Superiority of chicken manure reflects its high nutritional value for plants.

Water stress was associated with decreased K contents in plant tissues. Highest K contents were in the 100 % water regime and lowest were in the 33 % water regime. Plants which survived at water stress of 33 % were those which received conditioners at the medium or high rates. To show effect of water stress on K contents data shows that at 33 % water regime (water stress) K contents of 2.32 % in stem, 1.57 % in leaves and 1.17 % in fruits. At 100 % water regime (no water stress) average K contents were much higher; being 3.94 % in stem, 2.79 % in leaves, and 1.85 % in fruits. Such a finding confirm the results of Richards and Wadleigh (1952) who found that a decreasing soil moisture supply is associated with a decrease in K percentage.

4.2.4.6. Potassium uptake:

Values of K uptake by cucumber organs grown on the sandy soil treated with soil conditioners under different water regime are presented in Table (21) and Fig. (18).

All conditioners gave more K uptake by different plant organs at all water regimes as compared with no application of conditioners. K uptake given by 100 % and 66 % water regime treatments receiving no conditioners were 1.81 and 1.29 g/plant respectively for stem, 0.10 and 0.07 g/plant for leaves and 0.48 and 0.35 g/plant for fruits. No plant growth occurred at 33 % water regime where no conditioner were applied, and also where the lowest rates of conditioners were applied.

Average values of uptake for the 100 %, 66 % and 33 % water regimes where conditioners were applied are as follows: Stem: 4.82, 3.52, and 2.58 g/plant for each water regime respectively; leaves: 0.26, 0.19, and 0.12 g/plant for each water regime respectively; fruits: 1.34, 0.99, and 0.58 g/plant for each water regime respectively.

Thus, addition of different conditioners to the soil increased uptake of K by stem, leaves and fruits of cucumber plants. This increase was more obious by increasing the rate of the applied conditioner. The maximum increase in K uptake by stem, leaves and fruits was obtained at the highest rate of conditioners.

Assessment of the magnitude of increase in K uptake which occurred at the highest rate of conditioner at each of the three water regimes; and in each of the three plant parts (or stem, leaves, and fruits) is as follows:

For polyacrilic acid, the magnitude of increase was as follows: at 100 % water regime: 224.1, 210.0, and 195.8 % for each plant part respectively. At 66 % water regime: 231.0, 228.6, and 250.0 %. (Plants did not survive where no-conditioner was applied at 33 % water regime, thus comparison at this water regime is not applicable).

For the composite conditioner, the comparable magnitudes of percentage increase in K uptake are as follows: at 100 % water regime: 254.8, 240.0, and 231.3 % for each plant part respectively. At 66 % water regime: 248.1, 375.0, and 262.9 %. (Comparison at 33 % is not applicable for reasons mentioned above).

For the chicken manure, the comparable magnitudes of percentage increase in K uptake are as follows: at 100 % water regime: 418.7, 360.0, and 437.5 % for each plant part respectively. At 66 % water regime: 407.0, 400.0, and 471.4 %. (Comparison at 33 % is not applicable for reasons mentioned above).

Increased uptake of K resulting from application of conditioners at the highest rate is very much greater than in the case of uptake of the other nutrients of N and P. Chicken manure was the most effective material in this respect.

Water stress caused a decrease in K uptake. The highest K uptake was with the highest water regime (the 100 % water regime), and the lowest was with the lowest water regime (the 33 % water regime). This is illustrated when K uptake of the 100 % water regime (average values of all rates of conditioners) were 4.82, 0.26, and 1.34 g/plant in stem, leaves, and fruits respectively. Comparable uptake for the 33 % water regime were 2.58, 0.12, and 0.58 g/plant for the same parts, respectively. As interaction between soil conditioners and water regimes, data show that chicken manure was superior to polyacrilic acid and composite conditioner particularly where moisture was sufficient i.e. at the 100 % water regime.

Fruits Medium 1.31 1.38 0.68 0.97 1.33 0.67 0.67 0.67 0.67 0.69 0.75 0.78 0.78 0.05 0.00 0.00 0.00 0.00 Table (21); Effect of water regime and soil conditioner materials on potassium uptake (g/plant) by cucumber organs. 0.25 0.25 0.31 0.26 0.18 0.10 0.10 0.10 Leaves Rate of application (R) Medium 0.25 0.25 0.26 0.26 0.18 0.13 0.13 0.13 $\begin{smallmatrix} 0.00 & 0.00$ Low Mean 5.87 6.06 6.06 7.27 7.20 Stem Medium 2.33 2.55 2.55 2.55 2.55 1.70 1.79 1.97 1.82 0.00 0.00 Material S O B > O B > OBY Water regime 100% Mean Mean (W1) 3 %99 (W2) 33%

1,22 1,34 1,34 1,32 0,93 0,93 0,53 0,79 0,79

1.07

High

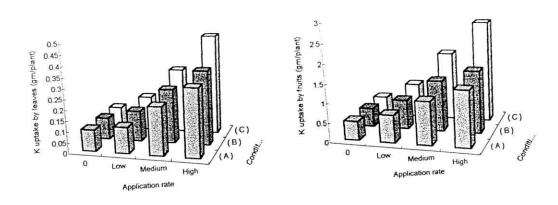
0.74	n n				
1.25	R=0.56 WR=0.97				
0.98	M=0.56 MR=0.97				
0.37 0.43 0.50			0.48	0.35	00.00
0.18	1				
0.24 0.26 0.37 0.29	R=0.12 WR=0.2				
0.07 0.18 0.09 0.19 0.08 0.24 0.08 0.20	M=0.12 MR=0.2 0.59				
0.09	W=0.12 WM=0.2 WMR=		0.10	0.07	0.00
3.32 3.32 3.64 3.64					
4.58 4.84 4.37 5.60	R=2.29 WR=3.96				
3.55 3.67 4.39 3.87	M=2.29 MR=3.96 4.1	crs:			
1.34 1.58 1.58	W=2.29 N WM=3.96 M WMR= 4.1	reatments receiving no conditioners:	1.81	1.29	0.00
(A) (C) (C) (C)		s receiving			
-	LSD 0.05	Treatment	W] =	W2 =	W3 =

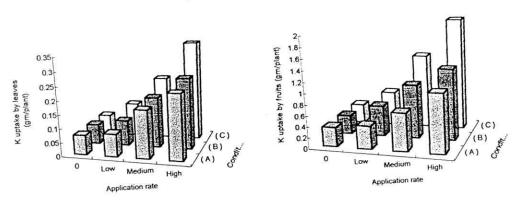
materials

Means of

0.00

(W3)





33 % water regime

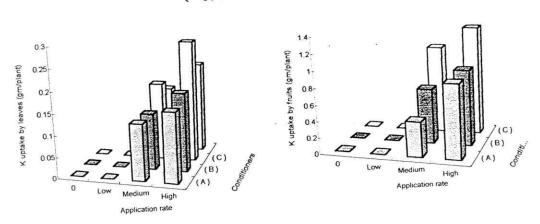


Fig.(18):Effect of water regime and soil conditioners onK uptake (gm/plant) by cucumber organs.