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INFLUENCE OF SOME ORGANIC ADSORBENT AND IRON LEVELS ON PLANT GROWTH AND SOME NUTRIENT AVAILABILITY IN SOIL.

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ABSTRACT

Pot experiment was carried out using sandy soil samples which were collected from the surface soil (0-20Cm) of Tahrier region . The experiment was designed in complete randomized with three replicates. The first factor was organic matters as FYM at the rate of 200 gm/pot (20ton/fed), sodium humate 50 mg/pot (5 Kg/fed) and potassium humate 80 mg/pot (8 Kg/fed). The second factors was ferrous sulfate 7,14 mg/kg soil (7.14 kg/fed).

The dry matter yield of corn plants significantly increased by using organic adsorbent alone or combined with iron compared with control. The best results of dry matter yield were obtained as follows: FYM > K – H > Na – H > control at all iron levels.

Nutrient contents (N,P,K and Fe) in corn plants increased with applying of organic adsorbents for all treated iron levels Similar trends of results were found as for the dry matter yield of corn plants.

Residual effect of N,P,K and Fe in soil after harvest of corn plants, generally increasing the nutrient extractable from soil. This increase for N,P and Fe was follows: FYM > Na- H > K – H > control. Only K extractable was in this order: FYM > K – H > Na - H > control.

Keywords: sodium humate, potassium humate, FYM, iron.

INTRODUCTION

The most common range of Fe in soils is from 0.5 to 5 %. Even in Fe-poor soil, there is no absolute deficiency of Fe for plants, but only deficiency of readily soluble a amounts. Soil Fe exhibits a great affinity to or mobile organic complexes and chelates, these compounds are largely responsible to Fe migration between soil horizons and Fe leaching from soil profiles and also are important in the supply of Fe to plant roots. Organic material was added to soil to produce chelating agents such as phenolic acids, complex polymeric phenols, humic acids fulvic acid...etc. (Stevenson 1994). These chelating agents make more Fe available to plants growing on calcareous soil. Wallace and Khadr (1996) found that humic acid when chelated with iron, seems to be able to correct iron deficiency of chlorotic sensitive plant species when grown in calcareous soil. Dahiya and Singh(1980) pointed that the concentration and uptake of iron by oat plants grown in loamy sandy soil was increased with increasing FYM up to 1% . Abdel-Latif and Abdel-Fattah (1985) studied the availability of micronutrients in two calcareous soils of Egypt, sandy loamy containing 12.8 %$CaCO_3$ and sandy clay loamy containing 27.2 % $CaCO_3$. They found that the addition of organic materials to both soils markedly increased the available of Fe and Zn. Fagbami *et al.*

(1985) pointed out that organic matter levels in soils are positively correlated with the extractable forms of Fe, Zn and Cu in soil including those of calcareous soil. Mc Caslin et al (1987) showed that the application of some organic residues for Sorghum plants growing on calcareous and silt clay loamy soil, revealed favorable responses for uptake of Fe, Mn Zn and Cu by plants. Taalab (1999) recommended that the application of town refuse 5, 10 and 15 ton /fed, water hyacinth compost 5,10, 20 ton / fed increased soil available Fe, Mn, Zn, and Cu more than the application of chemical fertilizers alone. Radwan *et al.* (2001)found that the dry matter yield of corn kernels and the concentration of iron and its uptake were increased with the increases of Fe addition(0, 4, 8 ppm). The chelating agents resulted in more increase of Fe content compared with the So_4 form (DTPA >EDTA>So_4).

The purpose of this study was to define the effect of organic matter substances such as FYM, sodium humate and potassium humate under different levels of iron on yield and ability of organic adsorbents on adsorption and release of iron to plants.

MATERIALS AND METHODS

Sandy soil samples were collected from the surface soil (0-20Cm) of Tahrier region. Analytical data of this soil are shown in Table(1A) and FYM, sodium humate and potassium humate in Table (1 B). All analyses were performed according to the Cottine *et al.* (1982) The experiment was designed in a complete randomized with three replicates. The first factor was organic matters as FYM at the rate of 200 gm/pot (20ton/fed), sodium humate 50 mg/pot (5 Kg/fed) and potassium humate 80 mg/pot (8 Kg/ha). The second factor as ferrous sulfate 7 (Fe1),14 (Fe2) mg/kg soil (7, 14 kg/fed). Ten kilograms of soil were packed in plastic pots, all pots were fertilized by N,P,K using ammonium sulfate 33.5 gm/pot (33.5 kg/fed), super phosphate 15.5 P_2O_5 1.5 gm/pot (15 Kg/fed) and potassium sulphate 4.8 gm/pot (48-50% K_2O/fed) respectively. Each pot was planted with 8 seeds of corn and irrigated with tap water at 60% of water holding capacity. The plants were harvested after 60 days, dried at 70°C until the weight became constant and prepared for chemical analysis.

Table (1): Some physical and chemical analysis of materials used in experiments.

A

Location Of soils	pH KCl	EC, $mS.Cm^{-1}$	OM %	$CaCO_3$ %	CEC, $mmol.Kg^{-1}$	W.H.C %	Sand %	Silt %	Clay %	Texture Grade
El Tahrier	7.35	0.41	0.010	0.80	48.82	34	96.95	1.90	1.15	Sandy

B

Materials	C %	N %	C/N	P, $mg.kg^{-1}$	K, $mg.kg^{-1}$	Fe, $mg.Kg^{-1}$
Soil	0.01023	0.00113	9.05	29.97	400	12.93
Na-humate	31.27	0.8400	37.26	304	4200	7140
K-humate	33.28	0.4275	77.84	264	165000	2510
FYM	38.04	1.2610	30.1665	5006	30700	3500

RESULTS AND DISCUTION

Data in Table (2) and Fig. 1 represented the effect of organic substances as (potassium humate, sodium humate and farmyard manure) and Iron levels and their interactions on the production of dry matter of corn plants. The obtained results show that the dry matter of corn plants significantly increased after the addition of organic substances to the soil compared with control . There is no significant difference effect between sodium humate and potassium humate. Significant effect was found between farmyard manure and both potassium humate and sodium humate. The high values of dry matter yield obtained arrange as the following: Farmyard manure > potassium humate > sodium humate >control . The relative increase in dry matter weight comparing with control were : 107.39% > 50.79 % > 41.68 % in the case FYM, potassium humate and sodium humate.

It means that organic substances participated on the increase of yield due to the mineralization process which released the nutrient to the plants . These results are in agreement with those obtained by Uren(1984), Chaney (1988), Basyouny (1996). Fecenko et al (1995) found that the yield of spring wheat was increased after addition sodium humate at the rate of 7 $kg.ha^{-1}$ compared with control. Shalabey (1998) found that the application of sodium humate at the rate of 5 $kg.ha^{-1}$ and farmyard manure at rate 20 $ton.ha^{-1}$ significantly increased the yield of spring wheat plants.

Concerning the iron levels, there are a significantly increased in yield of corn plants compared with control, but between iron levels there are no significant effect between them. The highest values were obtained by using Fe2 (14) ppm than Fe1 (7) ppm. The relative increases were 79.28 % for Fe2 and 61.68 % for Fe2. This may be attributed to that iron was increased the photosynthesis process through chlorophyll formation, and activated of some enzymes as dehydrogenises in plants compared with control (Clarkson and Hanson 1980) , Mengel and Krikby (1987). These results are in agreement with those obtained by Radwan et al. (2001) who found that the application of Fe at 4.12, 8 ppm at different forms as Fe-SO_4, Fe- EDTA and Fe – DTPA to the different soils, significantly increased the yield of corn plants.

For both organic substances and iron levels added to the soil their was a positive response in yield of corn after addition organic substances companied with iron levels This response is significant in all treatments between control and all levels of added Fe for three organic substances . On the other hand , we found that their was no significances between all added levels of iron in the case potassium humate and sodium humate. But under Farmyard manure has a highly significant difference in yield of corn plants. FYM seems to be materials with a higher buffering capacity compared to the sodium hum ate and potassium humate. This effect is related to the amount of materials used in the pot experiment.

Concerning the content of N, P,K and Fe (mg/pot) in corn plants which increased progressively with increasing iron levels applied to the soil alone or companied with studied organic matter. Regardless of iron effect on N,P,K and Fe. The highest values were obtained by using Farmyard manure.

The applied organic matter can be arranged as the following: Farmyard manure > Potassium humate > Sodium humate > control. It could be seem from Table 2 that organic substances gave a higher amount of nutrient uptake to corn plants compared with the control. This effect is interpret by the amount and chemical composition of materials which were used in pot experiment. Also the usedorganic substances produced some chelating agents, through mineralization process which makes more Fe available to plant growth.

Wallace and Khadr (1966)found that humic acid when chelated with iron, seems to be able to correct iron deficiency of chlorotic sensitive to plant species when grown in calcareous soil. Dahiya and Singh(1980) pointed out that the concentration and uptake of iron by oat plants grown in loamy sandy soil was increased with increasing FYM up to 1%. Sakr et al. (1995) found that, iron application as Fe-chelates to the soil increased P concentration and uptake by corn and sunflower plants grown on different soils. Radwan et al (2001) found that the dry matter yield of corn kernels and the concentration of (N, P, K ,Fe and Zn) and its uptake were increased with the increases of Fe addition(0, 4, 8 ppm). The chelating agents resulted was more increased of nutrients content compared with the So_4 form (DTPA > EDTA> So_4).

Residual effect of N,P,K and Fe in soil after the harvest of corn plants are shown in (Table 5). Generally the extractable soil nutrients were increased by application of both organic matter (farmyard manure, potassium humate, sodium humate) and iron to the soil. The values of extractable of nutrients were higher than that the values found in the soil before the establishment of pot experiment.

For organic substances the values in N extractable was increased at the rate of 19.53 %, 39.06 % and 227.34 % for sodium humate, potassium humate and farmyard manure. P extractable also increased at the rate of 13.7 %, 41.17 % and 113.70 % for sodium humate, potassium humate and farmyard manure. But K extractable was increased at the rate of 82.48 %, 16.22 % and 83.82 % for potassium humate , sodium humate and farmyard manure respectively. Concerning the iron extractable brought up to 30.83 %, 69.28 % and 103.92 % for potassium humate , potassium humate and farmyard manure. The differences between all treatments could be explained by the rate of amount addition and the rate of degradation between them and consequently producing some chelating agent to be strongly bound nutrient and being more mobile through soil particles. Also the beneficial effect of organic materials must be consider the most improving agent for soil fertility. Taalab (1999) recommended that the application of town refuse 5, 10 and 15 ton /fed, water hyacinth compost at rates of (5,10, 20 ton / fed) increased soil available Fe, Mn, Zn, and Cu more than the application of chemical fertilizers alone.

The influence of iron levels added to soil on extractable nutrients are shown in Table 2. Extractable N was increased at the rate of 19.19 % and 9.39 % for Fe1 and Fe2. P extractable also increased at the rate of 8.14 % and 26.74 % for Fe1 and Fe2 respectively. Both extractable K and Fe were increased at the rate of 17.39 %, 31.30 % and 41.66 %, 94.44 % for Fe1and Fe2 consequently.

From the obtained results, it can be concluded that, the application of organic substances combined with iron levels increased the dry matter yield and improved the nutritional status of plants and soil. The best effect of treatments was as follows were: FYM + Fe2 > K – H +Fe2 > Na – H +Fe2 > control +Fe2.

Table (2): Influence of potassium humate, Sodium humate, Farmyard manure and Iron levels on yield of corn plants growing in sandy soils and some nutrients uptake.

Treatments		Yield (g/pot)	N %	N (mg/pot)	P %	P (mg/pot)	K%	K (mg/pot)	Fe ppm	Fe (mg/pot)
Control	Fe0	11.66	1.04	121.26	0.25	29.15	3.21	374.28	24.00	0.2798
	Fe1	26.65	1.14	303.81	0.26	69.29	3.36	895.44	56.00	1.4924
	Fe2	31.76	1.16	368.42	0.28	88.93	3.77	1197.35	64.00	2.0326
K- H	Fe0	25.00	1.24	310.00	0.26	65.00	4.21	1052.50	44.00	1.1000
	Fe1	38.33	1.27	486.79	0.28	107.32	4.46	1709.52	68.00	2.6064
	Fe2	42.33	1.30	550.29	0.29	122.75	4.74	2006.44	78.00	3.3017
Na-H	Fe0	25.00	1.30	325.00	0.28	70.00	3.62	905.00	40.00	1.0500
	Fe1	36.14	1.35	487.89	0.28	101.19	4.46	1611.84	68.00	2.4575
	Fe2	38.14	1.36	518.70	0.32	122.05	4.75	1811.65	74.00	2.8224
FYM	Fe0	33.66	1.29	434.21	0.28	94.28	4.89	1645.97	62.00	2.0869
	Fe1	53.00	1.37	726.10	0.31	164.30	5.23	2771.90	80.00	4.2400
	Fe2	58.66	1.41	827.11	0.36	211.17	5.30	3108.98	90.00	5.2794
L.S.D.	5%	6.29	----	----	----	----	---	---	----	----
Φ Fe0		23.83	1.22	297.62	0.27	64.61	3.98	9901.44	43.00	1.1290
Φ Fe1		38.53	1.28	501.15	0.28	110.53	4.37	1747.18	68.00	2.6990
Φ Fe2		42.72	1.30	566.12	0.31	136.23	6.64	2031.11	76.50	3.3590
L.S.D. 5%		4.46	----	----	----	----	----	----	----	----
Φ Control		23.35	1.11	264.50	0.26	62.45	3.45	8.22.36	48.00	1.2683
Φ K-H		35.22	1.27	449.03	0.28	98.36	4.47	1589.48	65.53	2.3561
Φ Na-H		33.09	1.34	443.86	0.29	97.74	4.28	1442.85	61.35	2.1094
Φ FYM		48.44	1.36	662.47	0.32	156.57	5.14	2508.91	77.33	3.8687
L.S.D. 5%		2.91	----	----	----	----	----	----	----	----

K-H (Potassium humate), Na-H (Sodium humate), FYM (Farmyard manure).
Fe0 (control of iron), Fe1 (7 ppm of iron), Fe2 (14 ppm of iron).
Φ(Average).

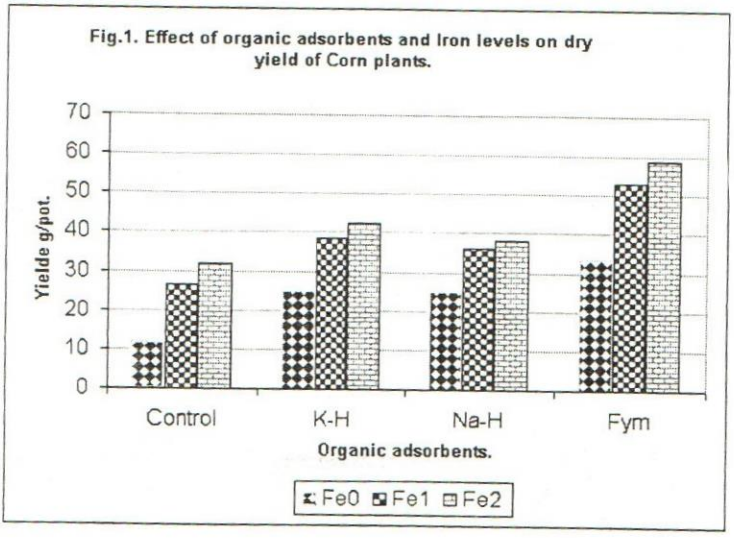

Table (3): Influence of potassium humate, Sodium humate, Farmyard manure and Iron levels on availability of some nutrients in soil after harvesting corn plants.

Treatments		N ppm Total	P ppm Available	K ppm Available	Fe ppm Available
Control	Fe0	126	16	20	7
	Fe1	130	17	26	8
	Fe2	130	18	28	11
Φ		128	17	24.66	8.66
K - H	Fe0	145	17	28	8
	Fe1	158	18	35	11
	Fe2	158	23	42	15
Φ		153	19.33	45	11.33
Na - H	Fe0	176	20	25	10
	Fe1	180	23	28	15
	Fe2	180	27	33	19
Φ		178	24	28.66	14.66
FYM	Fe0	378	33	42	11
	Fe1	478	35	46	17
	Fe2	403	41	48	25
Φ		419	36.33	45.33	17.66
Φ	Fe0	198	21.50	28.75	9
	Fe1	236	23.25	33.75	12.75
	Fe2	217	27.25	37.75	17.5

K-H (Potassium humate), Na-H (Sodium humate), FYM (Farmyard manure) Fe0 (control of iron), Fe1 (7 ppm of iron), Fe2 (14 ppm of iron). Φ(Average).

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تأثير بعض المركبات العضوية الأدمصاصيه ومستويات الحديد علي نمو النبات ومحتواه من بعض العناصر الغذائية وتيسرها في الأرض.

أسامه إبراهيم شلبي

قسم الأراضي معهد بحوث البيئه الصحراوية جامعه المنوفية مدينه السادات

في تجربة أصص تم استخدام عينات أرضية سطحية من ارض رملية من مديرية التحرير ، وزرعت بحبوب الذرة وصممت في تجربة كاملة العشوائية في وجود عاملين الأول وهي المواد العضوية الأدمصاصيه بمعدلات ٢٠٠ جم سماد عضوي مزرعى (٢٠ طن / ف) ، ٨٠ مج هيومات البوتاسيوم (٨ كجم / ف) ،٥٠ مج هيومات صوديوم (٥ كجم / ف) . العامل الثاني وهو الحديد في صورة كبريتات الحديدوز (صفر ، ٧، ١٤ مج/ كجم أرض) وهي تعادل (صفر ، ٧ و١٤ كجم/ف . تم إضافة هذه الكميات لكل أصيص سعة ١٠ كجم تربة وتم تسميدها بمعدلات التسميد العادية الموصي بها من النيتروجين والفسفور والبوتاسيوم والري عند ٦٠ % من السعة الحقلية . تم حصاد النباتات بعد ٦٠ يوم من الزراعة وتجفيفها علي درجة ٧٠ °م ووزنها وتجهيزها للتحليل الكيماوي لتقدير النيتروجين والفسفور والبوتاسيوم والحديد. وكانت أهم النتائج المتحصل عليها هي أن إضافة المواد العضوية الأدمصاصية أو الحديد إلي الأرض في صورة منفردة أو متحدة مع بعضها أدى ألي زيادة محصول المادة الجافة زيادة معنوية بالمقارنة بالكنترول ولم توجد أي معنوية بين المعاملات بمقارنتها ببعض البعض .وكانت أحسن النتائج المتحصل عليها عندما أضيف المادة العضوية مع الحديد علي النحو التالي :السماد العضوي المز رعي > هيومات البوتاسيوم > هيومات الصوديوم > الكنترول . زاد محتوى النبات من العناصر الغذائية النيتروجين والفسفور والبوتاسيوم وأخذت نفس اتجاه الزيادة في محصول المادة الجافة . أما التأثير المتبقي من هذه العناصر والتي تم استخلاصها من الأرض بعد حصاد المحصول فلقد أخذ البوتاسيوم أيضا نفس الاتجاه السابق كما في المادة الجافة ومحتوى النبات من هذه العناصر عدا عنصر النيتروجين والفسفور والحديد فكان كما يلي : السماد العضوي المزرعي > هيومات الصوديوم > هيومات البوتاسيوم> الكنترول .