



A study of levels of trace elements in water and soil of Hamadan Canal and Its Effect on leaves and fruits of Braim and Hillawi Cultivars of date palms

A.K. M. Abd^a and Z.J. Musa^b

^aDate Palm Research Center, University of Basrah

^bMarine Science Center, University of Basrah

Abstract

This work in during :the study of the quality of Shatt Al-Arab water in two locations in Hamadan Canl and the investigation of the effect of this water on two cultivars of date palms planted on the shores of the river .The following parameters were specified for investigation :pH; Electric conductivity(EC);Total dissolved solids (TDS); and concentrations of Cl,Ca,Fe,Cd ions. The results revealed that Shatt-Al-Arab water in the two locations is saline .It is also shown that the pH values fall within the normal limits as stated by FAO(International organization of Food and Agriculture).The T.D.S were within the permitted limits; Cl was in its highest value in station 2 in summer and in its lowest value in station 1 in winter. Ca and Fe were like Cl in their behaviour whereas Cd was in its highest value in station 1 in winter and in its lowest value in station 1 in summer .The obtained values in Summer ,were higher then those obtained in Winter concerning Cl,Ca,Fe and Cd in the Soil of both stations 1 and 2.

The results also revealed significant variation among the cultivars ,the seasons and the stations of the study, Al-Hillawi cultivars and winter gave the highest value concerning Fe and Cd in the leaves , station 1 from Cd and station 2 respectively. The same can be said about overlaps which had significant variation in values .

As far as the fruits are concerned ,the highest value was in station 1 from Fe,Cd and the cultivar of date did not have any significant effect .It was also revealed ,in the study ,that there was significant effect on the overlaps on the content of the trace elements in the fruits.

Key Word= Date palm, Hamadan Canal,Trace element.

1-Introduction

Shatt Al-Arab is directly exposed to many pollutants that result from disposing domestic, agricultural and industrial wastes and that negatively effect water. The studies that were carried out to determine the chemical and physical qualities of water in the river were: Salman and Faris (1977), the study of the Polish company (plaservice) by a request from Ministry of Irrigation, and Al-Najim *et al* (1993), who studied the quality of the water and how much it is useful for agriculture. The results demonstrated that water of Shatt-AL-Arab is classified as highly saline in terms of the classification of American Lab of salinity. It is very problematic to use this water for irrigation as far as value of electric transmission in terms of FAO classification is concerned.

Results also showed that concentration of Hydrogen ion was within normal limits in terms of the classification of FAO. Study of Hussein and Atte (2000 a,b) are the recent of Shatt-AL-Arab and Mehajran. Hussien (2001) also studied the sources of organic pollution in the water inside Iraq. He revealed, in his study, the annual ranges of chemical and physical qualities of shatt-AL-Arab and six of its canals of Garmat Ali, Mehajran, Asrraji, AL-Khora, AL-Ashar and Rubat in addition to the southern sector of Shatt-AL-Basrah. AL Maliki (2002) made an environmental survey of Hamadan Canal which is one of the main branches of

Shatt-AL-Arab. The study showed that this Canal was affected by the domestic and agricultural pollutants that were thrown from the places on the shores. AL-Aemara *et al* (2002) also studied the determine of trace elements in water sediments as AL-Houiza Marsh, Middle Marsh, Hammar Marsh, Satt-AL-Arab, Garmat-Ali and North West Arab Gulf. It was also revealed in the study the highest value was in Head of Beasha (85.97 mg/L) Cd, (574.33 mg/L) in AL-Kaed. As far as the Marsh Middle is concentration (35.92 mg/L) and (1845.5 mg/L) for Fe in AL-Houiza Marsh. Mastafa (2006) showed in a study of Onions seedling was cutting in green house, its given elements (Pb, Cd) value (2.1, 0.1) ppm respectively and to add mixture of (Pb, Cd) value (5+0.1), (5+1) and (100+2) ppm in water irrigation. The result revealed lowest dry weight of leaves and lowest concentration add elements (Pb, Cd) or both. That negatively effect weight of bulb, its increase add elements (Pb, Cd) and the element increase in leaves and bulb.

Trace elements also play an important role to help plant grow and adapt to diseases and unsuitable conditions. The trace elements those important for the growth of plants are: Fe, Mn, Se, Cr, Zn, Ni, Cu, and Mo in addition to other elements that are available in the different plants. When the concentrations of these elements are higher than what is needed by the

plant, they are considered as pollutants for the plant (Vymazal, 1990 and Viarengo, 1985). Plant trees are green fruit trees that need alimetal elements to sustain growth and production. Many Researchers have carried out many analyses to evaluate elements and leaves. Yousef *et al* (1976) emphasized that cultivars of date palms of Sayir, Hillawi and Zahdi are good sources of Fe, Cu and Mn and poor sources of Zn. Vender cook (1979) showed that cultivars of Hillawi, Sayir, Khidhrawi, Birhi, Khistawi, Zahdi contain many elements %2.14- %3.88 as ashes. Sawaya *et al* (1983) showed in a study of analye of elements in some important cultivars of date palms in kingdom of Saudi Arabia that there were low rates of Zn and significant rates of Fe and Cu. Concentration of Cu was 3-19 Microgram /gr as dry weight and concentration of Zn was 3-13 Microgram/gr as dry weight.

Aim of this study

To keep water resources that are considered as the main source of irrigation in Abu-AL-Khaseeb area and the surrounding areas, it is a must to carry out a study to evaluate water in Hamadan Canal, and to investigate the availability of some trace elements in it, and the accumulation of these element cultivars of date palms.

2-Materials and procedures

The study was carried out in one of Abu-AL-Khaseeb orchards in Basrah. The first station was chosen at the beginning of the Canal and the second in the end during the two seasons (winter and summer). Three date palms were chosen for each of the two cultivars of Braim and Hillawi. These date palms were of nearly the same length and power of growth. Samples of the leaves were gathered in the two seasons where as dates were gathered in only one season.

The pH, (E.C) and T.D.S were measured by HANNA instruments of the Portuguese cultivars. Proportion of chloride was measured by APHA method (1999) through mixing tears of the sample with solution of silver nitrate (0.01) and Ca was measured by lind method (1979) through tears of the sample with E.D.T.A solution and availability of Hydroxide and Peroxide

Sample Digestion

Samples of water, soil and plant texture were digested by APHA method (1999) and then they were solidified in the Atomic device of the cultivars sp Atomic Absorption and PYE UNICAM spectrophotometer. The center of Marine Sciences.

Statistical Analysis

Factors were randomly distributed according to Completely Randomized Block Design (CRBD) and according to the overlap of cultivars, seasons and stations based on an experiment. Significance among the means was tested by the Revised Least Significant Difference (RLSD) and with a level of probability of 0.05 depending on the work of (AL-Rawi and Khalaf Allah, 1980).

3-Results and Discussion

pH-values

Values of pH were in the base during summer and winter and this is a distinctive feature of Iraqi water. This result agrees with that of Shatt-AL-Arab is considered suitable for agricultural purposes in terms of the qualities assigned by FAO which consider 6-8.5 as the suitable pH range for agricultural purposes (Ayers Westcot, 1976). Table 2 shows that the highest pH value is 8.5 in the soil of station 1 in summer and the lowest pH value 8.2 in the soil of station 1 in winter. Yogodin (1984) indicated that plants in general, are sensitive to acidity of the soil at the beginning of the growth, but later they become relatively more resistant to the acidity of the soil.

Salinity

Value of salinity are low in winter and high in summer because of the high temperature and increase of Evaporation (AL-Helu and AL-

Edani, 1997) and by depending on the classification of the American Lab of salinity (Richards, 1954). Water of shatt-AL-Arab in times of tide and ebb is classified as high saline because values of electric transmission of the water are more than 2.25 DC simens /m. According to FAO classification (Ayers and westcot, 1976), there is a problem in case of using this water for irrigation. Table 2 showed that the highest value of salinity was in station 2 in summer; which was 1.34 micro simens /Cm for station 1 in winter which was (1.11) micro simens /Cm in areas of little rainfall, more amounts of salt gather in the soil where dissolved salts gather in the roots and effect the growth of the plant. This effect may be osmotic, alimentary, or Ionic.

T.D.S

Concentration of T.D.S is the least during months of the flood and it increases after that with the decrease of the river drainage during months of the scorcher. Total values of T.D.S were within the permitted limits where the highest value was in summer for station 1 (633.6 part per thousand). The highest value was in station 2 (844.8 part per thousand). Specification of Iraqi rivers determine value of the permitted total T.D.S to be 1500 part per one million (Hamad, 2002) value of T.D.S in table 2 showed that the highest value for station 2 was 860.16 parts per thousand in summer and the lowest value was 704.0 part per thousand in

station 1 in winter .Dissolved salts may be added to the soil by irrigation when salinity appears in irrigated Land in case the osmosis of the soil is very low because water movement to the bottom stops (AL-Neami,1990).

Cl

As shown in table 1,values of Cl in summer were higher than this of winter .The highest value was 160.6 mg/L for station 2 and the lowest value was 119 mg/L in the main negative ions available in this water .This is due to the farming activities, methods of fertilization, and entry of drainage to Shatt-AL-Arab in times of ebb (AL-Najm *et al*,1993) .Table 2 shows that the highest value of chloride 190.8 mg/L in soil of station 2 in summer and the lowest value 160.0 mg/L in station 1 in winter .Chloride salts dissolve heavily in water ;so washing processes can remove this element and thus the content of the soil in the dry and semi-dry areas more than that of wet areas (Hussein and Atte 2000 a,b)).High concentration of chloride may lead to poisoning of the plants ;a process whose mechanism is not yet known .(Bemstein and Hayward,1958).

Ca

The highest value (320.8 mg/L) Table 1 of Ca was in station 2 during the summer and the lowest value (290mg/L)was in winter(station 1,2) and thus it was higher than the permitted limit in Iraqi specification No 25 of 1967 which does not exceed 200mg/L.Table 2 shows that the highest value of Ca 280.25 in station 1 in summer and the lowest value is 160 in station 2 during the winter because of the high temperature and the increased rate of evaporation .

Ca exists in the soil as an original material in primary and secondary minerals of the soil and when these minerals are exposed to processes of airing the Ca is released to the soil solution as dissolved calcium ion which may come through :

1. Absorption by the plant through the distributed roots of that plant.
2. Deminishing from the soil by washing.
3. Changing to calcium.
4. Precipitation from the soil solution in a from of calcium carbons or calcium phosphate.

Table (1) Value of Some Environmental Variables and Trace Elements In Water of the Two station and for the Two seasons of the study

PH	E. C Micro simens/cm	T.D.S part per thousand	Cl mg/L	Ca mg/L	Fe mg/L	Cd mg/L	Stations	seasons
7.8	1.11	704	119.8	290	1.153	0.052	Stations 1	Winter
7.6	1.11	704	120.4	290	1.192	0.011	Stations 2	
7.6	0.99	633.6	124.07	300.6	1.357	N.D	Stations 1	summer
7.4	1.32	844.8	160.06	320.8	1.470	0.012	Stations 2	

Fe

Table 1 shows that the highest value for Fe in water of Hamadan Canal was 1.470 mg/L for station 2 in summer and the lowest value was 1.153 mg/L for station 1 in winter .This result agrees with that of the study done by Abaychi and Douabul (1985)who studied a group of trace elements in the water and sediments of Shatt-AL-Arab and found the rate of Fe concentration as 1.8 mg/L.

Table 2 shows that the highest value of Fe(3949.8 mg/L) in soil of station 1 in summer and the lowest value 3433.0 mg/L in station 2 during the winter .Table 3 shows concentration of trace element in leaves of date palms of AL-Braim and Hillawi cultivars in the two stations of the study in the two seasons of summer and winter.

Table (2) Value of Some Environmental Variables and Trace Elements In Soil of the Two stations and for the Two seasons of the study

PH	E.C Micro simens/cm	T.D.S Part per thousand	Cl mg/L	Ca mg/L	Fe mg/L	Cd mg/L	Stations	seasons
8.2	1.11	704	160	190	3628.0	5.333	Stations 1	winter
8.4	1.12	718	185	160	3433.0	6.899	Stations 2	
8.5	1.22	785.2	177	280.25	3949.8	5.638	Stations 1	summer
8.2	1.34	860.1	190	190.11	3775.9	7.330	Stations 2	

Table (3):Influence of cultivars ,seasons and stations of values of trace element on leaves of Hillawi and Braim cultivars of date palms in the two stations.

	Cd mg/g	Fe mg/g		
	1.449	31.652	Braim	cultivars
	3.717	34.560	Hillawi	
RLSD	1.417	2.207		
	3.218	35.198	winter	seasons
	1.949	31.014	summer	
RLSD	1.212	3.441		
	2.002	35.201	Stations 1	stations
	3.164	31.010	Stations 2	
RLSA	1.100	3.459		

The table shows that highest the value of Fe was in leaves of Hillawi cultivar during winter and in station 1are(34.560,35.198 and 35.201 mg/g) respectively with a significant difference from the lowest value in leaves of Braim cultivar during summer and in station 2 which was 31.652,31.014 and 31.010mg/g respectively. Table 4 shows the overlaps of

cultivars and indicates that Hillawi cultivar and winter scored the highest value with a significant difference from the lowest value in Braim cultivar and in summer .Hillawi value was (54.040mg /g).The lowest value of Hillawi was in station 2 scored the highest value and summer in station 2, scored the lowest value with a significant difference .

Table (4):Overlaps of cultivars ,seasons and stations of values of trace element on leaves of Hillawi and Braim cultivars of date palms in the two stations of the study.

	Cd mg/g	Fe mg/g			
	1.675	32.290	winter	Braim	cultivars
	1.224	31.014	summer		
	4.761	38.106	winter		
	2.673	31.014	summer	Hillawi	
RLSD	0.374	4.371			
	1.224	16.363	Stations 1	Braim	cultivars
	1.675	46.940	Stations 2		
	2.780	54.040	Stations 1		
	4.654	15.080	Stations 2	Hillawi	
RLSD	0.400	1.112			
	1.555	36.805	Stations 1	winter	seasons
	4.880	33.591	Stations 2		
	2.449	33.598	Stations 1		
	1.449	28.429	Stations 2	summer	
RLSD	0.098	3.455			

Table 5 indicates that station 1 has more significant concentration Fe element in the date content .It does not show significant differences among the cultivars .The data in Table5,also ,in dictate that Hillawi cultivar in station1 is significantly higher comparing to station2.Whereas found trivial change (N.D)(Table 6) .This study agrees with Yousif *et al*(1976).Who proved that sayir ,Hillawi and Zahdi cultivars can be considered as a good sources of Fe,Cu,Mn and poor sources of Zn.

Cd

The highest value of Cd concentration (0.012mg/g)was in station 2 in summer whereas the lowest value was N.D for station 1 in summer as shown in Table ; consideration

that environmental effects .Limitations of Cd element are not more than 0.01mg/g in terms of the Iraqi specification for rivers maintenance and protection from pollution No 25 of 1967 .This study agrees with that of Abyachi and Douabul (1985)who found that rate of Cd concentration in shatt-AL-Arab was 0.2 mg/L due to the nature of sediment in the area rich with oil .

The highest value of Cd (7.33 mg/g) was in summer soil of station 2 whereas the lowest value of Cd (5.333mg/g)was in soil of station 1 in winter as shown in Table 2 .

Table 3 reveals that the highest value of Cd was in leaves of Hillawi in station 2 during winter whereas the lowest value was in leaves

of Braim in station 1 during summer .When studying the effect of overlap ,showed that Hillawi in winter scored the highest value and station 2 scored the highest value with a significant difference Table 4.Whereas Cd had the highest value in Hillawi and station 1 and the lowest value in Braim and station 2 (Table 5).overlap had significant effect that the dates of the two cultivars contain trace elements : Hillawi date in station 1 had the highest value with significant difference whereas there was

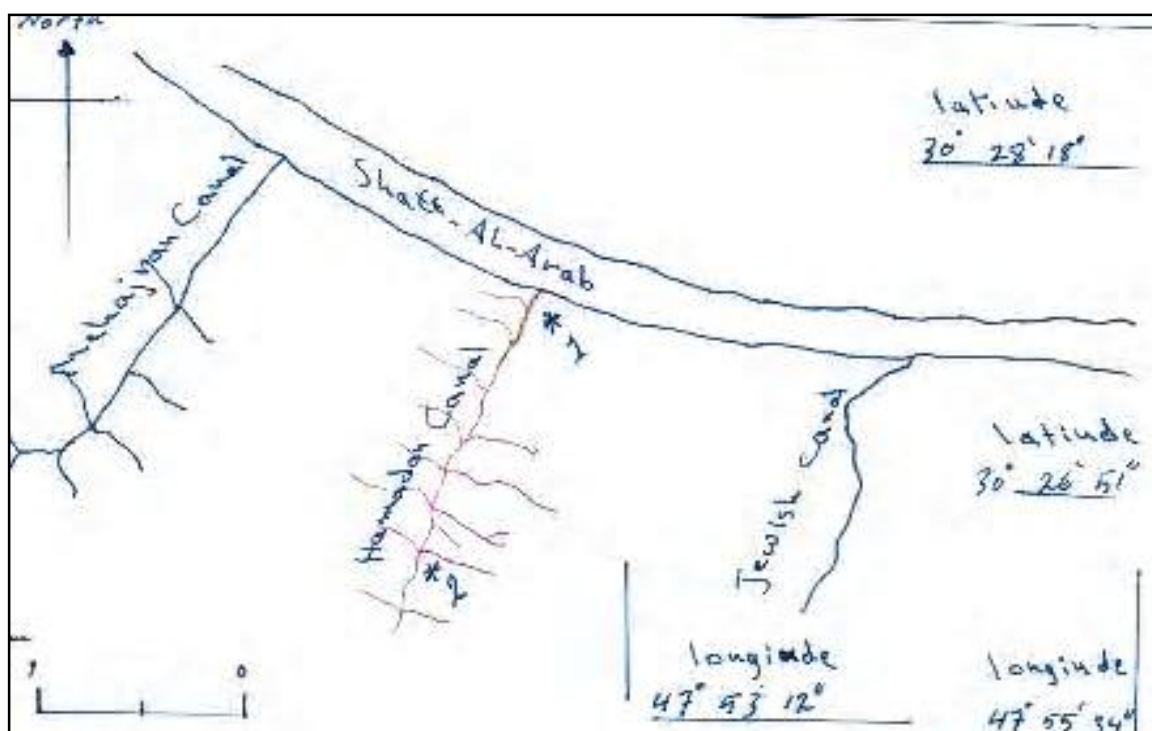
no tangibility for Hillawi and Briam dates in station 2 (Table 6).The area of study received the different wastes before they reached the area of Shatt-ALArab (Mustafa *et al* ,1995) .Moreover ,increasing of human operations during the previous years led to increasing of concentration of trace elements in the area and consequently they reached the different plants including- date –palms. Map: shows the area study.

Table (5):Influence of cultivars and stations of values of trace element in fruit of Hillawi and Braim cultivars of date palms in the two stations of the study.

	Cd mg/g	Fe mg/g		
	1.224	10.335	Braim	cultivars
	2.448	10.338	Hillawi	
RLSD	1.200	N.S		
	3.672	18.091	Stations 1	stations
	0.000	2.582	Stations 2	
RLSD	2.401	4.167		

Table (6):Overlaps of cultivars and stations of values of trace element in fruit of Hillawi and Braim cultivars of date palms in the two stations of the study.

	Cd mg/g	Fe mg/g		
	2.449	15.507	Stations 1	Braim
	0.000	5.164	Stations 2	
	4.896	20.676	Stations 1	Hillawi
	0.000	0.000	Stations 2	
RLSD	2.102	3.700		



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دراسة مستويات بعض العناصر النزرة في مياه وتربة قناة حمدان ومدى تأثيره على
 أوراق وثمار صنفي من نخيل التمر *Phoenix dactylifera* L.
 (البريم والحلاوي)

عبد الكريم محمد عبد* و زينب جودت موسى**

*مركز أبحاث النخيل، جامعة البصرة

**مركز علوم البحار ، جامعة البصرة

الخلاصة

تمت دراسة نوعية مياه شط العرب في موقعين من قناة حمدان ومدى تأثيره على أصناف من نخيل التمر المزروعة على ضفاف شط العرب. حيث تم تحديد المؤشرات الكيميائية التالية: الأس الهيدروجيني (pH) والتوصيل الكهربائي (E.C) والمواد الصلبة الذائبة (T.D.S) وأيون الكلور (Cl) والكالسيوم (Ca) والحديد (Fe) والكاديوم (Cd). أوضحت النتائج بان مياه شط العرب في منطقتي الدراسة تصنف على أنها موبلحة، وان قيم الأس الهيدروجيني يقع ضمن الحدود الطبيعية اعتمادا على تصنيف منظمة الغذاء والزراعة الدولية كما كانت المواد الصلبة الذائبة ضمن الحدود المسموح بها، في حين إن تركيز الكلوريد سجل أعلى قيمة له في مياه المحطة الثانية لفصل الصيف وأدنى قيمة له للمحطة الأولى لفصل الشتاء ونهج عنصر الكالسيوم والحديد نهج تركيز الكلوريد، أما بالنسبة للكاديوم فقد سجل أعلى قيمة له في المحطة الأولى لفصل الشتاء وأدنى قيمة للمحطة الأولى فصل الصيف. كما سجل فصل الصيف أعلى قيمة له من حيث الكلور والكالسيوم والحديد والكاديوم في تربة المحطة الأولى والثانية مقارنة بفصل الشتاء ولكلا المحطتين. أظهرت النتائج وجود تباين معنوي بين الأصناف والمواسم ومحطات الدراسة فقد أعطى الصنف الحلاوي وللموسم الشتوي والمحطة الثانية أعلى القيم (35.201، 35.198، 34.560) على التوالي وكذلك الحال بالنسبة للتدخلات فقد سجل تباين معنوي في القيم. أما في الثمار فقد سجلت المحطة الأولى أعلى القيم ولم يكن للصنف تأثير معنوي، كما وجد من الدراسة إلى تأثير معنوي للتدخلات في محتوى الثمار من العناصر النزرة.

كلمات مفتاحيه= نخيل التمر، قناة حمدان، العناصر النزرة.