

**A STUDY ON MANGANESE , ZINC AND COPPER CONTENTS
IN THE LEAVES OF SOME SAUDI ARABIAN DATE PALM
CULTIVARS**

BY

**Attalla A. Abo -Hassan and Mohamed A. Bacha
Department of Plant Production, College of Agriculture,
University of Riyadh, Saudi Arabia**

ABSTRACT

The manganese, zinc and copper contents of the leaves of four Saudi Arabian date palm cultivars namely, Seleg, Sakhi, Nebut Seif and Khudari were determined during two seasons.

The average concentrations of these elements ranged between 32 to 74 ppm for Mn, 16 to 23 ppm for Zn and 12 to 17 ppm for Cu in the leaves of the four cultivars.

Manganese content showed a gradual increase during the growing season in the leaves of the four cultivars. With respect to zinc content, it was almost constant throughout the season. However, the copper content did not follow a consistent trend.

INTRODUCTION

The leaf analysis is nowadays being widely used as an aid in diagnosing the nutritional status and in programming the fertilization of fruit trees.

Date palm (*Phoenix dactylifera*, L.) is an important fruit tree in Saudi Arabia and other Arab countries. Little work has been done on the nutrient contents of the leaves of date palm. However, Abo-Hassan and Bacha (1980) carried out some work on the contents of nitrogen, phosphorous, potassium, calcium, magnesium and iron in the leaves of four Saudi Arabian date palm cultivars.

For completion of the macro and micro-nutrient element contents, the present work was carried out in order to study the status of manganese, zinc and copper in the leaves of four important Saudi Arabian date palm cultivars namely; Seleg, Sakhi, Nebut Seif and Khudari grown in Riyadh area.

MATERIAL AND METHODS

This investigation was carried out during 1978 and 1979 growing seasons at the orchard of the College of Agriculture, Riyadh University. Four date palm cultivars namely; Seleg, Sakhi, Nebut Seif and Khudari were used. The palms of the four cultivars were 25 years old and grown on a loamy soil. Four similar vigour were selected from each cultivar. The trees were fertilized in December with organic manure at the rate of 15 m³ per acre per year.

Leaf samples were obtained by taking 4 median pinnae (two from each side of the mid-point of the rachis) from 5 consecutive leaves around the palm axis making a total of 20 pinnae per sample beginning with the first expanded leaf on each palm.

Samples were taken monthly during May-August period (time of fruit growth and ripening).

Samples were thoroughly washed, oven-dried and then ground. Manganese, zinc and copper contents were determined by atomic-absorption spectrophotometry according to the procedure established by Chapman and Pratt(1961).

RESULTS AND DISCUSSION

Manganese content:

The data of the present study indicated that leaf-manganese contents of the four date palm cultivars ranged from 32 to 60 ppm in the first season and from 33 to 74 ppm in the second season(Fig. 1). These figures were, generally, similar to those reported by Minessy *et al.*(1976) on Zagloul and Hayany date palm cultivars in Egypt.

The statistical analysis showed that, in both seasons, the leaf-manganese content in Nebut Seif cultivar was significantly higher than that in other cultivars, namely Seleg, Sakhi and Khudari. Also, in the second season, the leaf-manganese content in Sakhi cultivar was significantly higher than that in both Seleg and Khudari cultivars. Furthermore, the manganese content in Khudari cultivars was significantly higher than that in Seleg cultivar(Fig. 1).

Regarding the seasonal trend, the manganese content, gradually increased during the period from May till August in the leaves of the four cultivars except that, in the first season, in Khudari cultivar it did not show a consistent trend(Fig. 1). These results were in disagreement with those found by Minessy *et al.* (1976) on date palm. These contradicting results may be due to the differences in cultivars, cultural practices and environmental conditions.

Zinc content:

The leaf zinc content in the four date palm cultivars ranged from 17 to 23 ppm in the first season and from 16 to 22 ppm in the second season (Fig. 2).

In both seasons, the only significant difference was found between the zinc content in the leaves of Nebut Seif cultivar and that in the leaves of Khudari cultivar in the first season.

Regarding the seasonal variations, the data revealed that, the leaf-zinc content was nearly constant during the period from May till August in the four cultivars in both seasons (Fig. 2).

Copper content:

Data showed that the copper content in the leaves of the four cultivars ranged from 13 to 17 ppm in the first season and from 12 to 16 ppm in the second season (Fig. 3). These data are in agreement with those of Minessy *et al.* (1976) on Zagloul and Hayny date palm cultivars.

Statistical analysis indicated that, in the first season, the copper content in the leaves of Nebut Seif cultivar was significantly higher than that in Seleg cultivar. No significant differences were found among the other cultivars in both seasons.

Concerning the seasonal changes, the data showed that the leaf-copper content of the four cultivars did not follow a consistent trend in both seasons (Fig. 3). These findings agreed with those reported by Minessy *et al.* (1976) on date palm.

Because the scanty data on the leaf mineral contents of the date palm, therefore, our data are compared with those of other evergreen fruit trees. Hence, manganese and copper contents in the four studied cultivars are within the ranges reported in navel orange (Labanuaskas *et al.*, 1960) and in Washington navel and Shamouti oranges (Bacha *et al.* 1979). However, zinc content (Table 1) in the four cultivars is lower

than that reported by Labanusakas *et al.* (1960) on navel orange.

CONCLUSIONS

From data presented, it can be concluded that; Nebut Seif cultivar has consistently excelled the other cultivars in the three nutrient elements determined. Also, leaf content of Mn are within the reported ranges by other investigators. However, with Zn data have shown lower ranges compared with those reported by other workers on other fruit trees.

Table (1). The average concentration (ppm) of Mn, Zn and Cu in the leaves of some date palm cultivars in 1978 and 1979.

Cultivar	1978			1979		
	Mn	Zn	Cu	Mn	Zn	Cu
Seleg	39.0	20.0	14.0	41.5	17.3	13.4
Sakhi	42.4	20.5	14.7	55.4	18.5	13.5
Nebut Seif	50.0	22.1	15.9	67.6	20.6	13.5
Khudari	36.4	17.8	14.7	49.3	20.0	13.9
LSD 5%	5.8	2.6	1.4	3.8	NS	NS
1%	7.7	3.5	1.8	5.0		

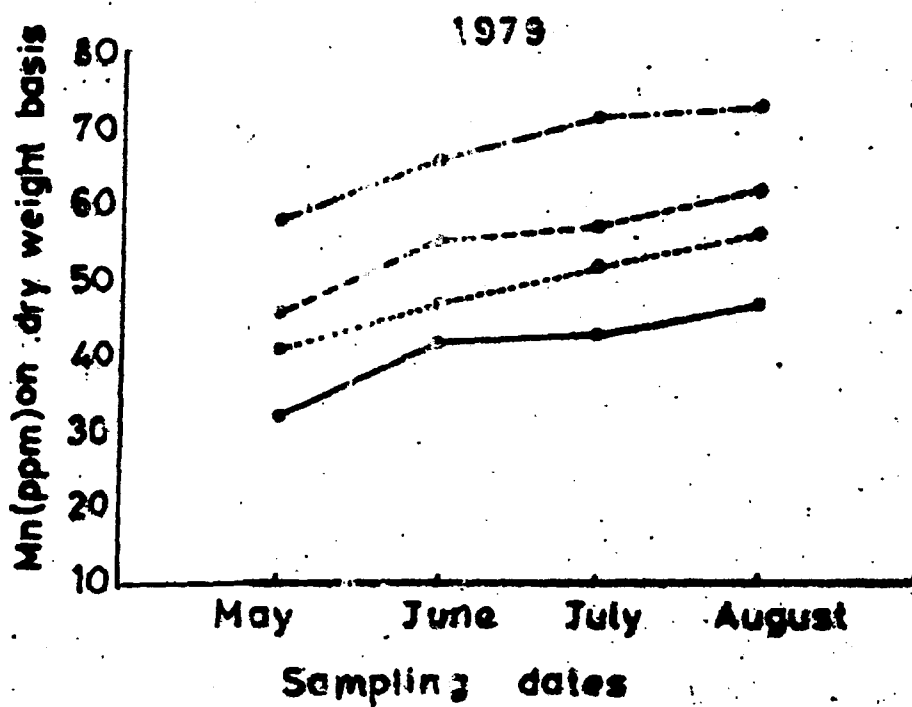
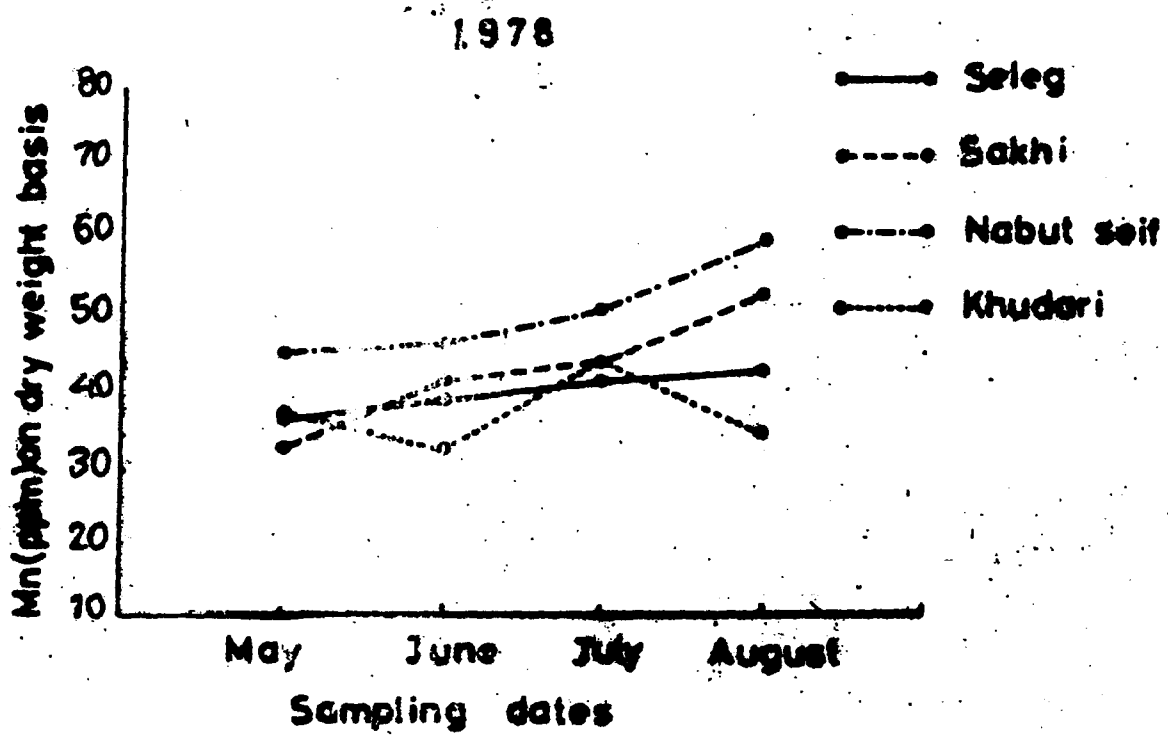


Fig.(1) Manganese seasonal trend in the leaves of Seleg, Sakhi, Nabut Seif and Khudari date palm cultivars in 1978 & 1979.

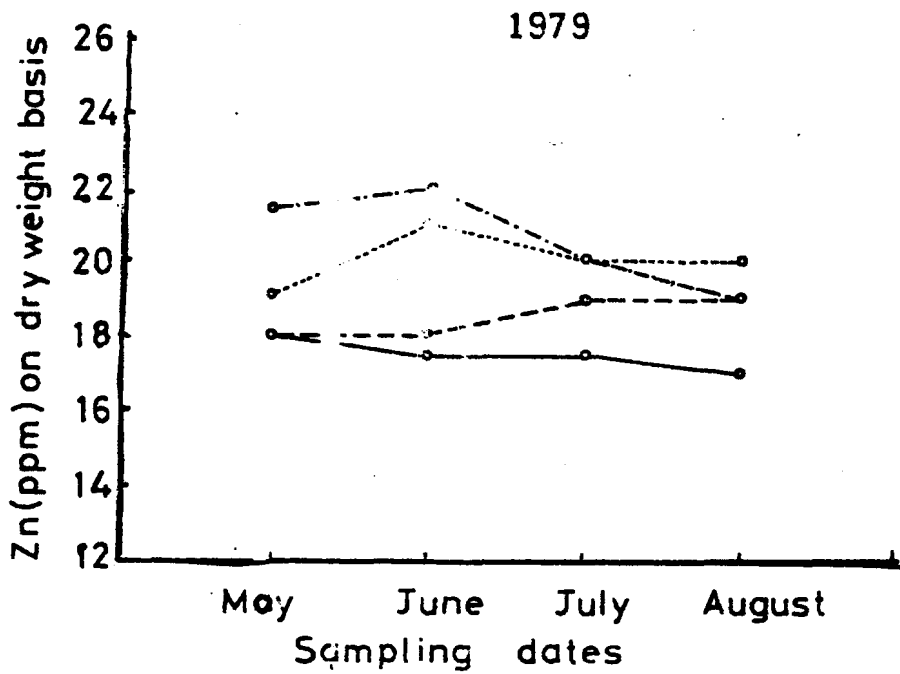
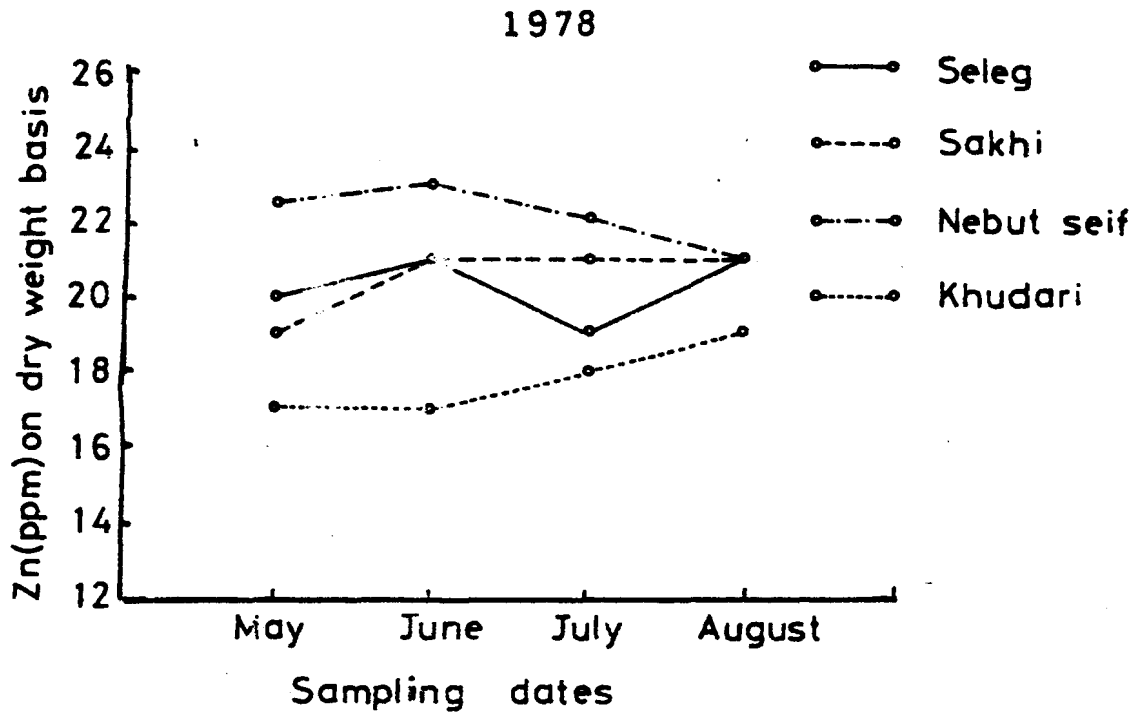


Fig.(2) Zinc seasonal trend in the leaves of Seleg Sakhi, Nebut seif and Khudari date palm cultivars in 1978 & 1979.

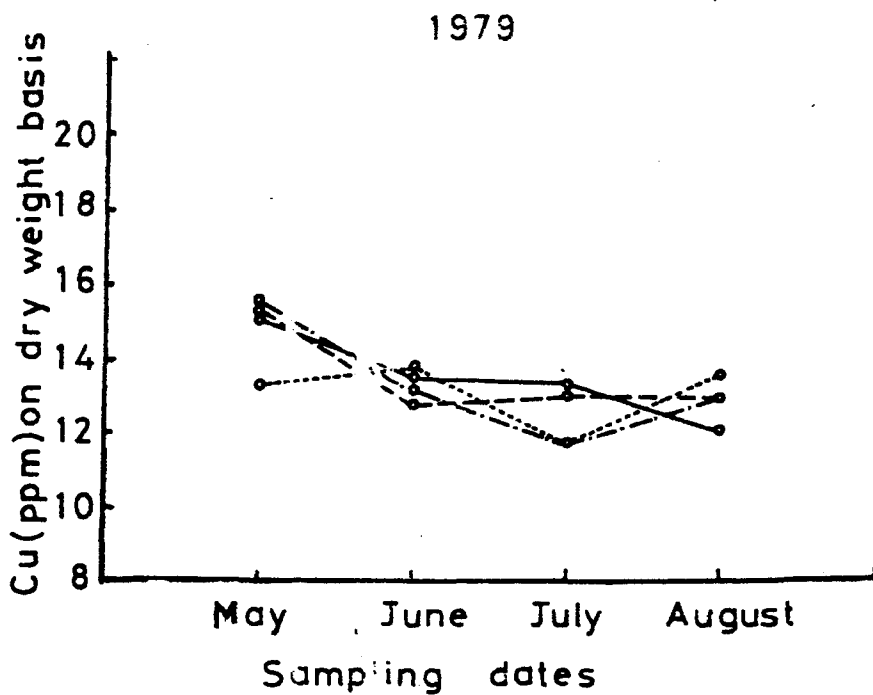
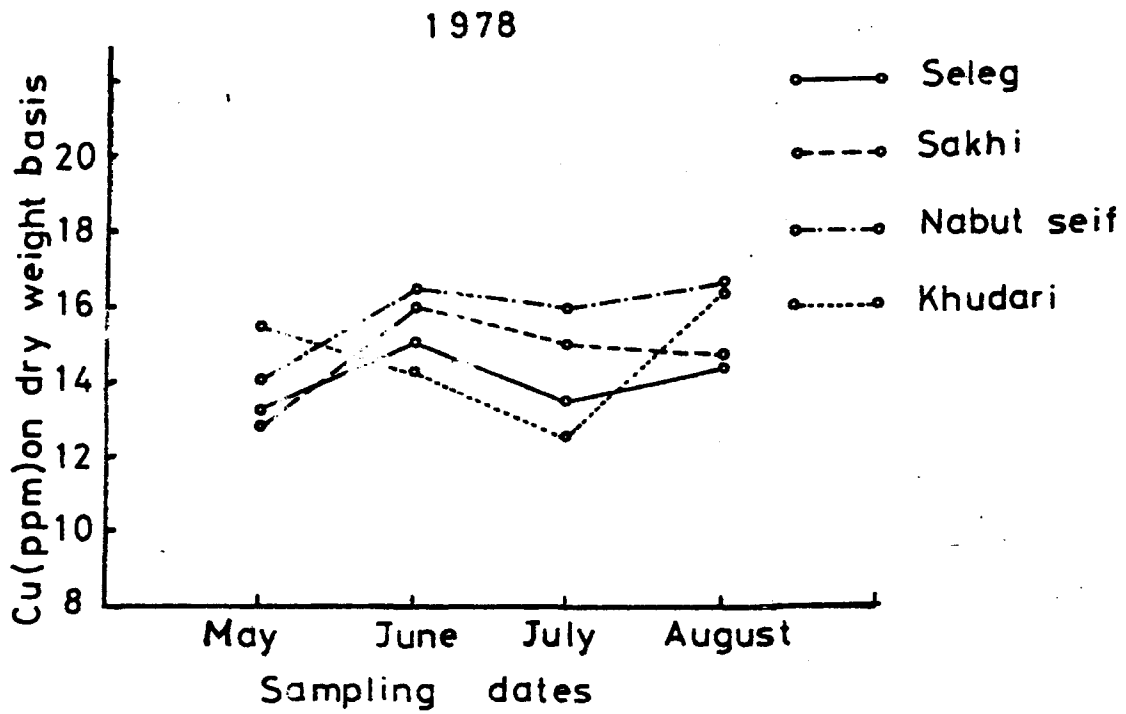


Fig (3) Copper seasonal trend in the leaves of Seleg, Sakhi, Nabut seif and Khudari date palm cultivars in 1978 & 1979

LITERATURE CITED

- Abo-Hassan, A.A. and M.A. Bacha (1980).** Mineral composition of the foliage of four Saudi Arabian date palm cultivars. *J. Coll. Agric. , Riyadh Univ.* Vol. 2 (In press).
- Bacha, M.A., I. M. Ibrahim and F.A. El-Morshedy (1979).** Seasonal changes in some macro and micro-nutrient elements in the leaves of Washington navel and Valencia orange cultivars. *J. Agric. Res. Tanta Univ. Egypt* 5(1):170-176.
- Chapman, H.D. and P.E. Pratt (1961).** Methods of analysis for soils, plants and water. Univ. of Calif. Div. of Agric. Sci.
- Labanauskas, C.K., W.W. Jones and T. W. Embleton (1960).** Seasonal changes in micronutrients in navel orange leaves. *Calif. Citrog.* 45;68-76.
- Minessy, F.A., M.A. Bacha and E.M. El-Azab (1976).** A comparative study on Fe, Mn and Cu content in the foliage of Zagloul and Hayany date palms grown in sandy soil. *Egypt. J. Hort.* 3(1): 21-27.

دراسة عن محتويات أوراق بعض أصناف التمور السعودية من المنجنيز
والزنك والنحاس

عطا الله أحمد أبو حسن و محمد علي باشه

قسم الإنتاج النباتي - كلية الزراعة - جامعة الرياض - المملكة العربية السعودية

قُدرت محتويات الأوراق من المنجنيز والزنك والنحاس لأربعة أصناف من
أصناف التمور السعودية هي : السلج والصفعي ونبوت سيف والخضري خلال
موسمين.

وقد تراوحت متوسطات تركيزات هذه العناصر بين ٣٢ إلى ٧٤ جزء في
المليون لعنصر المنجنيز، ومن ١٦ إلى ٢٣ جزء في المليون لعنصر الزنك ومن
١٢ إلى ١٧ جزء في المليون لعنصر النحاس وذلك في أوراق الأربعة أصناف.
وقد أظهرت محتويات المنجنيز زيادة تدريجية خلال موسم النمو في أوراق الربعة
أصناف. وبالنسبة لعنصر لمحتويات الزنك فقد كانت ثابتة تقريبا خلال
الموسم بينما وجد أن محتويات النحاس لم تتبع اتجاه محدد.