CHAPTER 8

RESULTS AND DISCUSSION: EFFECT OF WATER WASHING ON HEAVY METAL CONTENTS ON DATE FRUITS

8.1 Determination of Water Washing Effect on Heavy Metals Content

After determination of heavy metals content in all date samples using GFAAS, the water washing effect (reduction % of heavy metals content) was calculated as described in section 3.8.8. using equation 3.9. Result is shown in Table 8.1

Table 8.1: Effect of Washing on Total Heavy Metal Contents in Date Fruits (n = 3)

Element	Average flesh heavy metal contents (μg/g) fruit fresh weight	Average dust heavy metal contents (μg/g) fruit dust	Total contents (μg/g)	Washing effect (%)
Cd	0.009 ± 0.0.003	0.0048 ± 0.002	0.0138 ± 0.005	34.78
Ni	1.258 ± 0.443	0.116 ± 0.021	1.374 ± 0.464	31.02
Al	7.238 ± 2.121	3.150 ± 1.068	10.388 ± 3.980	30.32
Fe	27.160 ± 3.74	3.632 ± 1.399	30.792 ± 5.084	11.79
Sn	0.188 ± 0.027	0.0194 ± 0.002	0.207 ± 0.234	9.35
Pb	0.439 ± 0.116	0.045 ± 0.034	0.484 ± 0.150	9.30
As	1.048 ± 0.103	0.073 ± 0.011	1.121 ± 0.114	6.50
Cu	7.394 ± 1.253	0.071 ± 0.021	7.465 ± 1.274	0.95

8.2 Discussion

The effect of washing on some heavy metals deposited on date fruits was studied using wet digestion technique and GFAAS for analysis. Heavy metal contents in all samples were significantly reduced by washing for about 90 seconds at room temperature, and the results agree with those reported in the literature (Aldjain et al., 2011). The washing effect on dust removing was ranged from 34.78 % to 0.95 % and seemed to be in descending order as follows: Cd> Ni> Al>Fe>Sn>Pb>As>Cu. The highest washing effect was found for Cd (34.78 %) and then Ni (31.02%), Al (30.32 %), Sn (9.35 %), Pb (9.30 %), As (6.5 %) and Cu (0.95 %). Accordingly, studies reported the phenomena of accumulation of dust on date palm trees leaves and the effect of winds, location, and other factors on the quantities of accumulated dust (Qassim et al.,1986, Ibrahim and Nayef., (2001); Al-Anee et al., 2010). Also, in a study carried out by Qassim et al., (1986) on adult palm trees in KSA, the amount of adhered dust on the leaves was varied according to the distance of these trees from unpaved streets and agricultural roads. The mean dust deposit (mg/cm^2) according to the distance between (in meters) the roads through the year 1984 and 1985 was found to be, 0.67, 0.26 , 0.21, and 0.13 mg/cm^2 for distances of 10, 40, 80 and 120 meters, respectively from the roads. The study revealed that, the amount of adhered dust on the leaves was decreased as the trees are located further away from agricultural roads and unpaved streets. The study also revealed that, the accumulation of dust on date palm leaves has negative effect on the quality and quantity of date palm products because of the stress of dust pollution that affects the vital activities and the efficiency of leaves in offering the fruits with the carbohydrates and thus the productivity of fruits. In the study conducted by Ibrahim and Nayef (2001), a relationship was found between the amount of dust deposited on date palm trees cultivated of Hallway variety spread over three regions in the region of Basra and wind speed and temperature of palm planting area. The amount of dust dropping on the leaves were calculated according to the fruit growth months the study indicated that the production of trees in the study sites decreased, reaching 36 kg in Abu al-Khaseeb area, followed by Al-Hartha region where the average production of palm trees was 32 kg. The variability in date palm yields in the three studied regions may be attributed to variability of the deposited dust on fruit surfaces, as well as deposited dust on the leaves that reduces the leaves' efficiency in providing the fruits with the carbohydrates needed for their growth and development.

Similar results were found in the study of sampled palm leaves from growing trees collected different environments (Al-Anee et al., 2010) including industrial environment, marine environment, agricultural environment, desert environment, and urban environment. The study found three important results: first, that palm trees play a significant role in the absorption and sedimentation of large amounts of heavy metals, and the highest sedimentation of heavy metals was found on leaves taken from the industrial environment and the lowest concentration was found in the agricultural environment and then in the desert. Second, the percentage of heavy elements that are absorbed and deposited by palm leaves (cobalt, chromium, nickel, and lead) was ranged from 22 % to 91 %. Third, palm trees account for 40-80 per cent of the amount of dust suspended in the air and the total amount absorbed by the leaf’s ranges from 22 to 91 %. However, the presence of heavy metals in the air is mostly caused by air polluted by vehicles, nickel-cadmium batteries, oil industry, and mining (Chabukdhara et al., 2016). Pesticides and packaging materials may also contribute to the deposition of metals on the surface of fruit and vegetables. Moreover, the presence of heavy metals such as Pb and Cd in wash residues and date fruit was previously reported in several studies, i.e. (Aldjain et al., 2011; Hamid, 2011; Sueleman, 2014).

8.3 Conclusion

The effect of washing on some heavy metals deposited on date fruits was studied using wet digestion technique and GFAAS for analysis. Heavy metal contents in all samples were significantly reduced by washing for about 90 seconds at room temperature, and the results agree with those reported in the literature (Aldjain et al., 2011). The washing impact on dust removal varied from 34.78 to 0.95 % and seemed to be declining in the following order: Cd> Ni> Al>Fe>Sn>Pb>As>Cu. The findings demonstrate that washing can remove a significant proportion of the overall content of heavy metals attached to date fruits, lowering the danger to consumers' health.