Dedication

To who enlightening my path, to those who have right, offer Allah

My parent

To the one who bears with silence the hardship of my study with no much complaining, of the completion, of my scientific journey.

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Abstract

The study was focused on some heavy metals which are Mn, Zn, Cu and Pb that are known as the most toxic and contaminate to human health.

In this study XRF and AAS techniques were used to determine concentrations of Mn, Zn, Cu and Pb in soils and vegetables (Onion, Jew Mallow, Watercress, Marrow and Cucumber).

The mean value of concentrations of Copper in this vegetables by XRF technique (ppm), was found to be in Onion (11.32), Jew Mallow (6.18), Watercress (5.90), Marrow (7.05) and Cucumber (7.53), while the mean value of concentrations of Copper in soils (20.48), (19.01), (21.30), (19.40) and (19.56) respectively.

The mean value of concentrations of Copper in this vegetables by AAS technique (µg/g), was found to be in Onion (19.04), Jew Mallow (10.89), Watercress (9.95), Marrow (11.44) and Cucumber (9.89), while the mean value of concentrations of Copper in soils (35.28), (52.15), (51.32), (43.49) and (41.15) respectively.

The mean value of concentrations of Lead in this vegetables by XRF technique (ppm), was founds the concentrations to be in onion (1.43), Jew Mallow (0.87), Watercress (0.84), Marrow (0.98) and Cucumber (0.97), while the mean value of concentrations of Manganese in soils (15.13), (14.30), (13.36), (16.27) and (13.58) respectively.

However the AAS technique can not at all detect existence of Lead.

The mean value of concentrations of Zinc in this vegetables by XRF technique (ppm), was found to be in Onion (13.33), Jew Mallow (7.61), Watercress (13.58), Marrow (13.58) and Cucumber (15.67), while the mean value of concentrations of Zinc in soils (26.63), (22.34), (23.71), (22.93) and (24.40) respectively.

The mean value of concentrations of Zinc in this vegetables by AAS technique (µg/g), was found to be in Onion (13.33), Jew Mallow (23.92), Watercress (22.63), Marrow (30.56) and Cucumber (28.80), while the mean value of concentrations of Zinc in soils (49.18), (76.01), (72.12), (62.02) and (57.96) respectively.

The mean value of concentrations of manganese in this vegetables by XRF technique (ppm), was found to be in onion (41.67), Jew Mallow (41.72), Watercress (51.06),

Marrow (17.70) and Cucumber (Non-Detect), while the mean value of concentrations of Manganese in soils (350.59), (432.14), (423.75), (421.50) and (396.62) respectively.

The mean value of concentrations of manganese in this vegetables by AAS technique (µg/g), was found to be in onion (37.36), Jew Mallow (88.25), Watercress (89.84), Marrow (12.74) and Cucumber (10.9), while the mean value of concentrations of Manganese in soils (780.01), (106.09), (1012.90), (854.94) and (788.49) respectively.

It is very interesting to note that the concentrations of Copper, Zinc and Manganese found by AAS technique is higher than that of XRF technique, this may results from the fact that light element emits more visible photons than x-ray photons.

It is also very striking to note that XRF technique gives higher concentrations for Lead compared to AAS technique, this means that XRF spectrometer is better for Lead detection.

This sensitivity of XRF spectrometer may be attributed to fact that heavy elements such as lead emit x-ray energetic photons more than light visible ones, since the photon energy is proportional to the square of the atomic number.

المستخلص

تركزت هذه الدراسة حول بعض المعادن الثقيلة المنجنيز والزنك والنحاس والرصاص ذات التأثير الملوث والسمي العالي على صحة الإنسان .

في هذه الدراسة تم استخدام تقنيات الأشعة السينية المتوهجة ومطياف الامتصاص الذري لتحديد تركيزات المنجنيز والزنك والنحاس والرصاص في التربة والخضروات (البصل والملوخية والجرجير والكوسا والخيار).

أوجدت القيم المتوسطة لتركيزات النحاس في هذه الخضروات المحسوبة بتقنية الأشعة السينية المتوهجة (جزء لكل مليون) كالأتي : البصل (11,30) والملوخية (6,18) والجرجير (5,90) والكوسا (7,05) والخيار (7,53)، في حين بلغت القيم المتوسطة لتركيزات النحاس في التربة (20,48) و(19,01) و(21,30) و(19,40) و(19,56) على الترتيب.
اما القيم المتوسطة لتركيزات النحاس في هذه الخضروات المحسوبة بتقنية مطياف الامتصاص الذري (ميكروجرام/جرام) كالأتي: البصل (19,04) والملوخية (10,89) والجرجير(9,59) والكوسا (11,44) والخيار (9,89)، في حين بلغت قيمة متوسط تركيزات النحاس في التربة (35,28) و(52,15) و(51,32) و(43,49) و(41,15) على الترتيب.
وبلغت القيم المتوسطة لتركيزات الرصاص في هذه الخضروات المحسوبة بتقنية الاشعة السينية المتوهجة (جزء لكل مليون) كالأتي: البصل (1,43) والملوخية (0,87) والجرجير (0,84) والكوسا (0,98) والخيار (0,97)، في حين بلغت القيم المتوسطة لتركيزات الرصاص في التربة (15,13) و(14,30) و(13,36) و(16,27) و(13,58) على الترتيب.
أما تقنية مطياف الامتصاص الذري لم تتمكن من الكشف عن تركيزات الرصاص في هذه الخضروات والتربة.
وبلغت القيم المتوسطة لتركيزات الزنك في هذه الخضروات المحسوبة بتقنية الاشعة السينية المتوهجة (جزء لكل مليون) كالأتي: البصل (13,33) والملوخية (7,61) والجرجير (13,58) والكوسا (13,58) والخيار (15,67)، في حين بلغت القيم المتوسطة لتركيزات الزنك في التربة (26,63) و(22,34) و(23,71) و(22,93) و(24,40) على الترتيب.
أما القيم المتوسطة لتركيزات الزنك في هذه الخضروات المحسوبة بتقنية مطياف الامتصاص الذري (ميكروجرام/جرام) كالأتي: البصل (13,33) والملوخية (23,92) والجرجير(22,63) والكوسا (30,56) والخيار (28,80)، في حين بلغت القيمة المتوسط لتركيزات الزنك في التربة (49,18) و(76,01) و(72,12) و(62,02) و(57,96) على الترتيب.
وكانت القيم المتوسطة لتركيزات المنجنيز في هذه الخضروات بتقنية الأشعة السينية المتوهجة (جزء لكل مليون) كالأتي: البصل (41,67) والملوخية (41,72) والجرجير (51,06) والكوسا (17,70) والخيار(لم يتم الكشف عنه)، في حين بلغت القيم المتوسطة لتركيزات المنجنيز في التربة (350,59) و(432,14) و(423,75) و(421,50) و(396,62) على الترتيب.
أما القيم المتوسطة لتركيزات المنجنيز في هذه الخضار المحسوبة بتقنية مطياف الامتصاص الذري (ميكروجرام/جرام) كالأتي: البصل (37,36) والملوخية (88,25) والجرجير (89,84) والكوسا (12,74) والخيار (10,98)، في حين بلغت القيم المتوسطة لتركيزات المنجنيز في التربة (780,01) و(106,09) و(1012,90) و(854,94) و(788,49) على الترتيب.
ومن المثير للاهتمام ملاحظة أن تركيزات الزنك والمنجنيز والنحاس المحسوبة بتقنية مطياف الامتصاص الذري أعلى من التركيزات المحسوبة بتقنية مطياف الاشعة السينية المتوهجة وهذا قد ينتج من حقيقة أن العناصر الخفيفة تنبعث منها فوتونات أكثر فوتونات الأشعة السينية.

ومن المدهش أيضا ملاحظته أن تقنية الأشعة السينية المتوهجة تعطي تركيزات للرصاص مقارنة مع تقنية مطياف الامتصاص الذري وهذا يعني أن تقنية الأشعة السينية المتوهجة هي أفضل تقنية تستخدم للكشف عن الرصاص.
ويمكن أن يعزى هذه الحساسية لتقنية الأشعة السينية المتوهجة لحقيقة أن العناصر الثقيلة مثل الرصاص تنبعث منها فوتونات الأشعة السينية ذات الطاقة العالية أكثر من فوتونات الضوء المرئي ، لأن طاقة الفوتون تتناسب مع مربع العدد الذري.

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