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Determination of concentration of nitrates in different types of leafy vegetables by spectral methods

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ABSTRACT: *The aims of this study to estimate the concentration of nitrates in different types of fresh leafy vegetables in Tripoli (Janzour). The study included several samples (cabbage, spinach, watercress, paper lettuce, romaine lettuce, dill, coriander, parsley, celery and celery). Nitrate was determined in the samples using a NitraVer 5 high range test, where nitrate ion (NO_3^-) is reduced to nitrite ion (NO_2^-) by cadmium, and nitrite ions reacts with Sulfanilic acid to be the diazione salt. Diaconium salt, which combines with gentisic acid Hermany, and the intensity of the color depends on the concentration of nitrate solution in the sample. Samples were measured using a device (Spectrophotometer DR1900), The analysis results were compared to each other, as well as the results obtained of previous studies of other countries.*

Keywords: *Nitrates, Spectrophotometer, Vegetables, Diaconium salt, Sulfanilic acid.*

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I. INTRODUCTION

Food is considered the mainstay of human life, and vegetables are one of the main supplements for healthy food so humans seek to provide their needs by planting the land and work to increase the fertility of the soil and improve the quality of crops and increase production, including the addition of chemical fertilizers. Nitrogen fertilizers containing nitrogen element either Nitrate (NO_3^-) or ammonium (NH_4^+) or a mixture of them. Although nitrate (NO_3^-) is important in nutrition, excessive use of nitrogen fertilizers is one of the most dangerous contaminants that accumulate in the soil. Nitrate compounds are found in the soil[(1)], water and plants including vegetables. They are also used in many industries such as crackers and are used as oxidizing agents in the chemical industry as food preservatives and nitrogen fertilizers. Most fertilizers containing nitrogen are converted into nitrate in soil. . Nitrite compounds are not present in the soil in normal conditions but are formed during nitration and nitrate reduction [(2)]. The increase in the concentration of nitrates and nitrite in the in our bodies are serious danger to human health because they are toxic compounds and cause many diseases leading to death, and nitrates not effective but when reduced to nitrite in the body by bacteria in the gastrointestinal tract and enter the blood stream. Case to oxidation of (Fe^{+2}) in the hemoglobin to the ferric (Fe^{+3}) produces the methemoglobin, which cant transport the oxygen, has been observed, but it is This is the case In less than three months and in adults who are genetically suffering from high levels of methemoglobin and anemia, in the absence of these people and the arrival of methemoglobin to high levels, this inevitably leads to death, and the nitrite ion joins with some secondary amines found in the bodies of organisms Or react with some compounds resulting from the decomposition of pesticides, whether in soil, drinking water, plant or animal to produce nitrosamine compounds, which lead to cancer, as a result of the toxicity of nitrate and nitrite compounds and their risk to human health Several studies have focused on the high levels of nitrates in the environment, food and drinking water. Vegetables were considered the main source of nitrate to humans. Therefore, the study focused on estimating the concentration of nitrates in some types of leafy vegetables collected from the vegetable market in Ganzur area and analyzing them using Spectrophotometer and comparing the obtained results with previous studies of other countries [(3,8)].

Expermental Part

The chemicals used are Nitrante ragent powder (NitraVer 5 high range test), potassium chloride, sodium nitrate (high purity (99.9%).

Collection and preparation of samples

The vegetable samples are thoroughly cleaned with tap water, washed with distilled water, dried in the oven at a temperature of 70^{o}C for 24 hours, the vegetable samples are minced with a mortar, and 0.25 g of the

sample is weighed using the sensitive balance, 15 ml potassium chloride solution (2 N) was added to the sample by a volume pipette. The samples are rotated by centrifuge device for 15 minutes, then filtered, placed in a standard flask (50 ml) and diluted with distilled water.

Preparation of standard solutions:
Dissolve 149 g of potassium chloride in liter of distilled water to prepare (2 N) solution and dissolve 1.370 g of high purity sodium nitrate (99.9%) in liter of distilled water to prepare a 1000 ppm nitrate solution.

Measurement method

Determine the appropriate wavelength of the measurement at 400 nm, adjust the device by the blank sample, Tacked 2 ml of the sample to be analyzed inside the machine cell and dilute with distilled water to 10 ml. Add the nitrate detector powder to the sample, Leave for 5 minutes to develop the color, place the cell in the place assigned to the device and measured the concentration of the sample [8].

Standard curve Prepareation

Prepare a series of standard nitrate solutions (1, 2, 10, 20 ppm) by diluting the sodium nitrate. Prepare the plank sample, measure the absorption of the solutions, and draw the standard curve that represents the relationship between absorption and concentration.

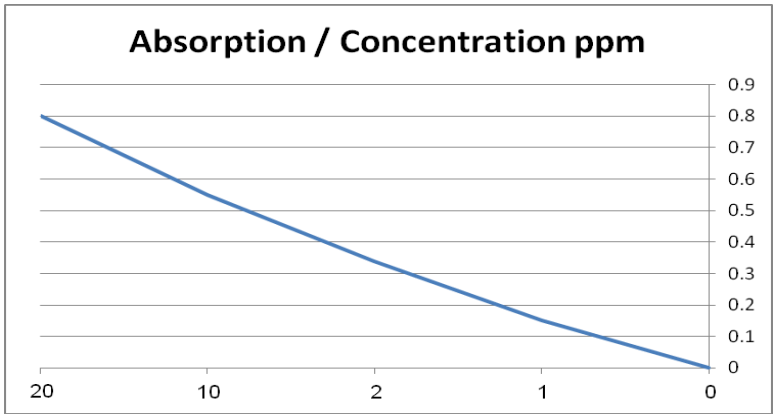

Figure (1) The standard curve of nitrates

II. RESULTS AND DISCUSSION

The results of the concentration of nitrates in the vegetable samples under study indicated in Table (1) showed a significant difference in the concentration of nitrates in the leafy vegetables samples where the concentration of nitrates was highest to lowest as follows: the highest concentration in the watercress 3880 followed by the salty 2920, the celery 2540 , Coriander 2360, dill 2300, romaine lettuce 1020, paper lettuce 260, spinach 520 and parsley 100 and the lowest concentration in cabbage was 80 mg / kg

	Name of sample	concentration mg / kg
1-	Romaine lettuce	1020
2-	Corridrum	2360
3-	Spinach	520
4-	Celery	2540
5-	Swisschard	2920
6-	Roquette Rocket	3880
7-	Cabbage	80
8-	Parsley	100
9-	Dill	2300
10-	Leaf lettuce	620

Table (1) shows the concentration of nitrates in the vegetable samples in our study

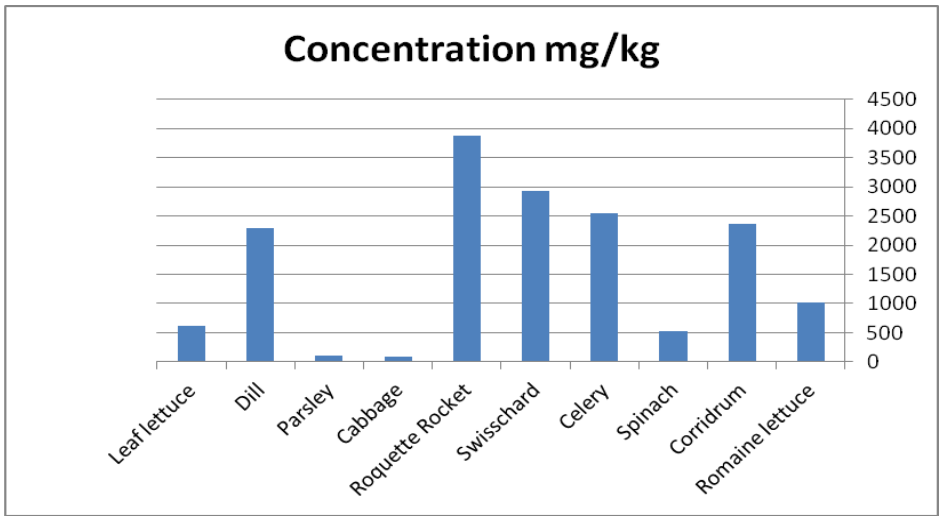

Figure (2) Comparison of the concentration of nitrates in the vegetable samples in our study

Table 2 shows the concentration of nitrate in vegetables with the results of previous studies of other countries. The concentration of nitrates in lettuce was among the results obtained in other countries. The concentrations of cabbage, spinach and parsley were lower, while both dill and celery Higher concentration than in other countries. The high concentration of nitrates in the vegetable samples under study may be due to the crop growing season or the excessive use of nitrogen fertilizers and pesticides or pollution of nitrate irrigation water or the contribution of all these factors to the contamination of nitrate vegetables.

Comparison of the concentration of nitrates in some vegetable samples with the results of previous studies of other countries

Table (2) Comparison of the concentration of nitrates in the vegetables under study with the results of studies of other countries (2)

Countries / Samples	Zanzour Market (Libya)	Hongkong* (China)	European* countries	Newzel and*	Korea*	Latina	Greece	Belgium	Italy
Romain Lettuce	820	950	1324	1323	2430	1311	222	2782	734
Cabbage	80	1200	311	275	725	399	208	-	90
Celery	2540	1700	1103	1339		998	-	-	-
Spinach	520	3100	1066	824	4259	3946	-	-	-
Parsley	100	-	-	-	-	666	-	-	-
Dill	2300	-	-	-	-	802	-	-	-

* Nitrates concentrations average.

III. CONCLUSION

The concentration of nitrates in leafy vegetables showed that the highest concentration of nitrates in watercress followed by celery, celery, coriander, dill, leafy lettuce, spinach and parsley was the lowest concentration in cabbage and compared the concentration of nitrates in vegetables under study with the results of previous studies of other countries There was a significant difference between these results with each other and with the results of other countries from previous studies. Where the concentration of nitrates in lettuce was among the results of other countries, and concentrations of cabbage, spinach and parsley were lower than other countries, while the concentrations of dill and celery higher than the concentrations of other countries, and may be due to the high concentration of nitrates in vegetable samples under study to the season Cultivation of the crop or excess in the use of nitrogen fertilizers and pesticides or pollution of irrigation water nitrates or the contribution of all these factors in the contamination of vegetables nitrate, and to reduce the risk of accumulation of nitrates and nitrite in the soil and the human body Farmers should be sensitized to reduce the use of chemical fertilizers and ASTP God, organic fertilizers, and the emphasis on conducting periodic monitoring of foods of different kinds of vegetables and canned foods and children as well as in terms of water pollution by nitrates.

REFERENCES

[1]. Water Quality Guidelines (1989). Second Edition - Part II. WHO - Standards and other assistance information.
[2]. Fadel Ahmed Abdul Shihab, Farid Majeed Abd (2008). Soil contamination. Dar Al Yazouri Scientific Publishing & Distribution - Amman - Jordan.
[3]. Nitrates and nitrites in food and their risk to human health. Www.aun.edu.eg / arabic / society / pdf / ajoes24_article6.pdf published on 05-06-2018))
[4]. Ahmed Abdel Moneim Hassan (1989). Secondary vegetables. Arabic Publishing House.
[5]. water treatment Calibration of methods of analysis in visible spectrometers. (Standardization). water -treated. Blogspot.com, 2013/07
[6]. Dr. Hach 1900 portable spectrophotometer. https://www.hach.com/asset-get.download.jsa?id=21410202551 (published on 02 - 06 - 2018)
[7]. Nitrogen, Nitrate for Water and wastewater-Hach https://www.hach.com/asset-get.dowenload.jsa?id=7639984195
[8]. Ramadane Dris, Farouk Hassan. Abdelaziz, Plant Nutrition Growth and Diagnosis.
[9]. Weike Zhong, Changmin Hu, and Minjiang Wang (2002). Nitrate and nitrite in vegetable from north china and take. Food additives and pollution, vol. 12, 1125- 1129.
[10]. S. Y. Chung, J.S. Kim, M.KIM, M. K. Hong, J. O. Lee, C. M. kim and I. S. Song. (2003) Survey of nitrate and nitrite contents of vegetables grown in Korea. Food Additives and Contaminations, July, vol. 7, 621-628.

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