



Original Article

**Studying the nitrate contamination in Parsley farms in Iran**

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**ABSTRACT**

The accumulation of nitrate in the agriculture products, especially vegetables, water and foods is one of those factors that exposes the people health and hygiene in particular the neonates to the risk. The purpose of present study is to examine the nitrate amount in the highly use plants, i.e. parsley at the vegetable farms of Dezful city. The sampling of the farms at third zone of Dezful was conducted randomly through three consecutive pickings from first, middle and last rows during morning. The samples was dried in an oven at 70°C and powdered by a mill. Next, a spectrophotometer device read their nitrates. In order to compare the mean and standard deviation, the nitrate concentration in the tested samples in the three zones was studied by employing Duncan test at 5% level using SPSS 18 package. The results showed that the highest nitrate amounts in the tested samples of the three farms were 10295 mg/kg of fresh weight in the parsley. Thus, there was no significant difference. All the parsley samples were beyond standard limit (500 mg/kg of fresh weight).

**KEYWORDS:** Nitrate, spectrophotometry, Parsley, Dezful.

**INTRODUCTION**

Today reaching to a stable agriculture is of interest for all policy-makers and programmers and researchers and correct and suitable use of agricultural characteristics specially all types of fertilizers is one of the most important ways in the direction of policies of stable agriculture development. In fact stable agriculture is producing enough foodstuffs with high quality accompanied with protecting environment health (Malakuti et al., 1383). With respect to increasing population growth in Iran, demand for foodstuffs is more increasing. So that it is common in most places to use chemical and organic fertilizers to produce more product in unite of area. Using too much of chemical substances causes many problems economically and enriromentally (Malakuti, 1375). Today relationship of plant feeding management with environmental solution is an important aspect in suggesting every fertilizer. New fertilizer suggestions should optimize performance and quality of plant and minimize the possibility of environmental effects caused by excessive fertilizing (Sadeghipur marvi, 1390).

Protecting human's health has a close relationship with consumer foodstuffs. Existing any pollution in foodstuffs can endanger people's health. Vegetables are important ingredients of a good and healthy diet and obtained results of past researches confirm that using healthy and hygienic Vegetables can prevent heart disease and some kinds of cancers especially cancers of digestive system (Salehipur bavarsad et al., 1390). Amount and the way of distributing nitrate in Vegetables is very important.

Because it effects their health and quality (Tuzel et al., 2001). Suggested amount of using greens and fruits by world health organization is 400 g per day (Hord et al., 2009). Meanwhile excessive use of nitrogen fertilizers which has a direct connection with absorption and accumulating nitrate in plants is of great interest (Kazemi posht masari et al., 1388). Major form of absorbing nitrogen by plants is in the form of nitrate (Bayburdi et al., 1383). Nitrate is one of the most important nitrogen source for plants use which is naturally available in soil, water, plants, shallow water, hay loft, agricultural products, weed, animal tissueand could be added to the soil through using dung or chemical fertilizer. Applying chemical fertilizers adds to amount of nitrate in soil and through nitrate-making processes cause producing natural nitrate in soil.

In general, nitrate is one of the common produced compounds through direct use or oxidation of Azote chemical fertilizers and by available micro-organisms in the soil which has a high absorption by plants. When the concentration of nitrate in soil is high, plants can absorb it more than their metabolic needs and gather it in cytoplasm and special vacuoles of cell especially at night. Being high of nitrate in usable organs of vegetables and fodder and in drinking water can cause kinds of poisonings in domesticated animals, and anemia (methmoglobinemia) in infants and create a carcinogenic substance named Nitrosamine in adults.

Parsley with scientific name *Petroselinum Sativum* belong to apiaceae (Umblifereae). Parsley is a poaceous, potherb, biennial or perennial plant

which blossoms at second year, and it's growth period is short. Height of this plant is 70 cm. it's leaves are dark green coloured and have lozenge and triangular cuts with some divisions. Flowers of Parsley are small, greenish and umbeliform. It's fruit is small with height of 2 mm and diameter of 1 mm and has a sweet smell. Parsley contains assimilable mineral salts which are: Calcium, Phosphor, Ferrum, Sodium, Potassium and is full of vitamin A. It also has a considerable amount of vitamins B and C. Benefits of Parsley: anti-flatulency, appetizer and excretes renal calculus.

## MATERIAL AND METHODS

From studied farms a random sample of primary cultured was picked to form a composite sample and also from the middle row and from the last row of the agricultural land, which totally 3 samples were taken from every land.

In this research, for the preparation of desired sample, edible parts of parsley organs were sampled. Sampling was done at 5 o'clock in the morning, and then the samples were transferred to laboratory. After transferring samples to the laboratory they were washed with distilled water and after chopping they were air-dried for 48 hours and with measuring wet weight of samples (First sample vessel was weighted and then the vessel was weighted along with the sample), they were dried at temperature 70 °C, and after weighting dry weight, they were powdered using an electric mill. A spectrophotometer was used for measuring nitrate.

Preparing nitrosulfusalicylic complex and reading it using a spectrophotometer:

Important properties of this method are: simplicity, low equipment and other existing ion's don't interference with plant tissues, high speed and wide domain of measurement. Salicylic acid in close proximity to nitrate produces nitro salicylic acid, the color of this combination is yellow- lemon-colored. Intensity of yellow- lemon- colored depends on the amount of nitrate in the plant tissue.

This color has maximum absorption at wavelength of 410 nm. In general, this method is more used for measuring nitrate in samples with high concentration (about 3%).

First, 0/1 g of dried Avon and powdered is weighted and 10 ml distilled water is added to it, and after closing the containers, they will be kept at temperature 45 °C for an hour, then samples will be centrifuged at speed of 1000 rpm (or instead active coal and wattman defecator paper can be used to filtrate the extracts).

0/2 ml is took from obtained extract through this method and 0/8 ml sulpho salicylic acid 5% was added to that. After cooling, 19 ml normal soda 2 was added to this mixture and severity of produced color at wavelength 410 nm was observed by spectrophotometer. It's obvious that for observing extracted samples, first a standard concentration of 5-300 mg/l nitrate azote must be prepared using dry Potassium nitrate salt (KNO<sub>3</sub>) and unknown samples could be observed with respect to that.

The results of decomposing samples with use of software SPSS18 and comparing averages with use of Duncan test and amount of nitrate by T test with allowed amounts

were compared and analyzed. Also, diagrams are drawn by software Excel.

## RESULTS AND DISCUSSION

With respect to table 2 it's observed that average of nitrate concentration in all three studied farms of Dezful is more than allowed amount which this probability is at level 0/01. Furthermore, comparing averages of three farms based on Duncan test showed that there's not a meaningful difference between farms 2 and 3 from perspective of the amount of nitrate in dry matter (DM). But these two farms have a meaningful difference with farm 1. Table 1 shows the difference of nitrate in dry matter and wet matter of this product, and could be observed that there's a high difference between dry and wet product of Parsley from perspective of the amount of nitrate. So it's better to use fresh Parsley.

**Table 1.** Comparison of average concentration of nitrate in dry matter and wet matter and allowed amount of nitrate concentration in Parsley.

Vegetable	Average concentration of nitrate in dry matter (mg kg <sup>-1</sup> )	Average concentration of nitrate in wet matter (mg kg <sup>-1</sup> )	Allowed amount of nitrate concentration
Parsley	37817	4795	500

**Table 2.** Comparison between measured concentration of nitrate and allowed amount of nitrate in Parsley.

Studied area	Number of Parsley samples	Range of measured amounts (mg kg <sup>-1</sup> )	Average nitrate concentration in dry matter of Parsley (mg kg <sup>-1</sup> )	Average nitrate concentration in wet matter of Parsley (mg kg <sup>-1</sup> )	Comparing average amount with allowed amount of 500
1	9	33591-73000	48372.78	5726	**
2	9	12997-68215	32170.56	4642.44	**
3	9	9281-53477	32907.89	4017.11	**

\*\* Indicates statistically significant difference in probability level of 1% in Duncan test.

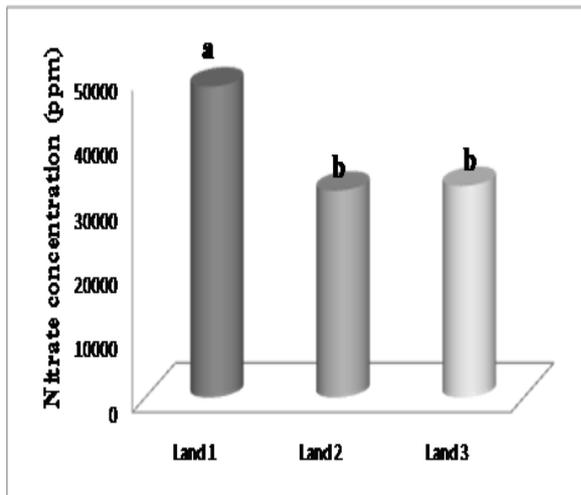


Fig. 1. Comparison of average of nitrate in dry matter of Parsley between three farms.

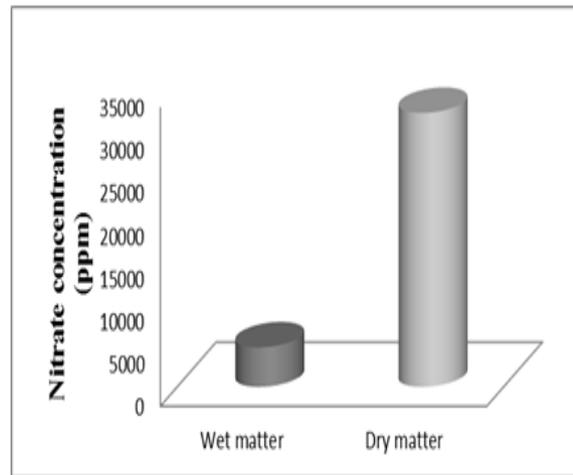


Fig. 4. Comparison of average of nitrate in dry and wet matter of Parsley in farm 2.

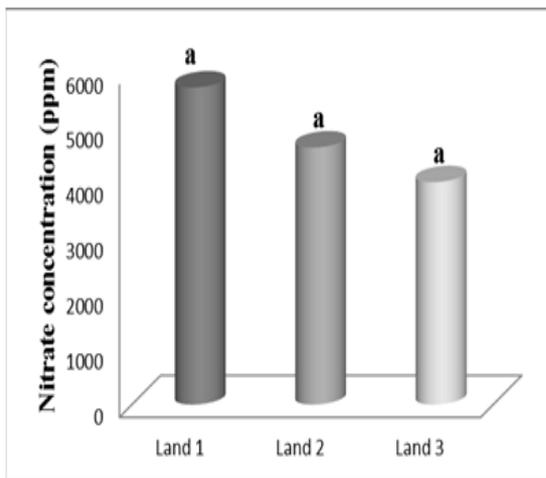


Fig. 2. Comparison of average of nitrate in wet matter of Parsley between three farms.

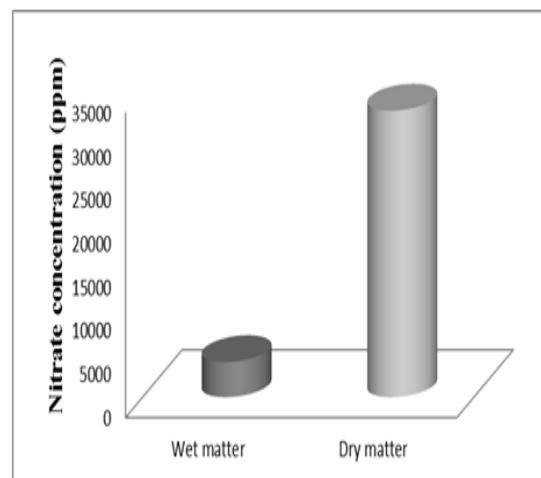


Fig. 5. Comparison of average of nitrate in dry and wet matter of Parsley in farm 3.

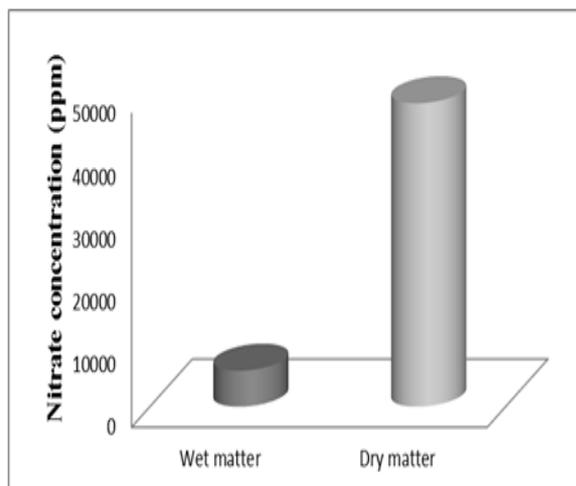


Fig. 3. Comparison of average of nitrate in dry and wet matter of Parsley in farm 1.

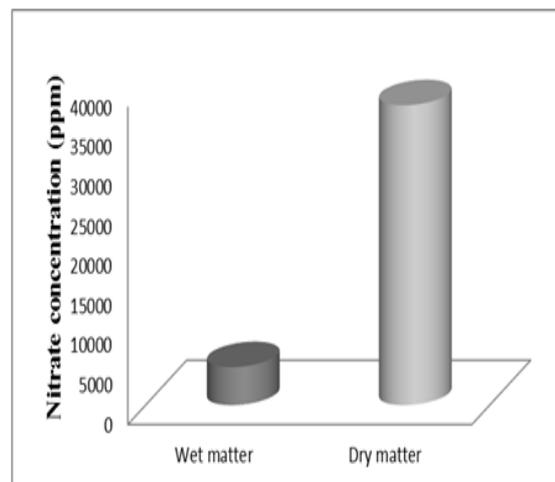


Fig. 6. Comparison of average of nitrate in dry and wet matter of Parsley in all three farms.

## CONCLUSION

The average amount of nitrate in all three farms of Parsley is more than allowed amount (500 mg/kg fresh weight), and amount of nitrate in 100% of Parsley samples is more than standard amount. With respect to standard amount of nitrate in vegetables, allowed amount per kg of body weight, is determined lower than 3.65 mg per day (Jafari et al., 2000). If a person with weight of 70 kg used Parsley in his/her diet in Dezful, he/she shouldn't use more than 53 g in a day with respect to average amount of nitrate in all three farms (4795 mg/kg fresh weight), cause with using this amount needed amount of nitrate is prepared in the body and using more than this amount can cause adverse effects and disorders in the body.

Sampling is done at 8 am or at the time of sunrise in other resources. But in this research sampling is done at 5 am and coincide with cropping vegetables by farmer and sending it to fruits and vegetables grounds. One of reasons of changings of nitrate with light is dependency of redactaz nitrate enzyme on light spectrum changes (Mohr et al., 1992). Although, there's no light limitation in our country, with changing wavelength of light we can investigate it's effects on nitrate metabolism. The effect of light on decreasing nitrate concentration is reported by various researchers (Mortesen and Stromme, 1987; Mohr et al., 1992).

It seems that intensity of the light has an important effect on decreasing amount of nitrate. Therefore, farmers shouldn't harvest vegetables before sunrise. One of the reasons of increasing excessive amount of nitrate in these farms is harvesting vegetables some hours before sunrise. It's suggested to harvest vegetables in the afternoon so that this action could be effective in decreasing nitrate in vegetables.

Therefore, efforts must be done to decrease amount of nitrate in vegetables especially for those who use vegetables very much in their diet.

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