

STUDY CONCERNING THE LEVEL OF NITRATES CONCENTRATION IN SOME VEGETAL PRODUCTS SOLD IN CRAIOVA

ELENA ROSCULETE, RODICA SOARE, C.A. ROSCULETE

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ABSTRACT

The accumulation of nitrates in vegetables and fruits is subject to factors such as applied agricultural technique and, in particular, applied fertilizers for the basic and additional fertilization, vegetable species and the biochemical and physiological genotypes, phase of vegetation, time of harvest, etc.

The process of accumulation of the vegetable product is a complex process that can though be controlled by growers. Their tendency to obtaining yields as high as possible by applying high doses of nitrogen and often not supported by appropriate doses of P and K, with the risk of vegetables with high contents of nitrate, must be stopped first by an intense educational, informative activity, and then the controls in markets.

The results obtained in this study were compared to the maximum permissible limit for each product.

In almost all analyzed vegetable species, irrespective of their origin, the nitrate content is far below the LMA, which can make us consider that health standards are respected, regarding the maximum limits for nitrates in foods of plant origin.

INTRODUCTION

Nitrates are the nitric acid's salts and are found in air, soil, water and food (in particular in vegetable products). They are soluble in water and on the strength of this behavior are successfully used as mineral fertilizers (nitrogen, sodium, potassium, ammonium, calcium).

The accumulation of nitrates in vegetal products is influenced by many environmental factors among which we can mention:

- Genetic factors: plants susceptible to nitrate accumulation: beets, carrots, green beans etc;
- Living environment that influences the intensity of photosynthesis and synthesis of molecules with energetic value;
- Nutritional factors with intake of trace elements indispensable to coenzymes and the presence of nitrates which represents the initial substrate (Derache, R., 1986).

The contents of nitrates will vary depending on the plant's body. Thereby, the largest amounts are being found in stalk and leaves and the lowest ones in fruits and seeds. Fully consumed plants (root, stem, leaf) bring a higher intake of nitrates than species whose edible parts are the fruits.

MATERIAL AND METHOD

To achieve the proposed objective, there were made determinations on the nitrate's content of vegetable species sold as conventional or organic products in Craiova.

Regarding commercialized products as conventional, they came from different countries in Europe and were collected from supermarkets and Central Market in Craiova; and organic products have been collected exclusively from the supermarket.

The biological material was represented by the basic vegetable species: carrots, parsley, radishes, lettuce, spinach, tomatoes, cabbage and potatoes.

For carrots and tomatoes, there were analyzed samples for organic products, which were purchased from the supermarket.

The samples were purchased in installments as they occur in markets, shops and in the field.

NO₃ extraction from plant materials was achieved using a solution of CH₃COOH 2%, after the increasement of freshly harvested plant material. To facilitate the increasement, quartz sand is added, and for the removal of organic substances and pigments, vegetal charcoal is added.

Measurement limits were 5-225 mg / l NO₃.

Depending on the values obtained from each individually analyzed product, it was calculated so that the nitrate content was expressed in mg / 100g of fresh plant material.

RESULTS AND DISCUSSIONS

Estimation of nitrates content in some species of vegetables from conventional crops in the central square of Craiova and supermarkets, and also organic products sold in supermarkets were compared to LMA of each product tested, according to the regulations on the permissible health limits for nitrates in food of plant origin (table 1).

Table 1
Sanitary norms regarding the maximum accepted limits(LMA) of nitrates in foods of plant origin

No.	Name of crop products	Maximum accepted limits (mg NO ₃ /kg products)	
		From open field	From protected field
1.	Early potatoes (harvested until 1 august) Tardy	200 160	
2.	Early cabbage (harvested until 1 august) Tardy	600 400	
3.	Early carrot (harvested until 1 august) Tardy	300 200	
4.	Tomatoes	80	250
5.	Cucumbers	150	400
6.	Beet	1400	
7.	Early onion with tails	400	600
8.	Dried onions	80	
9.	Sweet peppers	150	
10.	Peppers	150	
11.	Zucchini	400	
12.	Pumpkins	250	
13.	Pumpkins (raw material for the preparation of preserves for babies)	200	
14.	Eggplants	250	
15.	Radishes	1200	
16.	Fresh lettuce (<i>Lactuca sativa</i> L)	2000	2500
17.	Head lettuce	2000	2500
18.	Fresh spinach (<i>Spinacia oleracea</i>)	3500	3500
19.	Seasoning leafy vegetables (celery, parsnip, sorrel, parsley)	2000	2500
20.	Yellow melons	90	
21.	Watermelons	60	
22.	Food based on processed cereals, for infants and children of small age	200	

Regarding analyzes of the nitrate's content of certain vegetable species that is sold in Central Market Craiova and major supermarkets allows us to see that some of them are much lower than the permissible limits (LMA) set in the literature.

The results obtained from the analyzes carried out are presented in comparison with maximum limit (LMA) for each product analyzed (Table 2).

Table 2

The nitrates content of tehe analyzed vegetable species

No.	Species	NO ₃ ⁻ mg/kg content	LMA NO ₃ ⁻ mg/kg
1.	Tomatoes ecological product	Undetectable	150
2.	Tomatoes market	399	250
3.	Tomatoes supermarket	Undetectable	150
4.	Carrot ecological product	Undetectable	400
5.	Carrot market	Undetectable	1500
6.	Carrot supermarket	Undetectable	1500
7.	Parsley market	Undetectable	2500
8.	Parsley supermarket	882	3500
9.	Radish market	987	3000
10.	Radish supermarket	231	3000
11.	Patatoe market	Undetectable	300
12.	Patatoe supermarket	189	300
13.	Spinach market	504	2000
14.	Spinach supermarket	168	2000
15.	Cabbage market	567	900
16.	Cabbage supermarket	294	900
17.	Lettuce market	Undetectable	3000
18.	Lettuce supermarket	672	3000

After the analysis made, it was found that all vegetable species that were measured, the nitrate content was far below the maximum allowed, regardless of their place of origin. Exceptions were the tomatoes from the Central Market, which was found containing 399mg NO₃/kg compared to 150 mg NO₃/kg as LMA would be. Of all the analyzed vegetable species, for carrots the nitrates content was undetectable in all samples.

CONCLUSION

Based on the results regarding the nitrate accumulation in marketed vegetal products Craiova, both in Central Square and the supermarket, it came to the following conclusions:

1. In the tomatoes sold in Central Market has been detected a nitrates content of 399 mg NO₃ / kg compared to 150 mg NO₃ / kg as LMA woul be. This result can make us estimate that vegetable growers who deliver to supermarket yields do not comply with proper dosages when using fertilizers, administering higher doses of mineral and organic fertilizers in order to obtain a higher production's quantity, instead of quality.

2. In the carrot analyzed samples, which came from three different sources, nitrates were not detectable, which can be explained by the fact that the root vegetables lose some of the nitrates content due to long-term storage.

3. In the presented study samples of tomatoes and carrots from organic crops, the nitrate content was undetectable.

4. The administration of chemical and organic fertilizers in vegetables in particular should be performed when the plant needs it and in doses rigorously established based on

the analyzes of soil, and in compliance with the rest interval between the time of application of fertilizers and harvest time are essentials for avoiding adverse effects regarding the health of the consumers.

5. The promotion of organic cultivation technology must be supported, because by applying technological sequences to organic vegetable crops, the nitrates content has values way below maximum permissible concentrations.

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