ANALYTICAL TESTINGS OF THE CONTENT OF NITRATES DETERMINED AT SOME VEGETABLE SPECIES DEPENDING ON THE LEVEL OF THE NITROGEN FERTILIZATION

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Abstract*: The quality of the crop can be appreciated on the one hand by its high content in organic and mineral compounds necessary for the human and animal nutrition and by the presence in the vegetarian products of other compounds with unfavorable characteristics for the health of humans and animals. Among such compounds may be enumerated as well nitrites and nitrates which in some vegetarian products can be accumulated in large enough quantities such that it can become dangerous for humans and animals from a sanogenetic perspective.*

The level of nitrates from plant varies depending on the species, the breed, the organ of the plant, the nitrates content from the soil, the degree of illumination of the plants and some other factors. It can be accepted that the vegetables from the leafy category contain more nitrates than the ones from which the fruits are consumed. It is certain that the presence of too many nitrates in the soil is one of the most important reasons that causes the excessive accumulation of NO_3^- in the leafs of nitrophilous plants.

This paper aims to draw attention on some possibilities and means of reducing the content of nitrates from parsley plants whose products are meant for consuming in a fresh state using agro-chemical measurements which can be extended in the production process favoring the attainment of high and appropriate in terms of quality crops, thus eliminating the opposite trends between the consumer and the producer.

Keywords*: vegetables, content of nitrates and nitrit, influences as luminosity.*

Introduction

The supplies in ground's nutritional elements are limited, therefore maintaining and increasing ground's fertility by applying fertilizers are essential pre-requisites in order to obtain great crops, constant as period of time and quality.

Chemical fertilizers with azoth can substantially heighten the leguminous plants' crop, firstly the leafy and root ones, which in most cases are *nitrofile*, having the tendency of the accumulation of excessive quantities of nitrates, dangerous sanogenetically when the production process is not correctly directed [Rusu M. and his co-workers, 2005].

The nitrates represent the main source of azotes for plants. Before being attract in metabolism, the NO_3^- ions suffer a decreasing process, which takes place in two stages, on the first stage the NO_3^- passing to NO_2^-, on the second stage placing the reduction of NO_2^- to NH_3 [Escobar-Gutiérrez and his co-workers, 2002]. In general, it is accepted the idea that in the reduction mechanism are involved two enzymes: nitratreductaza, which activates on the first stage of reduction and nitritreductaza, which activates on the second stage of reduction. There is a tight connection between clorofilian assimilation and the reduction of the nitrates within green cells. At some species (tomatoes), 80-90% of nitrates are reduced in green leaves, in roots the reduction process being almost absent; at some species the reduction activity of the nitrates manifest also in roots.

However, practically, bigger dozes of nitrogen comparative to the specific consume level of plants are used for

avoiding the eventual decreases of the crop level towards the maximum that can be offered by the sort or the hybrid.

The biggest amount of nitrates is accumulated in the leafy vegetables. According to some sources, the maximum limit of nitrates in the green house salad is of 3500 mg/kg fresh amount, in the summertime. For wintertime the limit is of 4500 mg/kg fresh amount (McCall, D., 1998). For the salad cultivated in field the maximum admissible limit (LMA) is of 2000 - 3000 mg/kg. At the spinach is of 2000 mg/kg, and at the cabbage can vary depending on the sort between 500-900 mg/kg.

At the root crop we can see very great variations according to the species. At the radish these are between 900-4500 mg/kg, but LMA is of 600 mg/kg, while at the carrot LMA is of 200-300 mg/kg.

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In the leguminous case variations can be seen, between 6-126 mg/kg at the pea and to 400-950 mg/kg at beans (Lacatuş V., 1997).

The research theme proposes the testing of some methods of decreasing the accumulation level of nitrates in the vegetal mass of leguminous plants conceived for human consume by applying corrective fertilizers on plants.

Materials and Method

For assay the accumulation level of the nitrates in the vegetal mass of the leguminous plants there were used test-plants: parsley (*Petroselinum crispum*) and the summer radish (*Raphanus sativus L.*). The harvest of the plants was effectuated at the time of commercial maturity that means after 110 days for parsley and 40 days for radish per month. There were extracted from the crop leaf exhibits and roots from the parsley, as well from the radish.

At the plants' testing's extracted at the time of the crop the following determinations were effectuated:

- the nitric acid was determined by the colorimetrical method, from fresh material; by extraction in acetic acid solution 2%, and the dosing of the extract was made with fenoldisulfonic acid in alkalescent medium.

There were used five methods of fertilization:

P1 - 0 kg nitrogen/ha;
P2 - 25 kg nitrogen/ha;
P3 - 50 kg nitrogen/ha;
P4 - 75 kg nitrogen/ha;
P5 - 100 kg nitrogen/ha)

There used as fertilizers the ammonium nitrate with 33.5% N.

Results and discussions:

1. Results acquired for parsley

The studied factors influenced differently the accumulation process of the nitrates in parsley

Table 1 The content of nitric azote accumulated in the parsley roots and leaves

Variants	Treatments	Roots	Leaves
		$N\text{-}NO_3$ ppm	$N\text{-}NO_3$ ppm
P1	0 kg nitrogen/ha;	97	198
P2	25 kg nitrogen/ha;	176	210
P3	50 kg nitrogen/ha;	225	276
P4	75 kg nitrogen/ha;	288	386
P5	100 kg nitrogen/ha;	428	536

From the registered dates in table 1 are ascertained:

The fertilization level influenced substantially the nitrates content from leaves and roots. In consequence, at variant P1 to which applied a 0 kg doze of fertilizers, the nitrates content of roots was of 97 ppm N-NO_3 and that of the leaves of 198 ppm N-NO_3 while at variant 5 to which it was used a great doze of nitrogen fertilizers, the level of the nitrates content grew up at 536 ppm N-NO_3, and that of the roots at 428 ppm N-NO_3. This shows that chemical fertilizers with nitrogen applied to the ground (ammonium nitrate in the present case) carries out an essential role in increasing the plants' nitrates content.

Thus, the nitrates content from the leaves increased at five under the influence of a great ammonium doze applied to the ground, and that of the roots at four (figure 1). This demonstrates that when the nitrates content from the ground is raised up, the transfer of the NO_3^- ions absorbed in the air part of the plant is maintained by a biological mechanism, which comes under the possibility of the NO_3^- ions' conversion to NH_4^+ and their incorporation in organic compounds. A high ground content of nitrates constitutes a motive in increasing the content of nitrates from the air part of the plant, but the same motive can favor the accumulation of nitrates in the root, fact that presents importance for the parsley meant to the production both of leaves and of roots, employable in the alimentary diet's preparation.

The regulation of the nitrates from the leaves and roots can be done, therefore, by using dozes of fertilizers applicable to ground that do not outrun 150 kg N/ha, applied fractionized in two rounds.

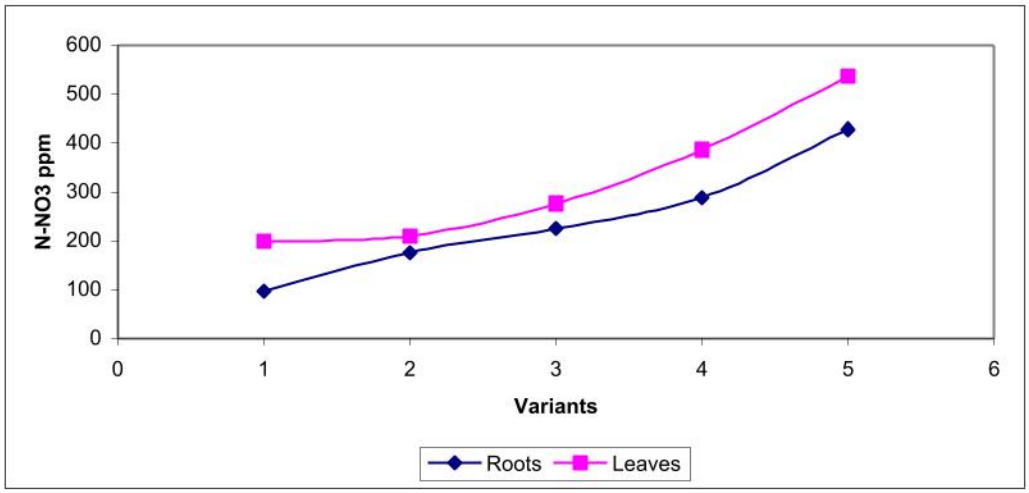

Figure 1. Variations content of nitrates from the parsley roots and leaves in accordance with the treatments through foliant splashes and with the ground fertilizing

Results obtained at the monthly and summer radish

The nitrates content accumulated in the radish roots (table 2) outstands very significantly the effect of the fertilizers applied to ground.

Table 2. The nitric nitrogen content accumulated in the monthly and summer radish roots

Variants	Treatments	Monthly radish roots	Summer radish roots
		$N\text{-}NO_3$ ppm	$N\text{-}NO_3$ ppm
P1	0 kg nitrogen/ha;	83	158
P2	25 kg nitrogen/ha;	166	213
P3	50 kg nitrogen/ha;	275	283
P4	75 kg nitrogen/ha;	465	432
P5	100 kg nitrogen/ha;	498	512

For the variant P5 in which were applied fertilizers in dozes four times bigger comparative to the agro-content variant P1 it arrived at an increasing of more than five times of the nitrates content from the monthly and summer radish (figure 2).

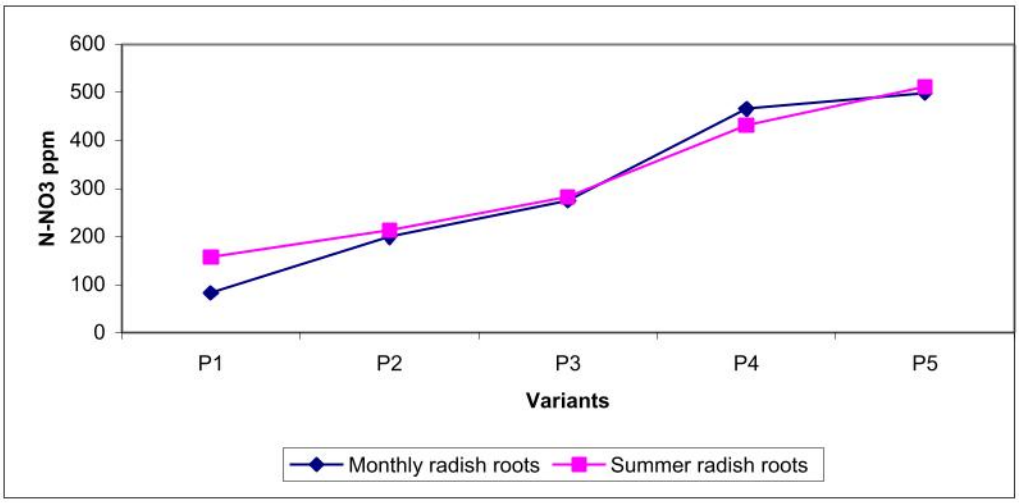

Figure 1. Variations content of nitrates from the monthly and summer radish roots in accordance with the treatments through foliant splashes and with the ground fertilizing

The maximum admitted limit in radish cultivated in winter, in greenhouse is of 4500 mg N03/kg (1017 mg N-NO3/kg) and of 3500 mg NO3/kg (791 mg N-NO3/kg) in summertime, the normal content being of approximately 3000 NO3/kg fresh mass [Scarpf, 1991].

Conclusions

The fertilization level influenced substantially the nitrates content from leaves and roots.

In consequence, at variant P1 to which applied a 0 kg doze of fertilizers, the nitrates content of roots was of 97 ppm N-NO3 and that of the leaves of 198 ppm N-NO3 while at variant 5 to which it was used a great doze of nitrogen fertilizers, the level of the nitrates content grew up at 536 ppm N-NO3, and that of the roots at 428 ppm N-NO3.

The ground's fertilizing with mineral fertilizers which contain nitrogen favor the accumulation of some excessive amounts in the vegetative air and underground organs of the leguminous plants.

The summer radish reacted differently to the monthly one, at the high fertilized agro-content taking place a lowering of the crop level, probably because 'she' cannot stand elevated concentrations in the ground from the mineral forms of nitrogen.

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