

Content of Nitrates and Pigments in Leaves of Some Parsley Cultivars Grown in Greenhouse

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Abstract. The content of nitrates, chlorophylls „a” and “b”, carotenoids determined in leaves of parsley: cultivars Common, Titan cultivars with flat-leaf and Triplex, Caderava- cultivars with curly-leaf. The content of pigments was determined by spectrophotometric method in solution of acetone extracts. Content of nitrates was determined by the photo colorimetric method and has been used Multiparameter Bench Photometers C 200.

Keywords: leaves of parsley, nitrates, chlorophylls „a”, chlorophylls “b”, carotenoids

INTRODUCTION

Parsley leaves constitutes an important source of human food due to rich content of vitamins, mineral salts and essential oils. The leaves contain vitamin C 200 mg%, plus the contents in vitamin A, vitamin B and small amounts of folic acid, apiol (Stan *et al.*, 2003).

Parsley is rich in chlorophyll, which has the ability to purify and to inhibit the spread of bacteria, fungi and other microorganisms, notes dr. Gillian McKeith. The leaves of parsley is consumed raw, ensure the full use of vitamins and the chlorophyll which has important plastic and antianemia properties.

The accumulation of nitrates in products is influenced by many factors, of which we can mention: genetic factors, susceptible plants which accumulate nitrates; environment and photosynthesis intensity influencing the synthesis of molecules with recovered energy; factors of nutrition with the intake of essential trace elements and the presence of nitrates coenzymes constituting the initial substrate (Derache *et al.*, 1986).

Accumulation of nitrates in plants is varied, the quantity of their being non-changeable: in leaves their percentage is lower and the higher is in stem and ribbed. Parsley leaves contain 50-60% less nitrates than ribbed stems of these plants (Dubrovin, 2000). Plants grown in greenhouses earn generally higher amounts of nitrates.

The World Health Organization (WHO) recommended not exceeding the daily consumption of 3.65 mg/kg, nitrates, which represents 280 mg NO₃ for a human.

MATERIALS AND METHODS

Physiological studies have been conducted to following varieties of parsley: V1-Common, V2-Titan, F1- cultivars with flat-leaf and V3-Triplex, V4-Caderava cultivars with curly-leaf. Biological material consists of fresh leaves varieties of previously mentioned. The researches were organized in greenhouse, greenhouse located in the experimental field of the Department of vegetable crops, State Agrarian University of Moldova.

Physiological analysis of the pigments and to the concentration of nitrates from the leaves of parsley was made during the period of vegetation. In the laboratory the Department

Technology Storage and Processing of Agricultural Products, S.A.U.M. has conducted analysis of the levels of nitrates, which was determined by the photocolometric method and has been used Multiparameter Bench Photometers C 200, measuring range from 0.0 to 30,0 mg/l. Results were expressed as mg/kg fresh weight.

In the laboratory of Plant Physiology Department, it was determined the content of pigments by spectrophotometric method in solution of acetone extracts. The results are expressed in mg/g fresh weight and mg/g dry weight. Work stages: extraction with acetone, spectrophotometrically at 662 nm for chlorophyll “a”, spectrophotometrically at 644 nm for chlorophyll “b” and spectrophotometrically at 440,5 nm for carotenoids. To determine the contents of pigments using spectrophotometer SF-26 concentrations were determined according to the equation proposed by by Holm Wettstein (Stepanov *et al.*, 1988).

Through research it has pursued the variety influence over the content of nitrates, chlorophyll pigments and carotenoids, under the same conditions.

RESULTS AND DISCUSSION

Parsley is a species that has a tendency to accumulate nitrates, which is the limiting factor of the quality of agricultural products.

According to the Norms of State sanitary-epidemiological investigation on content of nitrates, the permissible limit for parsley is 2000 mg/kg and grown in the open field of 2500 mg/kg grown in protected land (The Official Gazette of RM, 2005). Observations on physiological parameters of the drill, have shown that they react, according to variety. The results obtained from the processing of raw data are presented in figures 1-3.

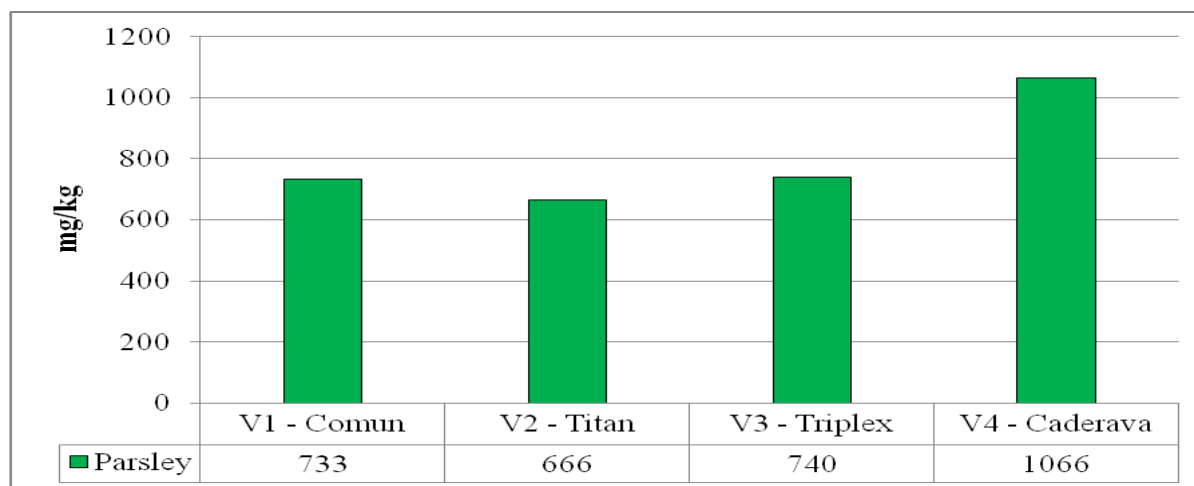


Fig. 1. The content of nitrates in the varieties of parsley

The analysis was done all the variations of nitrate content in leaves. Analyzing the results in figure 1, the value of the content of nitrates is from 666-1066 mg/kg. Maximum values in the content of nitrates are assigned in version 4, the variety Caderava and values of the minimum version 2, variety Titan. Experimental results indicate that the varieties of parsley with curly-leaf, V3 -Triplex and V4 -Caderava, the content of nitrates is higher compared varieties parsley with flat leaf V1 – Common and V2 – Titan.

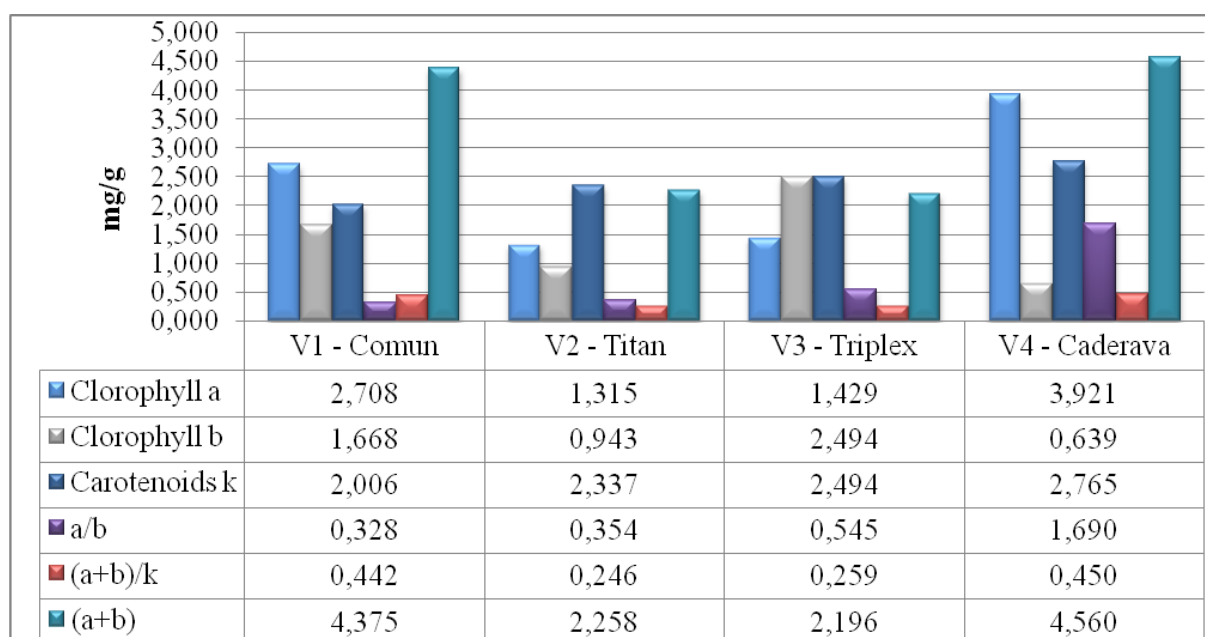


Fig. 2. The contents of pigments in the dry matter in the varieties of parsley

The process of photosynthesis depends on the efficiency of pigments from chloroplasts assimilated light energy. Transfer of energy by the centers of the leaf chlorophyll enzymatic returns “a”, while chlorophyll “b”, and carotenoids are accessory of assimilator (Norman and Polescu, 1988).

Study of pigments comprised two variants, namely: the contents of pigments in dry and fresh matter. He studied in this way, “a” variation of chlorophyll, chlorophyll “b”, carotenoid bioavailability, and reports: chlorophyll “a”/chlorophyll “b”, and carotenoids. The results were recorded in tables, on the basis of which it represented graphically (Fig. 2-3), by variety. By comparing the results on the contents of pigments in dry matter I found significant differences depending on the variety.

A high content of chlorophyll “a”, was recorded at V4-3,921 mg/g with significant deviation of 2,492 mg/g-V3 and 2,606 mg/g-V2. Comparing the values of the chlorophyll “b” to the four varieties of parsley, were observed a value significantly higher, at variety Triplex (V3-2,494mg/g) and the Common variety (V1-1,668mg/g) compared to other varieties. Pigments are in the range of carotenoids from 2,006 mg/g to the common variety to 2,765 mg/g Caderava variety. Relationship between chlorophyll values “a” and “b” varies between 0,328 mg/g to V1 and 1,690 mg/g to V4. Report chlorophyll and carotenoids varies over the range 0,246mg/g-V2 and 0,450 mg/g – V4. The total amount of chlorophyll in the varieties analyzed is aggregated from 2,196 mg/g-V3 up to 4,560 mg/g-V4.

Comparing the results on the contents of pigments in fresh matter, we can affirm, and in this case, significant differences of nitrates and pigments, depending on variety.

Analyzing data from figure 3, we observe that the variety Caderava-V4 recorded the largest amount of chlorophyll “a” 0,830 mg/g and the smallest amount of chlorophyll “a” 0,298 mg/g are assigned in a variety of Titan -V2. The Common variety – V1 is distinguished with the highest content of chlorophyll “b” - 0,441 mg/g, and the variety Caderava with the lowest content of chlorophyll “b” - 0,135 mg/g. Watching results to the contents of carotenoids are slightly more stable highlights values ranging from 0,524-0,585 mg/g fresh mater. content higher in chlorophyll (“a” + “b”) should be given to the following V1 and V4 being 1,157 mg/g and 0,965 mg/g ratio of chlorophyll and carotenoids is an important and

varies from 0,054 mg/g to variety Triplex until 0,117 mg/g to the Common variety ranging depending on the contents of pigments and carotenoids accumulated during the period of vegetation.

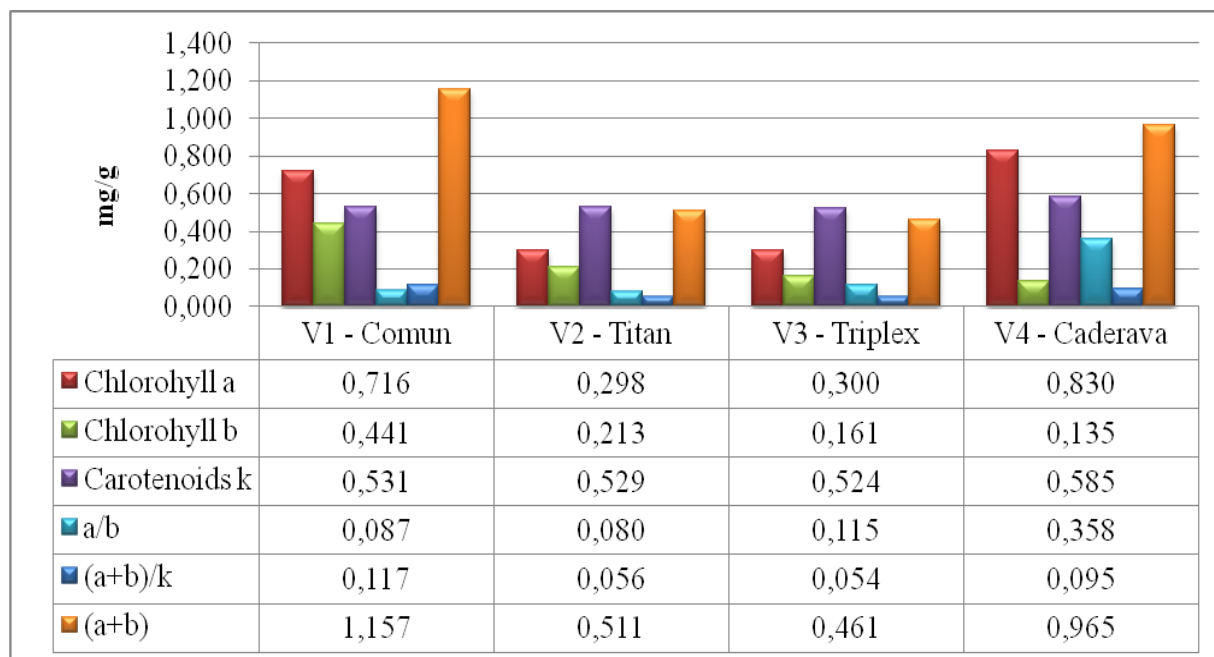


Fig. 3. The contents of pigments in fresh matter at varieties of parsley

CONCLUSIONS

Values obtained with regard to the content of nitrates in the varieties of parsley do not exceed the maximum permissible limit (LMA) and there is no danger of poisoning of the human body after consumption.

Parsley with curly-leaf varieties have higher nitrate content compared with flat-leaf varieties.

Common varieties of parsley and Caderava had a higher content in chlorophyll and carotenoids compared to other varieties under study.

The varieties of parsley are factors that contribute to the content of nitrates and pigments in leaves.

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