CHEMICAL COMPOSITION OF HAZELNUT (*CORYLUS SPP*) CULTIVARS

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Key words: cultivars, hazelnut, dry matter, proteins, oils, methyl-estar.

Based on the results it was established that the fruits of all three tested varieties have less than 5% moisture. The dry matter content is over 95% which is several times higher than other fruit species. The high content of dry matter and low moisture content in the fruits of hazelnut allows much longer storage of the fruits of other species, with no changes and harmful consequences for the quality.

Sugar content ranges between 4.91% ('Tonda Gentile delle Langhe') to 6.73% in ('Roman hazelnut'). The protein content of examined cultivars is about 16%, and oil content as the majority of the organic matter in the fruits of the hazelnut was over 60%. Vegetable oils are mainly composed of unsaturated acids, oleic over 81% and 6% of linoleic and saturated, about 5% palmitic and stearic over 4%.

Based on the above we can conclude that the fruits of hazelnut high-quality and essential in the diet, due to the significant roles they play in the human body. The aim of this study was to analyze the chemical composition of fruits of three major economic and most widespread cultivars of hazelnut in Serbia: 'Istrian long', 'Roman hazelnut' and 'Tonda Gentile Delle Langhe'.

INTRODUCTION

Hazelnut represents a very important type of nuts, which fruits value on the domestic and foreign markets. World production of hazelnuts in shell has reached over 700,000 tons in recent years and shows a tendency of further growth. Following the production of hazelnuts (Bignami 1999) Turkey is the largest hazelnut producer with 75.6% of world production, while Italy is second place with 15.2%. The hazelnut is the source of a large number of very useful compounds, such as oils, proteins, carbohydrates, mineral substances and vitamins. According to various authors, the hazelnut core had a content of oil between 55-72%, protein between 12-22%, carbohydrates about 14%, sugar 2-10%, and mineral matter of 1.8-3%.

Recent research (Blomhoff et al 2006) shows that hazelnut also have an antioxidant effect, as well as lowering the cholesterol content (Mercanlgil et al 2007). The high nutritional and dietary value of the hazelnut core enables a steady increase in demand and consumption by the confectionery industry, which is also the largest consumer, and today it is becoming an increasingly important subject of international trade. A smaller amount of hazelnuts used for human nutrition. In addition, hazelnuts a widely used in the cosmetics and pharmaceutical industries.

Low water content in the core provides significantly better and longer conservation of fruits from the fruits of other fruit species. Tolerance to agro ecological conditions, profitable production and favorable prices on a market have contributed to hazelnuts a cross from extensive to intensive production. A systematic study of hazelnut has been devoted to us relatively modest attention. Insufficient knowledge about hazelnut influenced

the slow introduction to a production and planting a large plantations, despite a very favorable environmental conditions for its cultivation in our country. The aim of our research was a examined chemical composition of the core of hazelnut.

MATERIALS AND METHODS

The subject of this research was a three most important cultivars of hazelnuts in our country: 'Istrian long' (IL), 'Roman hazelnut' (RH) and 'Tonda Gentile Delle Langhe' (TGDL). Experimental orchard was planted in 1992. year. Planting distance was 5 m * 4 m, and hazelnuts were in the shape of a bush. The fruits were harvested after their full maturity and fall out of the envelope, then dried and their chemical analysis was carried out. In a plantation were applied regular agricultural and pest control treatments.

The content of moisture and dry matter in the core was determined by drying at 105 °C to constant weight. Determination of the oil content was carried out by extraction in the Soxhlet apparatus with petrol ether, and the protein according to the Kjeldahl method. The composition of the methyl esters of the constituent acids of hazelnut oil was determined by gas chromatography technique using two different types of detectors: flame-ionizing (FID) and mass spectrometric (MSD).

RESULTS AND DISCUSSION

Based on the average values of the three-year examined (Table 1.) it can be concluded that the moisture content of the fruits of the investigated varieties of hazelnut is below 5%, which is one of the essential preconditions for a successful prolongation and storage of hazelnuts (Manušev 1974). The dry matter content of all three examined cultivars ranges over 95%.

Table 1

Chemical composition of core in hazelnut cultivars

Cultivars	Content moisture (%)	Content of dry matter (%)	Total sugars (%)	Content of proteins (%)	Content of oils (%)	Me-palmilat	Me-stearat	Me-oleat	Me-linolat
'IL'	4.72	95.28	5.24	16.98	62.14	5.52	4.15	83.65	6.68
'RH'	3.91	96.09	6.73	15.70	66.82	5.18	4.31	83.79	6.72
'TGDL'	3.90	96.10	4.91	16.37	65.92	5.39	6.42	81.29	6.90

Comparing the content of dry matter in hazelnuts core with the content of dry matter in other fruit species, it can be concluded that it is several times higher. Because of that, the a hazelnuts core can storage for long time without any harmful effects on quality. The highest content of total sugar had a cultivar 'Roman hazel' (6.73%), and the lowest a cultivar 'Tonda Gentile delle Langhe' (4.91%).

The hazelnut core contains about 14% of carbohydrates, of which 4-10% of sugar (Miljković 1985). Proteins are high molecular nitrogenous organic substances that are part of living organisms and which have a central place in the existence and function of living matter. These are the most important biological substances and the most complex substances in terms of their chemical structure. The protein content of a cultivar 'Istrian long' was the highest (16.98%), while cultivar 'Roman hazel' had the lowest (15.70%).

Similar results were confirmed by other authors in their research (Vulic 1990; Paoleti 2007).

Oils are reserve nutrients and rich sources of energy. In addition to the exceptional biological, they also have great technical significance, because they serve as raw materials in the cosmetics and pharmaceutical industries. Compared to other plants a hazelnut core contain significantly higher amounts of oil, which is why this fruit species is highly appreciated. Based on the data presented in Table 1, a preliminary finding of very high oil content is confirmed, over 60% of all three hazelnut varieties tested. The average oils content of cultivars 'Roman hazel', 'Tonda Gentile delle Langhe' and 'Istrian long' were 66.82%, 65.92% and 62.14%, respectively. With an average yield of 1,500 kg of cores per hectare (Hlišč 1971) realized production of 900-1,000 kg of high-quality oil.

Represented in a very high percentage in the core of hazelnut (55-70.3%) vegetable fats predominantly consist of unsaturated acids: oleic 82%, linoleic 11%, fatty acid glycerides, stearic 4%, palmitic 3% and myristic, as well as mixed glycerides of said fatty acids (Miljković 1985). These acids are essential for the normal physiological function of the organism. Some of them cannot be synthesized in human cells, but they must be taken through food. The most important and the most represented unsaturated acid was oleic, with significantly higher content compared to others acid. A cultivar 'Istrian long' and' Roman hazel' not exhibit significant differences in the content of saturated and unsaturated acids, while the 'Tonda Gentile delle Langhe' cultivar has higher content of stearic and linolenic acid.

CONCLUSIONS

The moisture content of core to the all examined cultivars was below 5% and dry matter was over 95%. Also, a high protein content was found and the largest had a cultivar 'Istrian long' (16.98%). The exceptional significance of hazelnut is due to the very high content of oil, which exceeds 60% in the tested cultivars. Qualitative analysis of the oil revealed a very high content of oleic acid, over 80%, while the content of other unsaturated acid - linoleic is significantly lower. The content of saturated acids - palmitic and stearinic were slightly lower than the content of linolenic acid and significantly lower than oleic acid.

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