THE MONTHLY DYNAMICS OF THE PROTEIN BIOSYNTHESIS IN THE LEAVES HARVESTED FROM *HIPPOPHAE RHAMNOIDES* L. VARIETIES

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Abstract: Seabuckthorn (*Hippophae rhamnoides*) presents interesting economic potential due to its well known nutraceutical properties. Seabuckthorn (*Hippophae rhamnoides*) is a unique medicinal plant and it is cultivated or naturally grown in various parts of the world, including Romania. Almost all part of plant (fruits, leaves and bark) are uses in food, pharmaceutical and cosmetic industries. The leaves of the seabuckthorn plant contain many nutrients and bioactive substances.

This paper presents the results of a study regarding the amount of soluble proteins from five seabuckthorn leaves varieties (Auraş, Silvia, Serpenta, Tiberiu and Victoria). The samples were harvested from Fructex Bacău between May and September months, 2009. The result indicates that the soluble protein content of seabuckthorn leaves depending on the varieties investigated and the harvested moment.

INTRODUCTION

Seabuckthorn (*Hippophae rhamnoides*) is a unique medicinal and aromatic plant who belongs to the family of *Elaeagnaceae*. Seabuckthorn is cultivated and naturally grown in the various parts of the world, including Romania. The wide distribution of seabuckthorn is showing by berry variation characters such as fresh weight, chemical and sensory attributes (Yang and Kallio, 2001). The seabuckthorn is an important species due to the antioxidant activity of the extracts from fruits and leaves, such as vitamin C, E, carotenoids, flavonoids, proteins (Singh, 2007). The proteins represent 38-60% of the total nitrogen contained in the seabuckthorn. The proteins are represented by the globulins (53.7 to 56%) and the albumin (33.1 to 38.4%). In the seabuckthorn "seeds" the proteins are found in 30% (from 26.8 to 32.8%) and in the pulp 0.79 to 1.64% (Solonenko and Privalov, 2007). Almost all part of plant (fruits, leaves and bark) are uses in food, pharmaceutical and cosmetic industries due to their content of essential and bioactives (Utioh *et al*., 2007). The leaves of the seabuckthorn plant contain many nutrients and bioactive substances (Guan et al., 2005). Leaf extracts contain triacylglycerols, free fatty acids, carotenoids, aldehydes, and triterpenes, which exhibit pharmacological properties. Two new hydrolysable tannins, hippophaenins A and B, two flavonoids, six known hydrolysable tannins, four C-glycosidic ellagitannins, gallic, caffeic, p-coumaric, sinapic, ferulic, ellagic and chlorogenic acids have also been isolated from sea buckthorn leaves (Goncharova and Glushenkova, 1995).

In the previous studies, the analysis of the protein content in the sea buckthorn leaves collected in two phenophases (the maximum growth of the shoots and the ripening fruit) indicates an oscillation depending on the varieties of seabuckthorn investigated and the time of harvest (Olteanu *et al*., 2008; Oprica *et al*. 2007).

The present study has aimed to investigate the soluble proteins amount from five seabuckthorn leaves varieties (Auraş, Silvia, Serpenta, Tiberiu şi Victoria) harvested between May and September months 2009, in view of encourage the use of leaves so rich in phytonutrients, in food (like tea) or as animal feed.

MATERIALS AND METHODS

The plant material studied is represented by the leaves harvested monthly from late spring to early autumn (May-September) during 2009, from five seabuckthorn varieties cultivated in Romania: Auras, Silvia, Serpent, Tiberius and Victoria. The sprouts were grown under controlled conditions in greenhouses located at SC FRUCTEX S.A. Bacau (20-22ºC temperature, drip irrigation every 30 minutes, warm sandy soil). The leaves were taken randomly from the sprouts of one year and subjected to biochemical analysis in order to dose the soluble proteins.

Bradford method, used to establish the content of soluble proteins, is based on colour reaction of proteins with Coomassie Brilliant Blue G250 (Artenie *et al*. 2008).

RESULTS AND DISCUSSION

The protein is one of the important chemical components in seabuckthorn leaves that has value in animal feed and can be used as a source of unconventional protein for human food (Pirie, 1986). Leaves of female and male *Hippophae rhamnoides* plants were reported to contain an average of 17,1 and 16,2 g protein/100 g dried leaf, respectively (Lu, 1992).

The results obtained from the analysis of the protein content at five seabuckthorn varieties leaves harvested in May from Fructex Bacau indicate a variation between 1.71 mg/g at the Victoria variety and 2.5 mg/g at the Tiberiu variety (Fig. 1). The values of the quantity of protein at the analyzed samples are very similar, the difference between the maximum and minimum being of 1,46 times.

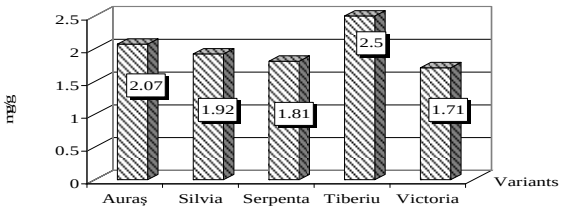

Fig. 1 – The variation of soluble protein amount of seabuckthorn varieties harvested in May

The maximum amount of soluble protein found in June is registered at the leaves of Silvia variety (1,64 mg/g) and the smallest amount is showed at Auras variety (0,97 mg/g). Compared with May, we notice a slight decrease in the quantity of soluble proteins, the obtained values ranging in very low limits (Fig. 2).

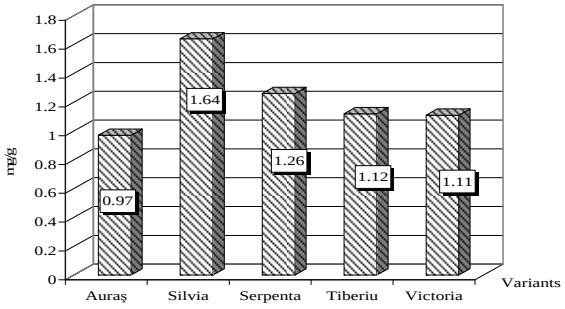

Fig. 2 – The variation of soluble protein amount of seabuckthorn varieties harvested in June

The observed values from the analysis of the amount of soluble proteins from the leaves harvested in July are very close, 1,34 mg/g at Auras variety, 1,43 mg/g at Silvia variety and 1,36 mg/g at Serpenta variety. The minimum protein content is recorded at the Auras variety (1,34 mg/g) and the maximum at Victoria variety (1.65 mg/g) (Fig. 3).

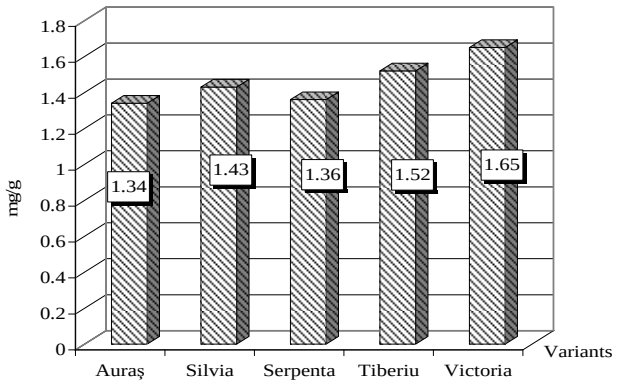

Fig. 3 – The variation of soluble protein amount of seabuckthorn varieties harvested in July

The analysis of the results on the protein content in the leaves of the seabuckthorn varieties harvested in August presented in Figure 4, shows a small variation of about 1,5 times between the maximum value recorded at Auras variety (1,2 mg/g) and the minimum value registered at Victoria variety (1,8 mg/g). The protein content have similar values at Auras, Silvia and Serpenta varieties (1,2 mg/g, 1,42 mg/g, respectively, 1,36 mg/g) relatively low compared with Tiberiu and Victoria varieties (1,65 mg/g and 1,8 mg/g).

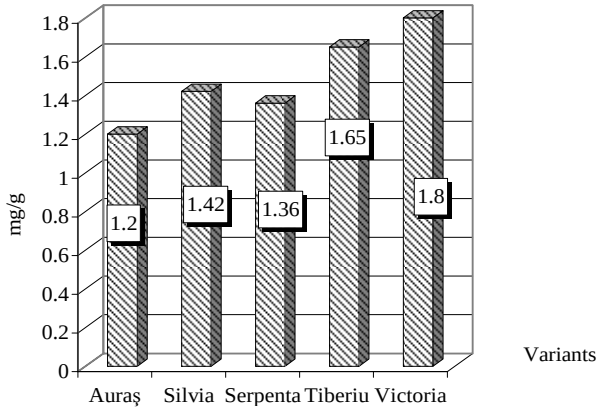

Fig. 4 – The variation of soluble protein amount of seabuckthorn varieties harvested in August

At the variants of the seabuckthorn leaves examined in September, the soluble protein content has small oscillations. The variants investigated in this month records a maximum content of protein at Tiberiu variety (1,36 mg / g) and a minimum at Victoria variety (1,6 mg / g) (Fig. 5). The same trend of reduced variation of the amount of protein in leaves was recorded at seabuckthorn variants in July but to other varieties.

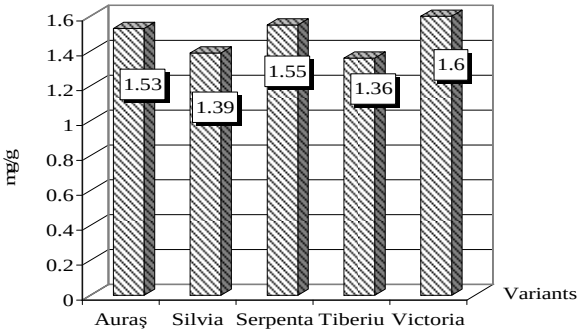

Fig. 5 – The variation of soluble protein amount of seabuckthorn varieties harvested in September

CONCLUSIONS

The soluble protein content harvested in the monthly dynamics (May-September) at the five seabuckthorn varieties (Auras, Silvia, Serpent, Tiberius and Victoria) grown in SC FRUCTEX S.A. shows the same trend of variation for the months July, August and September, while the leaves harvested in May and June show uneven variations at all the seabuckthorn variants.

The largest amount of soluble protein was detected in May, at the leaves of Tiberiu variety (2,5 mg/g) and the smallest amount was found at the variety Auras (0,97 mg/g) in June.

The soluble protein content is correlated with the area of cultivation, respectively, sampling and environmental factors, so we can assume that the values obtained are relatively uniform due to the controlled conditions of seabuckthorn sprouts (greenhouse).

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