

## PREDICTED NUTRITIONAL QUALITY OF WALNUTS AND OILCAKE

Sandulachi E., Reșitca V., Grosu C., Boaghi E.

Technical University of Moldova, Chisinau, Republic of Moldova

Sandulachi Elisaveta: [elisaveta.sandulachi@tpa.utm.md](mailto:elisaveta.sandulachi@tpa.utm.md)

**Abstract:** This article presents a bibliographic and experimental study of nutritional quality of walnuts core and oilcake *Juglans Regia L.* Nutritional quality of the walnuts is given by total protein content, their quality, including the included amino acids in the chemical composition. For walnut core and oilcake were evaluated: Protein efficiency ratio (PER), Essential Amino Acid Index (EAAI), Biological Value (BV), Nutritional Index (NI).

**Keywords:** walnut, oilcake, nutritional quality, amino acids.

### Introduction

There is a growing interest in the study of the chemical composition of vegetable oils since knowledge of oil allows the assessment of the quality of the products on the market. It is known that tocopherols and carotenoids act on the oxidation stability of oils, while chlorophyll is responsible for the photooxidation [5]. The protein content, including the amino acids content play an important role in walnut core and meal quality.

### Materials and methods

#### Materials

Walnuts (*Juglans Regia L.*) from Cogalniceanu and Calaras variety, harvested in Moldova. Walnut oil and oilcake it was obtained by cold pressing laboratory Technical University of Moldova. In walnut core and oilcake samples were evaluated protein and essential amino acids content. Based on these indicators was forecasted nutritional quality of core and walnut meal.

#### Methods

##### Predicted Nutritional quality

##### Protein efficiency ratio (PER):

Protein efficiency ratio (PER) was estimated according to the regression equations developed by Alsmeyer *et al.* (1974) [1], as given below:

$$\text{PER}_1 = -0.684 + 0.456(\text{LEU}) - 0.047(\text{PRO}) \quad (1)$$

$$\text{PER}_2 = -0.468 + 0.454(\text{LEU}) - 0.105(\text{TYR}) \quad (2)$$

$$\text{PER}_3 = -1.816 + 0.435(\text{Met}) + 0.780(\text{Leu}) + 0.211(\text{His}) - 0.944(\text{Tyr}) \quad (3)$$

##### Essential Amino Acid Index (EAAI):

Nutritional qualities were determined on the basis of the amino acid profiles. The Essential Amino Acid Index (EAAI) was calculated using the method of Labuda *et al.* [4] according to the equation below:

$$EAAI = \sqrt[n]{\frac{100a \times 100b \dots 100j}{av \times bv \dots jv}} \quad (4)$$

where: n = number of essential amino acids,

a, b .....j = represent the concentration of essential amino acids (lysine, tryptophan, isoleucine, valine, arginine, threonine, leucine, phenylalanine, histidine and the sum of methionine and cystine) in test sample.

av, bv ..... jv = content of the same amino acids in standard protein (%) (egg or casein) respectively.

### Biological Value (BV):

Biological Values were computed according to the methods of Oser [6], respectively. The following equation was used for BV determination.

$$BV = 1.09 (\text{EAA Index}) - 11.7 \quad (5)$$

### Nutritional Index (NI):

The nutritional index of the food samples was calculated using the formula below as described by Crisan and Sands [3].

$$\text{Nutritional index } [\%] = \frac{\text{EAAI} \times \% \text{ protein}}{100} \quad (6)$$

**Fatty acid composition:** was determined by gas chromatography (GC).

### Results and discussion

Owing to the favorable effects of essential fatty acids and essential amino acid on human health, a great degree of interest on fatty acid and proteins profiles as well as nutritional quality of walnuts have been of interest in the recent years.

*Table1.* Essential Amino Acid Content in walnuts core and walnut meal

Essential Amino Acid	Content g / 100g of protein				Nutritional value per 100 g Chicken egg [1]
	Calaras		Cogalniceanu		
	core	meal	core	Meal	
Lysine	2.33	2.34	2.46	2.21	0.904
Threonine	3.09	3.48	3.33	3.26	0.604
Phenylalanine	3.41	3.94	3.14	3.72	0.668
Isoleucine	3.61	5.70	3.56	3.63	0.686
Leucine	7.01	9.32	6.97	9.25	1.075
Methionine	1.83	2.71	0.82	0.54	0.392
Valine	3.84	3.37	2.78	2.58	0.767
Tryptophan	-	-	0.27	0.20	0.153
<b>Essential Amino Acid Index (EAAI)</b>	<b>9.16</b>	<b>6.71</b>	<b>10.40</b>	<b>13.88</b>	

Walnuts having a high content of protein are used in the manufacture of various types of confectionery, bakery, dairy and meat industry products as an ingredient. Their contribution to rheological structure formation and functional properties depend on the

protein content and their quality. For this purpose there have been evaluated the proteins of walnut core and meal grown in Moldova. The results are shown in Table 2.

**Table 2.** Distribution of walnuts and oilcake amino acids classified according to similar chemical properties (g/100g of protein)

Group	Content g / 100g of protein					
	Calaras		Cogalniceanu		peanut [2]	
	core	meal	core	meal	peanut meal	peanut meal dehydrated
Hydrophobic (nonpolar) <sup>a</sup>	29.82	34.99	29.32	32.6	36.68 ± 0.01	37.28 ± 0.03
Uncharged polar <sup>b</sup>	11.08	11.73	12.03	9.72	12.57 ± 0.03	12.29 ± 0.01
Basic <sup>c</sup>	30.84	21.46	24.11	20.56	16.97± 0,06	16.80 ± 0.03
Acidic <sup>d</sup>	23.12	26.85	31.32	30.16	28.29 ± 0,01	29.39 ± 0.02
Sulfur containing <sup>e</sup>	3.39	4.09	2.16	3.05	2.36 ± 0,01	2.44 ± 0.04
Aromatic <sup>f</sup>	5.57	6.62	5.14	6.43	9.69 ± 0,06	9.77± 0.01
Total protein	92.26	95.03	96.78	96.89	106.61	107.97

Values are means standard deviation of three determinations.

<sup>a</sup>Gly, Ala, Val, Leu, Pro, Met, Phe, Trp, and Ile; <sup>b</sup>Ser, Thr, Cys, and Tyr.

<sup>c</sup>Lys, Arg, and His; <sup>d</sup>Asp and Glu; <sup>e</sup>Cys and Met; <sup>f</sup>Phe, Tyr, and Trp.

By comparing the protein content and their quality of the analyzed samples and the values referred to in the bibliographic study it was found Distribution of walnuts and oilcake amino acids classified according to similar chemical properties (g/100g of protein) being similar to peanuts.

In Table 3 are shown the evaluation results of nutritional parameters on walnut core and meal variety **Calaras** and **Cogalniceanu**.

**Table 3.** Determination of nutritional parameters

Nutritional parameters	Calaras		Cogalniceanu	
	core	meal	core	meal
<b>Essential Amino Acid Index (EAAI)</b>				
PER <sub>1</sub>	9.16	6.71	10.40	13.88
PER <sub>2</sub>	2.406	3.704	2.292	3.385
PER <sub>3</sub>	-	-	2.664	3.711
PER <sub>3</sub>	2.894	4.463	2.692	3.58
<b>Biological Value (BV)</b>	-1.72	-4.39	-0.364	3.43
<b>Nutritional Index (NI):</b>		1.72		3.64
$\Sigma$ Sulphur amino acid(Meth+Cyst) (g/100g)	97.1	117.3	61.9	57.1
$\Sigma$ Aromatic amino acid (Phe+Tyr) (g/100g)	115.86	134.28	106.43	126.82
$\Sigma$ EAA+His+Arg/TAA (%)	27.587	32.753	25.185	27.064
$\Sigma$ EAA/ $\Sigma$ NEAA	0.387	0.494	0.325	0.363
$\Sigma$ NEAA/ $\Sigma$ TAA)%	0.703	0.657	0.742	0.722

### Conclusion

The conducted bibliographic and experimental study shows that the nutritional quality of walnut core and meal is comparable to that of peanut flour. The study allows us to broaden our assortment of autoctone walnuts use, yielding products with well-defined functional and technological properties.

### References

4. **Alsmeyer RH, Cuningham AE, Hapich, ML.** Equations predicted (PER) from amino acid analysis. *Food Technology*, 1974; 28: 34 – 38.
5. **Amza T., Amadou I., Kamara, M.T. et al,** Nutritional and functional characteristics of gingerbread plum (*Neocarya macrophylla*): an underutilized oilseed, *GRASAS Y ACEITES*, 290-298, 2011
6. **Crisan EV, Sands A.** *Biology and Cultivation of Edible Mushrooms.* Hangeri Academic Press, New York. 1978; 137-142
7. **Labuda J, Kacerovský O, Kováč M, Štirba A.** *Výživa a krmenie hospodárskych zvierat. Príroda, Bratislava.* 1982; 164
8. **Nikolova K., Eftimov T, Perifanova M and Brabant D,** Quick Fluorescence Method for the Distinguishing of Vegetable Oils, *Journal of Food Science and Engineering 2* (2012) 674-684
9. **Oser BL.** An integrated essential amino acid index for predicting the biological value of proteins. In A.A. Albanese (Ed.), *Protein and amino acid nutrition.* New York: Academic Press. 1959; 295-311.