

PHYSICO CHEMICAL PARAMETERS OF SOME VARIETIES OF WALNUTS (JUGLANS REGIA L) GROWN IN MOLDOVA

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Currently, in the food industry, it is given attention to processing autochthonous walnuts in order to obtain quality products with high nutritional value. Walnuts present a valuable raw material considering the content of unsaturated fatty acids, saturated acids, vitamins, antioxidants, minerals. During the storage, the quality of walnut kernels decreases and this process alters the organoleptic and physicochemical properties. This paper shows the changes of the chemical composition of walnut (*Juglans regia L*) grown in Moldova during the storage. There were estimated the following indicators: acidity, peroxide index, water activity. The study was conducted on autochthonous nuts which were stored for 1 month, 1 and 2 years.

Key words: walnut, peroxide index, water activity, kernel ratio

INTRODUCTION

Walnuts are of high economic for the food industry and its nuts are highly appreciated for its unique organoleptic characteristics [2], hypocholesterolemic effects [3, 4] and antihypertensive effect [5]. Walnuts *Juglans regia L.* are rich in polyunsaturated fatty acids, especially 18:2 and 18:3 and protein value [6]. Walnuts present a valuable raw material considering the content of unsaturated fatty acids, saturated acids, vitamins, antioxidants, minerals [1, 7, 8].

This paper shows the changes of the chemical properties of walnut (*Juglans regia L.*) grown in Moldova during the storage. There were estimated the following indicators: acidity, peroxide index, water activity. Quality of walnuts is determined by the physical properties such as: nut diameter, nut length, nut thickness, nut shape, nut size, nut weight, shell thickness, shell roughness) and kernel properties (kernel weight and kernel ratio).

1. MATERIAL AND METHODS

Materials

The study was conducted on autochthonous walnuts which were stored for 1 month, 1 and 2 years. Nuts *Juglans regia L.* Were harvested in Telenesti, Moldova, during harvest 2010 and 2011. Storage took place at ambient temperature.

Methods

Physical analysis: Physical analysis includes nut fruit properties (i.e. nut diameter, nut length, nut thickness, nut shape, nut size, nut weight, shell thickness, shell roughness) and kernel properties (kernel weight and kernel ratio) [4].

Shape of the nuts was determined by the following formula:

$$Nut_{index} = \frac{Nut_{length}(mm)}{(Nut_{diam} + nut_{thickness})/2} \quad (1)$$

Nut_{index} < 1.25 were taken as sphere shape, Nut_{index} > 1.25 indicate the oval shape of the nuts

Kernel ratio was determined by the formula:

$$Kernel_{ratio} (\%) = \frac{Kernel_{wt} (g)}{Nut_{wt} (g)} \times 100 \quad (2)$$

Size extra for the nuts if:

Nut diameter > 27mm for sphere; Nut diameter > 26mm for oval

Chemical analysis: For the Chemical analysis AOAC methods were used. Fats contents were determined by using AOAC 22.034.

Free acidity was determined by titration of the dissolved oil in a mixture of alcohol-ether (1:2) with an aqueous solution of sodium or potassium hydroxide (Standard EN ISO 660).

Acidity value represents KOH quantity in mg that is necessary for neutralization of free fat acids in one of fat (oil) [6].

AV was determined by the formula:

$$AV = \frac{28 \times V \times f}{m}; \text{ (mg KOH/g oil)} \quad (3)$$

Where: V= solution volume of KOH used by titration (ml);

f = 0.8416, solution factor of KOH 0.5 N

m = sample quantity, in gram

FA was determined by the formula:

$$FA = 0.5041 \times AV, \quad (\text{g. oleic acid/100g oil}) \quad (4)$$

Peroxide value represents the quantity of peroxide who is found in aliment and who have the capacity to liberate in one oxidative process iodine by potassium iodine [6].

For peroxide value, was used the next formula:

$$PV = \frac{(V_1 - V_2) \times n}{g} \times 100, \quad (\text{meg/Kg oil}) \quad (5)$$

Where: V1 = ml sodium thiosulphate used by sample titration;

V2 = ml sodium thiosulphate used by reference sample titration;

g = quantity of sample, g;

n = solution normality.

Water activity plays an important role in the oxidation of walnuts and walnuts oil in storage. Water activity walnuts and nuts oil was evaluated with the device Novasina LabSwift-aw.

2. RESULTS AND DISCUSSION

Fruit properties of the walnuts: Walnut cultivars in Telenesti, center of Moldova. Table 1 shows the physical characteristic: fruit dimensions and shape properties of walnuts *Juglans regia* L.

Table1. Fruit dimension and shape properties walnuts *Juglans regia* L. grown in Moldova

Physical properties studied	Values	Harvest year		Mean 2010-2011
		2010	2011	
Nut length, mm	Minimum	15.5 ± 0.45	14.5 ± 0.47	15.0 ± 0.55
	Maximum	2.55 ± 0.70	2.70 ± 0.53	26.3 ± 0.60
	Limit values	15.5 – 25.5	14.5 – 27.0	15.0 – 26.3
Nut diameter, mm	Minimum	12.5 ± 0.68	11.5 ± 0.48	12.0 ± 0.62
	Maximum	18.5 ± 0.56	22.0 ± 0.43	20.25 ± 0.72
	Limit values	12.5 – 18.5	11.5 – 22.0	12.0 – 20.25
Shape		11.6 – 17.1	10.4 – 20.1	11.0 – 18.6

The data obtained indicate that the diameter walnuts investigated during the two years, the harvest years 2010 and 2012 was within the limits 11.5 ... 22.0mm; length limits values in 14.5 ... 27.0mm.

Table 2 includes the minimum, maximum and average fruit, nut kernels, and indicators kernel ratio, shell thickness.

It was found that walnuts have investigated various dimensions and physical parameters. So we can assume that the chemical composition of walnuts was diverse.

Table2. The physical parameters of walnut

Harvest year	Values	Fruit weight, (g)	Kernel weight, (g)	Kernel ratio (%)	Shell thickness (mm)
2010	Minimum	11.88	4.78	40.03	0.93
	Maximum	13.68	6.89	50.4	2.0
	Average	12.88	4.82	37.5	1.47
2011	Minimum	13.02	3.85	29.7	1.1
	Maximum	14.01	7.04	50.3	1.9
	Average	13.19	5.02	38.4	1.5
2010 - 2011	Limit values	11.88 - 14.01	4.78 - 7.04	29.7 - 50.4	0.93 - 2.0
	Average	13.01	4.02	30.9	1.5

Quality walnuts *Juglans regia* L. during storage was evaluated following chemical and physical parameters: acidity value (AV), peroxide value (PV) and water activity (Aw) (Table 3). These indicators determine the quality of those walnuts and nut products. It was found that with prolonged storage duration increased values of these indicators.

Table 3. Physic chemical parameters studied nuts, grown in Moldova

Harvest year	During storage, months	AV, mg KOH/g	FA, % acid oleic	VP, meqO ₂ /kg	A _w , %
2010	20	2.403 ± 0,05	1.21 ± 0,05	13.7 ± 0,2	0.500
2011	9	2.299 ± 0,10	1.16 ± 0,10	8.3 ± 0,5	0.491
2010-2011		2.299 - 2.403	1.16 - 1.21	8.3 -13.7	0.401 - 0.500

CONCLUSION

This work is a source of information on physic-chemical walnuts *Juglans regia* L, grown in Moldova, as well as these parameters change during storage. This result can serve as information for the food industry including oil extraction from walnuts.

The data indicate that fruits nuts of these cultivars vary greatly in term of nut weight, kernel weight, kernel ratio, shell thickness, moisture content. The variability observed in these parameters is due to both genetic and environmental parameter describing fruit properties, mineral composition and nutritional parameters including chemical composition and weight distribution of the endosperm.

Experimental data proves that storage affect the physic-chemical parameters of walnuts *Juglans regia* L. Results indicate the values will increase VP, AV, A_w, so there was a decreases quality nuts. Therefore, we recommend for production walnuts oil nuts with 1 year shelf life.

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