

PROSPECTS OF USING WALNUT OIL CAKE IN FOOD INDUSTRY

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Abstract: The walnut is an extraordinary culture, profitable and useful from all points of view. From the economic point of view, there is no doubt that the walnut is a profitable culture: all its “anatomic” parts can be used: first of all, the walnut kernels, then, its barks are used for dye preparation, the leaves and buds are used in pharmacology and cosmetics. Walnut with rich nutritious value is one of the high-quality protein and fat sources. During complex processing of walnuts are obtained different products as kernel, oil, oil cake which can be used in different fields. In nutrition a special interest represents walnut oil cake with is a high protein product.

Keywords: walnuts, walnut oil cake, cold pressing, storage methods.

Introduction

According to UN Comtrade calculations, Moldova is the 6th largest world exporter of shelled walnuts in terms of value and the 5th largest exporter in terms of volumes constituting \$46.7 million and 9,077 tons respectively.

Walnut Oil, same as walnut kernels, is a great source of unsaturated Ω -3 fatty acids. This kind of acids cannot be produced by human body, but is essential for healthy metabolism. Several scientific studies reported about improvement of immune system, benefits against cardiovascular diseases of consumption of products, that contain Ω -3 fatty acids. Were performed studies were on enriching foodstuffs with walnut oil [1].

After pressing, is obtained cake (meal) rich in proteins, in which a lot of essential amino acids, especially lysine. According to the content of lysine (6.2 g per 100 g) walnuts protein are superior to the eggs protein. Of minerals walnuts fruits contain potassium, calcium, iron, cobalt salts, phosphorus and sulfur. Walnut meal is obtained as a byproduct of solvent extraction from this material. The literature study shows that walnut oil cake is currently used mainly in dairy feeds but is potentially available for poultry feeding [6]. The goal of this study was to explore the use of walnut oil cake in food industry at global and national levels. The authors propose methods for storage and processing of oil cake for its use in food industry.

Walnut production at national level

The Moldovan Walnut Sector has enjoyed significant development since its conception in the early 1990s. Proceeding from the above estimates about the size of walnut orchards in Moldova and from the trade activity registered during the last years, it was estimated that the current supply-base area for the Moldovan walnut industry is about 10,000 ha of which approximately two-thirds are publicly owned trees and one-third household plantings. Nowadays, there are tens of companies in Moldova, which deal with walnut kernel gathering, and the export volume, for the whole country, constitutes 10 000 tons (Figure 1).

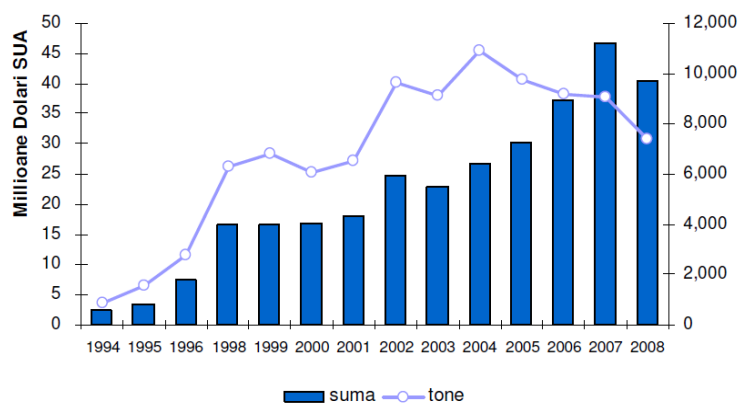




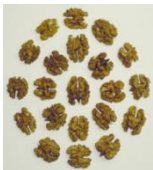

Fig. 1. Export of walnut kernels from Moldova, 1994-2008

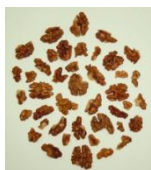
Figure 1 represents Moldova’s shelled walnut exports from 1994 to 2008. The exports grew steadily over the years reaching \$46.7 million in 2007. Growth was interrupted in 2003 because of an international crises provoked by the increased supply of cheap product from China and India. Starting with 2004, Moldovan export volumes started to decrease while the value enjoyed a steady growth of approximately 20% per annum. This could be explained by the increasing world prices during this period and the quality changes happening in the Moldovan processing industry oriented to add maximum value locally.

Walnuts use in food industry

In food industry are used walnuts, derived products (walnut oil), green walnuts (core and shell) and green leaves. Walnut kernel (both roasted and green) is used in the raw state as fruit. At industrial level walnuts are widely used as auxiliary component prepared to give flavor and aroma, as well as the basic ingredient in the preparation of products rich in terms of nutrition and energy, with beneficial and curative properties on the human body. Therefore, walnuts can be utilized as ingredients of many foodstuffs such as bakery products to enhance the nutrition value and sensory properties of the final product [2]. In industry walnut kernels are carefully selected and sold in the following fractions:

Table 1. Fractions of walnut kernels for sale

| | | | |
|---|---|---|---|
|  |  |  |  |
| Category A: Extra Light Halves | Category B: Extra Light Quarters and Pieces | Category C1: Light Amber Halves | Category C2: Light Amber, Quarters and Pieces |



Category C: Light Amber Mix



Category D1: Industrial Walnut / 1 (Amber)



Category D2: Industrial Walnut / 2 (Dark)

Green walnuts with pericarp, walnuts membrane septum are used to obtain concentrates of vitamins and polyphenols [3]. From walnut leaves are prepared teas. The components of fruit are used to prepare strong drinks: vodka, cognac, liqueurs. Walnuts are receiving increasing interest as a healthy foodstuff because their regular consumption has been reported to decrease the risk of coronary heart disease [4,5]. By pressing the walnut kernel (cold or warm) is obtained walnut oil. which qualities were noted since 1931 when researchers found that walnuts are a great source of vitamin C. Walnut oil is rich in omega 3 fatty acids, vitamin B1 , B2, and B3, vitamin E and niacin. Other proposed benefits of walnuts include their high content of protein, magnesium, copper, folic acid, potassium, fiber and vitamin E [6].

Prospects of using walnut oil cake in food industry

The average yield of extraction of walnut oil cold pressed is between 50% and 60% of the net quantity of nuts used, depending on the technical performance of used oil press. The shells may or may not be removed prior to extraction, the kernels may or may not be toasted, there may be one or two mechanical pressing steps, cold or hot.

A French two-step process has been described as yielding two types of oil meals: the first pressing gives a relatively high fat (20%) and medium protein (32%) oil cake, whitish and containing kernel fragments, while the second pressing yields a darker (yellow-brown) product, containing less kernel particles, less oil (10-12%) and more protein (37%) (Brunschwig, 2003). Data collected in France tend to support the notion that French walnut oil meals contain generally high levels of protein, low levels of fibre (5-10) (due to prior dehulling) and highly variable levels of oil (6-45%) (Figure 2).

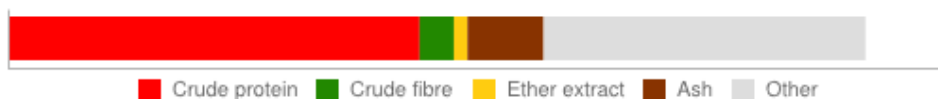


Fig. 2. Chemical composition of walnut oil cake, % DM [7]



Fig. 3. Chemical composition of walnut oil cake, % DM [7]

American processes seem to yield products containing much less protein (13-17%) and fat (6-10%) and a high amount of fibre (crude fibre 27-33%) [7]. The "muller" meal is reported to contain twice the amount of fibre and half the protein, a composition barely more nutritious than than of walnut shells. A representative meal contains about 13%

protein, 10% fat and some 35% crude fiber. In figure 3 is represented chemical composition of walnut oil cake.

In any case, the main nutrients of walnut oil meal - protein, fat and fibre - are extremely variable: the nutritive value of walnut oil meal ranges between that of the high-energy walnut kernels (50-60% oil) and the high fibre, low-energy shells. Cold pressing is welcomed because the obtained meal retains physico-chemical and organoleptic qualities.

The walnut meal is used to dust cakes, integrate into dough and batter, is incorporated into pastas, added to fillings, and used as a thickening agent in sauces. The nutritional value of walnut oil meal depends on the extraction process.

Rancidity is one of the first signs of deterioration in walnuts this is because they are rich in oil containing unsaturated fatty acids. High temperature and humidity, as well as sunlight, favour the development of rancidity in kernels, and the best storage conditions are therefore low temperature, low humidity and little or no light. In order to facilitate handling and transportation, the meal is often compacted through pressure and temperature treatment.

The walnut oil cake is a byproduct resulting from the production of walnut oil. Due to its nutritional properties it is important to introduce the oil cake human nutrition. To preserve the special qualities meal requires optimal storage conditions. In perspective will be researched various methods of storage (and their modes) as freezing, drying, vacuum packaging, allowing for long term preservation of walnut oil cake qualities.

References

1. Eugenia Boaghi, Cristina Popovici, Olga Deseatnicova. Can we use the walnut (*Juglans regia* L.) oil for the production of mayonnaise? The Annals of the 78th scientific conference of the young scientists, PhD and students "Scientific achievements of young scientists for solving problems of nutrition humanity in the XXI century", National University for Food Technologies, 2-3 April 2012, Kiev, Ukraine, p. 293.
2. Mexis, S.F.; Badeka, A.V.; Riganakos, K.A.; Karakostas, K.X.; Kontominas, M.G. Effect of packaging and storage conditions on quality of shelled walnuts. *Food Control* 2009, 20, 743–751.
3. Cristina Popovici, Eugenia Boaghi, Olga Deseatnicova, Artur Macari. Effect of solvent on solid-liquid extraction of phenolic compounds from walnut (*Juglans regia* l.) membrane septum. Technical and scientific conference of young scientists of Technical University of Moldova. 20 noiembrie 2011, p. 23-26.
4. Davis, L.; Stonehouse, W.; Loots du, T.; Mukuddem-Petersen, J.; van der Westhuizen, F.H.; Hanekom, S.M.; Jerling, J.C. The effects of high walnut and cashew nut diets on the antioxidant status of subjects with metabolic syndrome. *Eur. J. Nutr.* 2007, 46, 155–164.
5. United State Food and Drug Administration. Qualified Health Claims: Letter of Enforcement Discretion-Walnuts and Coronary Heart Disease. 2004.
6. Anderson, K.J.; Teuber, S.S.; Gobeille, A.; Cremin, P.; Waterhouse, A.L.; Steinberg, F.M. Walnut polyphenolics inhibit in vitro human plasma and LDL oxidation. *J. Nutr.* 2001, 131, 2837–2842.
7. F. H. Kratzer Pran Vohra, Feeding value of walnut meal for turkey poults, California agriculture, march, 1974.