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Functional and Nutritional Health Benefit of Cold-Pressed Oils

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ABSTRACT

Kachi ghani or cold pressed it means pressing the oil grains with force and oil is extracting. It is processed at lower temperature does not alter the properties of the oil which contains a higher phenolic content, flavour, aroma and nutritional value. The nutritionally valuable bioactive components of cold-pressed oils were presented such as: tocopherols, sterols, carotenoids and phospholipids with oxidizing properties partly removed from refined oils or destroyed during the industrial refining. Cold pressed oil does not contain Trans fatty acids and are naturally having cholesterol, it has great importance for cooking and skin care requirements. In the present study, it was emphasized on functional food and nutritional characteristics of cold-pressed oils and the method of its extraction, factors influencing the quality attributes of the obtained oils were also discussed.

Key words: Cold pressed oil, functional benefits, nutritional benefits, bioactive compounds, trans fatty acids

INTRODUCTION

In recent years, the consumers are paying more and more attention to those aspects of their life which improves its quality. Therefore, the diet, in addition to the way and conditions of life, is one of the key factors influencing human health and well-being. The consumers for fear of chemical remnants in the food and those environmentally-conscious choose the oils unaffected by drastic thermal treatment. Recently, an increase in the consumption of cold-pressed edible oils has been observed. In terms of nutritional values, these oils are more beneficial than the refined oil¹ (Fig. 1).

Cold-pressed oil has nutritionally valuable food components like tocopherols, sterols, carotenoids, phospholipids with oxidative properties which partly get exposed from refined oils or destroyed during the refining process²⁻⁵.

The quality requirements imposed both by the oil industry and more health-conscious consumers continue to increasing trends force the oil producers to improve their technology. It was achieved through the application of the most advanced technologies in different fields in order to obtain fats with the best health, nutritional and utilitarian attributes. Moreover, the ecological and economic aspects of fat production have been emphasized by Płatek⁶.

The traditional wet extraction methods used by rural communities is regarded as inefficient in terms of oil recovery and oil yield which is below the range of plant oil content found in the literature.

Ali *et al.*⁷ described that conventional methods, namely, solvent extraction and mechanical expression, are the well-known and widely practiced methods of oil extraction. Most of the seed oils are extracted either by both methods or by combination of the two. This classification may also include interpretation of that not being used widely. In spite of the extraction method, extracted and refined oil must be evaluated for its physico-chemical properties to determine its application or usage.

The health contributing effect of functional food should be well documented with scientific research, European Commission Community Research⁸, that has defined more often the consumers turn to natural food with health promoting qualities, termed functional food, if it's beyond nutritional values, proved to be therapeutic potentials on one or more of the body functions leading to health promotion and disease prevention. Attributes of conventional food and beneficial effects must possess in functional food with values to be consumed with balance diet as an integral part of every day's diet, which neither pills nor capsules.

The division of functional food was made taking into consideration its impact on physiological functions of the human body: food reducing the risk of circulatory diseases, cancer and osteoporosis developments; food regulating appropriate functions of GI tract and food aimed at combating stress-related symptoms. Besides, food was divided

into the natural food rich in a particular nutrient, food enriched with health promoting components and food deprived of anti-nutritional values. More the term of functional food has been applied to the products containing n-3 polyunsaturated fatty acids (PUFA), phytosterols and fiber⁹⁻¹¹. Cold-pressed oils provide a wide range of bioactive substances, such as tocopherols and tocotrienols, free and esterified sterols, hydrocarbons (squalene), triterpene alcohols, carotenoids and chlorophylls along with colourants being valuable nutrients are called functional food. It contains n-3 and n-6 PUFA or sterols having biologically active effects¹²⁻¹⁴. Dzięcioł and Przysławski¹⁵, Sacks¹⁶ and Ziemiański¹⁷ demonstrated that the presence of the essential ingredients in oils is dependent on the quality, grain type and its varieties which may serve as a functional food. The health beneficial capacities and practical applications of oil were determined by their chemical composition. It has been found that the rapid intake of these oils can result in obstruction of diseases, like, Ischemic Heart Disease (IHD), obesity hypertension due to presence of antioxidants like tocopherols and polyphenol compounds (significantly increased anti-oxidative properties).

PROPERTIES OF COLD-PRESSED OILS

Tynek *et al.*¹⁸ have emphasized on cold-pressed oils that can be valuable edible oils which do not contain harmful constituents to humans and free from microbiological contamination and metals (Fe, Cu) accelerating the oxidation of oils and chlorophylls usually removed during the refining process (Fig. 2, 3).

Recent technology of obtaining oils through cold-pressing using nitrogen atmosphere or supercritical carbon dioxide extraction allows retaining them almost in an intact state. Their chemical composition is richer in by-products with a higher level of biological and anti-oxidating activity. The



Fig. 1: Cold press edible oil health benefits



Fig. 2: Cold press extra virgin mustard oil



Fig. 3: Different types of cold compressed extra virgin oils

presence of antioxidants inhibiting deleterious changes and an insight into their activity and stability is of paramount importance not only for food technologists but also for nutritionists¹⁹.

Apart from the cold-pressing parameters, the technological attributes of raw material play a crucial role in obtaining the final quality of these oils. The cold-pressed oils can be produced from grains (including seeds), fruit, nuts or germs. Special consideration should be given to Cold-pressed rapeseed oil. In spite of modest market share of cold pressed oils, they are gaining more popularity day by day among consumers who prefer natural, traditional and low processed food. In certain European Countries like Poland, Germany, Switzerland, Austria and Great Britain, cold-pressed rapeseed oil has grown in popularity as it possesses characteristic taste with a hint of nuts, distinct aroma and intensive colour²⁰. The cold-pressed rapeseed oil in contrast to the refined one is less resistant to oxidation, unlike olive oil (extra virgin). The rape seeds of low quality i.e., too moist, unripe, contaminated, damaged and those already undergoing hydrolytic and oxidative changes result in obtaining low quality oil characterized by low oxidative stability. The most valuable in terms of sensory attributes are oils from high-quality raw materials subjected to minimum oxidative changes^{20,21}.

Cold-pressed oils have a distinct aroma and taste. They are used both as an additive to fresh food and as an ingredient enhancing various products (e.g., bread, mayonnaise) with specific bioactive nutrients. Oxidative stability is a crucial quality marker of cold-pressed oils containing natural antioxidants (carotenoids, tocopherols, sterols, phospholipids,

phenol compounds, among others) as well as undesirable substances with oxidative properties (e.g., chlorophylls, metals) being removed in the refining process²².

The appropriate measures taken to protect oils just after their extraction using various procedures such as inhibition or elimination of oxygen in contact with oils, light, metal ions promoting oxidation (Fe, Cu) as well as the inclusion of substances which reduce oxidation processes in oils permit to extend the shelf-life. Consequently, various kinds of antioxidants were utilized. Due to many health reasons associated with synthetic antioxidants a trend towards their limited application has been observed. However, great importance was attached to the employment of natural antioxidants or their identical alternatives. Their versatile antioxidant activity may result in the autooxidation of plant-derived oils rich in omega-3 PUFAs and while being introduced to diets they can render therapeutic effect on the human body thanks to their capacity to scavenge free radical²³.

Wroniak *et al.*²⁴ in their study demonstrated that cold-pressed sunflower and rapeseed oils and their refined counterparts did not produce statistically significant differences in terms of their stability in the Rancimat test. On the contrary, the differences between cold-pressed soybean oil and extra virgin olive oil and refined oils were statistically significant. The extra virgin olive oil was characterized by the longest induction time and the sequence of other oils was as follows: refined rapeseed oil, cold-pressed soybean, cold-pressed rapeseed oil, refined olive oil, refined soybean oil, refined and cold-pressed sunflower oil.

PRODUCTION OF COLD-PRESSED OIL

Cold-pressed oils are extracted from seeds and fruit of oil bearing plants having more than 15% oil content. The exception was the oil extracted from amaranthus seeds whose fat content is 4.9-8.1%. The quality attributes of oils or plant-derived fats are greatly affected by plant taxonomy and classification. Based on type of raw material and botanic classification oils can be obtained from seeds (e.g., canola, flax, poppy, borage, hippophae or sea-buckthorns, pumpkin, blackcurrant, grapes), fruit (e.g., plums, hippophae or sea-buckthorns), nuts or kernels (e.g., hazel, walnuts, argan) or sprouted grains (e.g., wheat germs)²².

Cold-pressing is one of the most ancient natural ways of oil extraction. This method is generally recognized as safe (GRAS) since no solvents are used. It is performed using hydraulic or expeller (screw-type) press equipped with a cooling system. This method is relatively easy and inexpensive.

STAGES OF COLD PRESSING

Seed defatting: It enables to obtain a better quality of oils (brighter colour, higher oxidative stability) and meal, though it is not used on an industrial scale due to some technical difficulties. This process improves the oil quality by reducing the content of chlorophylls and other substances such as metals, pesticides permitting through the hulls or shells into the oil.

Seed fragmentation (crushing): It permits to extract the oil by partial destruction of the seed structure and hull, opening some cells, enlarging the oil spillage area and lowering the cell resistance. Crushed seeds should immediately be subjected to further processing as the quality and stability of cold-pressed oil is time-dependent.

Seed conditioning: Roasting in the ovens by exposing the pulp to the temperature of approx. The 100°C and if necessary moisturizing it to the optimal humidity. This treatment positively affects oil extraction; however, it negatively influences the oil and meal quality.

The high quality of cold-pressed oils is affected by many factors. It is utmost importance the raw material quality i.e. purity, uniformity, integrity and ripeness. Harvest time is another key determinant. In addition, the raw material quality is impacted by pre-pressing activities including crop gathering, drying, storage and post-harvest handling.

Studies were conducted on cold-pressed oils extracted in the hydraulic press indicated that the only advantage of whole seed conditioning (roasting) before extrusion was a reduced level of lipid hydrolysis i.e., no significant changes in acid value in proportion to milled seeds. They suggested seed milling and application of conditioning temperature at 60-80°C in order to obtain the optimal oil quality and cause desirable changes (an increase in extraction yield and oxidative stability) while reducing the negative trends in taste deterioration, elevated acid and peroxide value and higher amount of pigments. Based on the findings it was discovered that in screw-type press used for cold pressing regardless of a nozzle diameter it was possible to extract oils in mild conditions without any changes in primary and secondary oxidation state (number) in fatty acid content and oxidative stability of the obtained oils. However, the extraction efficiency was low whereas the residual fat content in pomace (cake) high. Before pressing the seeds, exposing it to an elevated temperature causes a substantial increase in extraction yield in combination with an increase in colour darkening, lipid hydrolysis and pheophytin content.

Table 1: List of bioactive compounds present in plant-derived cold-pressed oils

Sr. No.	Oils derived from	Characteristic bioactive compound	Average content or percentage content in oil
1.	Olive oil	Oleic acid (n-9)	55-83%
2.	Rapeseeds	Brassicasterol, Plastochromanol-8	104 mg/100 g 55-80 mg/100 g
3.	Flax seeds	α -linolenic acid Linoleic acid Plastochromanol-8	51.8-60.4% 34.8-55.3 mg kg ⁻¹ 15.2-17.4%
4.	Camelina seeds	Sterols Carotenoids Linoleic acid Eicosenic acid	475.4 mg/100 g 147.5 mg kg ⁻¹ 30-40% 15%
5.	Eveningprimrose seeds	Tocopherols Sterols Carotenoids	713.6 mg kg ⁻¹ 510.9 mg/100 g 160.1 mg kg ⁻¹
6.	Borage seeds	α -linolenic acid Linoleic acid	8-14% 70-75%
7.	Raspberryseeds	α -linolenic acid	16-27%
8.	Grape seeds	Tocopherols Chlorophylls	1410.2 mg kg ⁻¹ 2.8 mg kg ⁻¹
9.	Amaranthus seeds	α -linolenic acid	29.1-32.4%
10.	Pumpkin seeds	Linolenic acid	50.1-77.8%
11.	Rice bran	Squalene	6-8%
12.	Sesame seeds	Squalene	0.9%
		γ -oryzanol	1.5-2.9%
		Sesamin	0.5-1.1%

Bioactive compounds present in cold-pressed oils and their health beneficial properties. The cold pressed oils to contain triglycerides (approx. 95%) and small amount of diglycerides, monoglycerides and free fatty acids (FFA). The rest consists of non-glycerol fraction unsaponifiable matter demonstrating a wide range of quantitative and qualitative modifications. These are phospholipids, tocopherols and tocotrienols, free and esterified sterols, hydrocarbons (squalene), triterpene, alcohols, carotenoids and chlorophylls along with colour-forming compound being valuable nutrients. The presence of these components was dependent on raw material quality, plant genotype along with climatic conditions of growth and cultivation techniques used. The content of fatty acids both in cold-pressed and refined oils does not change drastically whereas the content of non-glycerol fraction was reduced. During the chemical refining process, the unsaponifiable matter is partly removed e.g. tocopherols, sterols or polyphenolic compounds. Table 1 presents bioactive compounds present in the selected cold-pressed oils.

Thus cold-pressed oil exhibiting nutritionally desirable omega-6/omega-3 ratio (reaching 2.3) is rapeseed oil. Cold-pressed oils did not show any presence of trans fatty acid isomers, whereas in refined oils subjected to refining and deodorizing processes these isomers occurred at approx. 1%.

The current studies conducted in the oil processing sector are aimed at obtaining technology that guarantees the

production of high quality and health enhancing oil with low level wastes harmful to the natural environment, improved raw material and by-product utilization and better energy-efficiency.

CONCLUSION

Cold-pressed oils have been accepted as a functional food due to the presence of bioactive substances. The content of EFAs, sterols or tocopherols may prevent or retard the lifestyle diseases such as cardiovascular diseases, cancer and obesity or have anti-aging properties. Recently, numerous studies have been undertaken to evaluate the nutritional values of various cold-pressed oils. Chemical composition of cold-pressed oils determines their health contributing potential and their application. The ingestion of cold-pressed oils should be appropriate in order to balance the intake of omega-6 and -3 PUFAs.

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