

## The Use of Rapeseed for Medicinal Purposes

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**Abstract:** Rapeseed are many components and ingredients in the human diet that were not very popular before, but nowadays play an important role in the prevention and treatment of some diseases that the world civilizations fight with. Due to the numerous compounds with health properties that some plants contain, they have become necessary for a normal lifestyle. In this respect, the rapeseed is one of the plants that are used for medicinal purposes, for the benefits that its oil brings to the human body. Rapeseed oil is an important agricultural crop, grown primarily for oil production. Oilseed rape is the second-highest yielding oil crop worldwide and accounted for 14% of world major oil crop production. Rapeseed oil has been shown to be useful not only for food and oil industry, but also for recovery, health improvement and it contributes to some disease prevention. Micronutrients in rapeseed as polyphenols, tocopherols, phytosterols and phospholipids may have benefits in reducing atherosclerosis, according to the latest researches. The usage of rapeseed oil as a food product as well as in the production of non nutrition products such as greases, lubricant oils and especially diesel fuel may increase the rapeseed production in the world (Fulton, 2004).

**Keywords:** human health, medicinal use, natural remedy, rapeseed.

### Introduction

The rapeseed (Colza, Canola) (*Brassica napus* L.) is being cultivated from antiquity in the Mediterranean area and the Middle East, and it was known 2000 years ago in India, China and Korea. In Romania, it started to be cultivated in 1840-1850 and was brought from England (Muntean et al., 2008).

According to the data published in 2020, in MADR (Ministry of Agriculture and Rural Development), the cultivated area was 342.6 thousand hectares and average production of 2124 kg ha<sup>-1</sup> (MADR, 2020). According to data published by FAO in 2020, worldwide, the cultivated area was around 35,5 million hectares and the average yield was 2039 kg ha<sup>-1</sup>.

Nowadays, the rapeseed occupies a very important place in world economy as a source of vegetable oils. After soybean and palm oil rapeseed is the third most important source of vegetable oil in the world (Piazza and Foglia, 2001). The seeds contain 42-48% oil used both in human nutrition and industry: textile, adjuvant for pesticides, hydraulic fluids. From 100 kg of rapeseeds can be extracted around 30-35 kg of oil (Muntean et al., 2008). In west of Europe, like Germany, the rapeseed mixed with butane is used as fuel for diesel engines which is more economical than diesel, it is biodegradable and friendly with the environment by limiting pollution and fights the greenhouse effect (Berea, 1998). In the European Union, 77% of biodiesel production is produced from rapeseed oil (Zetkova, 2013)

More than that, the rapeseed has a lot of advantages for crops: it increases the fertility of the soil, prevents soil erosion, it is a great honey plant (can be produced 80-90 kg of honey from one hectare) (Borcean, 2003).

The seed oil of *Brassica napus* is commonly used for medicinal or food purposes. In Iranian conventional medicine, the root components of Colza have been used for healing functions as diuretic, anti-scurvy, anti-inflammatory of bladder and anti-goat (Zargari, 2001). Lin et al., 2013 show a number of potential health benefits of canola oil (Figure 1).

In the last years it was noted the fact that the rapeseed oil can be used also in many chronic diseases as arthrosclerosis, it decreases the cholesterol level and can prevent some types of cancer (Ellegard et al., 2005; Ramirez and Singletary, 2009).

## **Taxonomy and physiology of the plant**

The rape belongs to *Brassicaceae* (*Cruciferae*) family, *Brassica* genus and covers 34 species from which only 5 are being cultivated. For the oil production is being cultivated 2 species: Colza and Naveta (Muntean et al., 2008).

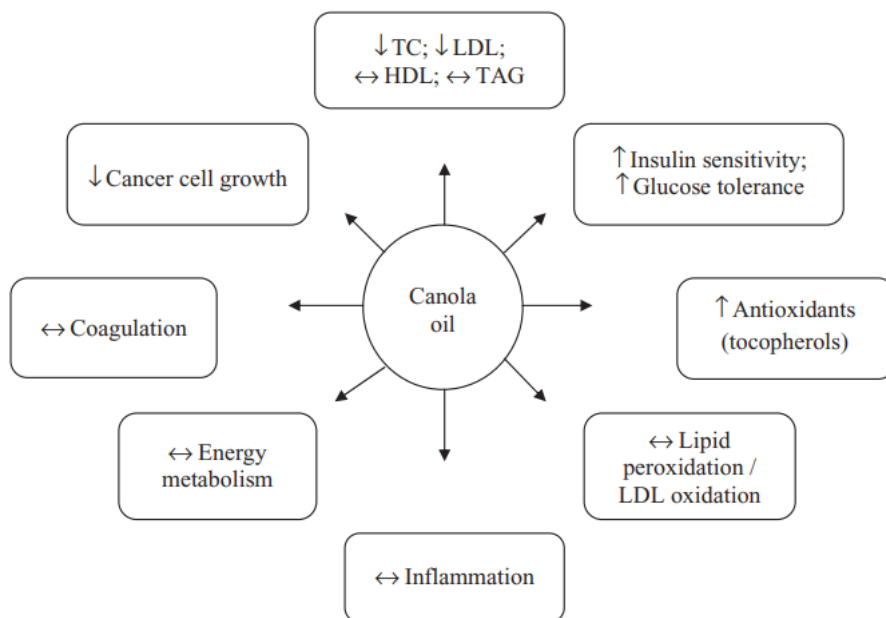


Figure 1. Effect of canola oil on health – related risk factors (TAG - triacylglycerol, LDL - low-density lipoprotein, TC- total cholesterol, HDL - high-density lipoprotein)

*Brassica napus* has yellow flowers, thin stem, long and branched. It is an annual plant, with pivoting root, the stem is branched, with the high of 1-1,5 meters, drop resistance and the degree of branching is influenced by the density of the crop.

The flower is hermaphrodite and the flowering begins from the bottom up. The fruit is a siliqua with 10-30 seeds (Muntean et al., 2014).

The seeds of rape Colza are globular, in black or reddish color, with grassy taste. The fat content is 45-50%. Vegetation period for autumn varieties is about 270-300 days and for spring varieties is about 110-130 days (Muntean et al., 2008).

### **Chemical Composition and nutritional value**

Rapeseed is a significant source of edible oil and has an important place in the global economy, as source of vegetable oils. The seeds contain 42-48% oil used for food industry (Muntean et al., 2014).

The research made by Kowalska et al. (2019) indicates that the oilseed rape is used for production of protein concentrates,

preparations classified as healthy food, rich in minerals, fiber and compounds with anti-neoplastic properties. Their study is based on analyses revealed from fifteen oilseed winter rape cultivars and demonstrates that the oilseed rape seeds can be a valuable source of protein and minerals for various branches of the food processing industry comparing to raw materials traditionally used so far, such as seeds of soybean, pea, lupine, wheat, triticale, rye.

According to the data in the below table, the rapeseeds contain 45-50% fats, 17,7-19,6% brut protein and 12,4-18% non-nitrogenous extractive (Zamfirescu, 1965). Varieties grown in Romania contain 38,4-45,5% oil.

Table 1

Chemical composition of rapeseed

Component element	Kellner-Fingerling	Baussingault	Birnaure	Orobcenko	Yumiko Yoshie-Stark
Water	7.3	11.0	5.2-7.3	5.2	7.01
Brut protein	19.6	17.4	19.6-23.3	23.78	19.0
Fat (oil)	45.0	50.0	37.2-49.6	38.01	54.2
Non-nitrogenous extractive	18.0	12.4	17.8-19.1	-	-
Cellulose	5.9	5.3	5.8-7.4	9.00	-
Ash	4.2	3.9	4.1-5.2	5.52	3.60

The rapeseed contains fatty acids in different amounts as: oleic acid, linoleic acid,  $\alpha$ -linolenic.

El-Beltagi and Mohamed, showed in a study from 2010 based on five different rapeseed cultivars a significant variability in their composition as the oleic acid ranged from 56.31 to 58.67%, linoleic acid from 10.52 to 13.74%,  $\alpha$ -linolenic acid from 8.83 to 10.32% and erucic acid from 0.15 to 0.91%. They reported small variations in the glucosinolate profile. In addition, total phenolic contents varied from 28.0 to 35.4  $\mu\text{g/g}$  dried weight.

Canola was developed in the 1970<sup>s</sup> by a plant-breeding program designed to develop cultivars of oilseed rape with low levels of glucosinolates and erucic acid. Canola oil is made from selective bred plants that contain less than 2% erucic acid. *Brassica napus* and *Brassica rapa* are two examples of these cultivars, which contain lower erucic acid and glucosinolates and they are very different from

high erucic acid rapeseed oil in chemical, physical and nutritional properties (Dewick, 2003).

Canola seed contains about 40% of oil and this oil must contain less than 2% of erucic acid. The erucic acid in large quantities can be harmful to the human body. In Canada there were created new breeds of rapeseed which can be considered without erucic acid (Berea, 1998)

The fatty acid of the rapeseed oil has a unique composition and makes it different from the other vegetable oils. It has a rich amount of linolenic acid (8-12%) compared to other vegetable oils such as sunflower oil, olive, corn (Economou et al., 1991)

More than that, the rapeseeds are low-fat vegetables that contain calcium, iron, vitamin C, carotene and other nutrients. The calcium amount in rapeseed is the highest from all the green leafy vegetables, and the vitamin C content in rapeseed is more than twice that of cabbage (Shi et al., 2009). Rapeseeds also contain dietary fiber which can be combined with cholesterol in food to help in reducing the absorption of lipids (Zhang et al. 2010).

### **Uses of rapeseed in medicinal purposes**

Consumed regularly, the rapeseed oil has anti-inflammatory effect on the blood vessels, an essential role in good function of the brain (due to the fatty acids), prevents depression and Alzheimer disease. Its qualities recommend it first of all as natural remedy for the following diseases: reduces hypertension, decrease the cholesterol level, prevent the formation of blood clots, decreases the risk of initiating the cardiovascular disease (Muntean, 2014).

Also, the seeds were reported to be used for treatment of hepatic and kidney colic. Colza seeds are also used in the Eastern folk medicine as bronchial cathartic (Evans, 1997; Zargari, 2001). The anti-bacterial proprieties it has, makes the rapeseed helpful against *Helicobacter pylory*, the cause for gastritis and peptic ulcers, but also associated with enhanced risk of gastric cancer (Fahey et al., 2002; Haristoy et al., 2003; Galan et al., 2004).

The most important discoveries have been made for the following disease:

**Cardiovascular disease** (CVD) is the largest cause of premature death which leads to increase the disability and has high costs in medical assistance. It also causes the arteriosclerosis, which is the most common pathologic process of the cardiovascular disease.

The oxidant stress factors, lipid abnormalities (Castelli et al., 1986) and also chronic inflammation (Castelli, 2005) have a crucial involvement in initiation and progression of atherosclerosis.

The study made by Hulunbuir Jinjian Biochemical Ltd demonstrated that the oilseed rape improved with micronutrients can reduce the risk of atherosclerosis (Xu et al., 2011). This study was made on forty male rats which weighed at first between 150-170 g and were kept individually in a controlled temperature at 24 °C with access to food and water. After the rats were adapted to that environment for one week, the animals were split randomly in groups of 10 and were fed with rapeseed oil improved with micronutrients. After 10 weeks, the rats were killed under anesthesia and were taken blood tests. The result showed that the rapeseed oil improved with these micronutrients (tocopherols, phytosterols and phenolic compounds) help in preventing and reducing the cardiovascular disease.

**Total serum cholesterol** can also be reduced by the consumption of rapeseed oil. It has been reported that rapeseed oil decrease cholesterol absorption by 11% compared to olive oil and increase excretion of cholesterol, bile acids and their sum as sterols by 9, 32 and 51% compared to olive oil (Ellegard et al., 2005).

**Cancer prevention.** *Brassica* genus contains Sulphur compounds called glucosinolates. The glucosinolates have been widely studied for their beneficial effects on human and animal nutrition. They are also responsible for the flavor of *Brassica* vegetables. The Cancer protective properties of *Brassica* vegetables have links to the glucosinolates. Isothiocyanate products formed from glucosinolates may regulate the development of cancer cell and block the cell cycle (Cartea et Velasco, 2007).

In the study “Glucosinolates in *Brassica* vegetables” made by Verkerk et al. are provided significant evidence that *Brassica* vegetables and their constituents have the ability to reduce colon cancer risk by detoxification of enzymes. Following this study, it was shown that the protective effects of these vegetables come from their content of glucosinolates and isothiocyanate, but also from other components such as antioxidants (vitamin C).

**Improve brain function.** The rapeseed oil is the second most important oilseed crop after soy and has been investigated to be an alternative to the oil soy, in producing liposomes. These are used to enrich the functional foods with healthy and biological

compounds, including antioxidants, vitamins, minerals and enzymes (Marin et al., 2018)

**Protective from oxidative stress.** Oxidative stress, a cellular imbalance between production and elimination of reactive oxygen species (ROS), is thought to underlie the pathogenesis of various diseases (Traka and Mithen, 2008). The rapeseed oil optimized with micronutrients might contribute to prevent atherogenesis and are important for functional food.

**Blood pressure.** The consumption of rapeseed oil as the only dietary fat for 13 weeks increased the systolic blood pressure, for the rats studied by Naito et al. in 2000. The study revealed that the rats' diet contained 10% rapeseed oil for a period of 13 weeks and increased also the plasma level of Na<sup>+</sup> and lipids and decreased the level of K<sup>+</sup>, compared to the soybean oil (Naito et al., 2000).

## Conclusions

- Studies and experimental research on animals demonstrated the fact that the oilseed rape has benefits on the human health; it prevents and cures some diseases. The rapeseed oil has anti-inflammatory effect on blood vessels, it reduces hypertension, decrease the cholesterol level, prevent the formation of blood clots, decrease the risk of initiating the cardiovascular disease (Muntean, 2014). The Sulphur compounds called glucosinolates, that were found in *Brassica* genus are beneficial to prevent some types of cancer.
- The rapeseed oil has the lowest concentration of saturated fatty acids from all the edible oils consumed frequently and a high level of monounsaturated fatty acids (Johnson et al., 2007, Jahreis and Schäfer, 2011). More than that, it is also rich in linoleic and  $\alpha$ -linoleic acid, being the closest in fulfilling the basic requirements of essential fats in the body (Seppänen -Laakso et al., 2010).
- The rapeseed has become more popular due to its qualities which recommend it first of all as a natural remedy.

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