

# Hemp and Flax Seeds and Oil in Modern Nutrition

## An Overview

### Summary

Both flax and hemp seeds are rich plant sources of omega-3 fatty acids and other valuable nutrients. Flax oil, with a very high content of the essential omega-3 fatty acid ALA, is an excellent supplement but flavor and stability limit its uses. Hemp oil offers a more balanced fatty acid spectrum, including the higher omega-3 SDA; the seeds also provide a reasonably well-balanced protein, significant amounts of vitamin E complex compounds and trace minerals. Their composition, taste, and culinary diversity make hemp oil and seeds a promising staple in the growing North American market for “natural foods”.

### The “Omega Issue”

Flax (linseed) and hemp, two seed crops grown in the Canadian Prairies, are finding growing demand in the North American market for “natural foods”. Both are primarily promoted and consumed as plant-based sources of “omega-3” fatty acids. What makes omega-3 intake so important? Mounting scientific evidence links many common ailments to an imbalance in the intake of omega-3 vs. omega-6 fatty acids in the typical

Western diet: too much omega-6 and not enough omega-3. The typical North American diet contains 10 to 30 times more omega-6 than omega-3 fatty acids, yet nutritional scientists recommend maintaining a ratio of between 2:1 to 4:1, i.e., a much higher relative omega-3 consumption.

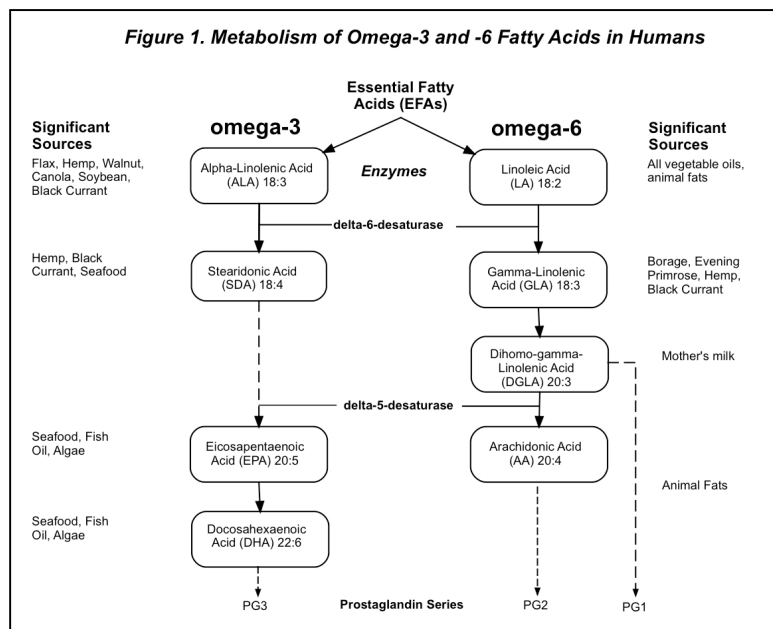
Many clinical studies implicate this imbalance as a key factor in the rising rate of inflammatory disorders and have demonstrated the benefits of a balanced dietary omega-3/omega-6 intake. Such benefits include a reduced risk of atherosclerosis, sudden cardiac death, and some forms of cancer, alleviation of the symptoms of rheumatoid arthritis, mood improvement in bipolar disorders, and optimized development in infants. It is this proven need to increase relative omega-3 intake that

ultimately drives public attention to, and growing demand for, plant and animal based sources of omega-3 fatty acids.

Figure 1 visualizes the metabolic pathways for the nutritionally two most important families of fatty acids, starting with their respective “essential fatty acids” (EFAs), i.e., alpha linolenic acid (ALA) and linoleic acid (LA). EFAs cannot be produced by our body and, like vitamins, must be consumed with the diet.

Not all omega-3s are equally “potent”. Clinical studies show that even healthy persons convert only a fraction of

ingested ALA to the ultimately needed omega-3s EPA and DHA and their respective “prostaglandins”.

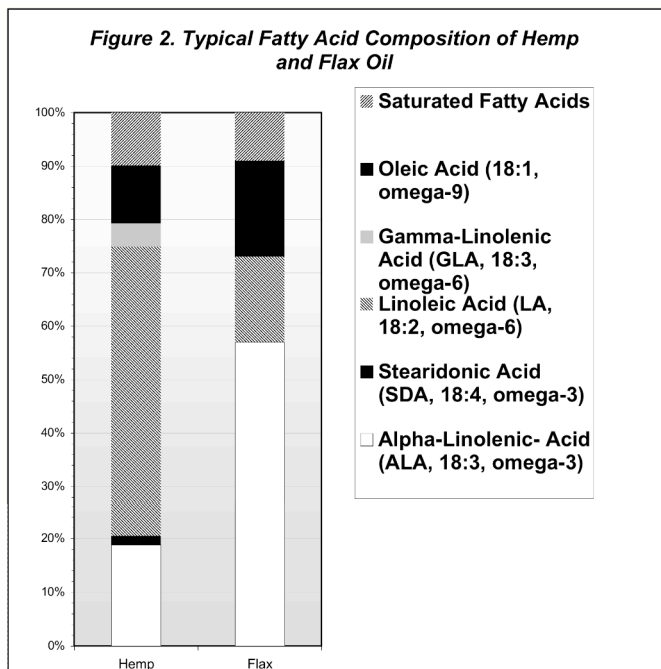


The “metabolic bottleneck” is the conversion of ALA to SDA by the delta-6-desaturase enzyme, with an efficiency of only 20%. This enzyme’s effectiveness in producing “higher omega-3s” is further inhibited in older people and by diabetes, obesity, excessive omega-6 intake, and elevated levels of insulin, coffee, trans fatty acids, and alcohol. These common conditions further aggravate omega-3 deficiency symptoms, while direct intake of SDA, DHA, and EPA would alleviate them. Unfortunately, only marine organisms contain DHA and EPA. These fatty acids are commonly consumed with fish or fish oil supplements. The predominant omega-3 fatty acid supplied by plants is ALA, while only a few seed oils, among them hemp as the only multi-use oil, also offer SDA, an omega-3 fatty acid with a “potency” about 5 times that of ALA.

## Hemp and Flax Compared

Of all common dietary oils, flax has the highest ALA content, about 55%. Hemp oil contains, depending on plant variety, 15-20% ALA, followed by walnut (~14%), canola (~11%) and soy oil (~7%). Its high ALA content makes flax oil an excellent ALA supplement, which can balance dietary omega-3 shortfalls. But because the triple-unsaturated ALA is highly reactive, flax oil also has a limited shelf life, turns rancid and develops off-flavors faster than other oils, even when refrigerated, and has limited culinary uses. Furthermore, the taste even of fresh cold pressed flax oil is not to everyone’s liking. Finally, flax oil does not provide the higher omega-3 SDA.

In comparison, hemp oil offers the two EFAs in a very desirable LA to ALA ratio of about 3:1 and contains both SDA and GLA in nutritionally relevant amounts, thus making up for a potentially impaired fatty acid metabolism. Figure 2 compares the fatty acid composition of “Finola”, a hemp variety commonly grown in the Canadian Prairies to that of flax oil, suggesting hemp oil as a



nutritionally balanced source of plant-based omega-3. The nutty, round taste of fresh, cold-pressed and unrefined hemp oil also gives it a wide range of culinary uses – in dressings, sauces, soups. Thus, unlike many other specialty oils, such as borage and evening primrose, which provide higher concentrations of a particular fatty acid but can only be used in supplements and are more costly, hemp oil combines a wide range of food uses with a nutritionally desirable fatty acid composition. The only limitation: hemp oil should not be used for frying. Its unique fatty acid spectrum also suggests hemp oil as a source of omega-3 for vegetarians, vegans, and those concerned about the notorious contamination of seafood with anthropogenic pollutants, such as mercury and polychlorinated biphenyls (PCBs).

Flax seeds and hulled hemp seeds (hemp nuts) are also available as staple foods or used as ingredient in food products. Because they are otherwise indigestible, flax seeds must be cracked, milled, or thoroughly chewed. Flax seeds provide a reasonably valuable protein, plus dietary fibers and lignans, i.e., phytochemicals valued for their anticarcinogenic potential. In comparison, hemp nuts

are readily digestible, and they offer a more balanced protein than flax along with their attractive fatty acid spectrum. Hemp nuts also contain significant amounts of tocopherols, i.e., compounds of the Vitamin E complex, and trace minerals, such as magnesium, iron, and manganese. Finally, with a delicate, nutty flavor, particularly when lightly toasted, hemp seeds offer a wider range of culinary uses – in granola, breads and pastry, soups, sauces and dressings, home-made sweets and many others.

Hemp food producers claim, with good reason, that hemp nuts and oil provide the human body much of what it needs without the caloric ballast of nonessential nutrients. This claim is supported for example by Health Canada's new regulations for health claims in food labeling. Under these rules, products containing sufficient amounts of hemp nut or oil can claim that they may reduce the risk of heart disease, solely on the basis of their composition. To qualify for such labeling, foods must be low in saturated and trans-fatty acids, provide sufficient omega-3 fatty acids, as well as significant quantities of vitamins and minerals per food serving.

Hemp food products now available on North American retail shelves include cold pressed hemp oil, salad dressings, nutrition bars, granola, nut butter, protein powders, chips, flour, breads, cookies, meatless burgers, pasta, and frozen desserts. It is the combination of nutritional value, flavor, and culinary versatility that distinguishes hemp seed and oil from the respective flax products, even though the latter can also be nutritious additions to a healthy diet. The North American's hemp foods industry's recent growth at more than 20% per year suggests that the combined effect of these factors will continue to grow hemp's presence in the North American natural foods market.

### ***Joint Industry Activities on Hemp Foods***

Formed in 2003, the Canadian Hemp Trade Alliance (CHTA) represents all relevant Canadian hemp seed processors, food manufacturers and distributors, as well as many of their partners in the U.S. Industry members have previously conducted research projects to control contamination of seeds by residues of THC, i.e., the main psychoactive ingredient of marijuana and also present in small quantities in industrial hemp varieties grown in Canada. Jointly, the industry has also prevailed in U.S. federal court against an attempt by the U.S. Drug Enforcement Administration (DEA) to ban hemp foods containing even trace amounts of THC. Under the auspices of CHTA, industry members recently initiated several joint projects to assess and publicize nutritional attributes and benefits of hemp products and to address quality control issues related to storage and shelf life of hemp foods. These projects are supported by federal and provincial governmental programs, such as the Agricultural Research and Development Initiative (ARDI).

### **About the Author:**

Gero Leson, D.Env. is an environmental consultant in Berkeley, CA, who has specialized in the food and technical uses of agricultural crops, such as flax, hemp, and coconut. Dr. Leson initiates and coordinates research and development projects. He serves as scientific advisor to the California Hemp Trade Alliance (CHTA) He can be reached by e-mail at [geroleson@sbcglobal.net](mailto:geroleson@sbcglobal.net).