

Hemp Foods in North America: Status and Joint Industry Research

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In 2005, Canadian farmers have planted about 8000 ha of hemp, virtually all of it for the production of seeds for food and body care products. Predominant varieties are Finola, USO 14 and the Canada-bred Crag, all rather early varieties with low fiber yields, thus readily harvested with combines. Canadian hemp acreage has increased consistently from 1,300 ha in 2001 and doubled compared to 2004. It is still below the peak 14,000 ha of 1999. Yet, unlike then it is not driven by speculation but almost entirely by the strongly growing demand for hemp foods in the North American market for “natural products”.

What is driving that growth? For one, Canadian farmers, processors and the manufacturers of hemp foods have learned how to produce high quality, good tasting raw materials from hemp seeds, including the hulled seeds (nuts), cold pressed oil and, increasingly the protein rich seed cake – or flour. Food manufacturers have developed a wide range of retail products. They include the nuts, oil and protein flour, energy bars, granola, hemp nut butter, pasta, ice cream. Manufacturers have also been very successful placing their products in retail stores. It is now possible to buy hemp food products in numerous grocery stores across the U.S. and Canada – not only in the often quoted “Whole Foods” markets, North America’s most successful natural products chain. Hemp foods have also benefited from the involuntary publicity created by the 2001 attempt of the federal Drug Enforcement Agency (DEA) to ban the sales of foods “containing any amount of THC”. That rule was challenged in U.S. federal court by a concerted effort by the hemp industry – led and largely funded by Dr. Bronner’s Magic Soaps. After winning several stays of execution, the industry ultimately prevailed in 2004 with its argument that food and body care uses of hemp seeds had always been legal under federal law and that the DEA has no authority to set arbitrary “zero limits” for THC in food. This legal battle was covered by media across the country and brought the very existence of “hemp foods” to the attention of many consumers.

Last not least, consumers are buying hemp foods because of their proclaimed desirable nutritional profile and the projected health benefits. Yet, these benefits, while taken for granted by industry, have not been well established and communicated to the nutritional science community and to consumers. This is most obvious in the area of “fatty acid nutrition”, particularly the issue of omega-3 fatty acids. Flax, canola, walnut and fish are routinely named, in articles in food and wellness magazines and the general press, as good sources of these crucial fatty acids, which are generally deficient in western diets. Hemp, on the other hand, while it offers a uniquely balanced omega-3/omega-6 ratio and significant levels of GLA and SDA, “higher” omega-3 and –6 fatty acids, is virtually never mentioned in that context. This is due in part to the growing reluctance of food and health journalists to reiterate unsupported claims by suppliers about the blessings of hemp foods – there have just been too many miracle foods already. Rather, journalists are increasingly looking for authoritative publications in peer-reviewed journals.

While several papers on hemp seeds and oil have been published in journals, they focused on documenting the fatty acid composition of hemp oil, some provided limited information on other relevant constituents, such as tocopherols and phytosterols and one study by Callaway et al. reported on the results from a clinical trial, which documented that using hemp oil vs. olive oil appears to improve symptoms of eczema. Yet, to date there has been no peer-reviewed comprehensive overview of the nutritional profile of hemp seed derivatives and authoritative assessment of the health benefits such a profile may provide. Consumers also increasingly ask hemp food suppliers about the levels of minerals, vitamins and phytochemicals in hemp foods but rarely receive satisfactory answers.

North American hemp food companies have realized that, in order sustain the current steep growth of the industry, they must establish and effectively communicate key attributes of their products, i.e., its balanced nutritional profile and projected health benefits, to the food trade and mainstream audiences. To that end, several companies joined forces in 2004 to initiate, under the auspices of the Canadian Hemp Trade Alliance (CHTA), a comprehensive hemp food research program with the following key objectives.

- To establish comprehensive nutritional profiles of hemp seeds, oil, nuts and flour for macronutrients, minerals, vitamins and phytochemicals across all established and emerging commercial hemp varieties in Canada.
- To assess, based on these nutritional profiles, the potential health benefits provided by hemp foods.
- To evaluate the factors controlling hemp seed stability and quality and establish guidelines for production, storage and processing.

Ultimately, the results from this program will establish the authoritative references both hemp food companies and consumers need to answer questions, such as the following:

- How complete with respect to amino acid composition is the protein in hemp seeds and in the increasingly popular “protein powder”, and how digestible is hemp protein?
- How variable is the fatty acid spectrum of hemp oil with respect to the content in SDA and GLA and are the amounts of these fatty acids sufficient to effect the formation of pro- and anti-inflammatory prostaglandins?
- Can consumption of realistic amounts of hemp nut enhance the supply of minerals and vitamins deficient in many people’s diet, such as magnesium?

During 2004, we have developed the scope of the overall research agenda, submitted four proposals for support from various Canadian government programs and received approval for all of them. We have also raised part of the needed co-funding from industry. Finally, we have compiled the large number of samples of seeds, oil and flour needed for the study and almost completed the first part of the work, the analysis of samples for macronutrients and assessment of the composition and digestibility of hemp protein. The key elements of the CHTA's overall hemp food research program, as it currently stands, are as follows:

1. Hemp Protein Study

A characterization of macronutrients and protein of hemp seeds and its derivatives. This includes analysis for macronutrients (fat, protein, carbohydrates and carbohydrate fractions, i.e., sugars, starch, soluble and insoluble fiber) and concurrent analysis of the amino acid composition and protein digestibility of hemp seeds, nuts and flour, covering all relevant commercial varieties. This work is cofunded by the Agricultural Research and Development Initiative (ARDI), a joint federal and Manitoba provincial program, which has generously supported the industry's research, particularly of the THC issue, in the past. The work commenced in March 2005. It is coordinated by Dr. Jim House at the University of Manitoba, Winnipeg. Results are expected by the end of 2005.

2. Vitamins, Minerals and other Phytochemicals

Characterization of hemp seeds, nuts, oil and flour for their fatty acid spectrum and all relevant vitamins, minerals, phytochemicals (phytoestrogens, such as lignans and isoflavones, phytosterols, and other minor compounds). This work, which involves analysis of about 100 samples, is coordinated by Dr. Roman Przybylski at the University of Lethbridge, Alberta. Roman has conducted research on hemp and other oil seeds since the mid 1990s. We have obtained co-funding for these projects from ARDI and the Saskatchewan government's ADF program and expect complete results by early 2006.

3. Assessment by Expert Panel

Complete results from these two studies and other evidence on the nutritional composition of hemp seeds and limited clinical research with hemp foods will be presented to a panel of experts on various aspects of nutritional health. The panel will review the compositional information, compare to other sources of these nutrients and develop conclusions and recommendations on the use and benefits of hemp foods. CAFI, a program by Agriculture and Agri Food Canada, the federal ministry of agriculture, co-funds this program element.

Once concluded, we will publish the results of nutritional characterization and health benefit assessment in one or several comprehensive reports and in peer-reviewed journal(s). Summaries of the program's main findings will also be made available to industry and media for

dissemination to target audiences, particularly the food and health trade press in North America and consumers.

In addition to the above agenda, the CHTA currently also coordinates research on hemp food quality control.

4. Product Stability and Preservation

The hemp food industry continues to face another crucial need, i.e., the control of product quality and prevention of deterioration of the sensitive hemp seeds and oil during production, storage and food preparation. A key need is to identify, which of the known contributing factors – including initial product quality, oxygen, temperature, light – have the largest impact on quality, which measures should companies focus on to maintain quality and what should and shouldn't consumers do when using hemp foods to extend shelf life of hemp products and avoid formation of unpleasant rancidity flavors and possibly unhealthy by-products? The research will involve exposure of several oil, seed and flour products to typical processing, storage and food preparation conditions. Index parameters, such as the peroxide and anisidine values, and conjugated dienes will be monitored over extended time periods to determine the kinetics of degradation and the key factors controlling product quality. The work will be conducted by the lab of Roman Przybylski at the University of Lethbridge, receive cofunding from ARDI and begin in later 2005.

5. THC Content

Keeping the THC content in hemp foods low to avoid potential conflicts with workplace drug testing in the U.S., is no longer the key quality issue it was in the late 90s. Test results from several sources suggest that Canadian hemp oil now virtually always contains less than 5 mg/kg (ppm) of THC, the limit set by the industry's voluntary "Test Pledge (www.testpledge.com)" program. Oils containing even less than 1 ppm are now routinely found. Apparently, the use of low-THC varieties, particularly the Ukrainian USO varieties, and the careful drying and cleaning of seeds after harvesting, has allowed processors to achieve these levels. Hemp nuts have even much lower THC concentrations because the hemp-contaminated shell has been removed. An extensive, independent 2004 survey of cannabinoids in commercial hemp seeds and oil by Health Canada's "Health Products and Food Branch" found that:

Of the 29 hemp oil samples tested by HC, the highest THC level found was 7.7 ppm, 25 samples met the Test Pledge limit of 5 ppm and 15 samples had THC levels below 1 ppm. Of the 27 samples of hulled seeds, the highest recorded THC level was 0.06 ppm and 22 samples had THC levels below 0.02 ppm, i.e. all samples were far below the 1.5 ppm Test Pledge limit. These figures are in good agreement with self-monitoring results generated by industry as required by law.

Keeping THC levels low will be an ongoing priority for the industry. The federal

governments in both the U.S. and Canada will, at some point propose risk-based THC limits. These may be somewhat lower than the Test Pledge limits – and industry must be ready for it.

Funding

Total cost for the above program will be about US\$160,000, of which \$40,000 must be cash contributions by industry. Dr. Bronner's Magic Soaps has, as on other projects, generously provided the seed money needed to initiate the work and several other Canadian and U.S. firms have pledged contributions. Yet, more support is needed to fund the entire project. We are confident that, as the North American hemp industry grows, becomes profitable and companies are realizing the benefits of joint R&D projects fundraising for joint R&D programs will become, they will contribute to program costs.