



BC Centre for Disease Control  
An agency of the Provincial Health Services Authority

Environmental Health Services

# Food Issue

## Notes from the Field

### Flax seed oil manufactured from home press

Request received from:	Regional Health Authority
Date of request:	October 8, 2013
Issue (brief description):	Review of FSP to produce flax and sunflower oil using piteba oil screw press for sale at farmers markets

*Disclaimer: The information provided in this document is based on the judgement of BCCDC's Environmental Health Services Food Safety Specialists and represents our knowledge at the time of the request. It has not been peer-reviewed and is not comprehensive.*

#### Summary of search information

1. Internet sources (Piteba site).
2. Ovid (define your search terms): CAB and FSTA abstracts using "flax seed oil" n=261 in combination with "food safety" n=115,964; "HACCP" n=3264; and "microorganisms OR standards OR processing OR food safety OR food safety plant foods OR food processing mp." n=180,723.
3. Other. FoodNetBase and Encyclopedia.

#### Background information

Most fats and oils require some processing to be edible, crude extractions can range from pleasant to offensive. <sup>1</sup> Generally, processing is used to remove impurities, such as gums, free fatty acid (FFA), pigments, metal complexes, and other undesirable materials.<sup>1</sup> Oilseeds are processed by one of three types of processes: (1) expeller or screw press extraction, (2) prepress solvent extraction, and (3) expander-solvent extraction. A typical oil extraction process involves cooking of the oilseeds before extraction, such as screw press extraction (see Figure 1). In commercial operations, several refinement steps occur to improve overall flavour and content.

Lower temperature extractions are typically used for flaxseed screw press operations to improve the quality and phospholipids, the temperature value quoted in one text was 35 to 60°C (95 to 140°F).<sup>1</sup>

The Piteba extraction equipment process appears to be a very simple screw press extraction process. Videos and links to their site are found at these locations:

<http://www.youtube.com/watch?v=co2JG5q89wM> and <http://www.piteba.com/eng/FAQ.html>.

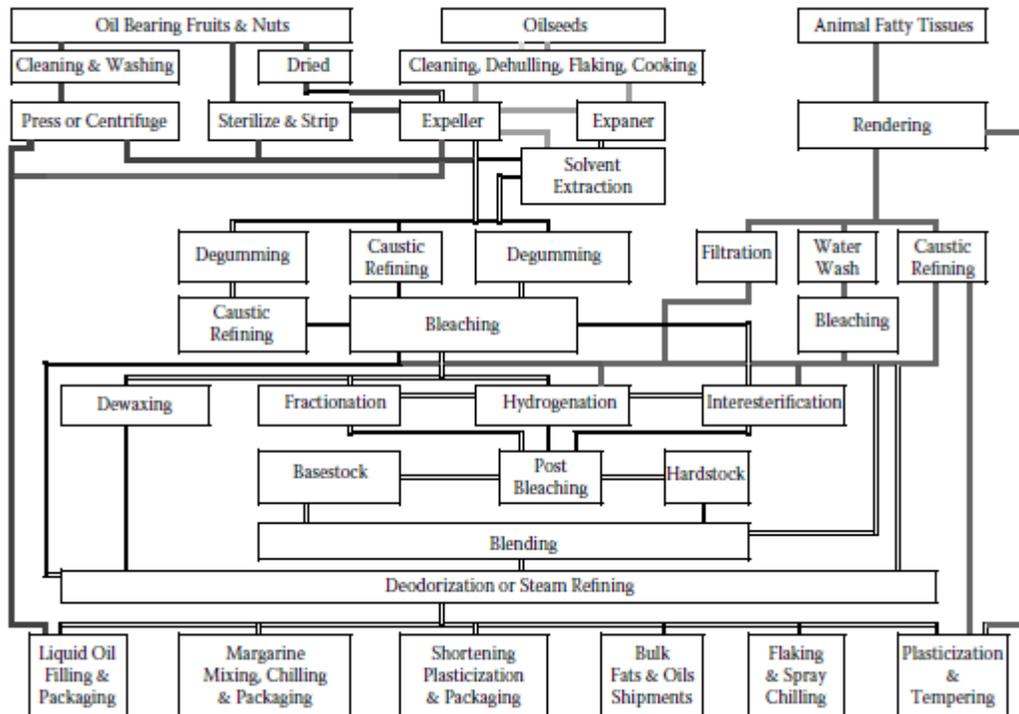


Figure 1  
Overview of fats and oils processing <sup>1</sup>

The general overview of the process described by the operator is to add a very small amount of water to sunflower seeds and store in the refrigerator for two days. No water hydration step is shown for flaxseeds. Following this the seeds are directly put through the screw press extractor, bottled and refrigerated. A best before date is given 5 days after the packaging and pressing date. No cleaning, washing, heating or boiling of the seeds prior to extraction are mentioned in the recipe.

Sunflower oils are prepared from the seeds of the plant *Helianthus annuus* L.<sup>2</sup> Crude oil extractions contain some phosphatides and mucilaginous matter, and physical refining is practiced. Sunflower oil is valued because of its high linoleic fatty acid and absence of linolenic fatty acids, making it good for spreads. Waxes in the seeds are responsible for the turbidity that develops when oils are held at temperatures below 70°F (21.1°C) – considered a cosmetic issue.<sup>2</sup> Flaxseed oil, also known as linseed oils, are prepared from the seeds of the plant, *Linum usitatissimum*. Flaxseed is high in polyunsaturated fats (73%), comprised of α-linolenic fatty acids (57%) and linoleic acid (16%).<sup>3</sup> After a crude extraction, other than the mixed triglyceride fatty acids present, 2% or more nonglyceride components may be present in the oil. These include phospholipids, tocopherols, sterols, resins, carbohydrates, pesticides, proteins, trace metals and pigments.<sup>2</sup>

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*What are the risks associated with fresh pressed sunflower and flaxseed oil products*

In the literature the main hazards associated with oil products are chemical and physical; no mention is given to biological concerns. However, that is likely due to commercial refinement of oil that removes protein impurities, waxes and water from oil. A summary of potential physical, chemical and biological hazards are shown in the table below.

	Physical	Chemical	Biological
<b>General hazards</b>	Seed casings, stones, dirt, leaves <sup>1</sup>		<i>Clostridium botulinum</i>
<b>Sunflower Oil</b>		Allergen	
<b>Flaxseed Oil</b>		Cyanide <sup>3</sup> Linatine, Phytic acid <sup>3</sup>	

Although the operator does not intend to perform chemical extractions to keep the product fresh and not degrade oils through decolourizing, deodorizing or through use of other refining processes, there are some other procedural steps in a commercial process that control for some of the hazards listed above. The main procedural steps absent from the recipe submitted are listed below.

*Procedural gaps to control for food safety hazards*

- No washing or disinfecting of seeds before grinding or use;
- No heating or cooking of seeds before grinding;
- No separation step to remove surface water from oil before bottling;
- No filtering of extracted oil to remove water through clay membrane; and,
- No filtering of extracted oil to remove physical particulates

Physical hazards: Physical hazards present on the seeds, such as dirt, sand and grit could be removed by washing. There is no mention of dehulling the sunflower seeds prior to the screw press step; seed shells and stems/leaves or other physical hazards potentially present in the oil could be easily removed using a fine metal mesh strainer.

Bacterial Hazards: Bacterial hazards may be present in soil on seed casings. Without a washing/disinfecting or cooking step, these remain on the whole seeds. Commercial methods for oilseeds include a cooking or heating step. This process step would remove vegetative bacteria (biological) hazards present. An anaerobic environment, as exists within oil, means that *Clostridium botulinum* is a hazard to be considered. In a commercial operation, refining steps remove proteins, waxes, gumming agents and other water soluble fractions from the oil. In this process, proteins (that may act as a nutrient source for harmful bacterial and as a potential allergen) and water sources may be available in the finished oil product, albeit at very low concentrations. The operator plans to refrigerate the product, and this will act as microbial hurdle to control the bacterial hazard of botulism, if present,

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as long as the oil is kept refrigerated with a short shelf-life. It is not known what other bacterial hazards may occur, however, since seeds may be exposed to soil, one may presume *Bacillus cereus* (a facultative anaerobe) and *Clostridium perfringens* (an anaerobe) might also be considered.

However, no target refrigeration temperature is given in the recipe, and would be needed to define the critical limit. A review of herbs and vegetables in oil found that outbreaks involving botulism were associated with Group I (heat resistant) *C. botulinum* strains, and these can be controlled at temperatures below 10°C (40°F).<sup>4</sup> However, the authors note that to control for Group II *C. botulinum* refrigeration temperatures must be below 3.3°C (38°F), further, performance of domestic refrigerators is unknown. They postulate that refrigeration alone would not be sufficient to control for *C. botulinum* in herb and vegetable oil products. Guidance for shelf-life based on a refrigeration temperature of between 5 to 10 °C, as the sole control for *C. botulinum* is given as less than 4 days.<sup>4</sup> In this recipe, the best before date is given 5 days after the preparation date, for a total of 6 days.

Chemical hazards: There are some reports in the literature that sunflower may elicit an allergenic response.<sup>5</sup> However, sunflower is not currently listed as one of the allergen groups in Canada.<sup>6</sup> The label will state what seed(s) the oil is made from. It is expected that anyone with allergenic sensitivity to sunflower oil would avoid this product if labelled correctly. Flaxseed oil does contain other chemicals, such as linatine and phytic acid, but not in levels high enough to be a concern.<sup>3</sup> Cyanide present in flaxseed products is eliminated by cooking, however since the seeds will not be roasted prior to oil extraction, this hazard will remain. However, there is no evidence that healthy populations should be concerned with the levels of cyanide naturally occurring in flaxseed.<sup>3</sup>

The operator has also given detailed good manufacturing instructions on cleaning and disinfecting the screw-press equipment, and these appear to be adequate.

#### *Previous guidance on crude oilseed extractions from British Columbia*

None.

#### *Guidance on crude oilseed extractions (elsewhere in the world)*

Crude pressed sunflower oils are commonly sold in China and India without prior heat treatment.<sup>7</sup> A general guideline for vegetable oil processing includes requirements for HACCP prerequisites such as Good Manufacturing Practices, chemical hazards (not needed for this operation) and consumer complaints.<sup>8</sup>

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## Recommendations from BCCDC

It is a little difficult to fully assess the potential hazards in this product, as very little information could be found on crude extractions of fresh pressed oils. Although the overall risks appear to be low and although the operator has outlined a very clear process, and has incorporated controls for this product, refrigeration and a best before date, there may be other process steps that could be added to improve the overall safety of the product. In our opinion, this is a low risk product, but it is not a zero risk product, and therefore recommend the following:

1. Seeds should be screened for dirt, sticks and other physical debris before using
2. Sunflower seeds could be hulled and seeds separated before using to reduce risk of seed hull splinters getting into the final product
3. Oil could be grossly refined by the following:
  - a. Pass through a fine metal mesh screen to remove particulate debris
  - b. Separate out water from oil components
4. Include the statement “keep refrigerated at all times” or something similar on the label.
5. Reduce the shelf-life to 4 days (from 6 days)

## Update from Health Canada Bureau of Microbial Hazards Risk Assessment Division

This food issue was reviewed by Health Canada, and the following advice was given November 2013 (personal communication, e-mail).

Our comments are focused only on the microbiological hazards associated with this product. Health Canada does not have specific guidelines on flax/sunflower oil production. Cold-pressed oils (such as some olive oils) are common in the marketplace and do not usually have an aqueous phase that would permit the growth of *C. botulinum*. Oils have very little to no available water to allow for bacterial growth.

As long as good manufacturing and proper sanitation/hygienic practices are satisfied along with an added separation step to remove any water, we do not foresee any microbiological issues with this sunflower-flax seed oil mixture. If these conditions were met, refrigeration is not necessary for this product from a safety perspective.

Please note that it is the manufacturer’s responsibility to ensure that its products are in compliance with all applicable statutory and regulatory requirements, including the provisions of the Food and Drugs Act and Regulations.

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