

Policy Brief

November 2024

1495



UNIVERSITY OF
ABERDEEN

The Rowett Institute

M. Neacsu N. J. Hayward, J. Duncan, K. Taylor,
and W.R. Russell

¹ The Rowett Institute, University of Aberdeen,
Foresterhill, Scotland, UK;

Contact: m.neacsu@abdn.ac.uk

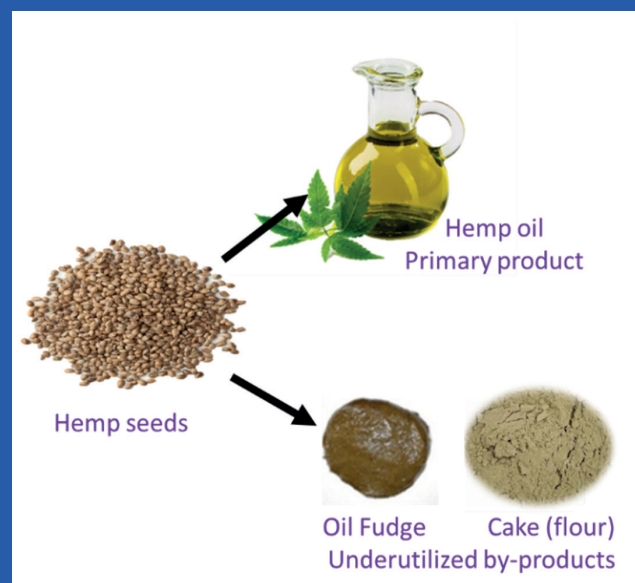
Development of foods from hemp seeds and co- products to help deliver dietary requirements



Increasing dietary diversity promotes agricultural diversity. By inclusion of sustainable sources of macronutrients from environmentally beneficial food crops is a strategic response from the food sector towards mitigation of greenhouse gas emissions (GHG) to support Scotland achieve its net-zero targets.

Research at the Rowett Institute was pivotal for reintroducing hemp to Scottish agriculture and for the first time to produce hemp for food production. In 2022, hemp oil was produced for the very first time on a commercial scale in from hemp seeds grown in NE Scotland.

This report demonstrates the suitability of hemp seed products and co-products to be used to reformulate staple and popular foods while improving their nutritional profile contributing towards nutritional claims and to deliver nutritional needs and recommendation for Scottish population.



Key Points

Agricultural hemp can successfully be grown in Scotland and could contribute to agricultural diversification, delivering a new break crop for Scotland and could be part of the strategic solution to meet the ambitious target of net-zero GHG emissions by 2045.

Hemp seed has an excellent nutritional profile and can contribute to dietary macronutrient diversification (i.e. new sources of protein, fat and fibre) and to contribute to meeting the dietary requirements of the Scottish population.

The hemp seeds represent a much-needed sustainable feed replacement for soya bean.

Hemp oil is a source of healthy fat with an omega-6 to omega-3 ratio (3 to 1) ideal for human health.

The co-products from hemp oil production, the hemp cake and oil fudge are versatile ingredients used to prepare staple foods such as bread and milk or popular meat formulations such as patties and sausages, boosting the dietary fibre and increasing the omega-3 fatty acids in the Scottish diet.

Figure 1: Primary product and co-products generated during hemp seed cold press for oil production

Reformulated hemp-rich foods



Hemp Bread: contains hemp cake

Low in saturated fat and sugar. Very low in salt, high in fibre and a source of protein. High in omega-3 fatty acids, rich in manganese, phosphorus, magnesium, iron and zinc. This bread was efficient in beneficially modulating gastric enzymes involved in maintaining healthy concentrations of sugar in blood



Hemp Milk: produced from hemp oil fudge

Low in saturated fat and sugar. Very low in salt, source of protein and high in omega-3 fatty acids. Rich in phosphorus, manganese, magnesium iron and zinc. One glass of hemp milk (250 mL) contains approx. 500 mg of myoinositol. The consumption of 500 mg of myoinositol per day has been associated to contribute to mental performance.



Hemp Burger: contains hemp cake

This high-fibre burger has a mixed source of dietary protein and could contribute to meeting dietary recommendations for fibre. Inclusion of plant protein reduces the carbon profile of the final product. It is also low in sugar and a rich source of omega-3 fatty acids, as well as phosphorous and zinc.



Hemp oil with superior stability: produced from hemp oil

Hemp oil is a source of healthy fat; being rich in omega (9, 6 and 3) fatty acids. The formulated oil has a significantly increased oxidative stability, approximately three time higher than the unformulated oil. This was achieved only by using natural ingredients, which also enriched the oil with several bioactive molecules such as vanillic acid, rosmarinic acid, carnosic acid and carnosol.

Main findings and recommendations:

- By replacing 15% of the wheat flour and 20% of beef meat with the hemp cake (flour) we have delivered healthier food products without compromising the palatability of the products. Both reformulated products, the bread and burger had similar scores in terms of taste, texture and appearance with the unformulated products when they were tried by the human volunteers.
- Both the hemp bread and hemp burger are high protein and high fibre food products. Only one slice of the hemp bread (65 g) delivers 17% of the recommended intake (RI) for dietary fibre, 11% of the RI for protein and 21% of the RI for omega-3 fatty acids. One serving of hemp burger (100 g) delivers 37% of the RI for dietary fibre, 45% of the RI for protein (from plant and animal sources) and 15% of the RI for omega-3 fatty acids.
- One glass (250 mL) of the reformulated "hemp milk" is a low-calorie dairy alternative drink which delivers 100% of the RI for omega-3 fatty acids, magnesium, phosphorus, manganese, and 52% of iron and 36% RI for zinc. This innovative drink formulation could be further explored for its health benefits due to the high content of myoinositol, a bioactive with reported beneficial effects on sugar metabolism and mental performance.
- The successful increase in the oxidative stability of the hemp oil expanded its shelf life and versatility for use as a vegetable oil. The presence of extra bioactives in the formulated oil promotes it for further development of healthier food reformulations. Ten grams of hemp oil deliver 2 g of omega-3 fatty acids; the quantity required to be consumed daily for maintenance of normal blood cholesterol concentrations.



Funding: This research was funded by the Scottish Government's Rural and Environment Science and Analytical Services Division (RESAS) Strategic Research Programme; Theme B, Hemp: a climate resilient crop for the future of Scottish agriculture; Project Reference: RI-B1-01 and Supply-Chain-Driven Food and Drink Reformulation to achieve Scotland's Dietary and Climate Targets Project RI-B5-03.

