

# Pulses and Weight Control

## Pulses can help maintain a healthy body weight

- Contain complex carbohydrates like fiber and resistant starch
- Nutrient dense source of protein
- Low in fat

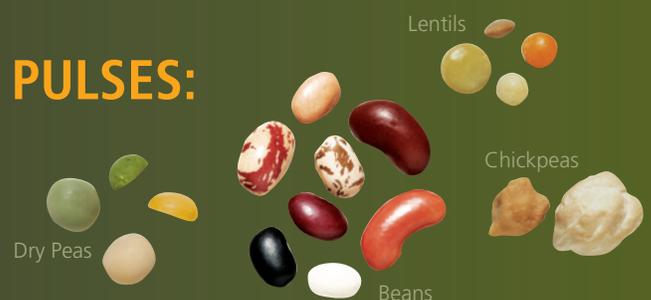


In addition to achieving energy balance and improving the overall diet, the WHO recommends that people increase consumption of **legumes (pulses)** to prevent obesity.<sup>1</sup>

**Pulse Canada** 

Research suggests that pulses may help to increase satiety over the short term and weight loss associated with energy restriction over longer periods.<sup>2</sup>

## PULSES:



## Why Pulses are Suitable for Weight Control

**FIBER** - Pulses contain 14-32 g/100 g of fiber of which 55-88% is insoluble and the remainder is soluble.<sup>3</sup> Soluble viscous fibers in particular aid in satiety by slowing the transit of digested food stuffs in the upper gastrointestinal tract, resulting in a more gradual absorption of dietary constituents including glucose. These actions can prevent rapid spikes and falls in blood glucose. The ability of food to moderate blood glucose is known as 'glycemic index' (GI) and is directly related to fiber content. Pulses have a low GI which provides for slow release of energy and a delayed response to hunger, both of which are critical for weight loss and maintenance.<sup>2,4,5</sup> The gastric and intestinal bulking effects of insoluble fiber in pulses also result in greater satiety and thus reduced energy consumption.<sup>6</sup>

**RESISTANT STARCH** - Resistant starch (RS) refers to carbohydrates that are not absorbed in the small intestine because they are resistant to the effects of certain gut enzymes. They have similar physiological effects and health benefits as fiber. Pulses contain 22-45% starch which is mostly amylose.<sup>7</sup> Upon cooking, amylose is more resistant to digestion, slowing absorption and thus acting as a RS.<sup>8,9</sup>

**OLIGOSACCHARIDES** - Oligosaccharides are non-digestible fibers with prebiotic effects - the ability to stimulate the growth and/or activate "good microflora", also known as bifidobacteria. Fermentation of oligosaccharides by certain bifidobacteria produces short chain fatty acids (SCFA), which can be oxidized and used for energy in preference to glucose. SCFA may also suppress hepatic glucose production.<sup>2</sup> More stable glucose metabolism can result which may lead to greater satiety and subsequent reductions in energy intake. The production of the SCFA propionate may also stimulate satiety.<sup>10</sup>

**PROTEIN** - Pulses contain 17-35% protein and offer a variety of amino acids.<sup>7</sup> Research has shown that weight maintenance diets high in protein result in increased satiety and weight loss as well as decreased energy intake.<sup>12</sup>

**PHYTOCHEMICALS AND ENZYME INHIBITORS** - Some components in pulses may contribute to weight control by inhibiting intestinal absorption of carbohydrates and other energy yielding nutrients like protein. Pulses, especially black beans and red kidney beans, contain high levels of antioxidant phytochemicals including tannins, flavonoids and polyphenols.<sup>2,9</sup> Polyphenols have been shown to inhibit the sodium dependent glucose transporter (SGLT1) on the brush border of the small intestine which may slow and partially inhibit glucose absorption.<sup>13</sup> Pulses contain enzyme inhibitors including trypsin, chymotrypsin, and amylase inhibitors which may prevent the digestion of protein and carbohydrate in pulses and thus result in less energy absorption. However, cooking pulses lowers the levels of these enzyme inhibitors.<sup>9</sup>

**HORMONE MODULATION** - Increase in the release of cholecystikinin (CCK), a gut hormone secreted in response to fat and protein, which helps to slow gastric emptying and increase satiety, has been reported following bean consumption.<sup>14,15</sup> Satiety may be enhanced through up-regulation of CCK brain receptors as peptides present in beans show very potent in vitro CCK stimulating activity.<sup>15</sup> Therefore, pulses may influence satiety through modulation of intestinal hormones and stimulation of satiety receptors in the brain.

### GLYCEMIC INDEX OF PULSES IN COMPARISON TO OTHER COMMON FOODS<sup>5</sup>

	<i>Food</i>	<i>GI<sup>2</sup> (Glucose=100)</i>
	Chickpeas	28 ± 6
	Beans, dried	29 ± 9
	Haricot & Navy beans	38 ± 6
	Kidney Beans	28 ± 4
	Lentils	29 ± 1
	Peas, dried	22 ± 0
	White bagel	72 ± 0
	White flour bread	70 ± 0
	Banana	52 ± 4
	Orange Juice	50 ± 4
	Baked Potato (with skin)	60 ± 0

\*Average energy density of pulses is 1.3kcal/g.<sup>2</sup>

**Did you know: Draining and rinsing canned pulses can reduce sodium content by about 40%?<sup>29</sup>**

## Pulse Consumption, Satiety and Weight Control

Existing research studies related to pulse consumption, satiety and body weight were summarized in a review paper by McCrory et al. published in 2010.<sup>2</sup> From this review, there is evidence that pulses may help to increase satiety over the short term and weight loss associated with energy restriction over longer periods.

A few **observational studies** have examined the potential associations between pulse consumption and weight status, and do consistently show that individuals with lower BMI consume more pulses. Using data from National Health and Nutrition Examination Survey (NHANES) 1999-2002, individuals who regularly consumed beans weighed less, had a 23% reduced risk of increased waist size and a 22% reduced risk of being obese.<sup>16</sup> In addition, they consumed significantly higher intakes of dietary fiber, potassium, magnesium, iron, and copper. Such results require further experimental confirmation to determine whether pulses have independent effects on body weight.

### Short-term studies (mostly single-meal studies)

indicate reduced hunger and increased satiety 2-4 hours after pulse consumption including canned beans, lentils, bean puree and bread made with chickpea flour, when meals were controlled for energy but not when controlled for available carbohydrate. This suggests that at least part of the effect of pulses on satiety may be mediated by available carbohydrate amount or composition.<sup>2</sup>

## Recommendations for Pulse Consumption in North America

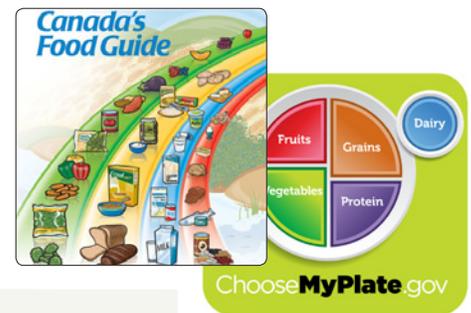
- Pulses are excellent sources of plant protein and provide other nutrients such as iron and zinc, similar to meats, poultry, and fish. Pulses are also excellent sources of dietary fiber and nutrients such as folate that are found in vegetables.
- Pulses are included in both the Meat & Beans group as well as the Vegetable group in the USDA's MyPlate food guidance system based on their nutritional profile.<sup>24</sup> A ½ cup of pulses counts as a two ounce equivalent in the Meat & Beans Group or one serving in the Vegetable group.
- Canada's Food Guide (CFG) suggests that people regularly choose beans and other meat alternatives such as lentils and tofu to minimize the amount of saturated fat in the diet.<sup>25</sup> Pulses are found only in the Meat and Alternatives group of CFG because it is based in part on how people use foods and people

Five published **interventions** tested the effectiveness of whole pulses for weight loss during intentional caloric restriction.<sup>17-21</sup> Four of the five studies reported significant effects on body weight from pulse treatments versus non-pulse control diets. These studies ranged from 6-8 weeks long and pulse treatments varied including eating rice and beans twice a day to incorporating mixed pulses (approximately 3 to 5 cups/week). Weight losses were in the range of 8 to 18 lbs.

A few human clinical studies have examined the effects of dietary **supplementation with pulse "extracts"** on body weight. The weight reducing effects of white bean extracts, which are believed to block carbohydrate absorption, have been reviewed.<sup>22</sup> Five of six recent studies used a randomized, double-blind, placebo-controlled design and all included only overweight or obese participants. Intervention length ranged from 4 to 12 weeks. All trials resulted in greater weight loss in the treatment group with mean weight loss being  $0.4 \pm 0.2$  kg/wk compared with  $0.2 \pm 0.2$  kg/wk in the placebo groups.

Consumption of a beverage containing a **pea protein hydrolysate** increased satiety by reducing hunger, the desire to eat, and thirst scores in overweight men and women.<sup>23</sup> Following the pea supplement, baseline hunger returned after 117-151 minutes in comparison to 100-128 minutes with the consumption of a whey protein beverage. After 240 minutes of consuming the beverages, less hunger was reported from pea protein consumers compared to whey protein consumers.

traditionally considered pulses as a substitute for meat. A 175 ml (¾ cup) serving of cooked pulses counts as 1 serving of Meat & Alternatives.



- The average intake of pulses based on the available studies is approximately 0.15 cups/day<sup>16,26,27</sup> which does not meet the current USDA recommendation for 3 cups per week for a 2,000 calorie diet.<sup>28</sup> It has also been estimated that of the 30% of adults who do consume legumes, only about 40-45% of them achieve at least the recommended intake.<sup>27</sup> Increasing the consumption of pulses and striving to meet dietary recommendations may aid in satiety and weight control as well as lead to healthier diets overall.

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This material has been made possible through Agriculture and Agri-Food Canada's Agricultural Flexibility Fund, as part of Canada's Economic Action Plan.

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