Effects of Pulses on Regulation of Short Term Food Intake and Metabolic Control

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59.2% Canadian overweight or obese
= 14.1 million people
Pulses and Obesity

- Adults and teens who regularly consume beans weigh less and have a lower risk of becoming overweight
  - Papanikolaou et al. *Faseb Abstract* # 383.5 2006
  - Fulgoni et al. *Faseb Abstract* # 402.6

- A traditional diet relying on rice and beans was associated with lower risk of becoming overweight and obese in a Brazilian population
  - Sichieri *Obes Res*, 2002

- Regular consumption for 2-8 weeks of beans (3.5-14 cups per week) have shown improved glycemic control, improved blood lipid profiles and/or weight loss
  - Winham and Hutchins *Nutr Res*, 2007
Glycemic Response and Food Intake

- Quick rise and fall of blood glucose
  - Meal interval
  - Food intake

- Sustained small rise of blood glucose
  - Meal interval
  - Food intake

Short Term Food Intake Design

Randomized cross-over design

Healthy men (n=15)
BMI: 20-25
Age: 18-35

- White bread (WB)
- Chickpeas (CP)
- Lentils (L)
- Navy Beans (NB)
- Yellow Peas (YP)

118g sauce
(isocaloric)
water

0 15 30 45 60 75 105 135
10 min post meal

VAS VAS VAS VAS VAS VAS VAS VAS

VAS = Visual Analogue Scales
Pulse Variety

- Does pulse variety affect outcomes differently?
- The effects of different pulses on:
  - subjective appetite
  - food intake
  - glycemic response
    - after pulse consumption (over 2 hours)
    - second meal effect (SME)
Food Intake

Food Intake (kcal)

Water (0 kcal) White Bread (300 kcal) Chickpeas (300 kcal) Lentils (300 kcal) Navy Beans (300 kcal) Yellow Peas (300 kcal)

2 hours after pulse consumption, n=15
Blood Glucose Area Under the Curve

2 hours after pulse consumption, n=15
Rise in Blood Glucose 10 min after Pizza Meal

10 min after pizza meal, n=15
Blood Glucose

Baseline: 0 minutes

Blood Glucose Change from Baseline (mmol/L)

Minutes

Baseline: 0 minutes

White Bread
Chickpeas
Lentils
Navy Beans
Yellow Peas

Standardized 850 kcal Pizza Meal

SME
Blood Glucose Area Under the Curve – SME

1 hour after pizza meal, n=15
Fractions

The effects of pea protein and fibre on:

- subjective appetite
- food intake
- glycemic response
  - after pulse consumption (over 2 hours)
  - second meal effect (SME)

Treatments (330 kcal):

- noodles, tomato sauce (control, 11 g protein, 5 g fibre)
- noodles, tomato sauce + protein (19 g protein, 5 g fibre)
- noodles, tomato sauce + fibre (11 g protein, 12 g fibre)
- noodles, tomato sauce, protein, fibre (19 g protein, 12 g fibre)
- yellow peas (19 g protein, 12 g fibre)
Food Intake

2 hours after fraction consumption, n=8
Blood Glucose Change from Baseline

![Graph showing blood glucose change from baseline over time for different dietary interventions.](image)

- **Control**
- **Protein**
- **Fibre**
- **Protein + Fibre**
- **Yellow Peas**

### Details:
- **Baseline:** 0 minutes
- **Baseline:** 135 minutes

**Ab libitum Pizza Meal**
Blood Glucose Area Under the Curve

Area Under the Curve (mmol • min/L)

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Protein</th>
<th>Fibre</th>
<th>Protein + Fibre</th>
<th>Yellow Peas</th>
</tr>
</thead>
</table>

2 hours after pulse consumption, n=8
Blood Glucose
Area Under the Curve – SME

1 hour after pizza meal, n=8
To investigate the effect of pulses in a mixed meal on:
- subjective satiety
- blood glucose
- food intake at 4 hours
- glycemic response SME
- satiety SME

To investigate the effect of the regular consumption of pulses over 8-weeks on:
- glycemic response
- satiety hormone response
- blood lipids and cholesterol
Conclusion

- The different pulse varieties affect outcomes differently.

- The recommendations for the individual types of pulses may be dependent upon what health parameters need to be changed.

- Can support new Canada Food Guide recommendations for pulses and new labeling of pulse products.
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Thank You
Appetite Control

- smell
- taste
- size

Summary

- Navy beans, yellow peas and lentils suppress food intake at 2 hours
- Only lentils reduce appetite compared to white bread over 2 hours
- Pre-meal blood glucose lowered by all pulses compared to white bread
- 10 minutes post-meal, chickpeas and lentils reduce blood glucose
- Lentils reduced glycemic response to subsequent meals (SME)
Summary

- Lentils reduced glycemic response to subsequent meals (SME)

- Lentils at multiple time points reduce appetite compared to white bread