Almond skin digestion: release of phytochemicals and gut health

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Almond skins (Amygdalus communis L.) are industrially produced by blanching and represent 4-8% of the weight of the nut. They are currently considered by-products from the almond processing industry with little economic value. However, almond skins still contain potentially added-value compounds, such as polyphenols and dietary fiber. In this study we describe the release of polyphenols from almond skins during simulated upper gastrointestinal (GI) digestion. The effect of a food matrix on this release and on skin fiber is also reported. The work is relevant to modulation of gut microbiota and upgrading an almond by-product.

1 Almond skins
- Blanched almond skin powder (BS) was prepared by hot water extraction and supplied by the Almond Board California.
- In order to investigate the effects of food matrix on nutrients and phytochemical bioaccessibility, BS were subjected to simulated GI digestion in water (baseline) and baked cookies.
- Handmade cookies with the following composition:
  - 6.2 g protein, 21.9 g fat, 64.3 g carbohydrate in 100 g biscuits (~463 Kcal).
  - 25 g portion containing 2 g BS (~115 Kcal) for simulated digestion.

2 Simulated GI digestions
- Dynamic Gastric Model:
  - Simulates the in vivo physical and biochemical processing.
  - Dynamic gastric additions.
  - Simulated delivery to small intestine.

  - pH 6.5, bile salts (8 mmol/l), CaCl₂ (11.7 mmol/l), trypsin (104 U/ml), chymotrypsin (5.9 U/ml), colipase (3.2 mg/ml), pancreatic lipase (54 U/ml).

3 Release of polyphenols
- The major almond skin flavonoids were catechin, epicatechin, kaempferol andisorhamnetin.
- Total dietary fiber (TDF): 46.3 %.
- 96% was insoluble dietary fiber (IDF), 4% was soluble dietary fiber (SDF).
- No changes in TDF composition after gastric plus duodenal digestion.
- Carbohydrate comprised 45% of the dry weight of BS. Glucose and galacturonic acid were the major sugars present, followed by arabinose and xylose. No significant changes in almond skin cell walls composition were observed post digestion.

4 Effect of digestion on dietary fiber
- BS
- BS post digestion

5 Microstructural analysis
- In order to investigate effects of digestion on overall structure of BS, fragments were examined under UV light to reveal autofluorescence components.

6 Summary
- Polyphenols are bioaccessible in the GI tract.
- No changes in dietary fiber were observed during digestion in water and cookies.
- Almond skins can be potentially used as added value food supplement.

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