

Acute benefits of kombucha on glycemia and insulinemia of a mixed meal

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Disclosure

- I am a non-executive Director of the Glycemic Index Foundation (www.gisymbol.com)
- I manage a GI testing service at the University of Sydney
- I have received royalties from books about diet and health
 - The Low GI Diet Shoppers' Guide



Background

- Fermented foods are produced via controlled microbial growth or the conversion of food components by enzymes¹
 - Spontaneous: kimchi, sauerkraut, tempeh, miso
 - Culture-dependent: kefir, kombucha, natto, sourdough bread
- ↑ interest in fermented foods due to gut microbiota awareness and purported health benefits but many haven't been well-studied
- Kombucha is a fermented tea beverage with a symbiotic consortium of bacteria and yeasts (SCOBY) – slightly sweet, carbonated acidic beverage

Rationale

- Chronic feeding studies with kombucha in animals^{1,2,3}:
 - ↓ fasting blood glucose
 - ↓ HbA1c
 - Beta cell regeneration
 - ↓ lipids
- One uncontrolled feeding study showed daily kombucha produced improvements in glucose control⁴
- Some culture-dependent fermented foods are low GI
- Fermented dairy foods associated with ↓ T2D risk⁵



Does a glass of kombucha help to lower the GI and II responses to a standard high carbohydrate, high GI meal?



Methods



Design

Randomised, single-blind,
placebo-controlled,
crossover trial
(ANZCTR:12620000460909)



Participants

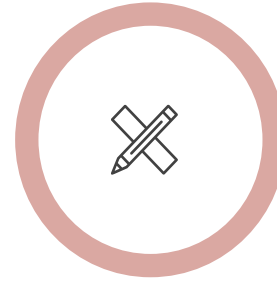
11 healthy adults (4M: 7F)
Age: 28.7 ± 4.5 y
BMI: 22.6 ± 1.0 kg/m²



Treatments

Glucose solution or
Meal + 330 mL beverage

- Rice + Soda Water
- Rice + Diet Lemonade
- Rice + Kombucha



Methodology

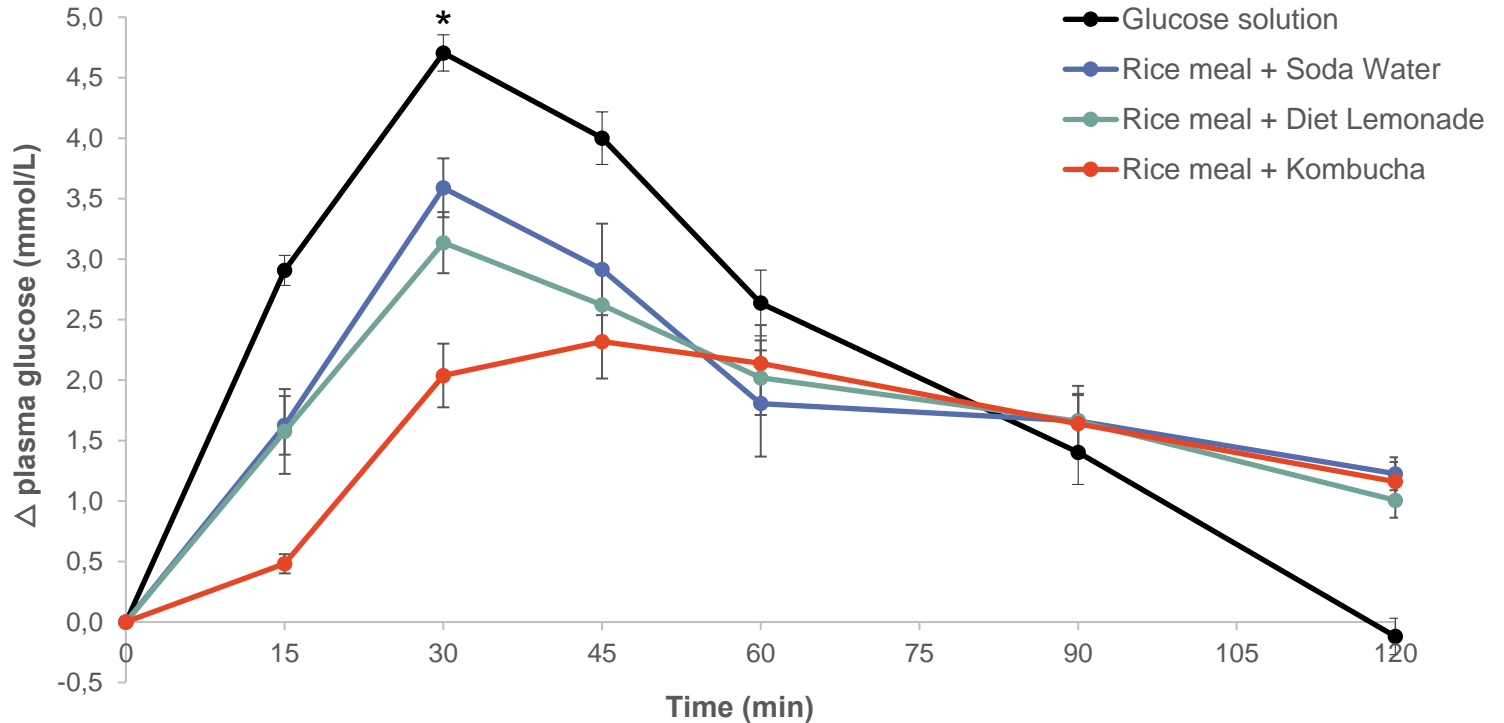
50 g avail carb portions*
Treatments randomised
ISO 26642:2010
Capillary sampling



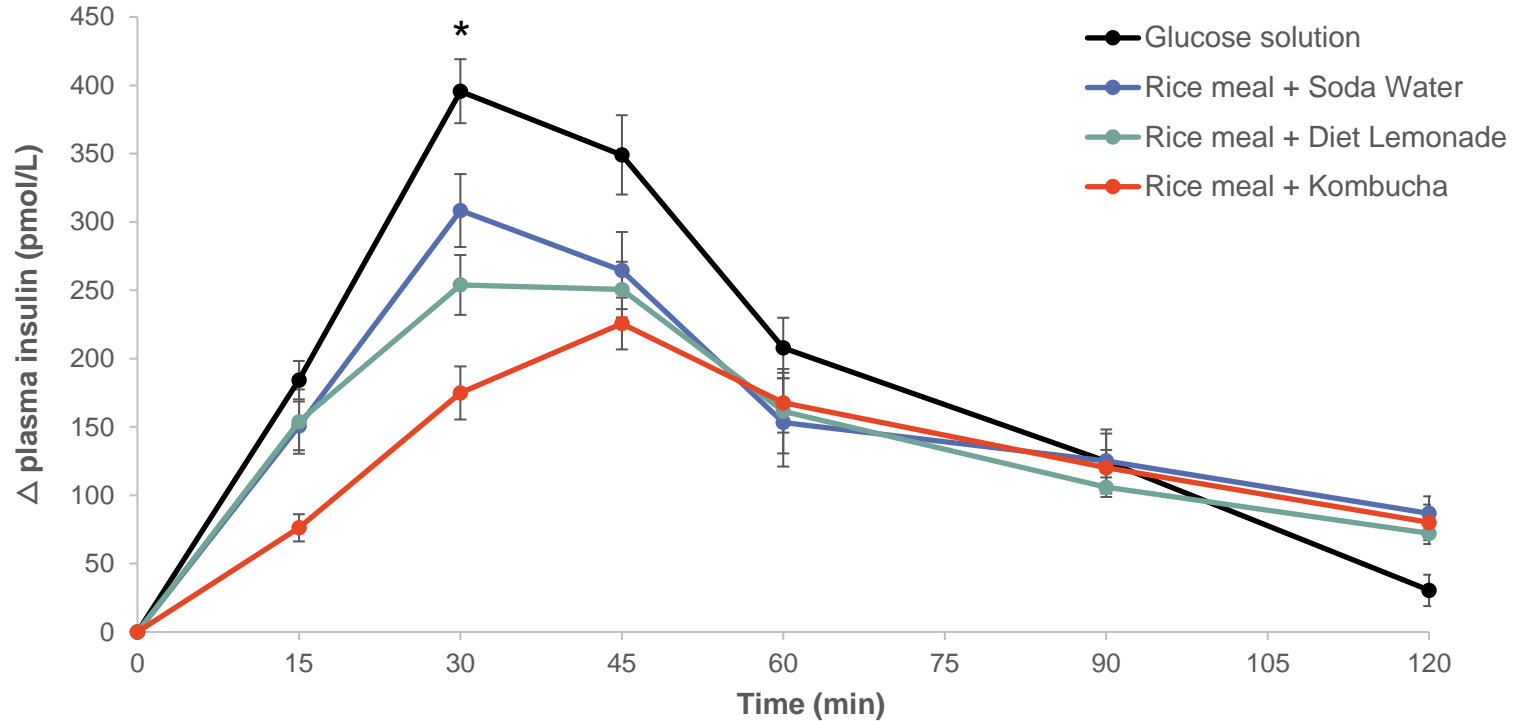
Parameters

Plasma glucose
Plasma insulin

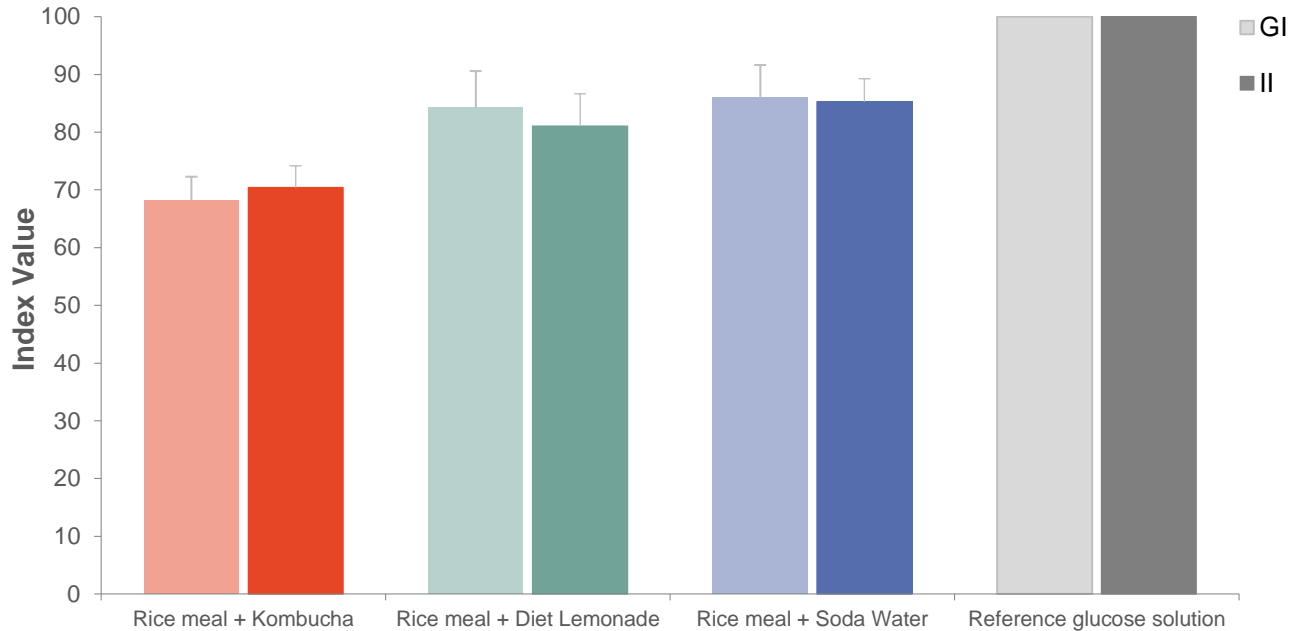
Postprandial glucose



Postprandial insulin



Glycemic index and Insulinemic index



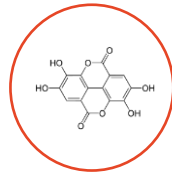
GI
Rice + Kombucha
19-21% lower
Soda Water, $p=0.041$
Diet Lemonade, $p=0.050$

II
Rice + Kombucha
14-18% lower
Soda Water, $p=0.041$
Diet Lemonade, $p=0.075$

Key findings

- Kombucha reduced acute postprandial glucose and insulin responses to a high-GI meal compared to matched beverages
- No reduction in glucose or insulin response with soda water or diet soft drink compared to Jasmine rice + plain water
- Delayed and flattened postprandial glucose response with the kombucha suggests it may slow down the rate of starch digestion and absorption

Beneficial components



ORGANIC ACIDS

Acetic and lactic acids

Vinegar¹ and fermented foods² ↓ ppGlu
BUT kombucha & diet soft drink had similar low pH (pH 3 vs 3.2)

ANTINUTRIENTS

Oolong and green tea contain tannins
↓ rate of starch digestion³

POLYPHENOLS + FLAVONOIDS

↑ content with fermentation⁴
↓ amylase and glucosidase activity

PROBIOTICS

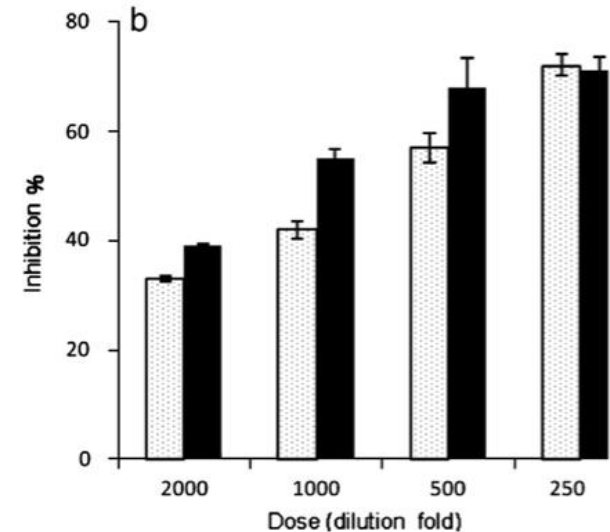
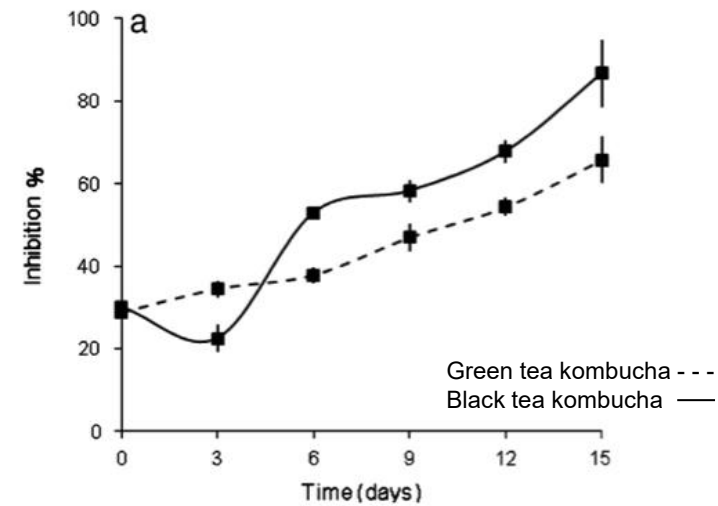
↓ oxidative stress?
Chronic studies suggest modest benefit for glucose control⁵

FLAVOURINGS

Ginger, fruit, herbs
Bioactive properties?⁶

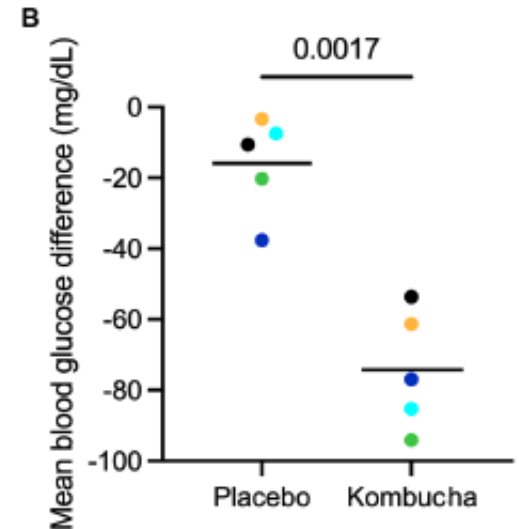
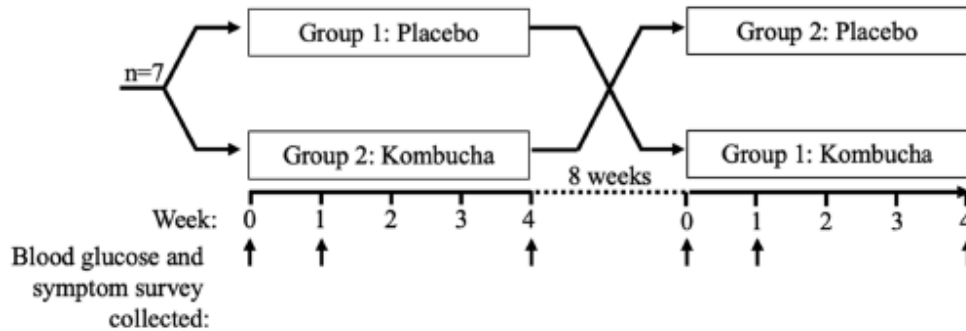
Potential mechanism: Kombucha

- Direct inhibition of pancreatic alpha-amylase
- Inhibition increased over time during fermentation process
- Dose-dependent inhibition of amylase (day 15 of fermentation) for both green tea and black tea kombucha
 - ~50% inhibition with 1000-fold dilution



Pilot study of kombucha in T2DM

- Short-term feeding study (240 mL/day kombucha or placebo) in T2DM (n=7)
 - ↓ fasting glucose vs baseline (164 to 116 mg/dL, p=0.035)
 - At 4 weeks: ↓ fasting glucose with kombucha vs placebo in participants with higher fasting glucose at baseline (*n=5)



Conclusions

- A realistic serve of kombucha consumed with a high-GI meal can produce clinically significant acute reductions in glucose and insulin in healthy adults
- Kombucha could be a better alternative to replace other effervescent beverages (eg. diet- or sugar-sweetened sodas, sparkling water etc)
- Kombucha has significant variation in ingredients, starter cultures and fermentation conditions - results may not be generalisable
- Foods that modulate blood glucose have the potential to help delay or decrease the risk of developing diabetes