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# Impact of inulin on phenolic acid bioavailability of tomato onion and lovage soup in healthy individuals: a randomized cross-over trial

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Non-digestible carbohydrates (NDC) influence the activity of the gut microbiota, and potentially the bioavailability of polyphenolic intermediate and end-products, such as phenolic acids [(1)]. This study aimed to evaluate the effect of a fibre (inulin) on urinary phenolic acid excretion from a flavonol-rich food.

Fifteen healthy participants (mean age 31 (SD 15) , mean BMI 27.1 (SD 6.8) kg/m$^2$) participated in a randomized cross-over trial (NCT03577145). Participants followed a low-polyphenol low-fibre diet for 2 days and then consumed 500 g of either tomato onion and lovage soup (TOL) (containing 101.5 µmol flavonoid as quercetin equivalent), TOL with 10 g inulin (TOL + INU) or a drink containing 10 g inulin alone (INU) with the same sugar content as TOL. Urine samples were collected 24h pre- and 24h post- test meal consumption. Bioavailability was assessed by quantitative analysis of urinary phenolic acids with gas chromatography-mass spectrometry. Kruskal Wallis and Wilcoxon's signed-rank test were used to determine differences in excretion of phenolic acids/ total phenolic acids between TOL and TOL+ INU arms. To investigate flavonoid metabolism pathways, one participant consumed TOL soup containing deuterium labelled lovage.

Urinary phenolic acids after TOL were mainly 4-hydroxy-3-methoxyphenylacetic acid (4-OH-3MPAA), 3,4-dihydroxyphenylacetic acid (3,4-diOHPAA) and 4-hydroxyhippuric acid. This was supported by the tracer study as lovage-derived $^2$H-4-hydroxy hippuric acid, $^2$H-3,4-diOHPAAand $^2$H-3-OH-4MPAA were excreted in urine. No difference was detected in total phenolic acid excretion (without hippuric acid) after TOL with or without inulin. In an exploratory sub-group analysis, obese participants (n = 5, 33y (SD 14), BMI 35.8 (SD 3.4)) responded differently to lean participants (n = 10, 30y (SD 15), BMI 22.7 (SD 1.6)) (Fig 1).

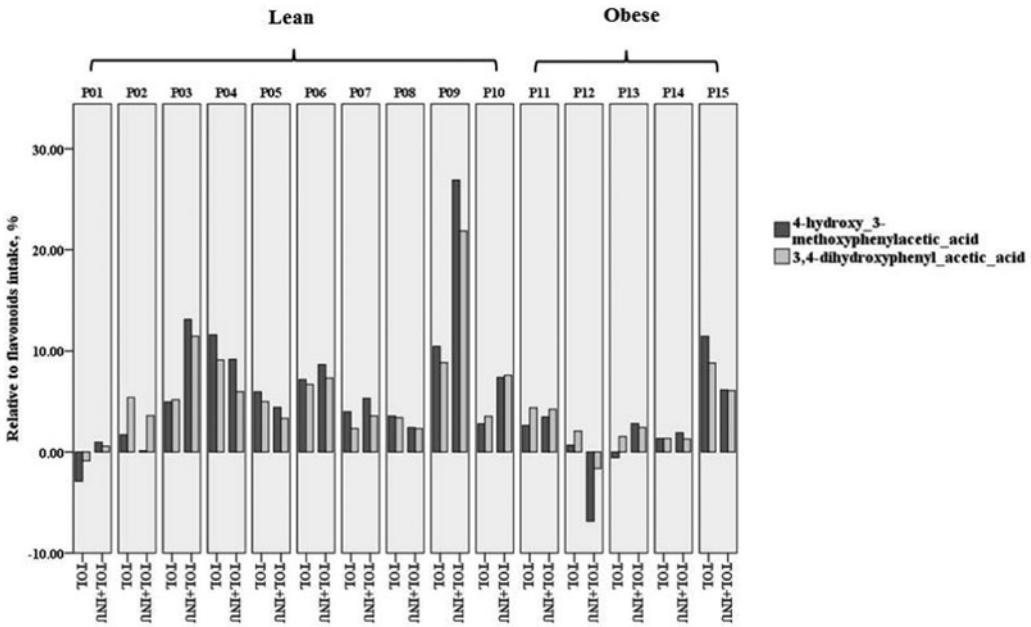


**Fig. 1.**

As a whole group, inulin had little effect on urinary phenolic acid excretion. There was some indication of a difference between normal weight and obese participants which may reflect different gut microbiota [(2)]. Further work is required to assess the impact of the microbiome. 4-OH-3MPAA and 3,4-diOHPAA are key biomarkers of the consumption of TOL and other quercetin/quercetin conjugates sources.

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