

Assessment of Feed Value of Chicory and Lucerne for Poultry, Determination of Bioaccessability of Their Polyphenols and Their Effects on Caecal Microbiota

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Abstract: Chicory and lucerne possess high feed value for poultry being good sources of protein and fiber. In addition, they are rich in polyphenols that help the body build an integrated antioxidant system to prevent damage from free radicals and positively modulate microbial populations in the gastrointestinal tract. These health-promoting effects of polyphenols depend on their bioaccessability and absorption in the animal body. The aim of the present paper was to study the bioaccessability of polyphenols from chicory and lucerne after subjecting the samples to gastric and intestinal phases of digestion in an *in vitro* model of chicken gut and assessment of their feed value by measuring the presence of fermentable substrates (in terms of gas production), SCFAs produced and their effects on gut microbiota population during *in vitro* cecal fermentation. Results revealed that the bioaccessability of polyphenols varied with different polyphenol compounds. The highest bioaccessability was recorded for *p*-hydroxybenzoic acid (90.8%) from chicory following the intestinal phase of digestion. The lowest bioaccessability was observed for quercetin-3-rhamnoside (12.6%) from chicory after the gastric phase of digestion. From lucerne, highest bioaccessability was recorded for kaempferol-3-glucoside (77.5%) after the intestinal phase of digestion. Total gas production was higher for lucerne (39.9 mL/g) than chicory (28.1 mL/g). Similarly, total SCFAs production was higher after 24 h of cecal fermentation with lucerne (42.2 mmolL⁻¹) as compared to chicory (38.1 mmolL⁻¹). Results also revealed that the relative abundance of *Clostridium* was reduced with chicory (0.225%) and lucerne (0.176%) as compared to the control (0.550%) after 24 h of cecal fermentation. The relative abundance of *Streptococcus* was reduced by lucerne (4.845%) but was increased with chicory (17.267%) as compared to the control (5.204%) after 24 h of fermentation. These findings indicated that chicory and lucerne differentially affected the microbial populations during *in vitro* cecal fermentation.

Keywords: chicory; lucerne; polyphenols; bioaccessability; chicken; gut microbiota; modulation; cecal fermentation; *in vitro* fermentation

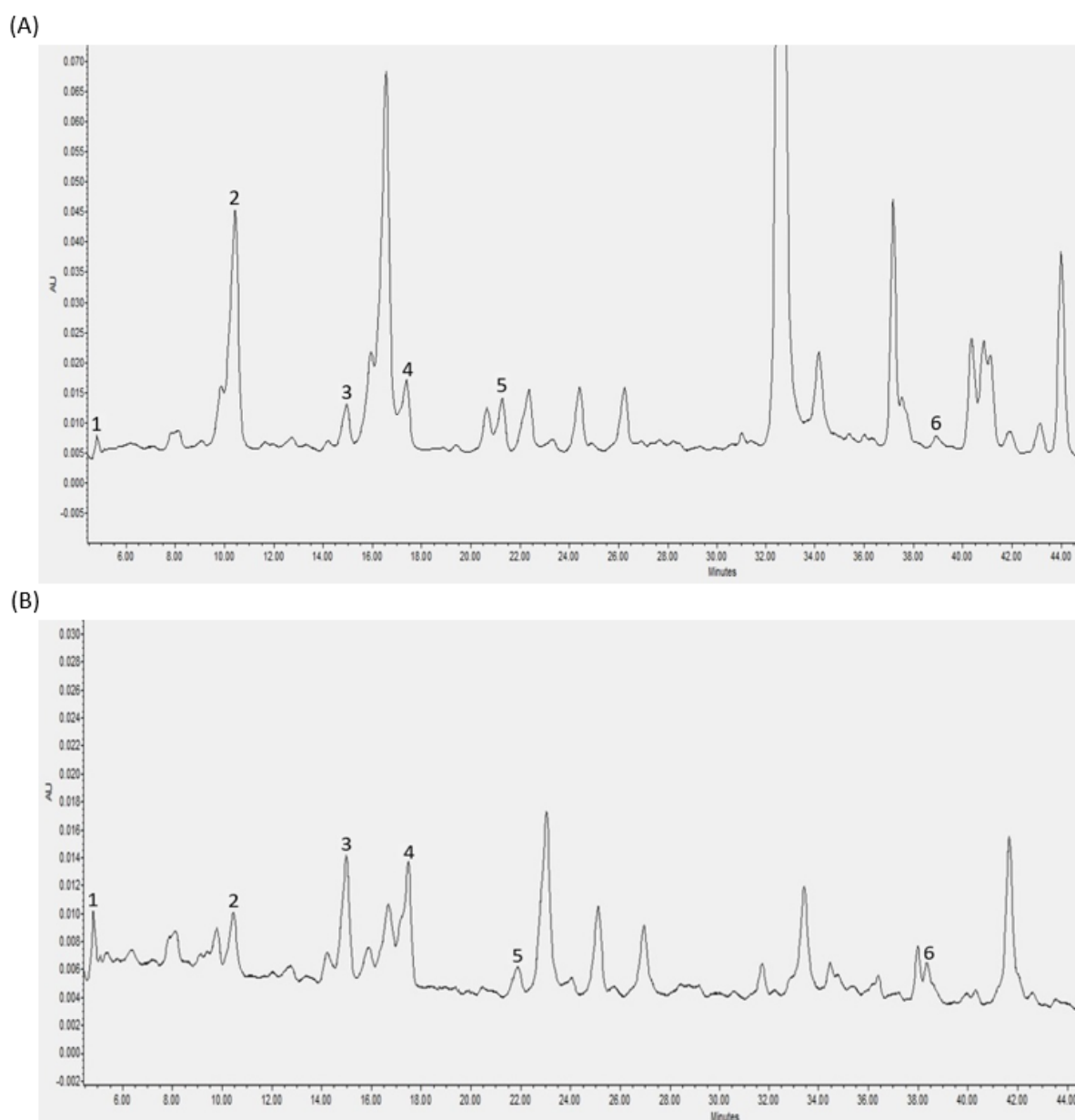


Figure S1. HPLC chromatograms of insoluble fractions of chicory; (A) Insoluble gastric fraction (extracted from the precipitate), (B) Insoluble intestinal fraction (extracted from the precipitate).

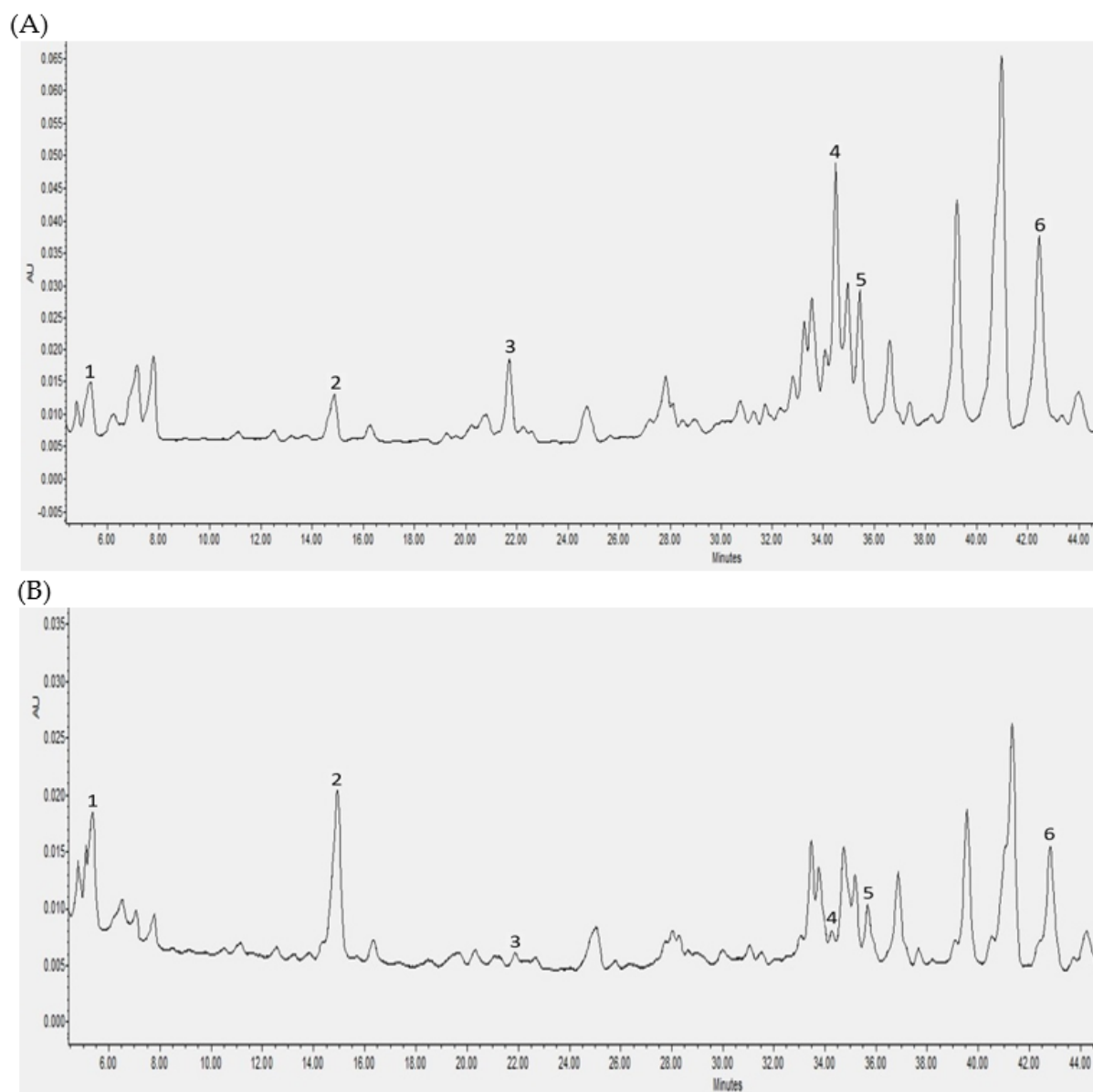


Figure S2. HPLC chromatograms of insoluble fractions of lucerne; (A) Insoluble gastric fraction (extracted from the precipitate), (B) Insoluble intestinal fraction (extracted from the precipitate).