Supplementary material:

Table S1: The effect of fibre, iron, ferulic acid, catechin, and naringenin on pancreatic lipase activity (%)

Compound [µg/mL]	% Pancreatic lipase activity
Control	100[a]
Fibre [80]	97.2±4.7[a]
Iron [100]	107.7±6.7[a]
Ferulic acid [60]	86.4±2.3[b]
Catechin [100]	78.7±7.9[b]
Naringenin [90]	98.6±5.6[a]

Values are means ± SD (n=5)

[abc]– Values with different superscripts are significantly different ($p<0.001$)

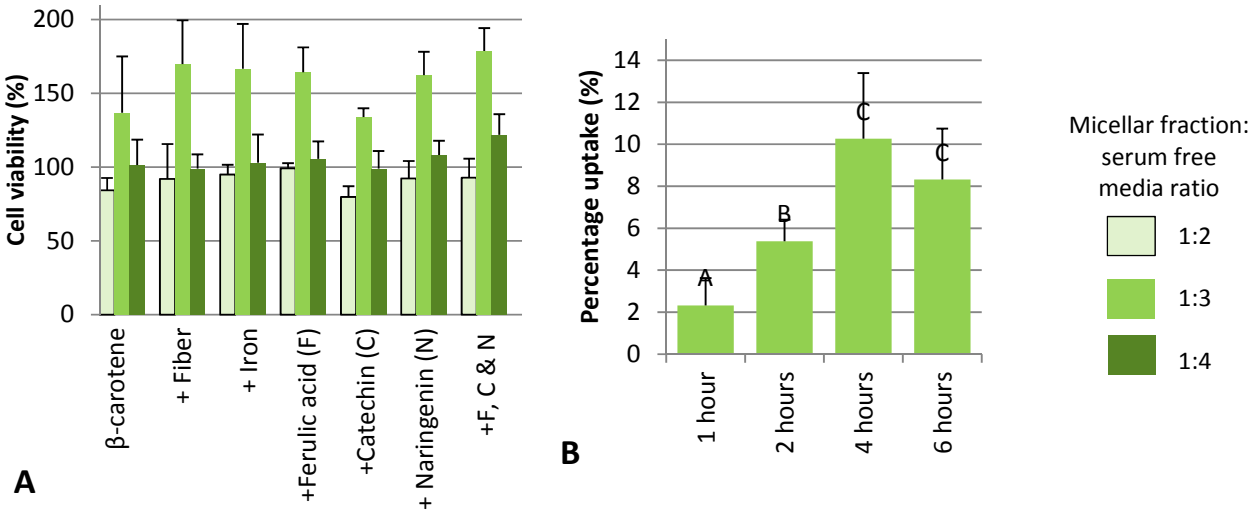

Figure S1: (A) The effect of different micellar fraction to DMEM ratios on Caco-2 cell viability (% of positive control - growth media). Error bars indicate one standard deviation (n=4). (B) The effect of different incubation times of 1:3 micellar fraction: DMEM ratio on the β-carotene uptake (%) by Caco-2 cells. Error bars indicate one standard deviation (n=5).

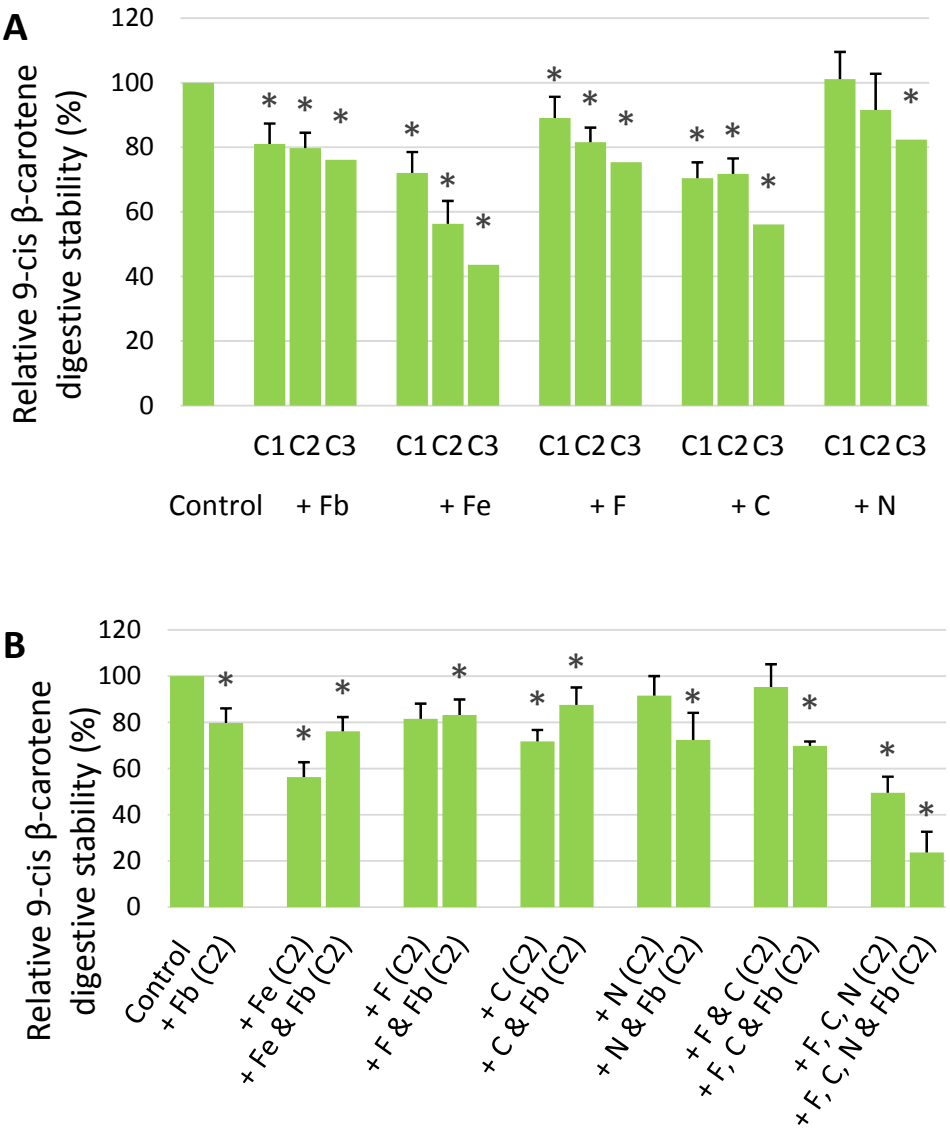

Figure S2: The effects of increasing concentrations (A) and combinations (B) of fibre (Fb), iron (Fe) ferulic acid (F), catechin (C) and naringenin (N) on the intestinal in vitro 9-cis β-carotene digestive stability (% of control - β -carotene digested alone). C1 is the lowest concentration of Fb (40 mg/ml), Fe (50 mg/ml), F (30 mg/ml), C (50 mg/ml) and N (45 mg/ml) added, with C2 and C3 double and three fold the concentration of C1, respectively. Error bars indicate one standard deviation (n=4). * - Significant difference from the control at $p<0.05$.

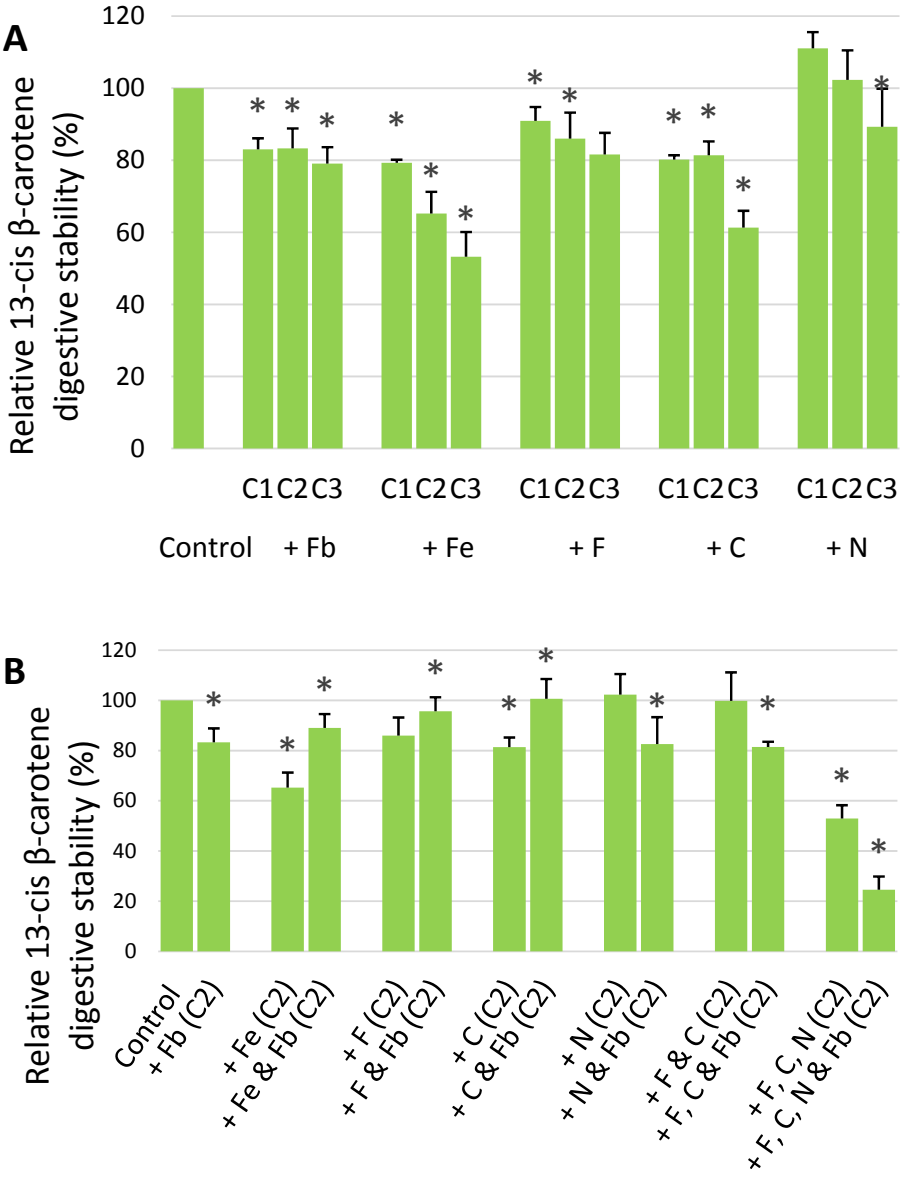

Figure 3S: The effects of increasing concentrations (A) and combinations (B) of fibre (Fb), iron (Fe) ferulic acid (F), catechin (C) and naringenin (N) on the intestinal in vitro 13-cis β-carotene digestive stability (% of control - β -carotene digested alone). C1 is the lowest concentration of Fb (40 mg/ml), Fe (50 mg/ml), F (30 mg/ml), C (50 mg/ml) and N (45 mg/ml) added, with C2 and C3 double and three fold the concentration of C1, respectively. Error bars indicate one standard deviation (n=4). * - Significant difference from the control at $p<0.05$.

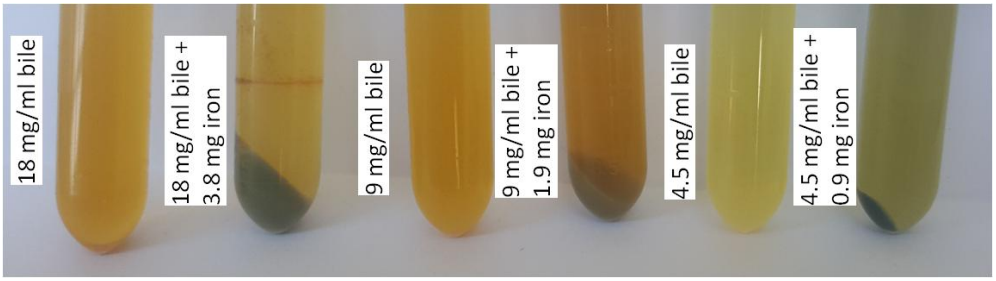

Figure S4: The effect of iron on the precipitation of bile extract

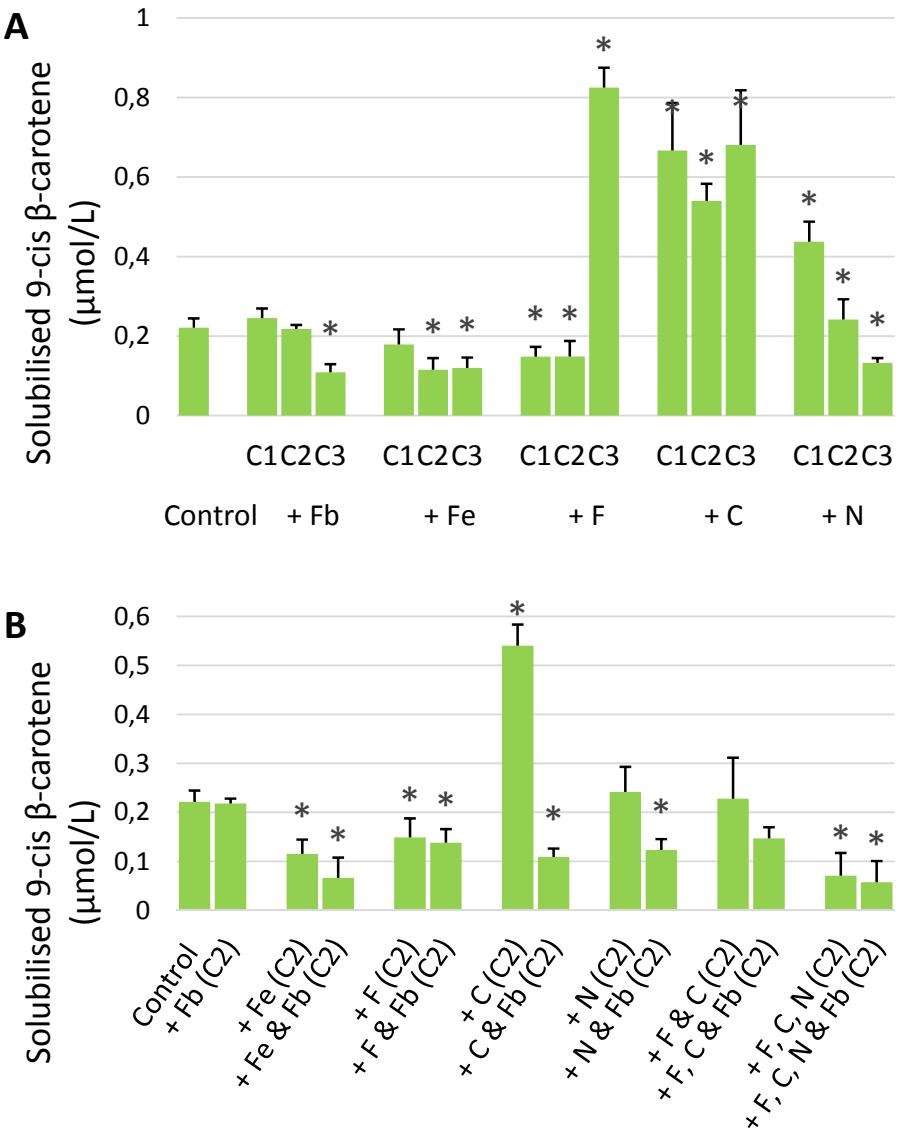

Figure S5: The effects of increasing concentrations (A) and combinations (B) of fibre (Fb), iron (Fe) ferulic acid (F), catechin (C) and naringenin (N) on the intestinal in vitro 9-cis β-carotene solubility (µmol/L). C1 is the lowest concentration of Fb (40 mg/ml), Fe (50 mg/ml), F (30 mg/ml), C (50 mg/ml) and N (45 mg/ml) added, with C2 and C3 double and three fold the concentration of C1, respectively. Error bars indicate one standard deviation (n=4). * - Significant difference from the control (β -carotene digested alone) at $p<0.05$.

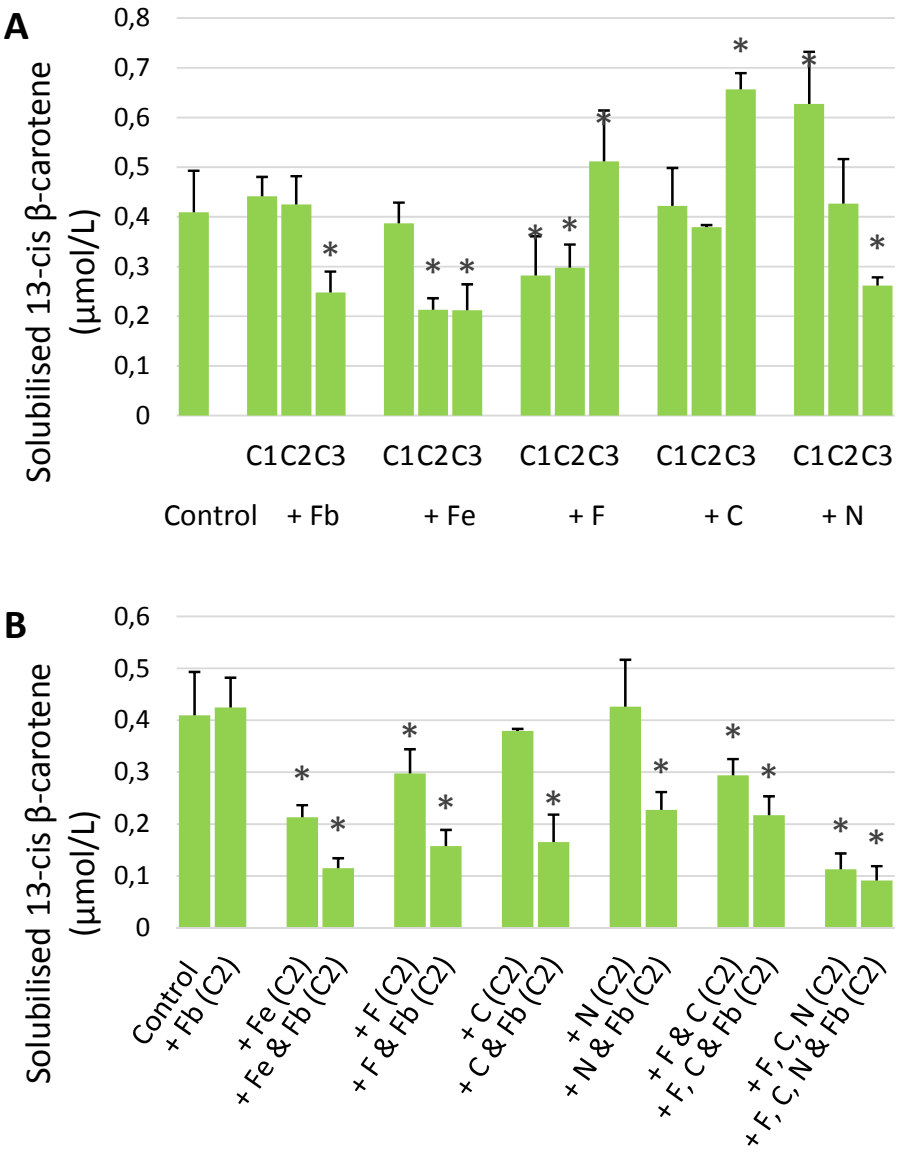

Figure S6: The effects of increasing concentrations (A) and combinations (B) of fibre (Fb), iron (Fe) ferulic acid (F), catechin (C) and naringenin (N) on the intestinal in vitro 13-cis β-carotene solubility (µmol/L). C1 is the lowest concentration of Fb (40 mg/ml), Fe (50 mg/ml), F (30 mg/ml), C (50 mg/ml) and N (45 mg/ml) added, with C2 and C3 double and three fold the concentration of C1, respectively. Error bars indicate one standard deviation (n=4). * - Significant difference from the control (β -carotene digested alone) at $p<0.05$.

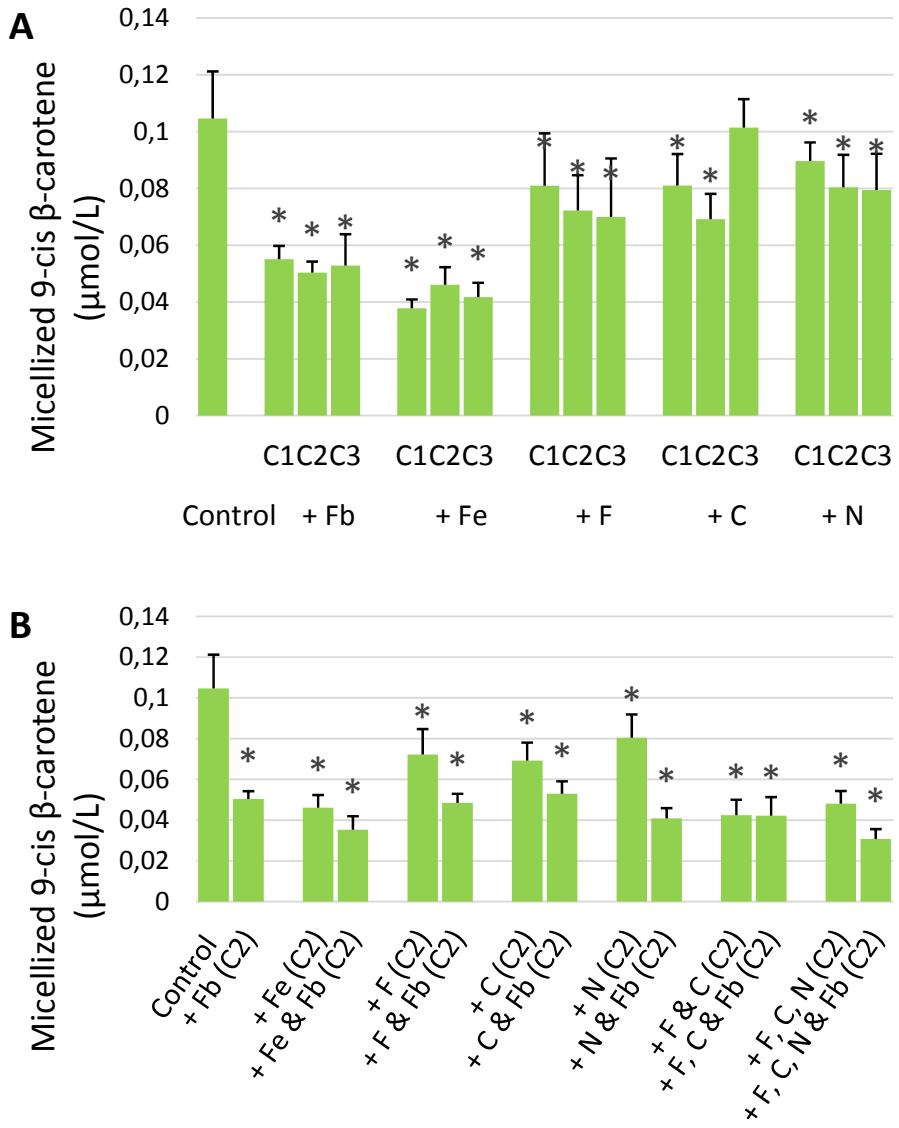

Figure S7: The effects of increasing concentrations (A) and combinations (B) of fibre (Fb), iron (Fe) ferulic acid (F), catechin (C) and naringenin (N) on the intestinal in vitro 9-cis β-carotene micellization (µmol/L). C1 is the lowest concentration of Fb (40 mg/ml), Fe (50 mg/ml), F (30 mg/ml), C (50 mg/ml) and N (45 mg/ml) added, with C2 and C3 double and three fold the concentration of C1, respectively. Error bars indicate one standard deviation (n=4). * - Significant difference from the control (β -carotene digested alone) at $p<0.05$.

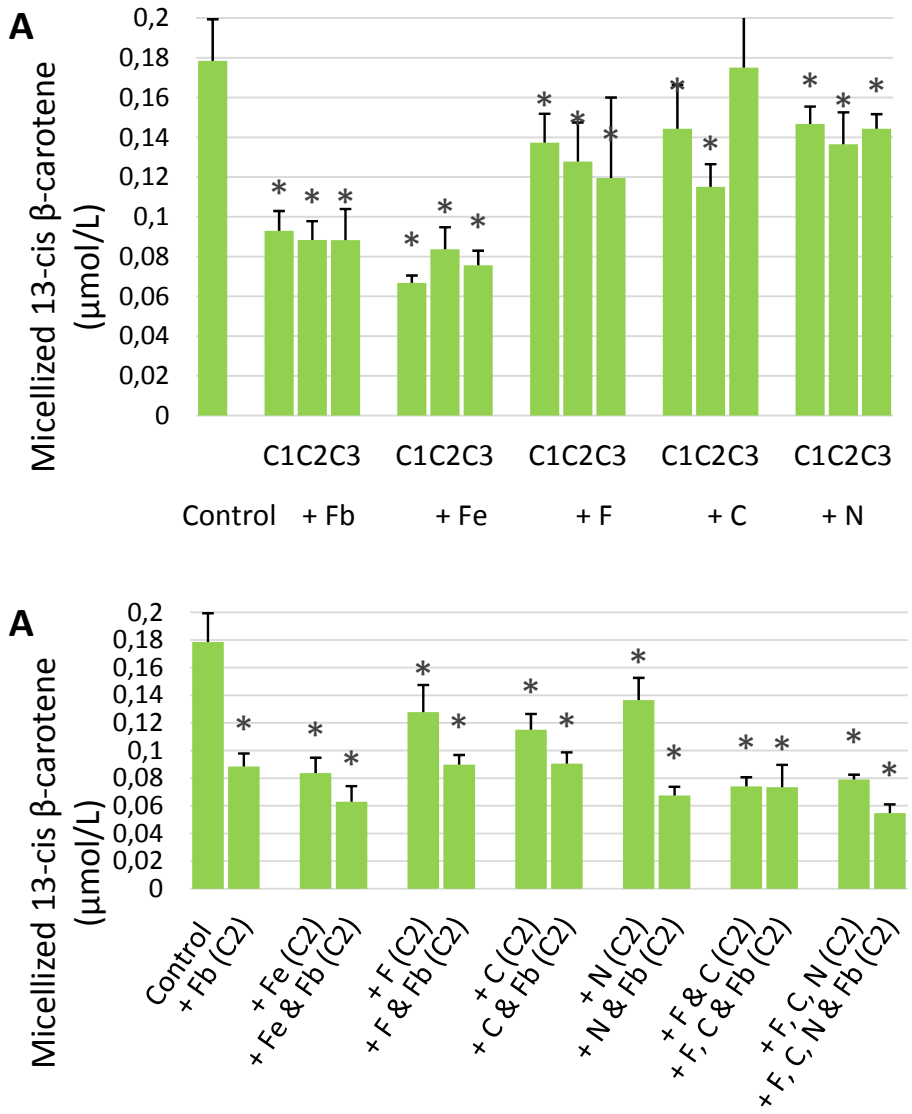

Figure S8: The effects of increasing concentrations (A) and combinations (B) of fibre (Fb), iron (Fe) ferulic acid (F), catechin (C) and naringenin (N) on the intestinal in vitro 13-cis β-carotene micellization (µmol/L). C1 is the lowest concentration of Fb (40 mg/ml), Fe (50 mg/ml), F (30 mg/ml), C (50 mg/ml) and N (45 mg/ml) added, with C2 and C3 double and three fold the concentration of C1, respectively. Error bars indicate one standard deviation (n=4). * - Significant difference from the control (β -carotene digested alone) at $p<0.05$.

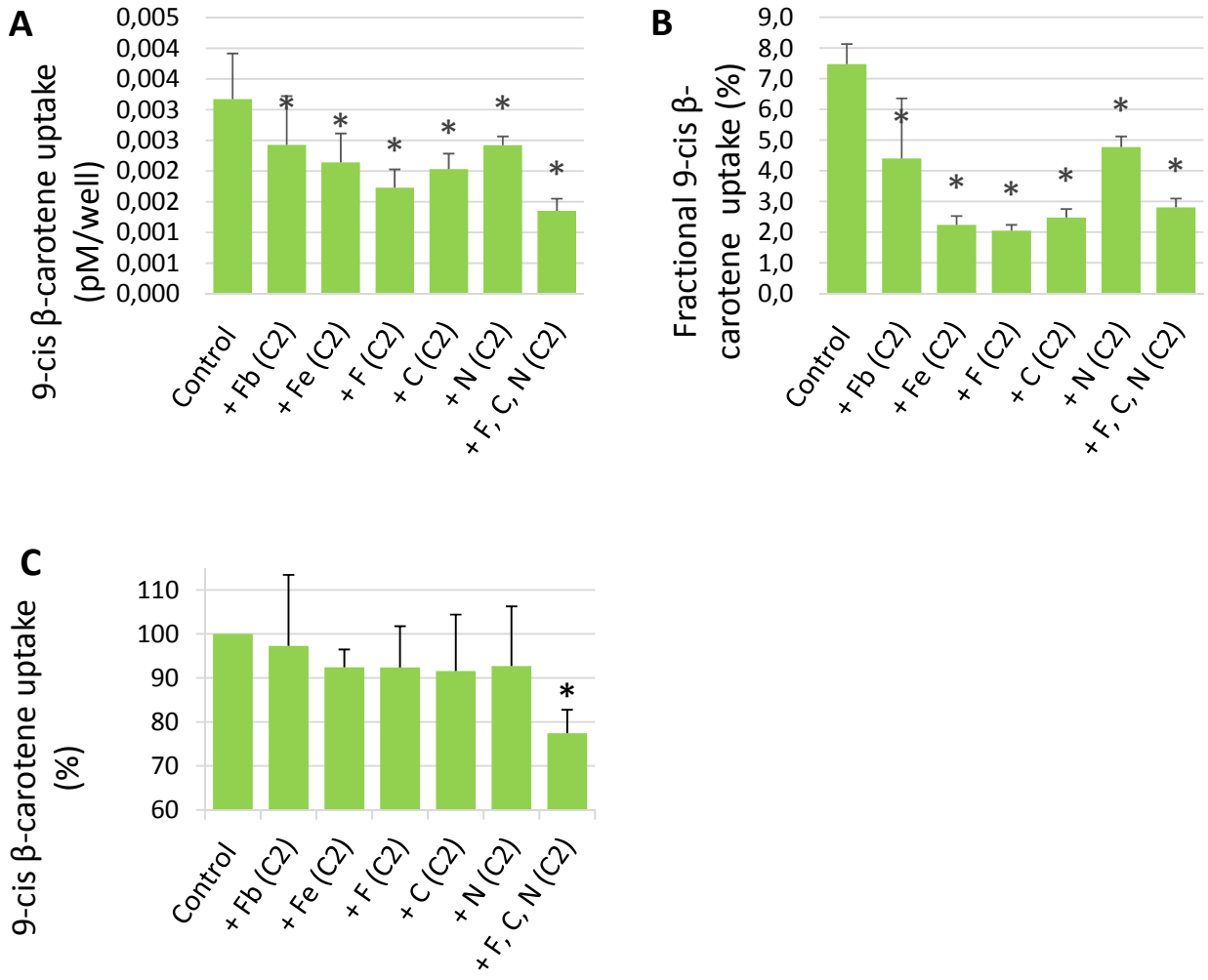

Figure S9: The effects of intestinal in vitro digestion of β-carotene with fibre (Fb) (80 mg/ml), iron (Fe) (100 mg/ml), ferulic acid (F) (60 mg/ml), catechin (C) (100 mg/ml) and naringenin (N) (90 mg/ml) on the (A) absolute uptake (amount of β-carotene absorbed by the cells) (pM/well) and (B) fractional uptake (percentage of micellirized β-carotene added to the cells) of 9-cis β-carotene by Caco-2 cells. (C) The effect of adding Fb, Fe, F, C and N, after intestinal in vitro digestion, to micellised β-carotene, on the 9-cis β-carotene uptake by Caco-2 cells (relative (%) to uptake of β-carotene digested alone). Error bars indicate one standard deviation (n=5). * - Significant difference from the control (β -carotene digested alone) at $p<0.05$.

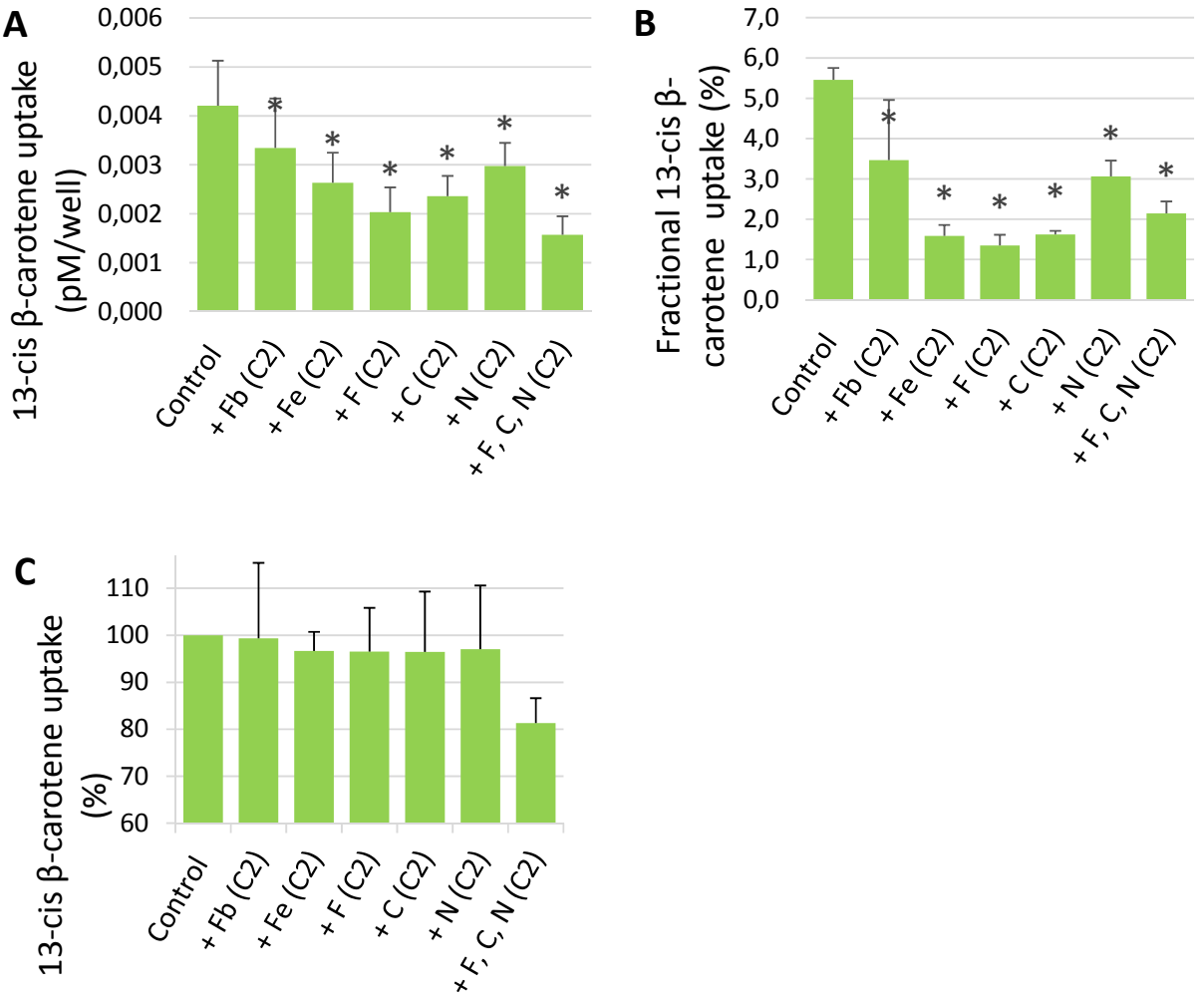

Figure S10: The effects of intestinal in vitro digestion of β-carotene with fibre (Fb) (80 mg/ml), iron (Fe) (100 mg/ml), ferulic acid (F) (60 mg/ml), catechin (C) (100 mg/ml) and naringenin (N) (90 mg/ml) on the (A) absolute uptake (amount of β-carotene absorbed by the cells) (pM/well) and (B) fractional uptake (percentage of micellirized β-carotene added to the cells) of 13-cis β-carotene by Caco-2 cells. (C) The effect of adding Fb, Fe, F, C and N, after intestinal in vitro digestion, to micellised β-carotene, on the 13-cis β-carotene uptake by Caco-2 cells (relative (%) to uptake of β-carotene digested alone). Error bars indicate one standard deviation (n=5). * - Significant difference from the control (β -carotene digested alone) at $p<0.05$.