Authentic human data for cinnamic acid (C_6=C_3) metabolites in urine, plasma, ileal fluid and feces

Gary Williamson[1] and Michael N. Clifford[1,2]

Author Williamson ORCID 0000-0002-5624-6267 is with the Department of Nutrition, Dietetics and Food, Victorian Heart Institute, Faculty of Medicine Nursing and Health Sciences, Monash University, Victoria Heart Hospital, 631 Blackburn Road, Clayton, VIC 3168 Australia.

Author Clifford ORCID 0000-0002-4204-5720 is with the School of Bioscience and Medicine, Faculty of Health and Medical Sciences, University of Surrey, Guildford GU2 7XH, Surrey, UK and is Adjunct Professor with the Department of Nutrition, Dietetics and Food, Victorian Heart Institute, Faculty of Medicine Nursing and Health Sciences, Monash University, Victoria Heart Hospital, 631 Blackburn Road, Clayton, VIC 3168 Australia.

Direct enquiries to author Clifford (Email M.Clifford@Surrey.ac.uk)

Introduction

This document is a compilation of published quantitative data obtained with authentic calibrants for the concentrations of C_6=C_3 metabolites (i.e. cinnamic acids and the associated phase-2 conjugates) in human urine, plasma, ileal fluid and feces. The originating publications were identified by searching Web of Science, PubMed and Google Scholar up to May 2024.

Data originally reported on a mass/day or mass/volume basis have been converted to a molar basis to facilitate comparisons, but some published data were excluded from these tables:

(i) Data originally reported relative to creatinine, the standard clinical practice with spot plasma and urine samples, cannot be accurately converted to a molar basis because creatinine production varies with sex, age and protein intake.

(ii) Data produced by acid or enzymic hydrolysis of phase-2 conjugates have not been tabulated except for glycine or glutamine conjugates when β-glucuronidase and sulfatase hydrolysis has been used.

Similar compilations have been prepared for C_6–C_1 metabolites (benzoic acids), C_6–C_2 metabolites (phenylacetic acids), C_6–C_3 metabolites (3-phenylpropanoic acids) and C_6–C_5 metabolites (5-phenylvaleric acids, 4-hydroxy-5-hydroxyphenylvaleric acids and phenylvalerolactones) and the metabolites have been identified using the nomenclature recommended by Kay *et al*. (Kay et al. 2020) and are numbered consecutively in a single series through the five documents.

Table 43. Cinnamic acid											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc[n] µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.073–0.659 [b]									Free-living volunteers (*N*=10, min, max) GLUCURONIDASE (Not amino acid conjugates)	(Shafaei et al.)	10
5.99 ± 2.92 (**5.51** ± 0.299)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** ± IQR)	(Le Sayec et al. 2023)	90
<LOQ [a]		**<LOQ** [a]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
	0.123 ± 0.034		Three days						Daily Cranberry juice (787 mg) for 1 month (mean ± s.e., *N*=10).	(Feliciano, Boeres, et al. 2016)	10
	0.098 ± 0.018		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10
	0.090 ± 0.017		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10
	0.096 ± 0.017		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	0.116 ± 0.018		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
		0.014 ± 0.007 day 1 0.014 ± 0.007 at 1 month	1-day including over-night fast	0.022 ± 0.005 0.022 ± 0.005 0.020 ± 0.004 0.020 ± 0.006					Daily Wild blueberries (726 mg) for 1 month (mean ± s.e., *N*=18).	(Feliciano, Istas, et al. 2016)	18
			—				0.63 ± 0.61		Free-living volunteers (*N*=5) (mean ± s.d.). No increase on hydrolysis	(Jenner, Rafter, and Halliwell 2005)	5
			—				0.22 0.21 0.30 0.27		One free-living volunteer over four consecutive days. No increase on hydrolysis		
										7	183

Notes : a) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

b) after enzymic hydrolysis but no hydroxyl substituents and would not hydrolyse amino acid conjugates so value acceptable

Table 44. 2'-hydroxycinnamic acid (*o*-coumaric)											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.168 ± 0.154 (**0.110** and 0.178)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** and IQR)	(Le Sayec et al. 2023)	90
<LOQ [a]		**0.026 (0.014–0.034)** [a]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
		0.35 ± 0.20	2-day and overnight fast		12-hours				Mangoes (500 µmol) (*N*=8, mean ± s.e.)	Crozier	8
			2-day and overnight fast		12-hours				Mangoes (500 µmol) Ileostomists (*N*=10, mean ± s.e.)		10
		0.2 ± 0 day 1 0.2 ± 0 at 1 month	2-day including over-night fast	0.022 ± 0.001					Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
		0.2 ± 0.1 day 1 0.3 ± 0.1 at 1 month	2-day including over-night fast	0.013 ± 0.003					Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23
	1.41 ± 1.14 +++								Guaco syrup (*N*=5, mean ± s.d.)	(Gasparetto et al. 2015)	5
	0.001 (0, 0.002)	0 (0.002, 0.1)	24 hours	0.001 ± 0.000		0.019 ± 0.007			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
		0.012 ± 0.006 day 1	1-day including over-night fast	0.001 ± 0.000 0.001 ± 0.000					Daily Wild blueberries (726 mg) for 1 month (mean ± s.e., *N*=18).	(Feliciano, Istas, et al. 2016)	18

		0.006 ± 0 at 1 month		0.001 ± 0.000 0.001 ± 0.000							
	0.006 ± 0.001		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10
	0.006 ± 0.001								Daily Cranberry juice (787 mg) (mean ± s.e., *N*=10).		10
	0.005 ± 0.001		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10
	0.006 ± 0.001		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	0.007 ± 0.001		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
										8	244

Notes: a) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

+++ pharmacological dose of coumarin

Table 45. 3′-hydroxycinnamic acid (*m*-coumaric)											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.010 (0.002, 0.079) **									Healthy controls (*N*=809, median 5 and 95% C.I.) Hydrolysed	(Murphy et al. 2018)	809
0.011 (0.002, 0.089) **									Cancer patients (*N*=809, median 5 and 95% C.I.) Hydrolysed		809
1.832 ± 1.107 (**1.565** and 1.451)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** and IQR)	(Le Sayec et al. 2023)	90
<LOQ [a]		**0.900 (0.545–1.920)** [a]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
		1.5 ± 0.9	2-day and overnight fast		12-hours				Mangoes (500 µmol) (*N*=8, mean ± s.e.)	Crozier	8
			2-day and overnight fast		12-hours				Mangoes (500 µmol) Ileostomists (*N*=10, mean ± s.e.)		10
		1.0 ± 0.2 day 1 0.8 ± 0.1 at 1 month	2-day including over-night fast	0.058 ± 0.003					Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
		1.0 ± 0.2 day 1 0.9 ± 0.2 at 1 month	2-day including over-night fast	0.096 ± 0.008					Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23
		0.055 ± 0.012 day 1 0.091 ± 0.018 at 1 month	1-day including over-night fast	0.001 ± 0.000 0.001 ± 0.000 0.001 ± 0.000 0.001 ± 0.000					Daily Wild blueberries (726 mg) for 1 month (mean ± s.e., *N*=18).	(Feliciano, Istas, et al. 2016)	18

	0.016 ± 0.005		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10
	0.029 ± 0.014								Daily Cranberry juice (787 mg) (mean ± s.e., *N*=10).		10
	0.016 ± 0.006		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10
	0.012 ± 0.004		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	0.013 ± 0.004		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
		n.d.	2-day including over-night fast	0.022 ± 0.001					Mean ± s.e., *N*=7, beans	(Mecha et al. 2020)	7
										7	238

Notes: a) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

Table 46. 4'-Hydroxycinnamic acid (*p*-Coumaric acid)											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.018 (0.012, 0.037) **									Healthy controls (*N*=809, **median**, 5% and 95% C.I.) Hydrolysed	(Murphy et al. 2018)	809
0.018 (0.012, 0.034) **									Cancer patients (*N*=809, **median**, 5% and 95% C.I.) Hydrolysed		809
0.114 ± 0.108 (**0.085** ± 0.113)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** ± IQR)	(Le Sayec et al. 2023)	90
0.0030 (0.0029–0.0036) [b]		**0.273 (0.092–0.398)** [b]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
		0.25 ± 0.06	2 days						Orange juice (368 µmol) (*N*=9, mean ± s.e.)	(Pereira-Caro et al. 2023)	9
		0.17 ± 0.03	2 days						Orange juice (368 µmol) plus oat bran (58 µmol) (*N*=9, mean ± s.e.)		
		0.2 ± 0 day 1 0.1 ± 0 at 1 month	2-day including over-night fast	0.003 ± 0.001					Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
		0.2 ± 0 day 1 0.2 ± 0 at 1 month	2-day including over-night fast	0.007 ± 0.001					Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23
	0.002 (0.001, 0.004)	0.3 (0.1, 0.8)	24 hours	0.001 ± 0.000		0.034 ± 0.016			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
	0.131 ± 0.051	0.036 ± 0.009	Three days						Daily Cranberry juice (787 mg) for 1 month (mean ± s.e., *N*=10).	(Feliciano, Boeres, et al. 2016)	10

	0.071 ± 0.031		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10
	0.240 ± 0.141		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10
	0.251 ± 0.108		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	0.364 ± 0.197		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
		0.018 ± 0.006 day 1 0.012 ± 0 at 1 month	1-day including over-night fast	0.003 ± 0.000 0.004 ± 0.001 0.004 ± 0.001 0.004 ± 0.001					Daily Wild blueberries (726 mg) for 1 month (mean ± s.e., *N*=18).	(Feliciano, Istas, et al. 2016)	18
	0.073 ± 0.017								Watermelon, Overweight / obese individuals (*N*=6, mean ± s.e.)	(Fan et al. 2020)	6
			—				0.71 ± 0.49		Free-living volunteers (*N*=5) (mean ± s.d.). No increase on hydrolysis	(Jenner, Rafter, and Halliwell 2005)	5
			—				1.41 1.10 1.11 1.50		One free-living volunteer over four consecutive days. No increase on hydrolysis		
			—				4 ± 2[a] 4 ± 1 [a] 3 ± 1 [a] 3 ± 1 [a]		(*N*=5, mean ± s.e.) Italy (*N*=5, mean ± s.e.) Germany (*N*=5, mean ± s.e.) Spain (*N*=5, mean ± s.e.) Denmark	(Knust et al. 2006)	20
										11	261

Notes: a) fecal matrix rather than fecal water (Knust et al. 2006).

b) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

Table 47. Cinnamic acid-4′-glucuronide											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
2.205 ± 5.124 (**0.096** ± 0.238)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** ± IQR)	(Le Sayec et al. 2023)	90
	Trace		Over-night	n.d.					Orange juice (398 µmol) (*N*=10, mean ± s.e.) Trained athletes	(Pereira-Caro et al. 2020)	10
		0.5 ± 0.1 day 1 0.3 ± 0 at 1 month	2-day including over-night fast	0.004 ± 0.001					Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
		0.7 ± 0.1 day 1 0.7 ± 0.1 at 1 month	2-day including over-night fast	0.005 ± 0.001					Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23
		0.10 (0.02, 0.5)	24 hours	<LOQ		0.101 ± 0.081			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
										4	153

Table 48. Cinnamic acid-4'-sulfate											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.143 ± 0.136 (**0.077** ± 0.203)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** ± IQR)	(Le Sayec et al. 2023)	90
	0.015 (0.009, 0.019)	0.9 (0.5, 2.6)	24 hours	<LOQ		0.298 ± 0.104			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
										2	98

Table 49. 3′,4′-Dihydroxycinnamic acid (Caffeic acid)											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.430 (0.336, 0.615) **									Healthy controls (*N*=809, median 5 and 95% C.I.) Hydrolysed	(Murphy et al. 2018)	809
0.427 (0.341, 0.606) **									Cancer patients (*N*=809, median 5 and 95% C.I.) Hydrolysed		809
7.40 ± 5.22 (**8.02** ± 9.18)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** ± IQR)	(Le Sayec et al. 2023)	90
<LOQ [b]		**3.89 (2.50–5.20)** [b]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
		0.06 ± 0.01	2-day and overnight fast		12-hours				Mangoes (500 µmol) (*N*=8, mean ± s.e.)	Crozier	8
			2-day and overnight fast		12-hours				Mangoes (500 µmol) Ileostomists (*N*=10, mean ± s.e.)		10
	0.027 ± 0.019								Purple potato extract (192 mg) (*N*=17, mean ± s.d.)	(Jokioja et al. 2021)	17
	Not reported	0.7 ± 0.1 day 1 0.9 ± 0 at 1 month	2-day including over-night fast						Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
	Not reported	0.6 ± 0.2 day 1 1.1 ± 0.2 at 1 month	2-day including over-night fast						Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23
	0.002 (0.001, 0.010)	1.1 (0.3, 4.6)	24 hours	<LOQ		0.036 ± 0.010			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
			—						Placebo daily for 12 weeks	(Tosi et al. 2023)	

0.020 ± 0.002 0.019 ± 0.003									Zero time (mean ± s.e., *N*= 31) Twelve weeks (mean ± s.e., *N*= 31)		60
0.021 ± 0.003	0.032 ± 0.003		—						Cranberries (588 mg) daily for 12 weeks Zero time (mean ± s.e., *N*= 29) Twelve weeks (mean ± s.e., *N*= 29)		
	0.001 ± 0.001	0.075 ± 0.022	Three days						Daily Cranberry juice (787 mg) for 1 month (mean ± s.e., *N*=10).	(Feliciano, Boeres, et al. 2016)	10
	0.001 ± 0.001		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10
	0.001 ± 0.001		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10
	0.012 ± 0.006		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	0.008 ± 0.004		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
		0.100 ± 0.011 day 1 0.111 ± 0.017 at 1 month	1-day including over-night fast	0.007 ± 0.002 0.007 ± 0.002 0.006 ± 0.002 0.007 ± 0.002					Daily Wild blueberries (726 mg) for 1 month (mean ± s.e., *N*=18).	(Feliciano, Istas, et al. 2016)	18
		25.9 ± 4.49	—				2.18 ± 0.24 [a] start 12.2 ± 3.2 [a] 6-weeks		White-fleshed apple (mean ± s.e., *N*=8) (197 mg)	(Macià et al. 2022)	29
		1.52 ± 1.52	—						Red-fleshed apple (mean ± s.e., *N*=12) (193 mg)		
		12.9 ± 4.2	—						Aronia infusion (mean ± s.e., *N*=9) (99 mg)		
		3.9 ± 0.7	2 days					**13 ± 4**	Coffee low dose (1053 µmol) (mean ± s.d., *N*=5 ileostomists) PLASMA HYDROLYSED	(Erk et al. 2012)	5
		4.6 ± 0.3	2 days					**16 ± 6**	Coffee medium dose (2219 µmol) (mean ± s.d., *N*=5 ileostomists) PLASMA HYDROLYSED		

		14.1 ± 17.8	2 days					**27 ± 8**	Coffee high dose (4525 µmol) (mean ± s.d., *N*=5 ileostomists) PLASMA HYDROLYSED		
			36 hours					**9 ± 3.1**	Coffee (385 µmol) (mean ± s.e., *N*=5 ileostomists)	(Stalmach et al. 2010)	5
	n.d.	0.42 ± 0.06							Green coffee extract (600 mg) (*N*=9, mean ± s.e.) zero time	(Angel Seguido et al. 2022)	9
	n.d.	0.45 ± 0.09							Green coffee extract (600 mg) (*N*=9, mean ± s.e.) 8 weeks		
	traces	0.44 ± 0.07			?	n.d.			Green coffee extract (600 mg) and oat β-glucan day 1 (*N*=9, mean ± s.e.) Free-living overweight / obese volunteers	(Seguido et al. 2022)	9
	traces	0.38 ± 0.05			?	n.d.			Green coffee extract (600 mg) and oat β-glucan 8 weeks (*N*=9, mean ± s.e.) Free-living overweight / obese volunteers		
			—				52 ± 47		Free-living volunteers (*N*=5) (mean ± s.d.). No increase on hydrolysis	(Jenner, Rafter, and Halliwell 2005)	5
			—				217 53 138 77		One free-living volunteer over four consecutive days. No increase on hydrolysis		
			—				8 ± 2 [a] 9 ± 2 [a] 34 ± 6 [a] 6 ± 3 [a]		(*N*=5, mean ± s.e.) Italy (*N*=5, mean ± s.e.) Germany (*N*=5, mean ± s.e.) Spain (*N*=5, mean ± s.e.) Denmark	(Knust et al. 2006)	20
		0.007 ± 0.001	2-day including over-night fast	0.0019 ± 0.0					Mean ± s.e., *N*=7, beans	(Mecha et al. 2020)	7
										18	405

Notes: a) fecal matrix rather than fecal water. Note also *cis*-isomer reported as 4 ± 1, 4 ± 1, 15 ± 3, 3± 2 µmol/l (Knust et al. 2006)

b) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

Table 50. 3'-Hydroxycinnamic acid-4'-glucuronide											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.388 ± 0.203 (**0.360** and 0.238)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** and IQR)	(Le Sayec et al. 2023)	90
0.0150 (0.0047–0.0214) [a]		**0.061 (0.048–0.096)** [a]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
		2.6 ± 0.5 day 1 2.5 ± 0.6 at 1 month	2-day including over-night fast						Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
		2.5 ± 0.5 day 1 2.3 ± 0.4 at 1 month	2-day including over-night fast						Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23
	0.014 (0.012, 0.032)	0.7 (0.4, 1.0)	24 hours	0.004 ± 0.001		0.115 ± 0.044			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
	0.059 ± 0.008	0.050 ± 0.012	Three days						Daily Cranberry juice (787 mg) for 1 month (mean ± s.e., *N*=10).	(Feliciano, Boeres, et al. 2016)	10
	0.033 ± 0.006		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10
	0.086 ± 0.014		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10
	0.110 ± 0.024		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	0.119 ± 0.015		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
		0.188 ± 0.034 day 1	1-day including	0.001 ± 0.000 0.001 ± 0.000 0.002 ± 0.002					Daily Wild blueberries (726 mg) for 1 month (mean ± s.e., *N*=18).	(Feliciano, Istas, et al. 2016)	18

		0.169 ± 0.034 at 1 month	over-night fast	0.002 ± 0.001							
		0.036 ± 0.005	2-day including over-night fast	n.d.					Mean ± s.e., *N*=7, beans	(Mecha et al. 2020)	7
										8	228

Notes: a) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

Table 51. 3'-Hydroxycinnamic acid-4'-sulfate											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.114 ± 0.029 (**0.114** and 0.020)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** and IQR)	(Le Sayec et al. 2023)	90
<LOQ [a]		**0.47 (0.28–1.18)** [a]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
			2-day including over-night fast	0.001 ± 0.000					Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
			2-day including over-night fast	0.001 ± 0.000					Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23
	0.067 (0.038, 0.171)	6.5 (2.5, 11)	24 hours	<LOQ		0.195 ± 0.101			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
		0.6 ± 0.1							Coffee (412 µmol) (mean ± s.e. *N*=11)	(Stalmach et al. 2009)	11
		0.6 ± 0.1	36 hours						Coffee (385 µmol) (mean ± s.e., *N*=5 ileostomists))	(Stalmach et al. 2010)	5
										6	169

Notes: a) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

Table 52. 4'-Hydroxycinnamic acid-3'-glucuronide											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.019 ± 0.016 **(0.014 and 0.020)**									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** and IQR)	(Le Sayec et al. 2023)	90
0.0012 (0.0006–0.0029) [a]		**0.180 (0.047–0.242)** [a]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
		0.01 ± 0.00	2 days						Orange juice (368 µmol) (*N*=9, mean ± s.e.)	(Pereira-Caro et al. 2023)	9
		0.12 ± 0.02	2 days						Orange juice (368 µmol) plus oat bran (58 µmol) (*N*=9, mean ± s.e.)		
		1.5 ± 0.3 day 1 0.9 ± 0.2 at 1 month	2-day including over-night fast	0.040 ± 0.006					Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
		2.4 ± 0.6 day 1 1.7 ± 0.3 at 1 month	2-day including over-night fast	0.048 ± 0.009					Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23
	0.006 (0.002, 0.020)	0.7 (0.2, 1.2)	24 hours	<LOQ		0.029 ± 0.012			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
	0.016 ± 0.004	0.070 ± 0.018	Three days						Daily Cranberry juice (787 mg) for 1 month (mean ± s.e., *N*=10).	(Feliciano, Boeres, et al. 2016)	10
	0.011 ± 0.003		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10
	0.034 ± 0.005		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10

	0.036 ± 0.007		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	0.045 ± 0.011		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
		0.399 ± 0.070 day 1 0.416 ± 0.104 at 1 month	1-day including over-night fast	0.002 ± 0.016 0.002 ± 0.001 0.004 ± 0.003 0.003 ± 0.001					Daily Wild blueberries (726 mg) for 1 month (mean ± s.e., *N*=18).	(Feliciano, Istas, et al. 2016)	18
		0.035 ± 0.003	2-day including over-night fast	n.d.					Mean ± s.e., *N*=7, beans	(Mecha et al. 2020)	7
										9	237

Notes: a) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

Table 53. 4'-Hydroxycinnamic acid-3'-sulfate											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.416 ± 0.722 (**0.188** and 0.319)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** and IQR)	(Le Sayec et al. 2023)	90
0.0041 (0.0040–0.0055) [a]		**3.66 (1.46–11.63)** [a]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
		0.11 ± 0.01	2 days						Orange juice (368 µmol) (*N*=9, mean ± s.e.)	(Pereira-Caro et al. 2023)	9
		0.28 ± 0.03	2 days						Orange juice (368 µmol) plus oat bran (58 µmol) (*N*=9, mean ± s.e.)		
	Trace		Over-night	n.d.					Orange juice (398 µmol) (*N*=10, mean ± s.e.) Trained athletes	(Pereira-Caro et al. 2020)	10
		<LOQ				0.2 ± 0.1 [b]			Orange juice (398 µmol) (mean ± s.e., *N*=10 trained)	(Pereira-Caro et al. 2017)	10
		0.02 ± 0.01				0.2 ±0.1 [b]			Orange juice (398 µmol) (mean ± s.e., *N*=10 detrained)		
	2.8 (1.47, 4.55)	39 (18, 64)	24 hours	<LOQ		0.367 ± 0.256			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
	0.092 ± 0.11	6.4 ± 0.8							Coffee (412 µmol) (mean ± s.e. *N*=11)	(Stalmach et al. 2009)	11
		6.2 ± 1.2	36 hours						Coffee (385 µmol) (mean ± s.e., *N*=5 ileostomists))	(Stalmach et al. 2010)	5
	0.181 ± 0.127								Mixed fruit purée (*N*=9, mean ± s.d.)	(Pimpao et al. 2015)	9
										9	162

Notes: a) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

b) 12-hour urines

Table 54. 4'-Hydroxy-3'-methoxycinnamic acid (Ferulic acid)											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.092 (0.049, 0.407) **									Healthy controls (*N*=809, **median** 5 and 95% C.I.) Hydrolysed	(Murphy et al. 2018)	809
0.093 (0.049, 0.409) **									Cancer patients (*N*=809, **median** 5 and 95% C.I.) Hydrolysed		809
1.382 ± 1.802 (**0.715** and 1.250)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** and IQR)	(Le Sayec et al. 2023)	90
<LOQ [b]		**26.30 (10.0–67.6)** [b]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
		0.01 ± 0.00	2 days						Orange juice (368 µmol) (*N*=9, mean ± s.e.)	(Pereira-Caro et al. 2023)	9
		0.05 ± 0.01	2 days						Orange juice (368 µmol) plus oat bran (58 µmol) (*N*=9, mean ± s.e.)		
	0.002 ± 0.001		Over-night	0.06 ± 0.03					Orange juice (398 µmol) (*N*=10, mean ± s.e.) Trained athletes	(Pereira-Caro et al. 2020)	10
		0.06 ± 0.02				0.03 ± 0.02 [c]			Orange juice (398 µmol) (mean ± s.e., *N*=10 trained)	(Pereira-Caro et al. 2017)	10
		0.1 ± 0.1				0.02 ± 0.01 [c]			Orange juice (398 µmol) (mean ± s.e., *N*=10 detrained)		
		2.4 ± 0.6 day 1 1.2 ± 0.3 at 1 month	2-day including over-night fast						Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
		1.5 ± 0.3 day 1 1.0 ± 0.2 at 1 month	2-day including over-night fast						Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23

	0.65 (0.13, 2.97)	58 (16, 77)	24 hours	<LOQ		4.23 ± 0.95	3.07 ± 1.32		Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
	0.01 ± 0.08 0.14 ± 0.05		3 days including over-night fast		2 hours				Rosemary tea (1055 µmol rosmarinic acid equivalent) (mean ± s.d., *N*=12) Quantified with free acid TWO MAXIMA	(Achour et al. 2021)	12
	0.047 ± 0.012		Three days						Daily Cranberry juice (787 mg) for 1 month (mean ± s.e., *N*=10).	(Feliciano, Boeres, et al. 2016)	10
	0.025 ± 0.009		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10
	0.074 ± 0.025		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10
	0.082 ± 0.027		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	0.116 ± 0.018		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
		0.052 ± 0.015 day 1 0.067 ± 0.010 at 1 month	1-day including over-night fast	0.006 ± 0.002 0.006 ± 0.002 0.007 ± 0.002 0.006 ± 0.001					Daily Wild blueberries (726 mg) for 1 month (mean ± s.e., *N*=18).	(Feliciano, Istas, et al. 2016)	18
		1.07 ± 0.13	—				6.87 ± 2.34 [a] start 15.3 ± 3.66 [a] 6-weeks		White-fleshed apple (mean ± s.e., *N*=8) (197 mg)	(Macià et al. 2022)	29
		0.32 ± 0.05	—						Red-fleshed apple (mean ± s.e., *N*=12) (193 mg)		
		1.04 ± 0.22	—						Aronia infusion (mean ± s.e., *N*=9) (99 mg)		
		2.8 ± 0.8	2 days					**3 ± 1**	Coffee low dose (1053 µmol) (mean ± s.d., *N*=5 ileostomists) PLASMA HYDROLYSED	(Erk et al. 2012)	5
		4.6 ± 0.6	2 days					**3 ± 1**	Coffee medium dose (2219 µmol) (mean ± s.d., *N*=5 ileostomists) PLASMA HYDROLYSED		

		17.1 ± 21.3	2 days					**5 ± 2**	Coffee high dose (4525 µmol) (mean ± s.d., *N*=5 ileostomists) PLASMA HYDROLYSED		
			36 hours					**0.8 ± 0.3**	Coffee (385 µmol) (mean ± s.e., *N*=5 ileostomists)	(Stalmach et al. 2010)	5
	Trace								Green coffee extract (600 mg) (*N*=9, mean ± s.e.) zero time	(Angel Seguido et al. 2022)	9
	0.008 ± 0.001								Green coffee extract (600 mg) (*N*=9, mean ± s.e.) 8 weeks		
	traces								Green coffee extract (600 mg) and oat β-glucan day 1 (*N*=9, mean ± s.e.) Free-living overweight / obese volunteers	(Seguido et al. 2022)	9
	traces								Green coffee extract (600 mg) and oat β-glucan 8 weeks (*N*=9, mean ± s.e.) Free-living overweight / obese volunteers		
			—				4.6 ± 8.2		Free-living volunteers (*N*=5) (mean ± s.d.). No increase on hydrolysis	(Jenner, Rafter, and Halliwell 2005)	5
			—				8.34 1.10 6.30 2.79		One free-living volunteer over four consecutive days. No increase on hydrolysis		
			—				10.3 ± 9		(*N*=5) (mean ± s.e.)	(Karlsson et al. 2005)	5
			—				5 ± 2 [a] 5 ± 2 [a] 6 ± 1 [a] 5 ± 2 [a]		(*N*=5, mean ± s.e.) Italy (*N*=5, mean ± s.e.) Germany (*N*=5, mean ± s.e.) Spain (*N*=5, mean ± s.e.) Denmark	(Knust et al. 2006)	20
										19	349

Notes: a) Fecal matrix rather than fecal water. Note the *cis*-isomer also reported 1 ± 0.7, 9 ± 3, 13 ± 6, 6 ± 1 µmol/l respectively (Knust et al. 2006).

b) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

c) 12-hour urines

Table 55. 3'-Methoxycinnamic acid-4'-glucuronide											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
11.0 ± 27.0 (**2.36** and 3.31)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** and IQR)	(Le Sayec et al. 2023)	90
0.014 (0.013–0.018) [a]		**2.73 (0.95–7.15)** [a]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
		2.9 ± 0.4	2 days						Orange juice (368 µmol) (*N*=9, mean ± s.e.)	(Pereira-Caro et al. 2023)	9
		2.2 ± 0.3	2 days						Orange juice (368 µmol) plus oat bran (58 µmol) (*N*=9, mean ± s.e.)		
	0.035 ± 0.002		Over-night	0.05 ± 0.02					Orange juice (398 µmol) (*N*=10, mean ± s.e.) Trained athletes	(Pereira-Caro et al. 2020)	10
		0.7 ± 0.2				0.2 ± 0.05 [b]			Orange juice (398 µmol) (mean ± s.e., *N*=10 trained)	(Pereira-Caro et al. 2017)	10
		1.1 ± 0.2				0.02 ± 0.01 [b]			Orange juice (398 µmol) (mean ± s.e., *N*=10 detrained)		
		0.5 ± 0.1 day 1 0.4 ± 0 at 1 month	2-day including over-night fast	0.005 ± 0.002					Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
		0.4 ± 0.1 day 1 0.6 ± 0.1 at 1 month	2-day including over-night fast	0.011 ± 0.003					Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23
	0.27 (0.087, 1.11)	30 (14, 48)	24 hours	0.005 ± 0.003		0.549 ± 0.252			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
0.016 ± 0.003 0.012 ± 0.002			—						Placebo daily for 12 weeks Zero time (mean ± s.e., *N*= 31) Twelve weeks (mean ± s.e., *N*= 31)	(Tosi et al. 2023)	60
0.018 ± 0.004	0.025 ± 0.003		—						Cranberries (588 mg) daily for 12 weeks Zero time (mean ± s.e., *N*= 29) Twelve weeks (mean ± s.e., *N*= 29)		
	0.165 ± 0.029	0.109 ± 0.020	Three days						Daily Cranberry juice (787 mg) for 1 month (mean ± s.e., *N*=10).	(Feliciano, Boeres, et al. 2016)	10
	0.105 ± 0.013		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10

	0.266 ± 0.039		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10
	0.312 ± 0.065		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	0.364 ± 0.046		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
		5.25 ± 0.719 day 1 5.2 ± 0.81 at 1 month	1-day including over-night fast	0.156 ± 0.040 0.182 ± 0.032 0.195 ± 0.076 0.223 ± 0.067					Daily Wild blueberries (726 mg) for 1 month (mean ± s.e., *N*=18).	(Feliciano, Istas, et al. 2016)	18
	0.056 ± 0.006		2 days						Coffee (1 cup/day) (mean ± s.e., *N*=21) T_{max} = 7.5 ± 1.3 hours	(Mena et al. 2021)	21
	0.081 ± 0.009		2 days						Coffee (3 cups/day) (mean ± s.e., *N*=21)) T_{max} = 5.9 ± 0.7 hours		
	0.052 ± 0.006		2 days						Coffee-cocoa mixture (3 cups/day) (mean ± s.e., *N*=21)) T_{max} = 6.5 ± 1.0 hours		
	0.073 ± 0.020		3 days including over-night fast		?	0.19 ± 0.09			Grape pomace (N=10, mean ± s.e.)	(Castello et al. 2018)	10
	0.012 ± 0.002								Watermelon, Overweight / obese individuals (*N*=6, mean ± s.e.)	(Fan et al. 2020)	6
		0.288 ± 0.038	2-day including over-night fast	0.0164 ± 0.0007					Mean ± s.e., *N*=7, beans	(Mecha et al. 2020)	7
										15	364

Notes: a) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

b) 12-hour urines

Table 56. 3'-Methoxycinnamic acid-4'-sulfate											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
1.27 ± 0.85 (**1.17** and 1.02)									Free-living volunteers (N=90, mean ± s.d.) (**Median** and IQR)	(Le Sayec et al. 2023)	90
0.019 (0.011–0.032) [c]		**17.22 (4.42–53.44)** [c]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
	0.065 (0.061, 0.090)	**9.9** (7.3, 13.7)	1st						Coffee low dose (412 µmol) (**median** and quartiles, *N*=11)	(Stalmach, Williamson, and Crozier 2014)	11
	0.033 (0.026, 0.041)		2nd						Coffee low dose (412 µmol) (**median** and quartiles, *N*=11)		
	0.126 (0.111, 0.195)	**14.4** (12.3, 26.7)	1st						Coffee medium dose 635 µmol) (**median** and quartiles, *N*=11)		
	0.054 (0.044, 0.073)		2nd						Coffee medium dose (635 µmol) (**median** and quartiles, *N*=11)		
	0.068 (0.047, 0.094)	**16.1** (12.3, 24.8)	1st						Coffee high dose (795 µmol) (**median** and quartiles, *N*=11)		
	0.035 (0.026, 0.073)		2nd						Coffee high dose (795 µmol) (**median** and quartiles, *N*=11)		
		6.2 ± 0.9	2 days						Orange juice (368 µmol) (N=9, mean ± s.e.)	(Pereira-Caro et al. 2023)	9
		6.0 ± 0.5	2 days						Orange juice (368 µmol) plus oat bran (58 µmol) (N=9, mean ± s.e.)		
	0.019 ± 0.002		Over-night	0.2 ± 0.1					Orange juice (398 µmol) (N=10, mean ± s.e.) Trained athletes	(Pereira-Caro et al. 2020)	10
		7.8 ± 2.5				2.2 ± 0.8 [d]			Orange juice (398 µmol) (mean ± s.e., N=10 trained)		10

		5.9 ± 2.1				2.0 ± 1.0 [d]			Orange juice (398 µmol) (mean ± s.e., N=10 detrained)	(Pereira-Caro et al. 2017)	
		137.4 ± 22.7 day 1 101.1 ± 18.0 at 1 month	2-day including over-night fast	0.003 ± 0.002					Day 1 placebo (mean ± s.e., N=22) Placebo after 1 month (mean ± s.e., N=22)	(Heiss et al. 2022)	22
		88.7 ± 18.6 day 1 98.9 ± 15.6 at 1 month	2-day including over-night fast	0.011 ± 0.005					Day 1 cranberries (525 mg) (mean ± s.e., N=23) Cranberries (525 mg) after 1 month (mean ± s.e.), N=23)		23
	0.70 (0.21, 3.17)	41 (26, 105)	24 hours	0.025 ± 0.005		1.95 ± 0.84			Artichoke (5727 µmol) (N= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
	2.27 ± 0.79	1.06 ± 0.26	Three days						Daily Cranberry juice (787 mg) for 1 month (mean ± s.e., N=10).	(Feliciano, Boeres, et al. 2016)	10
	1.21 ± 0.47		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10
	2.76 ± 0.88		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10
	3.71 ± 1.18		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	4.87 ± 1.51		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
		14.0 ± 2.33 day 1 14.0 ± 2.18 at 1 month	1-day including over-night fast	0.090 ± 0.033 0.106 ± 0.040 0.074 ± 0.026 0.080 ± 0.017					Daily Wild blueberries (726 mg) for 1 month (mean ± s.e., N=18).	(Feliciano, Istas, et al. 2016)	18
	0.076 ± 0.09	11.1 ± 1.6							Coffee (412 µmol) (mean ± s.e. *N*=11)	(Stalmach et al. 2009)	11
		9.9 ± 1.9	36 hours					**4.2 ± 1**	Coffee (385 µmol) (mean ± s.e., *N*=5 ileostomists)	(Stalmach et al. 2010)	5

	0.188 ± 0.107								Mixed fruit purée (*N*=9, mean ± s.d.)	(Pimpao et al. 2015)	9
	0.084 ± 0.017 0.056 ± 0.009 0.077 ± 0.009								Wholegrain bread (87 mg) and aleurone –enriched wholegrain bread (43 mg, 87 mg) (N=5, mean ± s.e.)	(Bresciani et al. 2016)	5
	0.010 ± 0.002 ±		3 days including over-night fast		?	0.11 ± 0.03			Grape pomace (N=10, mean ± s.e.)	(Castello et al. 2018)	10
	0.0026 ± 0.0009	4.3 ± 1.3 [b]							Mean ± s.e., *N*=10 Week 1 low consumption flavanone-rich ingredient	(Muralidharan et al. 2023)	10
	0.0022 ± 0.0008	6.9 ± 4.8 [b]							Mean ± s.e., *N*=10 Week 16 low consumption flavanone-rich ingredient		
	0.0028 ± 0.0007	3.8 ± 0.6 [b]							Mean ± s.e., *N*=9 Week 1 high consumption flavanone-rich ingredient		9
	0.0017 ± 0.0006	3.6 ± 1.0 [b]							Mean ± s.e., *N*=9 Week 16 high consumption flavanone-rich ingredient		
		6.17 ± 1.08	2-day including over-night fast	0.012 ± 0.001					Mean ± s.e., *N*=7, beans	(Mecha et al. 2020)	7
										18	331

Notes: a) µmol/kg for Macia

b) 48 hour urines

c) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

d) 12-hour urines

Table 57. 3'-Hydroxy-4'-methoxycinnamic acid (Isoferulic acid)											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.744 ± 0.783 (**0.506** and 0.656)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** and IQR)	(Le Sayec et al. 2023)	90
0.051 (0.047–0.062) [a]		**4.01 (1.89–8.40)** [a]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
	Trace		Over-night	n.d.					Orange juice (398 µmol) (*N*=10, mean ± s.e.) Trained athletes	(Pereira-Caro et al. 2020)	10
		31.3 ± 10.4 day 1 18.3 ± 6.1 at 1 month	2-day including over-night fast	6.10 ± 0.36					Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
		24.2 ± 6.2 day 1 14.6 ± 5.1 at 1 month	2-day including over-night fast	0.47 ± 0.21					Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23
	0.12 (0.085, 0.23)	10 (7.2, 14)	24 hours	<LOQ		0.577 ± 0.061			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
	4.59 ± 2.25	0.89 ± 0.23	Three days						Daily Cranberry juice (787 mg) for 1 month (mean ± s.e., *N*=10).	(Feliciano, Boeres, et al. 2016)	10
	5.53 ± 2.79		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10
	4.62 ± 2.00		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10

	4.24 ± 1.44		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	7.55 ± 3.46		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
		4.29 ± 1.25 day 1 4.58 ± 1.91 at 1 month	1-day including over-night fast	1.94 ± 0.35 1.63 ± 0.31 1.84 ± 0.38 1.69 ± 0.32					Daily Wild blueberries (726 mg) for 1 month (mean ± s.e., *N*=18).	(Feliciano, Istas, et al. 2016)	18
		3.9 ± 0.7	2 days						Coffee low dose (1053 µmol) (mean ± s.d., *N*=5 ileostomists) PLASMA HYDROLYSED	(Erk et al. 2012)	5
		4.6 ± 0.3	2 days						Coffee medium dose (2219 µmol) (mean ± s.d., *N*=5 ileostomists) PLASMA HYDROLYSED		
		14.1 ± 17.8	2 days						Coffee high dose (4525 µmol) (mean ± s.d., *N*=5 ileostomists) PLASMA HYDROLYSED		
			—				1.8 ± 1.1		Free-living volunteers (*N*=5) (mean ± s.d.). No increase on hydrolysis	(Jenner, Rafter, and Halliwell 2005)	5
			—				4.92 5.53 20.33 17.46		One free-living volunteer over four consecutive days. No increase on hydrolysis		
										10	241

Notes: a) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

Table 58. 4'-Methoxycinnamic acid-3'-glucuronide											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
4.057 ± 7.727 (**0.697** and 1.299)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** and IQR)	(Le Sayec et al. 2023)	90
0.0151 (0.0148–0.0154) [a]		**3.94 (1.27–7.79)** [a]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
		3.3 ± 0.2	2 days						Orange juice (368 µmol) (*N*=9, mean ± s.e.)	(Pereira-Caro et al. 2023)	9
		5.4 ± 0.9	2 days						Orange juice (368 µmol) plus oat bran (58 µmol) (*N*=9, mean ± s.e.)		
	0.013 ± 0.002		Over-night	0.01 ± 0.01					Orange juice (398 µmol) (*N*=10, mean ± s.e.) Trained athletes	(Pereira-Caro et al. 2020)	10
		1.6 ± 0.5				0.06 ± 0.03 [b]			Orange juice (398 µmol) (mean ± s.e., *N*=10 trained)	(Pereira-Caro et al. 2017)	10
		1.3 ± 0.4				0.07 ±0.05 [b]			Orange juice (398 µmol) (mean ± s.e., *N*=10 detrained)		
		20.3 ± 4.6 day 1 20.5 ± 4.6 at 1 month	2-day including over-night fast	0.010 ± 0.002					Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
		36.8 ± 8.1 day 1 18.1 ± 3.5 at 1 month	2-day including over-night fast	0.012 ± 0.002					Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23
	0.051 (0.041, 0.114)	1.3 (4.6, 16)	24 hours	<LOQ		0.557 ± 0.224			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
	0.390 ± 0.095	0.213 ± 0.041	Three days						Daily Cranberry juice (787 mg) for 1 month (mean ± s.e., *N*=10).	(Feliciano, Boeres, et al. 2016)	10
	0.56 ± 0.12		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10
	0.43 ± 0.13		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10

	0.23 ± 0.12		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	0.44 ± 0.12		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
		0.78 ± 0.16 day 1 0.77 ± 0.15 at 1 month	1-day including over-night fast	0.008 ± 0.002 0.006 ± 0.002 0.009 ± 0.002 0.008 ± 0.002					Daily Wild blueberries (726 mg) for 1 month (mean ± s.e., *N*=18).	(Feliciano, Istas, et al. 2016)	18
		11.8 ± 0.5	2 days						Coffee low dose (1053 µmol) (mean ± s.d., *N*=5 ileostomists) PLASMA HYDROLYSED	(Erk et al. 2012)	5
		15.9 ± 1.2	2 days						Coffee medium dose (2219 µmol) (mean ± s.d., *N*=5 ileostomists) PLASMA HYDROLYSED		
		23.7 ± 13.1	2 days						Coffee high dose (4525 µmol) (mean ± s.d., *N*=5 ileostomists) PLASMA HYDROLYSED		
		4.8 ± 0.5							Coffee (412 µmol) (mean ± s.e. *N*=11)	(Stalmach et al. 2009)	11
		3.9 ± 0.8	36 hours						Coffee (385 µmol) (mean ± s.e., *N*=5 ileostomists)	(Stalmach et al. 2010)	5
	0.070 ± 0.007		2 days						Coffee (1 cup/day) (mean ± s.e., *N*=21) T_{max} = 7.5 ± 1.3 hours	(Mena et al. 2021)	21
	0.122 ± 0.009		2 days						Coffee (3 cups/day) (mean ± s.e., *N*=21)) T_{max} = 5.9 ± 0.7 hours		
	0.067 ± 0.006		2 days						Coffee-cocoa mixture (3 cups/day) (mean ± s.e., *N*=21)) T_{max} = 6.5 ± 1.0 hours		
	0.008 ± 0.001								Watermelon, Overweight / obese individuals (*N*=6, mean ± s.e.)	(Fan et al. 2020)	6
										15	298

Notes : a) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

b) 12-hour urines

Table 59. 4'-Methoxycinnamic acid-3'-sulfate											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
<LOQ [a]		**0.324 (0.079–0.621)** [a]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
		1.1 ± 0.2 day 1 1.0 ± 0.2 at 1 month	2-day including over-night fast						Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
		1.2 ± 0.3 day 1 1.3 ± 0.2 at 1 month	2-day including over-night fast						Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23
	0.019 (0.012, 0.042)	7.6 ± 3.7	24 hours	<LOQ		0.070 ± 0.024			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
	0.049 ± 0.006	0.279 ± 0.088	Three days						Daily Cranberry juice (787 mg) for 1 month (mean ± s.e., *N*=10).	(Feliciano, Boeres, et al. 2016)	10
	0.035 ± 0.006		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10
	0.069 ± 0.015		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10
	0.063 ± 0.010		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	0.076 ± 0.014		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
		1.13 ± 0.29 day 1 1.10 ± 0.27 at 1 month	1-day including over-night fast	0.019 ± 0.003 0.018 ± 0.002 0.022 ± 0.005 0.020 ± 0.004					Daily Wild blueberries (726 mg) for 1 month (mean ± s.e., *N*=18).	(Feliciano, Istas, et al. 2016)	18

		0.4 ± 0.1							Coffee (412 µmol) (mean ± s.e. *N*=11)	(Stalmach et al. 2009)	11
		0.1 ± 0.0 [b]							Mean ± s.e., *N*=10 Week 1 low consumption flavanone-rich ingredient	(Muralidharan et al. 2023)	10
		0.1 ± 0.1 [b]							Mean ± s.e., *N*=10 Week 16 low consumption flavanone-rich ingredient		
		0.2 ± 0.0 [b]							Mean ± s.e., *N*=9 Week 1 high consumption flavanone-rich ingredient		9
		0.2 ± .0.0 [b]							Mean ± s.e., *N*=9 Week 16 high consumption flavanone-rich ingredient		
										8	161

Notes : a) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

Table 60. 4’-hydroxy-3’-methoxycinnamoyl-glycine											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
		18.7 (10.9, 26.4)							Coffee low dose (412 µmol) (median and quartiles, *N*=11)	(Stalmach, Williamson, and Crozier 2014)	11
		26.2 (17.5, 29.9)							Coffee medium dose (635 µmol) (median and quartiles, *N*=11)		
		27.2 (24.6, 38.9)							Coffee high dose (795 µmol) (median and quartiles, *N*=11)		
		20.7 ± 3.9							Coffee (412 µmol) (mean ± s.e. *N*=11)	(Stalmach et al. 2009)	11
	0.026 ± 0.004		3 days including over-night fast		?	0.98 ± 0.36			Grape pomace (N=10, mean ± s.e.)	(Castello et al. 2018)	10
										3	31

Table 61. 3’,4’-Dimethoxycinnamic acid											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
	0.50 ± 0.11								Coffee (*N*=8, mean ± s.d.)	(Farrell et al. 2012)	8
										1	8

Table 62. 4′-Hydroxy-3′,5′-dimethoxycinnamic acid (Sinapic acid)											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.255 ± 0.208 (**0.188** and 0.274)									Free-living volunteers (*N*=90, mean ± s.d.) (**Median** and IQR)	(Le Sayec et al. 2023)	90
		1.5 ± 0.2 day 1 1.2 ± 0.2 at 1 month	2-day including over-night fast	0.180 ± 0.015					Day 1 placebo (mean ± s.e., *N*=22) Placebo after 1 month (mean ± s.e., *N*=22)	(Heiss et al. 2022)	22
		2.6 ± 0.5 day 1 2.3 ± 0.4 at 1 month	2-day including over-night fast	0.140 ± 0.029					Day 1 cranberries (525 mg) (mean ± s.e., *N*=23) Cranberries (525 mg) after 1 month (mean ± s.e.), *N*=23)		23
	0.003 (0.002, 0.006)	0.7 (0.1, 2.7)	24 hours	0.001 ± 0.000		0.114 ± 0.075			Artichoke (5727 µmol) (*N*= 8, mean) (min, max)	(Dominguez-Fernandez et al. 2022)	8
	0.046 ± 0.011	0.114 ± 0.017	Three days						Daily Cranberry juice (787 mg) for 1 month (mean ± s.e., *N*=10).	(Feliciano, Boeres, et al. 2016)	10
	0.029 ± 0.007		Three days						Daily Cranberry juice (476 mg) (mean ± s.e., *N*=10).	(Feliciano et al. 2017)	10
	0.064 ± 0.020		Three days						Daily Cranberry juice (1238 mg) for (mean ± s.e., *N*=10).		10
	0.078 ± 0.022		Three days						Daily Cranberry juice (1534 mg (mean ± s.e., *N*=10).		10
	0.104 ± 0.030		Three days						Daily Cranberry juice (1910 mg) (mean ± s.e., *N*=10).		10
			—				0.97 ± 0.52		Free-living volunteers (*N*=5) (mean ± s.d.). No increase on hydrolysis	(Jenner, Rafter, and	5

			—				1.80 1.55 3.77 2.47		One free-living volunteer over four consecutive days. No increase on hydrolysis	Halliwell 2005)	
0.0042 (<LOQ–0.0042) [a]		**0.305 (0.191–0.921)** [a]							*N*=10, median and IQR. Polyphenol-rich breakfast for 3 days [a]	(Domínguez-Fernández et al. 2021)	10
		0.512 ± 0.036	2-day including over-night fast	n.d.					Mean ± s.e., *N*=7, beans	(Mecha et al. 2020)	7
										8	215

Notes: a) The participants consumed for breakfast for 3 days milled flaxseed (30 g/day), freeze-dried raspberry powder (40 g/day), and soy milk (250 mL/day), providing 300 mg/ day of lignans (300 mg of secoisolariciresinol diglucoside), 150 mg/ day of ellagitannins (118 mg of sanguiin H6, 14.3 mg of lambertianin C, and other minor ellagitannins), and 22 mg of isoflavones/day (20.10 mg of daidzin and 1.8 mg of daidzein).

Table 63. 3′,4′,5′-Trimethoxycinnamic acid											
Free-living Plasma spot value	Plasma C_{max}	Urine	Washout				Fecal water	Ileal fluid	Notes	Reference	N
µmol/l	µmol/l	µmol/24 hours	Washout duration	Plasma spot conc^{n} µmol/l	Urine collection duration	Urine content µmol	µmol/l	µmol/l			
0.049–2.422									Free-living volunteers (*N*=10, min, max) GLUCURONIDASE not amino acid conjugates	(Shafaei et al. 2019)	10
			—				0.12 ± 0.11		Free-living volunteers (*N*=5) (mean ± s.d.). No increase on hydrolysis	(Jenner, Rafter, and Halliwell 2005)	5
			—				0.16 0.25 0.16 0.16		One free-living volunteer over four consecutive days. No increase on hydrolysis		
										2	15

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