

Monitoring of caffeine, total sugar and artificial sweetener contents on caffeinated beverages in Seoul

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ABSTRACTS

This study performed to survey the contents of caffeine, artificial sweetener, and sugar in caffeinated beverages at commercial markets in Seoul. Total 126 items, consisting of 37 processed milks, 44 beverages, 11 teas, 24 coffees, and 10 nourishment drinks were collected from markets in Seoul and internet shopping malls. The contents of caffeine were beverage (0.99~1026.2 mg/kg), coffee (184.7~557.0 mg/kg), tea (44.3~290.5 mg/kg), processed milk (12.5~465.3 mg/kg), nourishment drink (107.5~362.1 mg/kg), respectively. The contents of total sugars per one serving size were beverage (N.D.~39.7 g), coffee (N.D.~21.7 g), tea (12.8~22.0 g), processed milk (13.0~32.1 g), and nourishment drink (4.8~16.4 g), respectively. When the beverage with highest sugar content per one serving size were compared to WHO guidelines, the percentages were 32% about recommended daily intake of sugar (50g). The detected artificial sweeteners concentration were followed: N.D.~0.25 for aspartame mg/kg, N.D.~0.33 mg/kg for acesulfame K, and N.D.~0.34 mg/kg for sucralose. The estimated daily intake (EDI) of aspartame, acesulfame K and sucralose were 4.2 µg/kg bw/day, 21.0 µg/kg bw/day, and 21.0~33.5 µg/kg bw/day, respectively. The intake levels were 0.01~0.22% of acceptable daily intake (ADI), which were all within safe levels. In view of above results, if caffeine consumption is a concern, consumers should check nutrition label about the caffeine content of caffeinated beverages.

MATERIALS AND METHODS

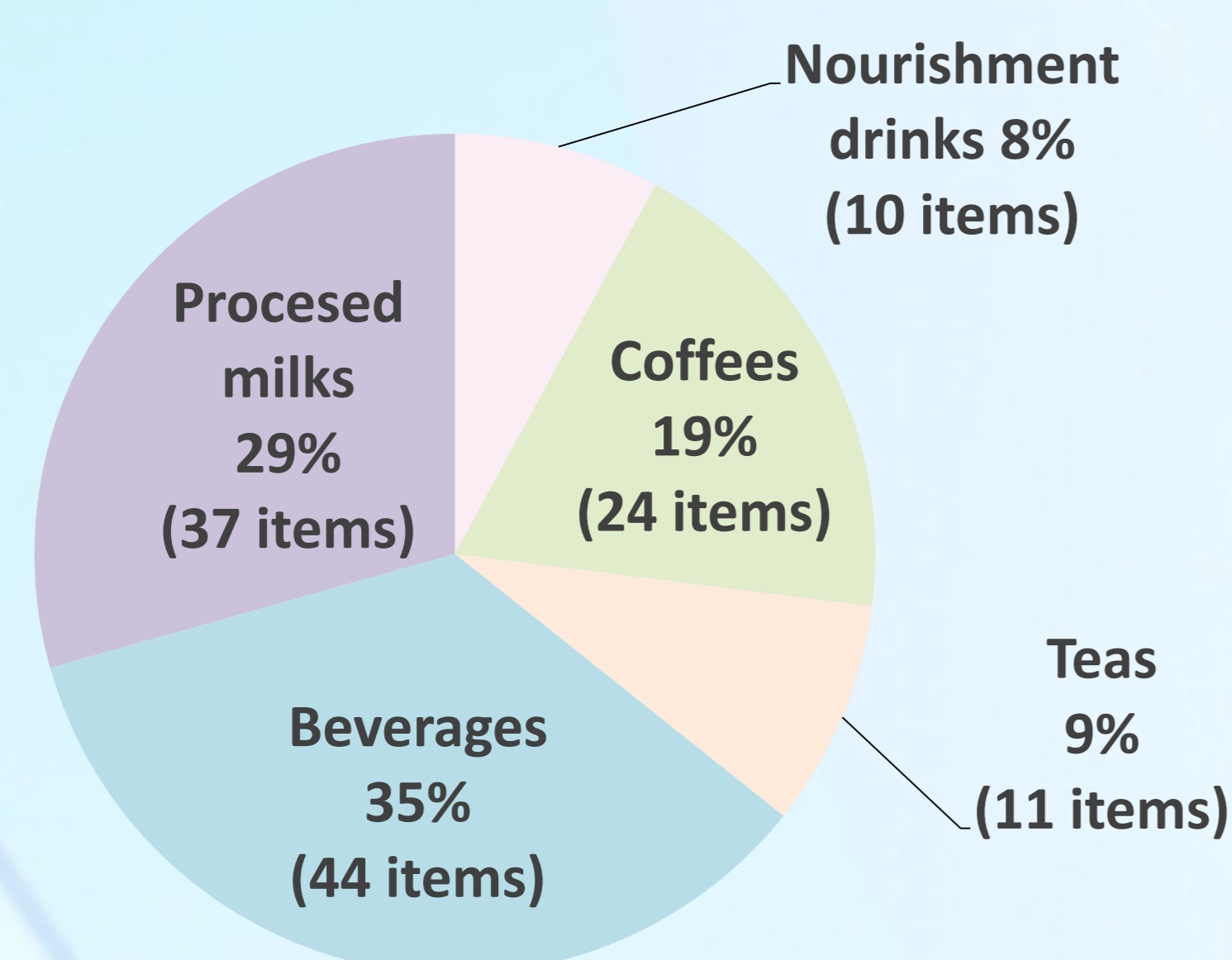


Fig. 1. Distribution of caffeine beverage products according to food type in Seoul

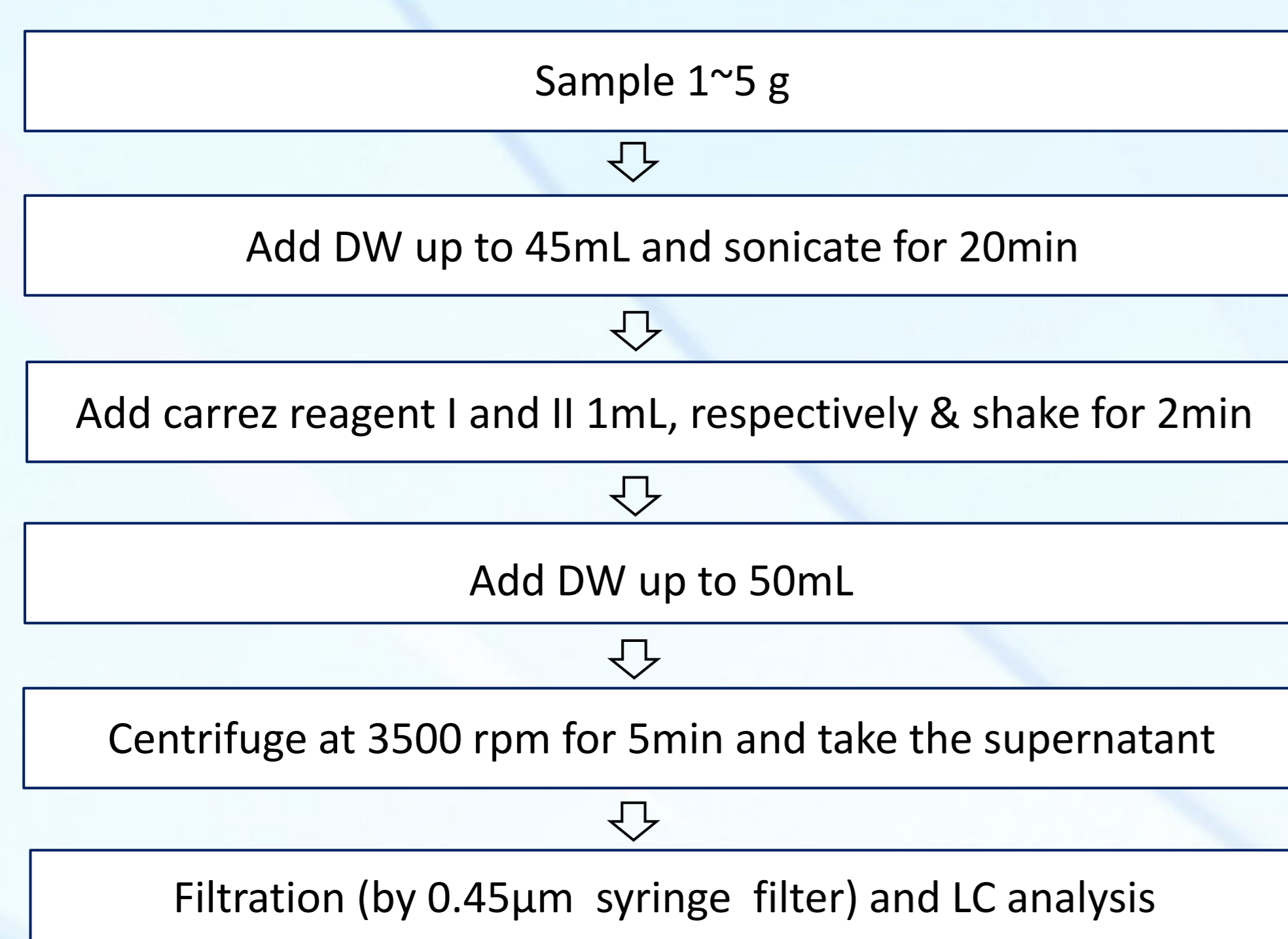


Fig. 2. Sample preparation

Table I. The operation parameters of HPLC for analysis of total sugars, caffeine, and artificial sweeteners

	Total sugars	Caffeine	Artificial sweeteners
Column	Prevail Carbohydrate ES (4.6 mm × 250 mm, 5 µm)	Agilent 5 TC-C18 (4.6 mm × 150 mm, 5 µm)	Luna 5µ C18 (3.0 mm × 250 mm, 5µm)
Mobile phase	Acetonitrile : Water (75:25)	MeOH: Acetic acid: DW (20:1:79)	0.005 M KH ₂ PO ₄ (containing 0.01 M TBA-OH, pH 3.5): acetonitrile (90:10)
Flow rate	1.0 mL/min	1.0 mL/min	1.0 mL/min
Injection vol.	10 µL	10 µL	20 µL
Column temp.	40°C	30°C	40°C
Detector	ELSD	UV, 280 nm	UV, 210 nm
- Pressure	3.5 bar	-	-
- Temp.	40°C	-	-
- Gain	5	-	-

RESULTS

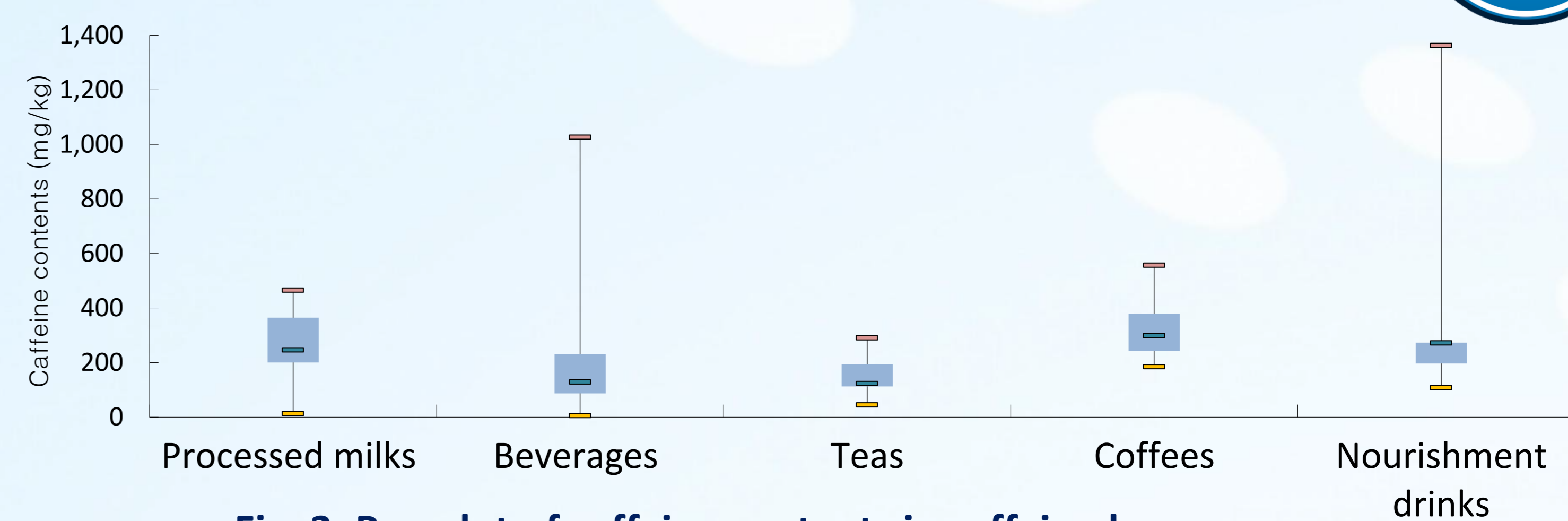


Fig. 3. Box plot of caffeine contents in caffeine beverages

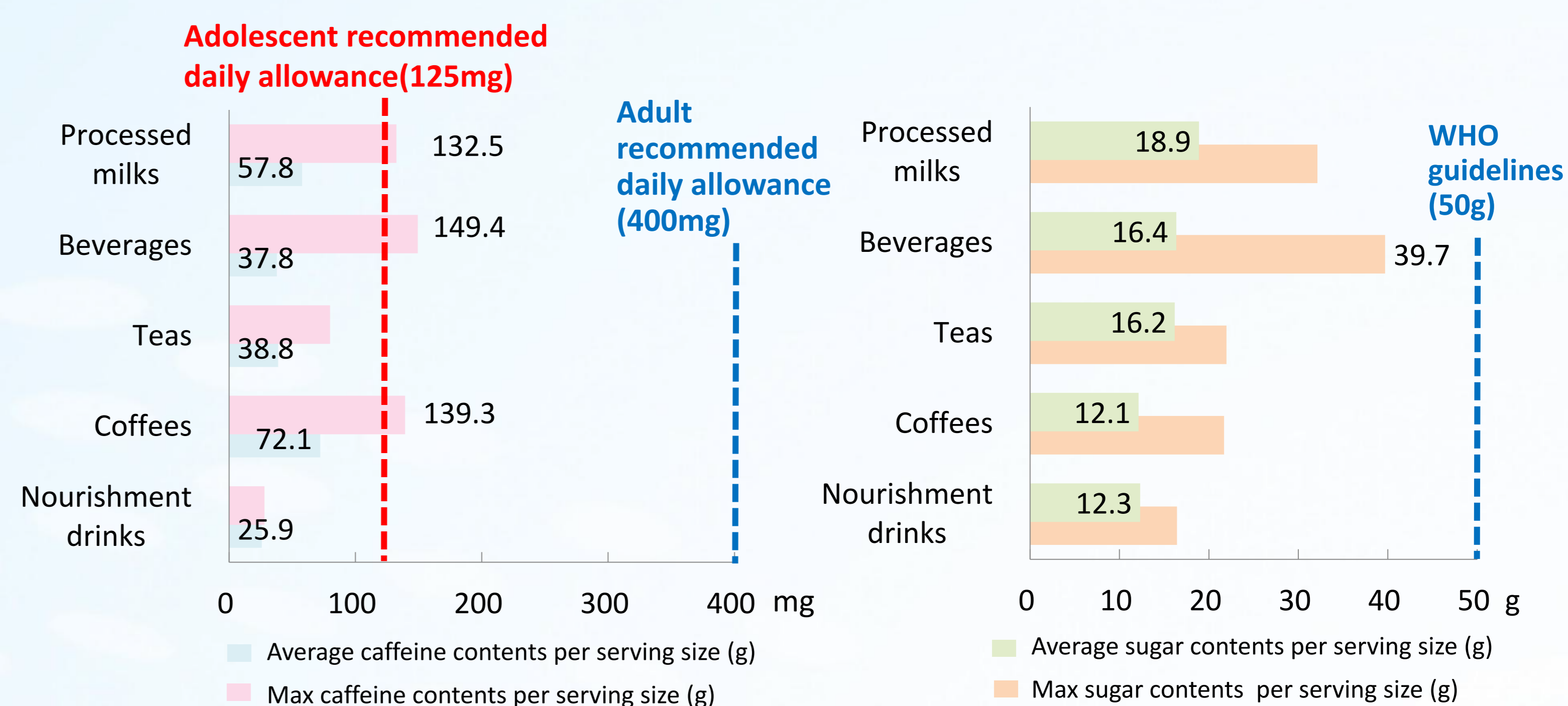


Fig. 4. Caffeine contents and sugar contents in caffeine beverages per serving size

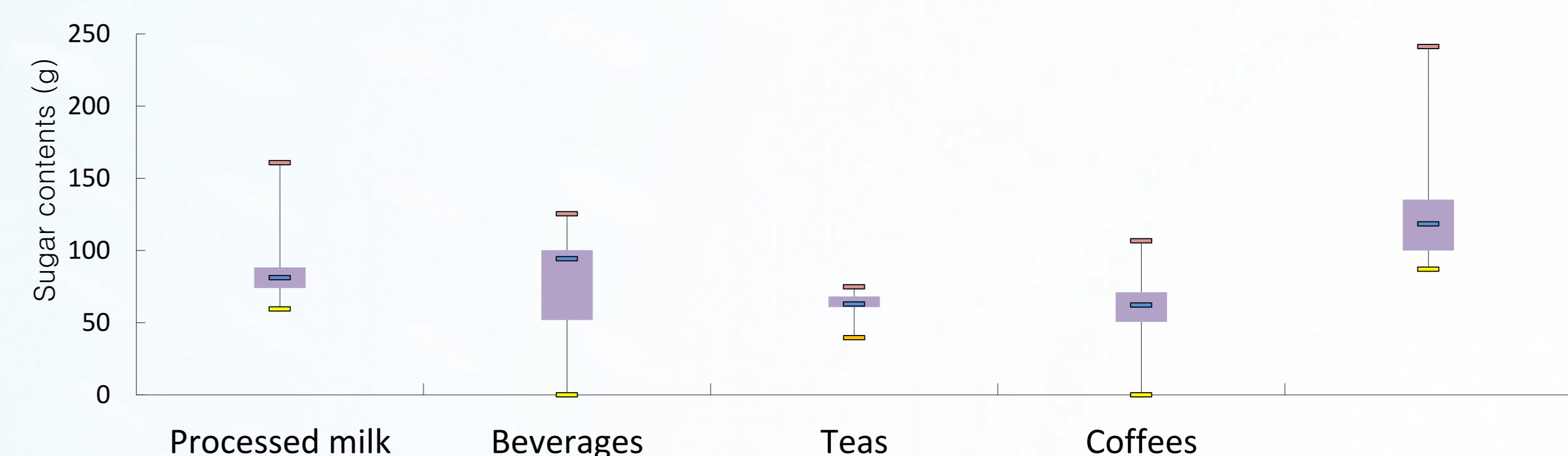


Fig. 5. Box plot of total sugar contents in caffeine beverages

Table 2. Assessment of dietary intake of artificial sweeteners in caffeine beverages

Artificial Sweeteners	Food type	Concentrations (g/kg)	Food intake (g/day)	Estimated daily intake (EDI) (mg/kg.bw/day)	Acceptable daily intake (ADI) (mg/kg.bw/day)	ADI (%)
Aspartame	Carbonated beverage	0.01	25.11	0.0042	40	0.011
Acesulfame K	Carbonated beverage	0.05	25.11	0.0209	15	0.139
	Carbonated beverage	0.05	25.11	0.0209	15	0.139
Sucralose	Mixed beverage	0.08	25.11	0.0335	15	0.223
	Processed milk	0.04	3.12	0.0021	15	0.014

DISCUSSION

- In view of above results, there was a wide range of product differences in caffeine and sugar contents and the intake of caffeinated beverages were needed to avoid excessive intake.
- If caffeine and sugar consumption is a concern, they are advised to read food labels carefully before purchasing or consuming prepackaged food to see the caffeine and sugar content of caffeinated beverages.

REFERENCES

- World Health Organization. Diet, Nutrition and the Prevention of Chronic Diseases. WHO Technical Report Series 916, 4-12, WHO, Geneva, 2003.
- World Health Organization. Principles for the safety assessment of food additives and contaminants in food. Environmental Health Criteria, 70. International Program on Chemical Safety in cooperation with the Joint FAO/WHO Expert Committee on Food Additives (JECFA). Geneva, Switzerland. 1987.