C11 Fortified Coffees with Iron, Zinc and Calcium: Evaluating the Impact of Quality and Roasting Degree on Sensory Responses.

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Rationale: Nutritional deficiencies reach people in all social classes and are considered to be major challenges for health policies all over the world. Fortification is a way to increase mineral intake in the food industry. The foods chosen for fortification should be regularly consumed by the population and accessible and coffee meets these criteria. The mineral salts used for fortification must be bioavailable and have good acceptance by consumers. However, fortification of coffee is a challenge, since most highly bioavailable salts confer strong off-flavors to foods. This study aimed to compare the sensory impact of coffee fortification with the salts of iron, zinc and calcium that presented higher recovery during brewing in a previous evaluation.

Methods: Four coffee blends with different quality (traditional-T and gourmet-G) and roasting degrees (mediun-M and dark-D, SCAA #55 and #35, respectively) were fortified (individually or jointly) with the following salts: iron bis glycine chelate, zinc lactate and calcium lactate, in the amount equivalent to 15% of RDI for adults in Brazil (ANVISA). Mineral analyses were performed by ICP-OES. Coffees were brewed in electric drippers, also commonly used in Brazil Sensory analysis was carried out by acceptance test (1 to 9 hedonic scale for overall acceptance) and check-all-that-apply (CATA with options of 28 attributes related to aroma, mouth feel and flavor). One hundred volunteers (41% male and 59% female), aged > 18 and < 66, participated in the study. Statistical analyses were performed using XLASTAT 2014 (Addinsoft, version 2104.2.07). ANOVA was used, followed by Fisher test and Multiple Factor Analysis (MFA). Differences were considered when $p < 0.05$.

Results: Minerals concentrations in fortified brews were 4.9; 1.5 and 222 mg/100ml of iron, zinc and calcium, respectively. Generally, unfortified and fortified (iron-zinc-calcium) gourmet coffees showed greater acceptance among consumers (especially female), with no difference in roasting degree. The lowest acceptance was observed in DT-iron. Cluster analysis revealed 3 distinct segments: Cluster 1 (n=15, average scores 7.9-7.2) attributed higher scores to DG and MG control and DG-calcium; Cluster 2 (n=51, average scores 6.0-4.1) attributed higher scores to MG, MT and MG-zinc, and MT-zinc, DG, DT and DG (iron-zinc-calcium), DT (iron-zinc-calcium); Cluster 3 (n= 34; average scores 4.3-2.8) gave higher scores to DG (iron-zinc-calcium), DT (iron-zinc-calcium). Fortification with iron alone caused change in the appearance of all brews and the lowest acceptance by most consumers. Among coffees fortified with zinc, MT-zinc and MG-zinc presented better acceptance. On the other hand, darker roast increased acceptability of calcium lactate. Regarding attributes chosen in CATA analysis, coffees with higher acceptance, including the ones fortified with all minerals, were associated with attributes such as characteristic, chocolate, vanilla, caramel, nuts and burnt, while attributes, like cereal, medicine, butter, were chosen for samples fortified with zinc; astringent, cereal, peanut, sour, were chosen for samples fortified with calcium; and green grass, astringent, salty, cucumber, iodine, earth, metallic, and burnt rubber were chosen for samples fortified with iron.

Conclusions: Fortification with iron bis glycine chelate, zinc lactate and calcium lactate salts did not alter the original flavor when offered jointly. Coffee quality and roasting degree affected the acceptance of the salts used for fortification, especially when they were offered separately.