



An investigation on the appropriateness of chocolate to match tea and coffee



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ABSTRACT

The aim of this study was to provide some recommendations for selecting a befitting tea and coffee to match chocolate with different cocoa contents. Three coffee samples (chocolate flavored, vanilla flavored and unflavored coffee), four tea samples (black tea, green tea, vanilla flavored tea and citrus flavored tea) and three chocolates (30%, 70%, and 99% cocoa) were hedonically rated by eighty regular chocolate consumers. The beverages were then paired with each chocolate, and the consumers were asked to indicate the hedonic liking of the resulting pairings, and to indicate whether the chocolate or beverage flavor dominated the pairing flavor. This study showed that liking of chocolate and coffee pairings and chocolate and tea pairings significantly varied ($p < 0.001$) across samples. Consumers preferred pairings with 30% cocoa and 70% cocoa chocolate to pairings with 99% cocoa chocolate. Overall, coffee is significantly ($p < 0.001$) preferred to tea as a chocolate partner. Chocolate and beverage pairing liking was biased by the liking of the beverage tasted alone, the liking of chocolate tasted alone, beverage type, chocolate type and the level of flavor match between chocolate and tea or coffee in a given pairing. When chocolate and beverage flavor balanced out in a given pairing, chocolate and coffee/tea pairings were significantly preferred by the consumers. A significant decrease in acceptance was observed when beverage or chocolate flavor dominated the flavor of the pairing, much more so when the chocolate flavor dominated the pairing flavor. However consumers don't enjoy any preferred chocolate with any preferred tea or coffee because some flavors match better than do others. Indeed, consumers formulate their hedonic responses taking into consideration what flavors go well together more than they rely exclusively on their hedonic judgments of the chocolates, the teas, and the coffees tasted alone.

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1. Introduction

Chocolate has a long history of pairings in different cuisines, rituals, and ceremonies (Alberts & Cidell, 2006; Cidell & Alberts, 2006), and various chocolate recipes exist for entrees, desserts, beverages, appetizers, pasta and meat. Despite the use of chocolate in a wide array of foods and the growing interest in the area of taste personalization focusing on the comprehension of factors that drive food and beverage pairings, only one systematic research has been conducted that examined pattern of consumers' preferences for chocolate and beverage pairings (Donadini, Fumi, & Lambri, 2012).

The results of this preliminary study showed that: 1) consumers preferred pairings with chocolate containing 30% and 70% cocoa solids over pairings with chocolate containing 99% cocoa solids; 2) balsamic vinegar, coffee, liqueur wine and Port wine were more suitable and versatile

partners of chocolate than were spirits, beers, and other types of wines; 3) chocolate and beverage pairing liking depended on the liking of the beverage tasted alone more than on the liking of chocolate tasted alone; and 4) a drop in acceptance was generally observed when chocolate flavor dominated the flavor of the pairing, whereas a drop or a gain in acceptance was observed when beverage flavor dominated chocolate.

This study requires to be complemented by specific pieces of information on flavor interactions that take place when chocolate and beverages are consumed according to a mixed tasting technique and on sensory drivers of consumers' acceptance. The exploration of the relations between sensory qualities of food and consumers' liking appears to be a key point to uncover underlying patterns of consumer preference for food and beverage matches and to select the most befitting beverage to match chocolate and simultaneously satisfy the hedonic demand of consumers.

Indeed, previous literature in the field of food pairing showed that for consumers some flavors harmonize better than do others and that consumers formulate their hedonic response to food and beverage matches taking into consideration what flavors go well together more than they rely exclusively on their personal preference for the food or

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the beverage tasted alone (Donadini & Fumi, 2011; Donadini, Fumi, & Lambri, 2013; Donadini, Spigno, Fumi, & Pastori, 2008).

Innovation is strategic to the food industry. Brainstorming activities involving product developers, marketers and consumers are critical for new concept generation as are field tasting surveys with consumers in real environments of consumption in offering valuable feedbacks on product performance (Moskowitz, Porretta, & Silcher, 2005; van Kleef, van Trijp, & Luning, 2005).

This is particularly valuable in Italy, home of some of the world's finest chocolate companies and creative artisanal chocolatiers (AIDEPI, 2012) for whom developing new flavors and thinking up new taste combinations are paramount to the fulfillment of consumers' demands.

Actually Italians indulge in milk chocolate but also love the sophistication of dark chocolate (Stagni, 2007). Espresso lovers, Italians are used to matching chocolate with coffee in their everyday life. They savor habitually a square of chocolate after dinner before an espresso, melt the chocolate right in the cup, stir their espresso with a chocolate spoon until the tip melts or eat espresso encased in a shell of dark chocolate in the form of praline.

Tea culture in turn is not as developed as coffee culture. However a growing proportion of Italian consumers, for the most part females, boosted sales of tea in recent years, especially of green tea, fruit/herbal tea and other tea with low tannin content (Euromonitor International, 2013).

Tea is mainly consumed during breakfast or as cold refreshing tea, and pairing tea with particular types of food is still an evolving art far away from being a consolidated habit of consumers. Chocolate producers, restaurateurs, and gourmets are beginning to explore pairing tea with food, chocolate included, in a more systematic way and to offer consumers a range of guidelines warning them that no longer does tea go with just breakfast foods.

The current study was designed to explore the hedonic response of consumers to chocolate and tea pairings and chocolate and coffee pairings by conducting tasting sessions with regular chocolate consumers in a natural environment of consumption. To reach this overall goal, a panel of eighty consumers was asked to hedonically rate twenty-one pairings of three coffees, four teas and three chocolates with a range of cocoa and to indicate whether the chocolate or the tea/coffee flavor dominated each pairing. To understand the relationships between the sensory data and consumer liking, expert panelists were asked to explore the sensory properties of the chocolate, the teas, the coffees and the resulting pairings by Descriptive Analysis (DA). The relations between DA data of the twenty-one pairings and the consumers' hedonic responses to these pairings were examined by means of PLS-Regression.

2. Materials and methods

2.1. Chocolate, tea and coffee samples and preparation for serving

Three chocolates with different cocoa contents (30%, 70%, and 99% cocoa), four teas (black tea, green tea, vanilla flavored tea and citrus flavored tea) and three coffees (chocolate flavored, vanilla flavored and unflavored coffee) were chosen to cover a range of different sensory characteristics. Information on ingredients, manufacturer and chocolate sensory characteristics is summarized in Table 1 and 2. Sample preparation for serving was in typical format extensively described in Donadini et al. (2012).

2.2. Determination of the sensory profile of coffee, tea, chocolate samples and the resulting pairings

Sensory profiling of the tea samples, the coffee samples and the resulting pairings were carried out in a test room designed in accordance with ISO standards (ISO, 2007) with Descriptive Analysis (DA; Stone & Sidel, 2004) and a lexicon generated following the guidelines of Lawless and Civille (2013), in the typical format described in Donadini et al. (2012).

The descriptors for coffee and tea selected and used in this study are listed in Table 3 and 4 respectively.

The descriptors selected and used in DA of chocolate and coffee pairings and in DA of chocolate and tea pairings included basic tastes (sweet, bitter, sour and salty), flavors (burnt, smoky, caramel-like, dried fruit-like; milk-like, licorice-like, tobacco-like, cocoa-like, vanilla-like, spicy), textures (gritty, fatty, sticky, soluble, firm, creamy, mouthcoating, body, and astringent), and two overall terms (flavor persistence, flavor intensity).

In addition, specific flavor descriptors were selected for DA of chocolate and coffee pairings (i.e. toasted and roasted) and of chocolate and tea pairings (i.e. straw-like, fruity, cooked vegetable-like, mint-like, herb-like, citrus-like).

For a comprehensive description of the lexicon, see Drewnowski and Almiron-Roig (2010); Geel, Kinnear, and De Kock (2005); International Coffee Organization (ICO) (2010); Lee and Chambers (2007); Maetzu et al. (2001); Narain et al. (2004); Navarrini, Cappuccio, Suggi-Liverani, and Illy (2004); Nebesny and Budryn (2006); Lingle (2001); Soh et al. (2008).

The panel employed by the authors in DA consisted of eight assessors who had previously participated in the sensory tests described in Donadini et al., 2012.

Table 1

Chocolate, tea and coffee samples selected for the study.

Samples	Brand	Producer	Ingredients as labeled
30% cocoa	Lindt Excellence Extra "fondant lait"	Lindt & Sprüngli ^a , Kilchberg (Ag), Switzerland	Sugar, cocoa butter, powdered whole milk, cocoa paste, anhydrous butter, lactose, powdered skimmed milk, malted barley extract, soy lecithin, flavorings
70% cocoa	Lindt Excellence 70% "noir intense"	Lindt & Sprüngli ^a , Kilchberg (Ag), Switzerland	Cocoa paste, sugar, cocoa butter, Bourbon vanilla beans
99% cocoa	Lindt Excellence 99% "noir absolute"	Lindt & Sprüngli ^a , Kilchberg (Ag), Switzerland	Cocoa paste, cocoa powder, cocoa butter, raw cane sugar
Black tea	Lipton yellow label tea	Unilever, London, England.	Black tea
Green tea	Premia Tè Verde	Agorà Network S.c.a.r.l. Milano	Green tea
Vanilla flavored tea	Vanilla Tea	R. Twinning and Company Limited, London, England	Black tea, flavorings, vanilla beans
Citrus flavored tea	Agrumance™ Tea	R. Twinning and Company Limited, London, England	Black tea, orange peel, lemon peel, citrus flavorings.
Coffee	Lavazza Crema e Gusto	Luigi Lavazza S.p.A., Torino, Italy	Mix (30% Arabica, 70% Robusta) of ground coffee
Chocolate flavored coffee	Flavored coffee chocolate	Torrefazione MUSETTI, Pontenure, Italy	Ground coffee with flavorings
Vanilla flavored coffee	Flavored coffee vanilla	Torrefazione MUSETTI, Pontenure, Italy	Ground coffee with flavorings

^a Distributor: Lindt & Sprüngli S.P.A. I-21056 Induno Olona (VA), Italy.

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