



A preliminary study investigating consumer preference for cheese and beer pairings



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ABSTRACT

The current study was designed to explore the hedonic response of consumers to cheese and beer pairings by actual tasting in a natural environment of consumption. Eighty regular beer and cheese consumers hedonically rated sixteen pairs among four different styles of beer (Standard Lager, Hefeweizen, Amber Bock, Vienna Lager) and four cheeses (Parmigiano-Reggiano, Gorgonzola, Mozzarella, Smoked Provolone). The consumers were asked to indicate whether the cheese or the beer flavour dominated each pairing. The hedonic response varied significantly ($p < 0.001$) across combinations of cheese and beer pairs: Parmigiano cheese and Standard Lager were significantly preferred over other cheeses and beers, respectively. The hedonic liking of beer and cheese pairs was affected, in order of effect size, by beer liking, cheese type, flavour dominance, beer type, and beer type \times cheese type interaction. Because the pairing was largely affected by beer preference, expert panellists were asked to explore the sensory properties of the beer with and without prior cheese consumption, using Parmigiano-Reggiano as a case study. Prior Parmigiano consumption showed a positive effect on beer liking, by modulating the perceived intensities of acidity, fruitiness, phenolic flavour, level of alcohol and carbonation, and sweetness. These outcomes are useful for engineering the most enjoyable pairing and to avoid intolerable mismatches, thus offering restaurateurs basic rules for aligning particular cheeses and beers in the marketplace.

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1. Introduction

Cheese and beer have a long history in pairing. Both cheese and beer started out as farmhouse creations, thus originating the primitive beginning of cheese and beer pairing. Middle Ages people in Central and Northern Europe ate cheese as a supplier of animal protein and drank beer as a beverage safer than water (Teuteberg, 1986). Cheese and beer soup is a traditional recipe in central Europe that combines sharp cheddar with chicken broth, diced vegetables and popped popcorn for garnish with beer. Monasteries of central Europe were known for their exceptional cheeses and beers, which constituted a staple for the monk diet and provided a source of income (Hieronymus, 2005). Regardless of traditional pairings, a perfect delectable pairing between cheese and beer requires the precise selection of each element of the pair for the ideal appreciation of the resulting combination.

A great deal of information is found about food and beer pairing in the popular press, such as tourism-related or culinary magazines, internet blogs, brewing companies, supermarket chain newsletters or websites, in which suggestions are mostly based on personal opinions of brew-masters, sommeliers, culinary and

gastronomy experts and beer enthusiast writers (Donadini, Spigno, Fumi, & Pastori, 2008). Apart from the mainstream press and anecdotal methods, scientific studies that examine ideal beer and food relationships under controlled conditions are scarce (Donadini et al., 2008; Harrington, Miszczak, & Ottenbacher, 2008). The majority of studies on the hedonic response of consumers to food and beverage pairings arise from research on food and wine combinations, which provide consistent evidence of both the suitability of cheese as an enjoyable partner of wine and conflicting results on the versatility of specific wine styles in partnering with different cheeses (Bastian, Collins, & Johnson, 2010; Bastian, Payne, Perrenoud, Joscelyne, & Johnson, 2009; Carlucci, Caporale, & Monteleone, 2008; Harrington & Hammond, 2006; Harrington, McCarthy, & Gozzi, 2010; King & Cliff, 2005; Madrigal-Galan & Heymann, 2006; Nygren, Gustafsson, Haglund, Johansson, & Noble, 2001; Nygren, Gustafsson, & Johansson, 2002; Nygren, Gustafsson, & Johansson, 2003). Few studies have focused on chocolate and drink pairings (Donadini, Fumi, & Lambri, 2012), extra-virgin olive oil and food pairings (Cerretani, Biasini, Bonoli-Carbognin, & Bendini, 2007), and meat and vegetable accompaniments (Aaslyng & Frost, 2008, 2010).

Therefore, understanding patterns that underlie consumer preference for cheese and beer pairings is required to improve the ability of brewers and cheese producers to make the appropriate

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cheese and beer matches. Consumers do not randomly pair food and beer. Beer liking and beer type largely drive the pairing acceptance and consumers recognise that some flavors harmonise better than others (Donadini et al., 2008; Harrington et al., 2008).

Italy is an appropriate scenario to examine cheese and beer and their relationships. Italy is one of the leading cheese producers worldwide with hundreds of cheeses that vary by flavour, texture (Koppel & Chambers, 2012), milk source (cow, goat, buffalo and sheep), fat content (full-fat, semi-fat and low fat), and rawnness (raw, semi-cooked and cooked curds) (Ottogalli, 2005). The beer variety is even greater, with approximately 1500 brands produced over 300 factories distributed throughout Italy (Assobirra, 2011). In particular, special craft beers are gaining momentum and are changing Italians' taste from mass-produced European pale Lagers to more complex and sophisticated products (Assobirra, 2011; Savastano, 2011). Beer consumers are increasingly predisposed to quality consumption and have a marked foodie attitude in their approach to food consumption. Their thirst for variety and experimentation are competitive advantages in the beer market, which has exhibited little growth in recent years. Consumers are now increasingly aware that beer is a versatile product that possesses the potential to fit different contexts and situations, and they are now particularly inclined to experiment with beer and food pairings even in countries such as Italy, for which wine is a traditional accompaniment to food (Assobirra, 2011; Ispo-Assobirra, 2011).

The current study was designed to explore the hedonic response of consumers to cheese and beer pairings by conducting tasting sessions in a natural environment of consumption. To reach this aim, regular cheese and beer consumers were asked to hedonically rate sixteen different pairings of four beers of different styles and four cheeses of different types and to indicate whether the cheese or the beer flavour dominated each pair. To understand the relationships between the sensory data and consumer liking, expert panellists were asked to explore the sensory properties of the cheeses and the beers by descriptive analysis (DA) with and without prior cheese consumption, using Parmigiano-Reggiano as a case study. The DA data and consumer liking were examined by means of PLS-Regression.

2. Materials and methods

2.1. Cheese

2.1.1. Cheese selection

Four cheeses were selected for this study: Parmigiano-Reggiano (24 months of ripening, cow milk, hard cheese; hereafter called Parmigiano), Gorgonzola (short-ripened “dolce” style, cow milk, soft cheese, blue veined cheese), Mozzarella (cow milk, fresh cheese, pasta filata cheese) and Smoked Provola (cow milk, smoked cheese, pasta filata cheese). Parmigiano and Gorgonzola are Protected Denomination of Origin (PDO) cheeses (EC Regulation 1107/96), whereas Mozzarella is a Traditionally Speciality Guaranteed (TSG) cheese (EC Regulation 2527/98). These cheese types were among the most commonly available and commonly consumed cheeses in Italy. They were chosen for this study to establish a list of cheeses that maximise differences in flavours.

2.1.2. Cheese sample preparation

All the cheeses were purchased from a local supermarket. All the samples originated from the same batch, were stored at 4 °C during trials, and were placed at room temperature for 0.5 h before the evaluation took place. Fifteen minutes prior to service, the rind of the cheese, nearly 15 mm in width, was removed and discarded. Then, the samples were cut into 25 g strips, nearly 2.5 × 2.5 × 5.0 cm in size, numbered with a three digit code for

tracking purposes, covered with Petri dishes to preserve volatile compounds and served on white porcelain dishes. The Mozzarella samples were prepared without removing the outer layer and were served as above described.

2.2. Beer

2.2.1. Beer selection

Four beers were selected for this study to span a wide range of sensory characteristics and to represent the most sold beer styles in the Italian market. Beer codes, alcohol by volume (% ABV), packaging, and country of origin are given in brackets. The grains usually employed in the brewing and the malt average colour in EBC units is also reported. The samples were as follows:

- A bottom-fermented Standard Lager (SL, 0.33 L, glass, domestic, 4.5% ABV) brewed from pilsner malt (2–5 EBC), a huge fraction of sugar syrup and a small amount of roasted malt (1300–1500 EBC).
- A bottom-fermented Amber Bock (ABK, 0.33 L, glass, domestic, 6.5% ABV) brewed mainly from Munich malt (10–15 EBC), and a small amount of roasted malt (1300–1500 EBC).
- A bottom-fermented Vienna Lager (VL, 0.35 L, glass, Mexico, 5.3% ABV) brewed mainly from a mix of Vienna malt (11–31.5 EBC), pilsner malt (2–5 EBC), and Munich malt (10–15 EBC).
- A top-fermented Hefeweizen (WHE, 0.50 L, glass, Germany, 5.5% ABV) brewed from Pilsner malt (2–5 EBC) and a huge fraction of malted wheat (2–3 EBC).

2.2.2. Beer sample preparation

The beer samples were bought from a local supermarket, had approximately the same remaining shelf life and belonged to the same batch. The beers were stored in a dark environment at nearly 12 °C during the trials. The beer samples were refrigerated to 8 ± 2 °C prior to serving. Each sample (30 mL beer) was poured into a coded, tulip-shaped glass, covered with a Petri dish to preserve volatiles and presented with nearly the same level of foam.

2.3. Consumer hedonic test

2.3.1. Consumer recruitment criteria, demographics and consumption behaviour

Eighty consumers who regularly consumed beer and cheese were recruited for this study from Milan and the vicinities. The panel was balanced for gender and age composition. The average consumer age was 43 years old and ranged from 19 to 78 years old. The panel was comprised of 55.0% males and 45.0% females. The consumers participated in the experiment of their own accord and received gadgets as incentives for the time spent to ensure motivation and to increase the likelihood of completing the evaluations. To generate a detailed profile of the beer consumers, the consumers completed a questionnaire on demographics and behavioural patterns of beer consumption. The questionnaire included multiple choice, categorical and numerical close-ended questions on gender, age, preferred beer styles, preferred serving temperature for beer, frequency of beer consumption, and whether the beer is consumed straight from the bottle or poured into a glass.

In detail, the patterns of the recruited consumers showed that 40.3% consumed beer sometimes per month, 30.0% sometimes per week, and 21.3% consumed beer every day. The bottom-fermented blond Lagers and Pilsners with alcohol contents between 4.5% and 5.5% ABV were preferred by 77.6% of the consumers, followed by wheat beers (30.0%) and double malted beers (27.5%), including Stouts (11.3%) and bottom-fermented amber beers of different styles (25.0%). Moreover, 77.5% of the consumers

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