Effect of social interaction and meal accompaniments on acceptability of sourdough prepared *croissants*: An exploratory study

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A B S T R A C T

The objective of this study was to investigate the effect of two contextual variables on consumer acceptance of *sourdough*-prepared croissants: social interaction among participants during the test and accompanying beverages. Three groups of consumers evaluated five samples in three different conditions: in individual testing booths (control group) and in the meeting room with and without an accompanying beverage. Croissants were also submitted to descriptive analysis (DA), and the effect of the sourdough addition on the sensory properties of croissants was evaluated. The results of DA demonstrated that sensory differences among croissants were mainly due to the leavening procedure used in their production process. Generally, those sensory differences did not significantly affect hedonic judgments, since all the samples were highly acceptable by consumers. Social interaction among subjects negatively affected all the liking scores when compared to the control group, whereas no effect of adding a beverage was observed. The liking of croissants for the three experimental groups corresponded to different sensory profiles, indicating that particular context in which the croissants were evaluated affected the relative contribution of the sensory characteristics to the consumer liking of the croissants.

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1. Introduction

Food, consumer and context are themselves bundles of various factors and phenomena. Food products have perceived sensory characteristics, which, of course, depend on the consumer, and extrinsic properties which affect consumer sensory perception and acceptability. Consumers have personalities, moods, physiological statuses, cultures, habits and memories which all affect their reactions to different foods. Finally, foods are not consumed in a vacuum, but within specific contexts which greatly affect their acceptability. Context can be considered as the time, the place, the situation, the way and who and what the food is consumed with (Gains, 1994).

Petit and Siefferman (2007) defined the context as all the circumstances that come with an event.

Meiselman, Johnson, Reeve, and Crouch (2000) emphasized that eating environment, serving conditions and association with other products could modify food acceptability and sensory attribute perception by consumers. Stroebele and De Castro (2004) pointed out that environmental factors such as where, when, and with whom food consumption takes place, presence of other people, time of consumption, smell, colors or physical setting influence food intake and food choice.

Meiselman (1996) separated the contextual variables into: internal context related to the product (preparation methods, association with other products), internal context related to the individual (actual experiences, expectations), and external context (social interaction, physical parameters, setting). Before, Cardello (1995) divided contextual factors into two categories: factors that are physically and concurrently present with the food (simultaneous) and factors that are antecedent to it (temporal). Each of these factors may also be sub-categorized as being food or non-food related. Food related simultaneous factors consist of other foods or beverages served and eaten together with the food of interest, whereas non-food simultaneous factors include social interaction, ambient conditions and other aspects of the food consumption. Food-related temporal factors include all foods and beverages recently consumed, whereas non-food temporal factors are variables as time of day or season of year.

Even though the importance of contextual factors was largely demonstrated, the most part of consumer tests is conducted in laboratory, while a little part is performed at central location, at home or in public places. A laboratory represents the most controlled environment for testing, because one can control environmental variables, stimulus variables and to a certain degree social interaction (Hersleth, Ueland, Allain, & Næs, 2005). That test situation allows that sensory characteristics are evaluated without being influenced by external variables (Cardello,

Schutz, Snow, & Lesher, 2000), however it is very different from a real eating environment and the realism of the test can be questioned. Meiselman et al. (2000) stated that laboratory consumer tests are not able to predict whether consumers will choose or consume the product in real life situation. Moreover, if a food is considered as a part of a context, other food and/or beverages are served and consumed with it, but natural and real meals are not usually served during laboratory test.

Miele, Di Monaco, Cavella, and Masi (2010) found a significant effect of meal accompaniments on mayonnaise acceptability evaluated in laboratory test; the effect was positive if the sample was consumed in association with the most appreciated food. The positive effect of meal accompaniment on spinach acceptability was also demonstrated by Bingham, Hurling, and Stocks (2005).

An alternative to the laboratory test is situational test developed to approach the context in which a product is really consumed (Petit & Siefferman, 2007). This test is organized in a mall, at a school, in a canteen or restaurant, where from a side one can partially control environmental variables and the degree of social interaction, and on the other side it is possible to increase the realism of the test (King, Weber, Meiselman, & Lv, 2004). Food testing by consumers in naturalistic conditions is considered to be more advantageous compared to laboratory tests with regard to realism of the evaluation, however situational tests are more expensive and time-consuming than laboratory ones (Petit & Siefferman, 2007). Experiments are carried out at a meal or a snack time in place where people naturally eat and social interaction is not limited (Meilgaard, Civille, & Carr, 2007). Hein, Hamid, Jaeger, and Delahunty (2010, 2012) studied the impact of evoking context by using a written scenario on hedonic ratings, as a tool to explore product acceptability under different contexts when real test is not feasible due to practical or financial constraints. Those researchers found that evoked context affected the relative importance of different sensory attributes for the consumers and the effect varied between product categories.

Many studies have clearly shown that the results of a hedonic test depend on the chosen methodology, but there is no consensus about the way in which it affects the results (Boutrolle, Delarue, Arranz, Rogeaux, & Köster, 2007). It is of great interest for food companies to obtain information about how preference ratings for a product may change from one situation to another. This knowledge may be of interest both for developing marketing strategies and in practical product development projects (Hersleth, Mevik, Næs, & Guinard, 2003). For the development of meat substitutes, the results of Elzerman, Hoek, Van Boekel, and Luning (2011) suggested that emphasis is needed on consumer evaluation of meal combinations instead of on the sensory properties of the individual product.

The objective of the present study was to investigate the effect of two contextual variables on consumer acceptance of croissants: social interaction among participants during the test and accompanying beverage. Croissants represent an interesting study case for our aim, since they are a food usually consumed with an accompanying beverage during breakfast time at home and moreover in a bar with other people. Three groups of consumers evaluated the same set of samples in three different conditions: in individual testing booths and in the meeting room with and without an accompanying beverage. In the experimental design definition, samples of croissants produced with different technologies were used. As sourdough, fermented by the original microflora of the flour or by selected lactobacilli (LAB), could influence the rheology of the dough and the quality of croissants, the samples were also submitted to descriptive analysis.

2. Materials and methods

The study consisted of two parts: 1) a sensory profiling of the croissants and 2) a consumer test, performed in three different experimental conditions.

2.1. Samples

Investigation was carried out over five samples of frozen croissants: four samples were provided by the same company (1) and were produced using different technologies; the fifth sample was provided by a competitor company (2). The analyzed samples were coded according to the main processing differences listed in Table 1.

The samples were stored at − 19 °C. Before sensory and consumer tests, the samples were equilibrated at room temperature for 10 min and cooked in an electrical oven for 23 min at 180 °C. Samples were evaluated 30 min after baking.

2.2. Descriptive analysis

Seven trained assessors took part in the descriptive analysis (DA) of the croissants. The DA included developing a sensory vocabulary (two sessions), training of the panel (four sessions), and actual evaluation (three sessions). The sensory vocabulary was developed via panel discussion and included attributes related to the appearance, odor, flavor, taste and texture of the samples (Table 2). During the training phase, each assessor evaluated a subset of three samples in triplicates on all attributes. Once the panel was sufficiently calibrated, they carried out to the actual sensory profiling. Three replicates were performed during which the assessors evaluated the croissant samples using 10 cm unstructured line scales (anchors are given in Table 2). The samples were placed on a white plastic plate and blind labeled with a three-digit code, and were evaluated in a monadic way by the assessors. The sample presentation order was randomized and balanced per subject during each DA session.

2.3. Consumer test

2.3.1. Participants' selection

95 consumers (66 women and 29 men; aged 18–33, mean: 23) participated at the consumer test. Most of them were students at the Food Science and Agricultural Department, University of Naples, who were recruited on the basis of interest and availability.

Prior to the study, 120 subjects completed a questionnaire where they provided information on their gender, age, as well as their liking (on a 9 point hedonic scale) and frequency of consumption for croissants (on a 7 point scale ranging from 1 = less than once a month, to 7 = every day). Only the subjects which gave both a liking score equal to or higher than 5 (= neither like nor dislike) and a frequency score equal to or higher than 3 (= 2 times a month) were selected to participate in the experiment. In the preliminary questionnaire the subjects were also asked to indicate their two preferred breakfast drink among ten different beverages (white milk, espresso coffee, *caffelatte*, *cappuccino*, tea, barley, orange juice, fruit juice, chocolate milk, other).

2.3.2. Procedure

Consumers were divided into three experimental groups that did not differ with regard to the following characteristics: gender ($\chi^2_{(2)} = 2.4$, $p = 0.4$); age ($F_{(2,92)} = 0.02$, $p = 0.9$); liking for croissant ($F_{(2,92)} = 0.003$, $p = 0.9$); and frequency of consumption ($F_{(2,92)} = 0.04$, $p = 0.9$). By establishing homogeneity between the groups, subsequent differences between conditions can be inferred to be a result of the experimental conditions.

The first group ("Control", $N = 32$) evaluated the samples individually in the sensory booths. The second group ("Social", $N = 33$) evaluated the samples in meeting sessions, during which consumers could freely interact and discuss, configuring a more realistic consumption situation. The evaluations occurred in a meeting room belonging to the Department of Agricultural and Food Science, with approximately six–eight consumers per session. The last group ("Social + Drink", $N = 30$) evaluated the sample in the same conditions as the previous one with the difference that they were served the croissant samples