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Sensory profile of P.D.O. Mozzarella di Bufala Campana Cheese

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ABSTRACT: The aim of this work was to define the typical sensory profile of DOP Mozzarella di Bufala Campana cheese as related to the technological process (industrial or artisanal), the geographical area (Salerno or Caserta), the season (spring or summer) and to the chemical composition of both milk and cheese. The results obtained showed that the sensorial profile of Mozzarella DOP changed for each variable considered. In particular, Caserta samples were more salty, with a more intense butter odour, higher peelability and homogeneity surface than those from Salerno area; the industrial samples, compared to the artisanal ones, were more salty, hard and "chewable", and exhibited an external layer more difficult to remove and more homogeneous.

Key words: Sensory profile, Mozzarella, Cheese.

INTRODUCTION - Mozzarella di Bufala Campana (MBC) cheese is the most important and famous Italian fresh pasta filata cheese, produced within three Southern Italy regions (Campania, Lazio, and Apulia) and worldwide recognised for its peculiar taste. According to the PDO (Protected Denomination of Origin) decree (European communities 1992; 1996), the cheese must contain exclusively water buffalo milk from "Mediterranean" breed, with a refrigeration time not exceeding 36 hours. MBC is traditionally manufactured employing natural whey cultures, that determines variability on cheese flavour (Coppola et al., 1990). The cheese is kept dipped in a shipping solution consisting in diluted whey or water from the stretching-molding phase, sometimes added with salt or lactic or citric acid, according to local tradition. Interestingly, the flavour of the cheese, depending on the microbial composition of the natural whey cultures, was found to be related to the geographical origin (Salerno and Caserta) (Mauriello et al., 2003). Indeed, in a previous work (Pizzolongo et al., 2005) MBC samples exhibited differences in acid taste, peelability, animal/stable odour, hardness, elasticity, cohesiveness, chewiness and surface homogeneity. The aim of this work was to determine the sensory profile of PDO MBC as related to technological parameters, season, geographical origin and chemical composition of milk and MBC.

MATERIAL AND METHODS - PDO MBC samples from twelve dairy plants (from Caserta and Salerno areas) produced either in spring or in summer 2005 were analysed.

Cheeses (M) were squeezed to obtain the interstitial liquid (LP) and the residual cheese (MP). Moisture, protein, fat and chloride percentages were assessed according to the Official Analysis Methods. Free fatty acids (FFAs) extracted by using acetonitrile were analysed by means of GC-MS (HP5890 gas chromatograph coupled with mass spectrometry HP 5972) with direct injection. MBC samples were submitted to quantitative-descriptive sensory analysis (QDA) by a trained panel of 16 judges and were evaluated according to a design balanced for taking into account order and carry over effects. All statistical analyses (ANOVA, Duncan's test, PCA and Pearson correlations) were carried out using XLSTAT – PRO 7.5.2 (Microsoft, USA) software.

RESULTS AND CONCLUSIONS - *Technological process.* The main differences between industrial and traditional dairy plants consisted in the mechanical stretching and molding of the curd and in the activity level of the chymosin added with the rennet (95% of chymosin in traditional plants against 75-50% in traditional ones). The heat treatment of milk was related to the microbiological quality; this meant that milk used for cheesemaking was ranging from raw, thermized or pasteurized (pausterisation was mandatory for samples exceeding 60 hours refrigeration after milking). The other differences consisted in the composition of the shipping sauce, which could consist of diluted whey or water, sometimes added with salt or lactic or citric acid. Dairy plants from Caserta used mainly a pasteurized water solution of NaCl (2%), lactic or citric acid. *Chemical composition of milk*. No significant differences in fat and protein content, pH and titrable acidity (°SH) values were found among milk samples. In contrast, pH and titrable acidity (°SH) values were significantly ($p<0.05$) higher in spring than in summer. *Chemical composition of MBC*. Cheeses samples (M) were significantly ($p<0.05$) different for protein, moisture and chloride content, either in spring or in summer. Comparing chemical results obtained in spring to those obtained in summer, cheese samples exhibited protein content significantly ($p<0.05$) higher in summer, probably because of the lactation period that considerably changes the milk composition. *FFAs composition.* Since FFAs could be distributed between the interstitial liquid and the squeezed cheese depending on their hydrophobicity, both LP and MP were analysed by means of GC/MS. In figure 1 the distribution of FFAs between the two matrices is shown. Results showed that the amount of FFAs (from C:4 to C:14) is higher in LP than in MP. *Sensory profile.* Quantitative descriptive analysis (QDA) profiles for odour, texture and taste attributes of MBC samples produced in spring are reported in figure 2. Cheeses resulted significantly ($p<0.05$) different for juicy, grinding, chewiness and salty descriptors. Samples analysed during summer (result not shown) were different for the same attributes as well as for butter (positively related to C4 content; r=0,6) and mushroom odour. Comparing sensory results obtained in spring to those obtained in summer, the former had both a hardness and a grinding score higher than the latter. *PCA.* A separation between Caserta and Salerno samples was found in spring (figure 3) along the second principal component (PC2), since Caserta samples, except G, were more salty and had butter odour, peelability and surface homogeneity higher than Salerno ones. A different separation with respect to spring was found in summer (figure 4) along the same principal component, the industrial samples exhibiting a more salty taste and hardness, chewiness, peelability and homogeneity surface higher than artisanal ones.

These results indicate that MBC is charactherised by a complex sensory profile depending

mainly by the heterogeneity either of milk microflora or of natural starter in individual plants. Due to these own peculiar characteristics of each cheese plant, to date it is not possible to define the "typical" sensory profile of MBC.

Figure 1. FFAs composition in M (a) and LP (b)

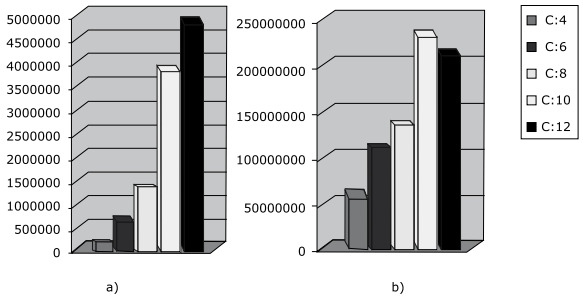
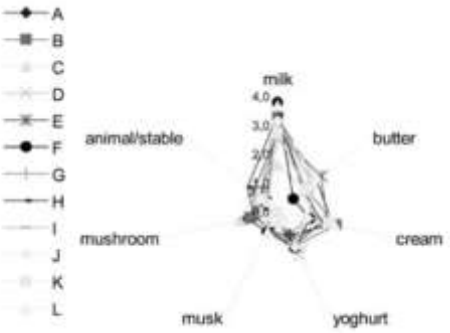
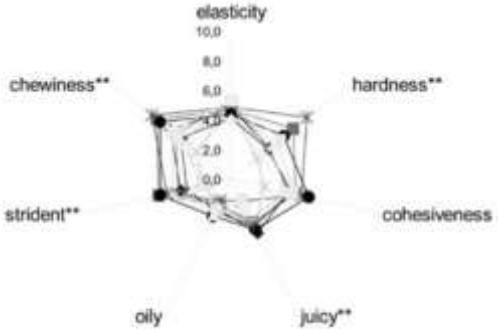


Figure 2. QDA profiles with sensory data obtained in spring and ANOVA significance (**=significant difference at p<0,05 level).

a) odour profile.



b) texture



c) taste

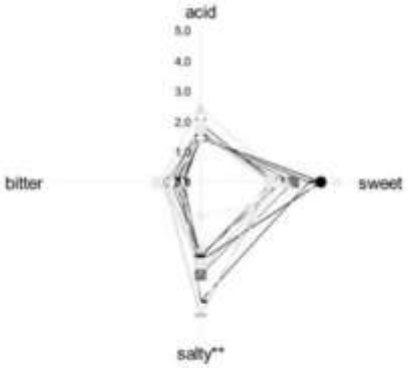


Figure 3. PCA of sensory data in spring.

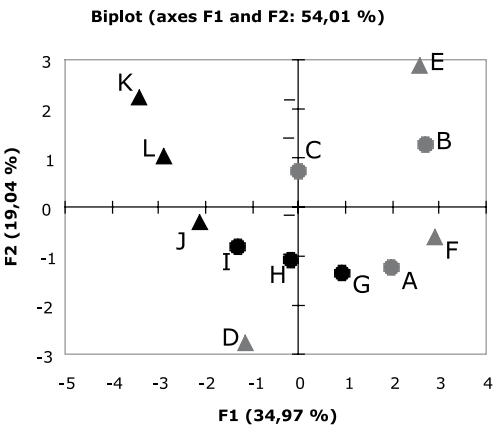
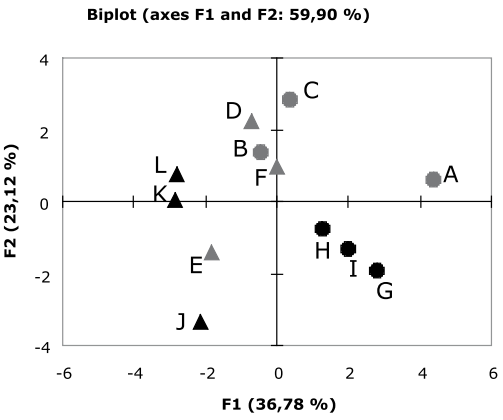


Figure 4. PCA of sensory data in summer.



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