



# Burrata Cheese – Mozzarella Transformed

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## Abstract

One of the less known Pasta filata cheese in Indian context is Burrata cheese, an Italian origin cheese popular in Southern Italy. Burrata is preferably consumed with olive oil and serves as an alternative to Caprese salad. This cheese variety is usually made from cow milk and are produced in two ways viz., artisanal method and industrial method. The product consists of a double structure viz., composed of a 'bag' made of mozzarella paste and an inner core 'stracciatella'; the latter is a blend of double cream and Mozzarella cheese strips. The cheese is characterized by being rindless, milky white with a smooth, shiny surface made up of fibrous elastic structure. The cheese is spherical, characterized by a head and a short neck and is rich in milk fat (60.0 % fat-on-dry matter). The high moisture ( $a_w$  0.95 to 0.97) and pH (6.1-6.2) favours microbial growth restricting its shelf life, even under refrigerated conditions. Modified atmospheric packaging has enabled shelf life extension of cheese. Psychrotrophic microorganisms such as Pseudomonas and Enterobacteriaceae species are responsible for the spoilage of burrata cheese. Efforts have been underway to produce reduced-fat Burrata cheese to obviate the high calorie content and appropriate means to extend its shelf life.

**Keywords:** Pasta filata, Burrata, cheese, manufacturing protocol, microbiology

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The term 'Pasta filata' is derived from an Italian phrase, which means 'stretched curd' or 'spun paste', referring to a unique stretching and plasticization process, which is used to manufacture these type of cheeses. Pasta filata cheeses had primarily originated in the greater northern Mediterranean regions such as Greece, Turkey, Balkans, Italy, and Eastern Europe. Burrata cheese is one of these Pasta filata cheeses.

Burrata cheese is a cow milk cheese produced in the Puglia region of Italy. The cheese is basically a sack of Mozzarella, filled with butter-cream. This product evolved from the idea of reusing the scrap from the production of mozzarella cheese, mixed with cream, to be used as filling of a cheese envelope, shaped like *Caciocavallo* cheese (del Prato, 2001).

Burrata, a creamy cheese, is a specialty of Southern

Italy, especially in the regions of Apulia, Campania, and Basilicata. On the other hand, Mozzarella cheese is typical of the region of Campania in Italy. The finished product is spherical, with a 'head' and a short 'neck,' and weighs between 100.0 g and 1.0 kg. Burrata has a rindless, milky white, smooth, shiny surface made up of fibrous elastic overlapping layers. The average pH value of cheese ranges between 6.1 and 6.2, and water activity values are between 0.95 and 0.97 (Conte *et al.* 2011). Recently, Burrata di Andria cheese has obtained the EU protected geographical indication.

The cream accounted for nearly 40.0 % of the total

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cheese weight (Faccia *et al.* 2013). Burrata has high fat and caloric content. Burrata cheese is associated with 60.0 % fat on dry matter, most part of which is saturated fat and the cheese confers > 300 kcal/100 g (Italian National Research Council, 1996). The photograph of Burrata cheese as 'whole' and 'cut-open' is shown in Fig. 1A and 1B respectively.

#### Technological means of producing Burrata cheese

The *Burrata* cheeses are produced using two different production techniques. According to the tradition, the artisanal process was entirely carried out manually starting from raw milk and whey cream obtained by spontaneous rising from the water used for the curd stretching, collected from the previous production cycles. The industrial cheese making utilized pasteurized milk and UHT cream obtained by centrifugation and all the steps are performed using specific equipment, typical to mozzarella production lines.

The milk (usually cow milk) is added with natural whey starter (3L/100 L) and, after a partial acidification (i.e. to pH 6.1) it is warmed to 37°C. Coagulation of milk is accomplished using calf rennet (15-30 mL/100 L); coagulation period is 30-40 min. The cream was added to the strips to assemble the filling. Finally, it was used to fill the mozzarella envelope that was closed thereafter.

Burrata cheese is manufactured from pasteurized cow's milk, which is mixed with the acidified serum (natural whey starter @ 3 L/100 L) of the previous day's cheese making so that the initial equilibrated pH is adjusted to 6.1 and warmed to 37°C before adding calf rennet (@ 15-30 mL/100 L). Coagulation period taken is about 30-40 min. The curd is cut and kept under whey for maturation (acidification) for 30 min. Subsequently, the curd is kneaded (85-90°C) under hot salted water (1.5 % NaCl) and stretched to produce *pasta filata* strips and envelope. The cheese mass is molded to form an open hollow cheese sphere. The final product consists of a double structure viz., composed of a 'bag' made of mozzarella paste and an inner core called 'stracciatella'. Stracciatella is composed of mixture of double cream and Mozzarella cheese strips. Such stracciatella is used to fill the hollow sphere and then closed manually. The bag is produced using mozzarella curd through chemical acidification of milk without using starter culture. After filling and closing the bag, the cheese is salted in brine for a few minutes and cooled in water at 4°C and packaged in vessel containing chilled water.

#### Composition of Burrata cheese

The composition of Burrata cheese would vary based on the process used for cheese making and even the composition of the 'bag' and 'strips' of Mozzarella will



(A)



(B)

Fig. 1: Photograph of Burrata cheese in (A) whole and (B) cut-open form



differ from each other. The composition and water activity of components of Burrata cheese prepared by artisanal and industrial method is depicted in Table 1.

**Table 1:** Composition and water activity of components of Burrata cheese prepared by two methods

Constituents/parameter	Method of preparing cheese	
	Artisanal method	Industrial method
<i>Burrata cheese</i>		
Moisture, %	59.46	62.59
Salt (NaCl), %	0.99	0.12
pH	6.35	6.51
Water activity ( $a_w$ )	0.963	0.969
<i>Mozzarella strips</i>		
Moisture, %	70.72	69.96
Salt (NaCl), %	0.41	0.80
pH	6.16	6.68
Water activity ( $a_w$ )	0.961	0.963

Source: Rea et al. (2016).

### Microbiological quality of Burrata cheese

Due to its naturally poor competitive microbiota, relatively high values of activity water ( $a_w$ ), and mildly acidic pH, various microorganisms, especially bacteria, might grow in burrata cheese, causing various shelf life-limiting spoilages (e.g., loss of elasticity, discolorations) (Conte et al. 2011).

The manufacturers of Burrata cheese vary a lot in the use of ingredients in cheese making (e.g., whey cream produced by spontaneous rising or UHT cream or cheeses produced at artisanal or industrial levels). These factors result in cheeses that differ in sensory, safety aspects, and varied shelf-life. Psychrotrophic microorganisms (*Pseudomonas* spp. and *Enterobacteriaceae*) are the main spoilage agents of burrata cheeses (Minervini et al. 2017).

One of the approaches used to prevent the growth of undesirable microorganisms and prolong the shelf life of fresh Burrata cheese is the application of biopreservatives (i.e., nisin or protective cultures).

Protective cultures are live microorganisms that are deliberately added to food to inhibit the growth of undesired (spoilage agents and/or pathogenic) microorganisms, without adversely affecting the sensory quality of cheese (Minervini et al. 2017). The addition of protective lactobacilli (*L. plantarum* LPAL, *L. rhamnosus* LRB) improved the flavor of the Burrata cheeses. Neither body-texture nor bitter defects were noted in cheeses containing blend of dietary fibers (fructooligosaccharides, inulin) and protective lactobacilli. The use of protective lactobacilli strains increased the shelf-life of burrata cheese by 3 days (Minervini et al. 2017).

As compared to control cheese (without protective microbes and dietary fiber), the incorporation of two such additives strongly reduced *L. lactis*, which is implicated in the spoilage of fresh dairy products. The protective lactobacilli also slowed the growth of staphylococci, coliforms and *Pseudomonas* spp., especially during early storage period. *Pseudomonas fragi* and another *Pseudomonas* sp. (proteobacteria) increased in the cheese especially after 8 days of storage. (Garofalo et al. 2017). *Hafnia alvei* and one *Hafnia* spp. was identified in burrata cheese. *H. alvei* is reported to influence the synthesis of sulfur compounds in cheese (Irlinger et al. 2012).

In one study, the number of *Escherichia coli* in all (4040 samples from Bari, the Barletta, Abndria and Trani provinces of Italy) tested samples of Burrata cheese were below the limits specified by EC Regulations, with a mean value of  $4.4 \times 10^2$  cfu/g. Even the Coagulase Positive Staphylococci (CPS) values were  $< 10^5$  cfu/g, which conformed to the microbial standard set by EC Regulation 1441/07. However, CPS testing gave positive result for 3.7 % of burrata cheese samples, with mean values of  $10^3$  cfu/g (Dambrosio et al. 2013). This stresses the fact that the cheese producers have to make their consumer aware about the correct storage temperature (0 to 4°C) to be kept at home in order to slow down the replication of staphylococci (and others) avoiding the release of enterotoxin in food. Nevertheless, all the burrata cheese samples tested negative for *L. monocytogenes* and *Salmonella*



spp. The absence of these microorganisms indicated use of good microbiological quality raw milk, further the effect of high temperatures used to pasteurize the milk (75°C for 25 s) and to stretch the curd (80-90°C) were able to destroy such microbes (Dambrosio *et al.* 2013).

#### Shelf-life of Burrata cheese

Burrata cheese has a very short shelf life (3-5 days under refrigeration) and must be eaten within days after production. Mechanization of the forming and filling phase (contemporary made by means of 'blower machine') extends its shelf-life to 20 days.

The otherwise limited shelf life of Burrata cheese could be enhanced by combining antimicrobial compounds (i.e. lysozyme and Na<sub>2</sub>-EDTA dissolved in cream) to be applied during the process of burrata filling, active coating with alginic acid (2.0 % w/v) and silver nanoparticles and following Modified Atmospheric Packaging (MAP composed of gases CO<sub>2</sub>:N<sub>2</sub>; 65:35 v/v). An extension in the shelf life of cheese to an extent of 200.0 % was obtained as compared to control Burrata cheese, packaged in normal air. The application of active coating improved the sensory quality of cheese during storage (Costa *et al.* 2017).

End use application of Burrata cheese

**Burrata is best eaten with bread and olive oil, as a more decadent alternative to Caprese salad, or over the root vegetables or pasta.**

Reduced-fat Burrata cheese

A greater portion of energy is derived from milk fat contained in dairy product, with saturated fatty acids (SFA) accounting for ~ 70.0 % of total fat; mainly myristic, palmitic and stearic acids. A high SFA intake, and to some extent cholesterol intake, is associated with an increased risk of coronary heart disease (CHD) (Markey *et al.* 2015). According to the EU regulation, a reduced-fat cheese should contain at least 30.0 % lower fat than the full-fat cheese (EC, 2006); Italian standard specifies reduced-fat product to contain 20.0 to 35.0 % FDM (Italy, 1992).

A satisfactory quality reduced-fat Burrata cheese could be produced using 14.0 % fat cream, obtained by diluting double cream (28.0 % fat) with a suspension (0.5 %) of carob seed flour. The moisture content of cheese increased from 62.6 (for full-fat) to 68.4 % (for reduced-fat), while FDM content decreased from 59.1 (full-fat) to 34.7 % (reduced-fat); this translated to decrease in the caloric content of cheese from 1060.8 to 718.0 J/100 g (Trani *et al.* 2016).

Recommended intake of poly unsaturated fat (PUFA) in diet has been inversely related with the risk of CHD (Lunn and Theobald, 2006). In that context, fortification of reduced-fat (34.7 % FDM) Burrata cheese with PUFA was carried out using formulates derived from flaxseeds and *Carthamus tinctorius* oil; enabling enrichment of cheese with  $\alpha$ -linolenic acid (ALA) and conjugated linoleic acid (CLA) respectively. Considering the sensory scores of resultant cheeses, the fortification of product was feasible at maximum level of 7.0 mg/g fat ALA and 6.8 g/g fat CLA. The enhancement in the PUFA content of such cheese with respect to control product (without using PUFA source) was 8-folds (Trani *et al.* 2016).

#### CONCLUSION

Burrata cheese has its own identity and has been well accepted in countries other than its originating place. Owing to the high moisture and pH conditions prevailing in such cheese, problems are faced in shelf life of such products. Introducing low-fat versions or cheese with functional virtues will promote the acceptance of this cheese type amongst the consumers. Developing probiotic Burrata cheese is imminent since the conditions prevailing in cheese would favour probiotic microorganisms. If export potential is sought after, means to extend the shelf life of Burrata cheese will pave the way.

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