



Review

Influence of ingredients and chemical components on the quality of Chinese steamed bread



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ABSTRACT

Chinese steamed bread (CSB) is a staple food in China since ancient time. The basic ingredients include wheat flour, yeast/sourdough, and water. Current consumer trends urge the production of CSB on a large scale as well as the formulation of healthier CSB with specific nutritional benefits. This requires a better definition of the relationship between the properties of ingredients/chemical components and CSB quality. This review summarises the recent advances in understanding the roles of basic and optional ingredients and their chemical components in the appearance, textural, sensory, and shelf-life properties of CSB, and provides suggestions for further research to match the current trends.

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Contents

1. Introduction	155
2. Classification of CSB	155
3. Criteria for CSB quality	155
4. Influence of basic ingredients and their chemical components on CSB quality	156
4.1. Yeast/sourdough fermentation	156
4.2. Wheat flour	158
4.2.1. Effect of milling the CSB quality	158
4.2.2. Protein	158
4.2.3. Starch	159
4.2.4. Endogenous lipids	159
4.3. Quantitative trait loci analysis for the molecular basis of CSB quality	159
5. Influence of optional ingredients on CSB quality	159
5.1. Xylanase	159
5.2. Emulsifiers	160
5.3. Glycerol in frozen dough	160
5.4. Dietary fibre and resistant starch	160
5.5. Phytochemicals and polyphenols	160
6. Shelf-life properties	160
7. Nutritional properties	161
8. Conclusions and future outlook	161
References	161

1. Introduction

Chinese steamed bread (CSB) (sometimes written as Chinese steamed bun or mantou) is a type of fermented and steamed wheat food with distinctive cultural features. The genesis of the Chinese name mantou (馒头) is commonly attributed to the famous politician Zhuge Liang during the Three Kingdoms, the 3rd century A.D. (Su, 2005). It has been consumed in some parts of China as a staple food over two millennia, and the popularity is increasing around the world. It is considered as healthy food due to the absence of toxic Maillard reaction products such as acrylamide and furan (Su, 2005), and also possible low oil and sodium contents. The relatively low steaming temperature (100 °C) during production may render better retention of diverse endogenous and added nutrients as compared to the baked bread.

The production procedures of CSB and baked bread have commons with distinctions. Basically, the manufacturing process starts with the mixing of wheat flour, water, and yeast, followed by fermentation, neutralisation with alkaline, moulding, proofing, and steaming. Sourdough starter is sometimes used instead of yeast (Huang & Miskelly, 1991). On the laboratory scale, a commonly used procedure is based on a Chinese standard (SB/T 10139-1993) for northern style type, though there are variations existing in the manufacturing process. Diverse functional ingredients such as dietary fibre and emulsifiers can be added to impart CSB desired nutritional and/or eating properties (Zhang, Sun, & Li, 2007; Lin, Chen, Lu, & Wang, 2012).

The CSB represents ~40% of the wheat consumption in China (Kim, Huang, Zhu, & Rayas-Duarte, 2009). Rapid urbanisation in China demands a larger scale production of CSB. Furthermore, the rise of health food market in recent years requires CSB with novel and desired nutritional quality. Compared with baked bread, the fundamental physicochemical processes during CSB production are far from full understanding. The introduction, formulation, processing, and evaluation of CSB were reviewed previously (Huang & Miskelly, 1991; Yue & Rayas-Duarte, 1997). This review summarises the recent advances in our understanding of the properties of basic and optional ingredients and their chemical components in relation to the textural, eating, nutritional, and shelf-life properties of CSB, with an aim to provide basis for further research to improve the quality of CSB to meet the modern demands. A significant part of the references was selected from the Chinese journals and theses where a rather large amount of research was published.

2. Classification of CSB

Though the types of CSB differ widely across different regions of China due to the cultural and geographic diversity, CSB were roughly classified into two major types as the northern and southern style CSBs based on the composition of basic ingredients and the production process (Huang, Betker, Moss, & Quail, 1993; Huang, Quail, Moss, & Best, 1995; Chen et al., 2007; He, Liu, Pena, & Rajaram, 2003; Huang, Quail, & Moss, 1998; Huang, Yun, Quail, & Moss, 1996; Zhang, Sun et al., 2007; Zhu, Huang, Khan, & O'Brien, 2001). Northern style CSB, the most popular type (Shandong Qiang Mian mantou as a typical example), was described as having a chewy and dense texture; and southern style CSB (Xiao Mian mantou as an example) with a more open and softer texture (Huang & Miskelly, 1991). Guangdong style CSB (often with addition of sugar) was also mentioned as a type of dessert with special characteristics, which is widely produced in Guangdong, Hainan, Fujian, Hong Kong, Taiwan, and some Southeast Asian countries (Huang et al., 1998; Limley et al., 2013). Taiwanese style CSB with shortening/fat and sugar addition, resembling Guangdong style in the ingredient formulation, was also reported (Lin, Chen et al., 2012; Wu, Chang, Shiau, & Chen, 2012). The above mentioned classification of CSB can be roughly applied to the overseas markets outside China.

Based on a sensory survey in China, Su (2005) suggested another classification by dividing the CSB into three major types in terms of the specific volume and hardness, namely soft, medium, and hard types. The flour type and the ratio of ingredients determined the CSB type. It should be noted that despite the efforts in the categorization of the CSBs, variations do exist due to the wide range of the eating habits and cultural diversity of people from different regions. It should also be noted that the production and formulation methods used in various studies may differ. This makes direct comparison of results from different reports difficult, and urges more unified standards to maximise the research effort. Nevertheless, most of the reported studies focused on the northern style CSB.

3. Criteria for CSB quality

The mostly used criterion for assessing northern style CSB quality is derived from the Chinese standard SBT 10139-93 (wheat flour for CSB production), launched by the Ministry of Commerce of

Table 1
Quality evaluation scoring system of SBT 10139-93 by Ministry of Commerce of China.

	Characteristics	Full score	Criterion
Exterior attributes	Specific volume (sv) (mL/g)	20	Score = 20 for sv > 2.3 mL/g; when sv < 2.3 mL/g, score = 25 - (2.3 - sv) * 10
	Appearance	15	Smooth surface, symmetrical shape, well rounded: 12.1–15; in between 9.1 and 12; coarse surface, asymmetrical shape, presence of hard spots: 1–9
Interior attributes	Colour	10	White, milky white: 8.1–10; in between 6.1 and 8; grey, dark: 1–6
	Structure	15	Even distribution of crumb cell with small size: 12.1–15; in between 9.1 and 12; uneven distribution of crumb cell with large size: 1–9
	Elasticity and cohesiveness	20	High resilience after being pressed by fingers, elastic and cohesive: 16.1–20; in between 12.1 and 16; low resilience after being pressed by fingers, poor elastic and cohesive: 1–12
	Stickiness	15	Unsticky to teeth, chewy: 12.1–15; in between 9 and 12; sticky, unchewy: 1–9
	Odour	5	Wheaty and pleasant odour: 4.1–5; in between 3.1 and 4; unpleasant odour: 1–3
	Total	100	

The recommended CSB production procedures are described in SBT 10139-93. The wheat flour (100 g) is mixed with 48 mL water (38 °C) containing dried yeast (1 g). The ingredients are mixed by glass stick/chopstick which is further hand-kneaded for 3 min to form dough before proofed at 38 °C for 1 h. The proofed dough is further hand-kneaded for another 3 min and moulded to the shape of CSB and put at room temperature for 15 min. The dough is then steamed for 20 min before wrapped with gauze and cooled at room temperature for 40–60 min.

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