

Use of Potassium Bromate in Baking Industry: A Perspective

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Review Article

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ABSTRACT

Baked goods are consumed throughout the world as part of diet and in countries like India these are consumed more in the form of snacks. We can observe a significant rise in the demand for baked goods globally in recent decade. Potassium bromate is most common ingredient and an important component during process of baking. But recently this component was proven as carcinogenic compound, and that is why it is very important to review and analyze its use and delayed epidemic effects on humans. This study would certainly help, guide and promote new studies and possible alternative compound search and development in recent future.

INTRODUCTION

Baking is one of the food-preparing processes and it has been part of the human regular life since ages. It has undergone many changes along with the human advancements in terms of technology and techniques. In the ancient days baking was done at homes by women for domestic purposes but as baked goods got popularized, it propagated and became an industry. It is said that baking in ancient Greece led to the invention of the enclosed ovens and Egyptians in ancient times used yeast in baking. Baking industry flourished in Roman Empire and the profession was considered one among the respected due to their fondness towards pastries and this was the time where different and large varieties of baking goods came into existence. Baked goods are more flavorful and include large varieties like breads, biscuits, cookies, cakes, pastries etc.

Baking

Of all the baked goods bread is the most common product and involves four basic ingredients flour, yeast, salt and water. Bread has been a staple food in mans diet. Other than being a good source of starch that gives energy bread also contains dietary fibre and vitamins like thiamine, riboflavin, niacin, pyridoxine and folic acid. With respect to minerals, it contains large amounts of phosphorus, magnesium, calcium and potassium, and in lesser quantities of sodium, iron, or iodine. Due to these nutritional values nutritionists consider it to be essential part of diet.

Baking of bread involves the following steps.

Mixing

All the ingredients are mixed properly to form the dough.

Rising (Fermentation)

The dough is allowed to rest where the yeast grows utilizing the carbohydrates breaking them down into simple sugars and produce alcohol and CO₂ gas which is trapped in the dough forming pores in it resulting in rising of the dough.

Kneading

The dough is kneaded again for the even distribution of the gases and to remove any large size pores and set again for rising if needed.

Baking

The risen dough is transferred to the oven where the heat penetrates the dough, as the gases expand the size of the dough increases giving its size and shape. Caramelization of the sugars takes place giving bread its taste and smell [1-6].

To make good bread the dough must have elastic nature, ability to hold gases produced by yeast and the property to retain its shape [7-15]. All this is done by the Gluten protein that is naturally found in the flour [16-25].

Need of oxidizing agents

Bonding between the gluten molecules is the result of oxidation, in olden days flour was aged by exposing it to the open air for oxidation for days to weeks and then added to dough, later chemical oxidizing agents have come into use that have cut down the ageing time [26-31].

Potassium bromate (KBrO₃) as oxidizing agent

Potassium bromate is a potential oxidizing agent and also acts as a bleaching agent that imparts bond strength by improving the elasticity that results in soft, fluffy and White bread. During the process of baking Potassium bromate is completely used up leaving its byproduct potassium bromide. It is also used as a component of lotions, in barley processing and formed as a byproduct during water ozonation [32-38].

Carcinogenic nature

KBrO₃ is used as a food additive but a study conducted by Japan researches found it to be carcinogenic in mice and rats. The study proved that KBrO₃ causes cancer in rats and acts as a nephrotoxic in humans and experimental animals causing tumors in the kidney and other tissues. It has both tumor initiating and promoting nature thus considered as a complete carcinogen. Another study conducted on dose response studies in mice showed decrease in the survival time and significant increase in the incidence of tumors with doses 125 ppm and more, and have calculated Virtually Safe Dose to be 0.950 ppm. Tumors in the thyroid follicle were observed (in mice) in 26 weeks when KBrO₃ was administered in drinking water at a concentration of 0.1-0.2g/L in a study based on dose and time. KBrO₃ may also cause hormonal disturbances as it induces oxidative stress that contributes to neoplasia in endocrine glands [39-45].

Regulation

With the outcome of the carcinogenic nature of this food additive countries around the world like Argentina, Brazil, Canada, Nigeria, South Korea, Peru, Srilanka, China, India (June 20, 2016) and others have banned its use in food products. IARC have classified it as a category 2B carcinogen (possibly carcinogenic to humans). If the final product contains negligible amounts less than 20ppm or 0.02µg/g of KBrO₃ can be considered harm less, thus it is not

banned in USA ^[45,46], but FDA has prescribed standards for its safe use and has asked bakers to voluntarily give up using it. In California all the KBrO₃ baked goods are supposed to have label indicating its use.

CONCLUSION

Potassium bromate has been proved as a carcinogen and has been banned in many countries, there is no better option left than to stop using it to reduce its effects on health as any kind of negligence in its use in terms of quantity, or flaws in baking like inadequate temperature for less than required time will result in the residues in the final product. Thus its use should be completely avoided and look for a safer alternative.

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