Improving Quality Management in Panification

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Abstract: *Consumers of panification products (as well as consumers of any other type of product or service) are concerned about the quality of the products they purchase. Implementing the quality management system in the food industry is not compulsory, but it can bring about numerous, palpable benefits, particularly in reducing the amount of acryl amide. It is a modern system allowing the management analysis aiming at checking and reaching the goals to define new objectives, and the continuous improvement of the quality of processes and products.*
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1. INTRODUCTION

Quality control aims at assessing product quality requirements, focusing on a distinct objective, "ensuring quality". Everything needs to be well documented and observe the rule "Write what you need to do and do what you have written down!"

Quality management system is a modern system of managing quality involving the entire personnel.

One of the main principles of a standard is involving more in quality issues by establishing one's own policy in the field of quality and goals to reach. Data resulted from quality management systems are used in a management analysis aimed at assessing the way goals have been reached and at designing new goals to reach, together with the need to continually improve the quality of processes and products [4, 5].

At present, investment in quality is, for the operators in the milling and panification industry, a safe way to increase unit competitiveness, to reduce costs and, implicitly, to sell cheaper, hence consumer fidelity and new niche markets [1, 3, and 7].

Designing and implementing a quality management system differs from one organization to another, depending on size, structure, type of products, type of processes, goals, etc. therefore, it is imperative that each operator knows the legislation in the field, have a trained personnel, and cooperate only with accredited certification societies where they need to certify the system.

For a good functioning of the organization, it is necessary to be operated and controlled systematically and transparently, which can be done by implementing and maintaining a management system designed to continuously improve performances, including quality management.

High management should observe the following eight principles: operate a customer-oriented organization, leadership, involving personnel, process-based approach, approaching the management as a system, continuously improving, efficiency in decision-making, mutually advantageous relationships between the organization and suppliers.

A quality management system should rely on the following requirements:

- general requirements:
  - establish a quality management system;
  - documenting a quality management system;
  - maintaining a quality management system);
- documentation requirements:
  - documented policy statement;
  - editing a quality manual;

- documented procedures required by the standard;
- documents necessary to ensure planning, operating, process control, and records control efficacy.

According to **SR EN ISO 9001:2001**, the elements of a quality management system can be ranged in four domains:

- management responsibility;
- resource management;
- product manufacture;
- product measurement, analysis, and improvement.

Organizations wishing to implement a quality management system should identify the processes necessary to really implement the system, to establish and to understand the interactions between these processes, to document in detail each process to ensure efficient functioning and control. It is process analysis that should lead to establishing the documents necessary for a quality management system and not the documents [7].

2. MATERIAL AND METHOD

In milling and panification, we talk about **quality**, on one hand, and about **quality management**, on the other hand, from the moment we need to correlate the main quality parameters of wheat and flour.

For most raw matter used in the food industry, the years that have passed brought about more methods of assessing quality (technological qualities), and wheat and flour are no exceptions. Unfortunately, there is no analysis that can tell everything about how the flour will behave in the technological flow and particularly in the dough phase. We can say without exaggerating that healthy wheat is wheat not enough investigated.

In this paper we present a scientific approach of reducing acryl amide content in panification products – **bread**, **biscuits, crackers, and crunchy bread**, and **breakfast cereals** – aiming at improving quality management.

3. RESULTS AND DISCUSSION

3.1. BREAD

Acryl amide occurs in **panification products** in general as follows:

- it develops through the reaction of asparagines with reducing sugars (both occur naturally in cereals), rarely with sugar as minor ingredient;
- acryl amide occurs at temperatures above 120^0C, but in small amounts during the normal baking;
- acryl amide occurs mainly in the crust;
- acryl amide content depends on temperature, baking time, and asparagines and reducing sugar content in the wheat grain.

Acryl amide can be controlled by:

- monitoring baking time and temperature to prevent excessive browning of the crust;
- avoiding to add reducing sugars in the recipe;
- adding calcium salts (e.g. calcium carbonate and calcium sulphate).

Panification producers are recommended to select, from the "instruments" detailed below, those that best fit the type of product, the processing method, and the product quality specifications.

Thus, in order to reduce acryl amide content in **panification products**, in general, producers should observe the following rules concerning the *recipe* and the *baking conditions*:

a) ***Recipe***:

- choose flours from low-asparagines content wheats: this is not simple in practice, since bread type fundamentally depends on the type of cereal (for instance, though rye contains more asparagines than wheat, it is the main ingredient in rye bread);
- reduce to a minimum whole wheat which has a high content of asparagines compared to other types of flours: reducing whole wheat content of a product is not an option (though beneficial from the point of view of the acryl amide, numerous data support the point of view according to which whole wheat

panification product consumption is, on the whole, beneficial for the health and that it should not be discouraged);
- avoid adding reducing sugars: for numerous types of bread, this is already the rule, but when they introduce small amounts of reducing sugars in the recipe, the impact on the product quality and consumer acceptability is limited);
- add calcium salts (e.g. calcium carbonate or calcium sulphate): if added in larger amounts, calcium salts can affect baking features and product quality.

b) ***Baking conditions***:
- mind the baking time and temperature to avoid excessive browning of the crust: the outer colour of the bread may be lighter, and consumption features can be changed, which can affect consumer acceptability;
- prolong rising time to reduce acryl amide: other contaminating agent levels can increase, though, in the process.

3.2. BISCUITS, CRACKERS, AND CRUNCHY BREAD

Acryl amide occurs in **biscuits**, in **crackers**, and in **crunchy bread** as follows:
- it develops through the reaction of asparagines (which occurs naturally in cereals) with reducing sugars (e.g. fructose and glucose);
- acryl amide occurs at temperatures above 120^0C;
- acryl amide content depends on recipe and on temperature and baking time.

Acryl amide can be controlled by:
- replacing ammonia bicarbonate with other aerating agents;
- asparaginase;
- avoiding the use of fructose, if possible.

Because of the wide range of recipes, ingredients, and processes used in the traditional production of biscuits, there is no simple method to reduce acryl amide: for instance, crunchy risen bread contains, in general, much less acryl amide than crunchy unrisen bread, but each of them has its own features.

In order to reduce acryl amide content in **biscuits**, **crackers**, and **crunchy bread**, producers should observe the following rules concerning the *recipe* and the *baking conditions*:

a) ***Recipe***:
- replace ammonia bicarbonate with potassium carbonate and potassium tartrate, or with disodium diphosphate and sodium bicarbonate in biscuits: there may be some loss of size, flavour, or texture (take care, though, to excessive amounts of sodium in the finite product);
- use asparaginase in gingerbread, crunchy bread, and cookies: there are no quality issues, but the efficacy of the treatment can vary and be analysed from case to case;
- replace fructose with glucose (glucose syrups with low content of fructose) in gingerbread: monitor carefully the impact on the colour and flavour in the finite product;
- reduce the amount of whole flour, though it is preferable for its nutritious value and for its taste.

b) ***Baking conditions***:
- bake at lower temperatures and for longer periods of time while preserving moisture: make sure that the product (lighter in colour) is not raw (it could cause microbiological issues during the storage).

3.3. BREAKFAST CEREALS

Acryl amide occurs in **breakfast cereals** as follows:
- it develops through the reaction of asparagines (which occurs naturally in all cereals) with reducing sugars (e.g. fructose and glucose);
- acryl amide occurs at temperatures above 120^0C, with speeding up when moisture goes down below 5%;
- acryl amide content depends on recipe, process and on frying conditions.

Acryl amide can be controlled by:
- reducing to a minimum the reducing sugars in the preparation phase;
- avoiding excessive baking or frying;

- maintaining even colour of the product;
- taking into account other ingredients (e.g. nuts).

Because of the wide range of recipes, cereals, ingredients, and processes used in the traditional production of biscuits, there is no unique, simple method to reduce acryl amide: for instance, wheat breakfast cereals contain, in general, more acryl amide than rice or maize-based breakfast cereals, but each of them has its own nutritious and consumption features.

In order to reduce acryl amide content in **breakfast cereals**, producers should observe the following rules concerning the *recipe* and the *baking conditions*:

a) ***Recipe***:
- reduce to minimum sugars during the pressure preparation phase: this can result, in general, in products too dark in colour;
- mind small pieces of baked pieces similar to biscuits: in some countries, they produce müsli with baked pieces containing ammonia carbonate;
- use almonds fried at lower temperatures: though they look fine, their flavour is not a very strong one.

b) ***Baking conditions***:
- bake / fry at lower temperatures while preserving moisture: make sure that the product is not raw (it could turn rancid during the storage);
- mind the frying to get an even colour: normally, producers avoid the "bicolour" effect (avoiding it also means avoiding acryl amide).

4. CONCLUSIONS

In order to improve quality management in the panification industry, we need to strictly observe three types of management in the milling and panification industry – quality management and the eight organizational principles (regulated by the standard family ISO 9001), environmental management (with the environmental standard ISO 14001), and health management (with health safety and occupational safety standards) – and the main methods of analysis of the technological features of wheat flours – amylase activity, amylolytic activity, flour panification quality, flour quality, fall rate, moist gluten content, protein content, gluten deformation index, Zeleny index, rheological features (rising ability, elasticity, extensibility, flow, etc.), flour strength, stretching resistance of a dough sheet, stretching resistance of a dough roll, and gluten strength.

As for quality and quality management in the panification industry, we need to mention three main aspects that should be taken into account in the field:
- the sue of whole cereals (underlying the benefits of whole cereals on health);
- the use of gluten-free cereals and of dietary supplements: vitamins (folic acid, choline, niacin, thiamine, vitamin K), and minerals (cadmium, calcium, copper, and iron).

Improving quality management in the panification industry is possible from three points of view:
- of a set of "instruments" meant to reduce acryl amide in panification products;
- of some methods of reducing acryl amide in biscuits, crackers, and crunchy bread;
- of some methods of reducing acryl amide in breakfast cereals.

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