

A “Toolbox” for the Reduction of Acrylamide in Bread Products

Acrylamide

Acrylamide is a substance that is produced naturally in foods as a result of high-temperature cooking, e.g., baking, grilling, or frying. Acrylamide can cause cancer in animals and experts believe it can probably cause cancer in humans. Although acrylamide has probably been part of our diet since man first started cooking, because of concerns over safety, world experts have recommended that we reduce the levels of acrylamide in foods.

Acrylamide has been found in a wide variety of foods, including those prepared industrially, in catering and at home. It is found in staple foods such as bread, potatoes as well as in some specialty products such as crisps, biscuits and coffee.



The CIAA Acrylamide Toolbox

Following the discovery of acrylamide in food, the food industry and other stakeholders, including regulators, took action to investigate how acrylamide is formed in foods and possible methods that can be employed to reduce levels of acrylamide in foods. The European Food and Drink Federation (CIAA) coordinated the efforts and pooled the results together to produce the Acrylamide Toolbox.

What does the Toolbox do?

- Details existing methods to reduce acrylamide in foods
- Allows users to assess and evaluate which reduction measures to use

This brochure is designed to help bread manufacturers.

Alternatively, for advice contact AIBI (International Federation of Plant Bakers) at martell@grossbaecker.com

What can you do?

- Use this brochure to identify methods that you can use to reduce acrylamide levels
- Not all methods will apply to your manufacturing needs
- You will need to examine your production methods, recipes, product quality and national legislation in order to identify the most appropriate “tools”.



Acrylamide in bread products

Methods of formation

- Acrylamide is formed via the reaction of asparagine and reducing sugars (both naturally occurring in cereals); in few cases sugar is also added to bread as a minor ingredient
- Acrylamide is formed at temperatures higher than 120 °C; low amounts will be formed during normal baking
- Most acrylamide is found in the crust
- The amount of acrylamide formed depends on
 - Temperature
 - Baking time
 - Amounts of asparagine and reducing sugars in the grain

Tools to try

- Control the baking time and temperature to prevent excessive browning in the crust
- Avoid adding reducing sugars in the recipe
- Addition of calcium salts, e.g. calcium carbonate and sulphate

Methods of Reduction Bread Products

The following “Tools” have been used successfully to reduce levels of acrylamide in Bread Products.

Manufacturers are advised to select those “Tools” that are most suitable to their type of product, process methods and product quality specification.

Manufacturing Stage	Reduction Measures	Comments
Recipe	<p>→ If possible, choose flours produced from cereals with low levels of asparagine in order to minimise the formation of acrylamide during baking.</p>	<p>← This approach is not easy in practice because the character of the bread depends fundamentally on the type(s) cereal(s) used. For example, it is self-evident that while rye typically contains more asparagine than wheat, rye is an essential component of rye bread</p>
	<p>→ Wholemeal products are desirable from both a nutritional and taste point of view. However, wholemeal flour is relatively high in asparagines compared to other flours, which leads to acrylamide formation. Minimising the wholemeal content of a recipe will reduce acrylamide.</p>	<p>← Reducing the wholemeal flour content of a product described as 'wholemeal' is not an option. While reduction in wholemeal content may be beneficial with regard to acrylamide, a large body of evidence supports the view that consumption of wholemeal products is beneficial to health overall and should not be discouraged.</p>
	<p>→ Avoid the addition of reducing sugars to the recipe</p>	<p>← For many bread types this is already the case, but where small amounts of reducing sugars are included in the recipe, effects on product quality and consumer acceptability may be limiting.</p>
	<p>→ The addition of calcium salts, e.g. calcium carbonate or calcium sulphate, has shown to reduce the formation of acrylamide</p>	<p>← Baking characteristics and product quality may be affected at higher levels of addition.</p>
Processing : Baking conditions	<p>→ Adjust the time and temperature during baking to avoid excessive browning of the crust</p>	<p>← The bread will have a lighter external appearance and eating characteristics may be altered. This may affect consumer acceptability.</p>
	<p>→ Extend fermentation times as it can reduce acrylamide formation.</p>	<p>← Product characteristics and therefore acceptability may be affected. Mitigation strategies to reduce acrylamide may lead to increased levels of other process contaminants.</p>