Module 1: Hydrothermal processing to promote micronutrient bioavailability in processed food products

Biofortification of Whole Grains - Enriched by Nature

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Biofortification

For more than 10,000 years, grains have been consumed around the world. Long before people started cultivating grains, wild seeds from different grass species were collected. Thousands of varieties of grains have been grown around the world since the beginning of the domestication of those wild seeds.

During the so-called 'Green Revolution' starting in the 1960th, a small number of high yielding varieties of rice and wheat almost completely replaced thousands of landraces previously cultivated by the farmers.

Primitive varieties, older cultivars and landraces have been pointed out by researchers as more nutritious than modern varieties, **enriched by nature**. Traditional grains are therefore interesting raw materials to use for further processing -a kind of biofortification by selective breeding.

Bioprocessing

When biofortification occurs during processing of grains and legumes to increase the availability of nutrients in the meals, it is called **bioprocessing**.

Industrial processing is often considered to be a negative attribute in nutrition. Indeed, many forms of industrial processing like refining of grains result in high loss of micronutrients.

When polishing rice and refining wheat, 60–90% of the micronutrients are lost and our staple food becomes sources of empty calories. It means that the bulk of staple food in the world has been depleted of its nutrients through the current treatment.

Photo source: Unsplash

Bioprocessing methods

Cereals have never been eaten raw or unprepared and, if processed in the right way (bioprocessed), huge benefits can be reached. Scientific studies show that cereals require some processing prior to consumption in order to increase mineral nutrition.

Traditional household methods used worldwide like **fermentation and hydrothermal preparations** are bioprocesses and can achieve many of the demands in terms of nutritional value, taste, texture and affordability that are placed today on modern food products.

Photo source: Unsplash

Bioprocessing methods

Bioprocessing methods to revive the seeds and activate their own enzymes and microorganisms are **hydrothermal process, germination, malting** and different **fermentation** techniques such as sourdough. These methods are tried, tested and well documented in research.

In addition to improving the usage of nutrients, they all have different advantages and applications. As an example the amounts of folic acid and vitamin C are increased in germination and malting. Fermentation enhances the flavours and increases the durability in e.g. sourdough and bean based products like Miso or Tempeh.

Bioprocessing

Bioprocessed foods from whole grains and legumes in combination with fruits and vegetables could be a reliable way to avoid and prevent hidden hunger.

Beyond nutritional advantages other benefits are gained by applying bioprocessing methods:

- Enhanced taste.
- Good shelf stability.
- Convenient and easy to use raw materials.

Read more about **fermentation** here: Nkhata, S. G., Ayua, E., Kamau, E. H., & Shingiro, J. B. (2018). Fermentation and germination improve nutritional value of cereals and legumes through activation of endogenous enzymes. Food science & nutrition, 6(8), 2446–2458. https://doi.org/10.1002/fsn3.846

More information about **hydrothermal process** is provided in the following chapters of this course.