

Ever Healthier

New Cereals and Processing Techniques out to Conquer the World

Worldwide, the spotlight is on healthy (pseudo-)cereals. The Netherlands is at the forefront of two interesting cereals: gluten-free oats and non-bitter European quinoa. In addition, work is done on creating healthier cereals from wheat by using new processing techniques.

The need for gluten-free food and healthy food are the two main drivers for the current diversification in raw grain products. And people are looking beyond wheat. Traditional cereals such as spelt, oats and barley are making a comeback, while crops that were only used locally, such as quinoa and teff, are now conquering the world.

The Netherlands is known for its innovations with quinoa and oats. Through plant breeding, Wageningen UR has created non-bitter quinoa varieties suitable for cultivation in Europe. These cultivars are at the base of a range of new foods and ingredients, which in turn have led to a new chain of enterprising start-ups, such as the Dutch

Quinoa Group and GreenFood50. Wageningen UR has also initiated a successful gluten-free oat chain in the Netherlands.

In addition, Dutch developers are working on improvements in grain processing and making bread. Well-thought-out processes can lead to end products with more flavor, higher fiber content and more readily available micronutrients. TNO has developed enabling technologies to achieve just this in the European HealthBread project.

▪ ANJA JANSSEN ▪

One of the DQG's quinoa fields; DQG has already increased its cultivated land more than eightfold since 2014.



Innovating with Quinoa

The new quinoa cultivars created by Wageningen UR are suitable for cultivation in Europe and lack a coating of bitter-tasting saponins characteristic of South American quinoa. Cultivation, processing and application of the new cultivars is increasing rapidly.

When Robert van Loo and his Wageningen team began breeding quinoa cultivars that thrive in Europe in the nineties, there was no gluten-free rage, let alone a quinoa craze. Even when the first cultivars were ready, the gluten-free pseudo grain still led a relatively quiet life. However, the French company Abottagra was interested in becoming the head licensee in 2007. Now, millions of people have discovered quinoa as a nutritious and healthy alternative to wheat due to its higher protein content, good amino acid composition with all essential amino acids, high fiber content and low glycemic index. This popularity has contributed to a quick rise in European production. Under Abottagra, there are now sub-licensees for the cultivation of the Wageningen cultivars in the UK, Germany, the Netherlands, Belgium and Spain. "Together, the areas in the Netherlands, Belgium, Germany and England amount to approximately 1,000 hectares, with another 1,000 hectares in Spain and some 3,000 hectares in France," says Van Loo. "In the meantime, we continue to work on improved cultivars with a higher yield and seed varieties with a different color. Additionally, we are studying cultivation in saline soils in amongst others China, Vietnam and Chile." Illustrative of quinoa's growth is the development of the Dutch Quinoa Group (DQG), the Dutch sub-licensee. Starting from a modest 30 hectares in 2014, DQG has already increased its cultivated land more than eightfold. "We strive to reach 1,000 hectares as soon as possible," says Director Rens Kuijten to indicate his ambitions. The

DQG manages the entire chain and engages in market and product development. The company supplies quinoa seeds, roasted quinoa seeds, quinoa flour, and quinoa flakes in bulk packaging to large-scale consumers, such as bakers. For consumers, quinoa seeds will enter the Dutch supermarkets this year under the Lola Quinoa brand.

Ingredients from Quinoa

Quinoa from the Wageningen cultivars can also be made into ingredients, such as protein, starch, fiber and oil. This is what the Dutch start-up GreenFood50 specializes in. "We study how different quinoa fractions can be used in foods. Our focus is primarily on the protein fraction," states Managing Director Marc Arts. "For fractioning quinoa, we also work together with Wageningen UR Food & Biobased Research." GreenFood50 has recently introduced a brand new ingredient: whole grain quinoa flour containing fifteen percent protein. This flour is currently being used at the Topsport Restaurant in Papendal, the Netherlands. Athletes can really appreciate the quinoa pancakes baked with this flour. In addition, together with manufacturers, GreenFood50 develops consumer products with quinoa. "A cracker, for instance, with almost thirty percent quinoa and fifty percent spelt, which can help the elderly to eat more protein," Arts illustrates. Other products with quinoa currently being developed are salads, vegetarian products and gluten-free bakery products. The still



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high cost of the gluten-free seed complicates product development, notes Arts. "That is why we are continuously on the look-out for new healthy products in which quinoa can provide sufficient added value."

www.dqg.nl

www.lolaquinoa.nl

www.greenfood50.com

www.wageningenur.nl, dossier quinoa

Nutritional Composition of Quinoa

- Protein: 12.9-16.5%
- Starch: 58.1-64.2%
- Dietary fiber: 6-10%
- Fat: on average 5-7% (unsaturated and polyunsaturated)

Source: Brittany L. Graf e.a.: *Innovations in Health Value and Functional Food Development of Quinoa (Chenopodium quinoa Willd.)*, IFT Comprehensive Reviews in Food Science and Food Safety, 2015.



Gluten-free Oats

In the field and during processing, oats, that are gluten-free by nature, are often contaminated with glutes. In the Netherlands, a well-functioning gluten-free oat chain has been established, which has proven able to generate new gluten-free products.



Luud Gilissen has been a passionate advocate of the return of oats as a food raw material.

Just like quinoa, oats are a nutritious and high-fiber supplement to the diet. Not just for celiac patients, who often have to make do with low-fiber wheat substitutes, but also for consumers without gluten intolerance or gluten sensitivity. Oats, and barley

‘Traditional cereals are making a comeback’

too, contain soluble fiber and beta-glucans, of which health claims for lowering cholesterol and reducing the glycemic response have been recognized by the European Food Safety Authority (EFSA).

Partly because of these favorable properties, Luud Gilissen of Wageningen UR has been a passionate advocate of the return of oats as a food raw material. Gilissen was one of the front men when the gluten-free oat chain was established in 2005. Fur-

thermore, he also led research on the immunogenic properties of oats. “Only very recently have oats been accepted as a gluten-free cereal and now that celiac patients can eat them, oats also seem to improve their gastrointestinal tract,” the researcher adds.

Another result of the Wageningen research is that it is now possible to make oat bread on the basis of a dough

– which bakers often prefer – instead of a batter.

Checking Every Link

Seed company Vandinter Semo is at the heart of the Dutch oat chain. This company monitors very closely that the cultivation, fertilization, harvesting, processing and distribution is kept gluten-free. From beginning to end, every link is checked for possible contamination. Contamination may not

exceed 20 ppm for gluten-free products, but Vandinter Semo applies stricter standards and strives to 0 ppm, says Gilissen. Through the Dutch grain crushing plant De Halm an important part of the harvest goes to customers such as FreeOf (gluten-free oat bread), Rosies (gluten-free breakfast cereal), De Bisschopsmolen (bakery products such as oat and quinoa wraps) and brewery Witte Klavervier (gluten-free oat beer, in development).

Neighboring countries Belgium and Germany have also shown a lot of interest in gluten-free oats, states Gilissen. “Gluten-free oats are hard to come by. Other than the Netherlands, the only other chains are in Finland (Raisio) and Sweden (Lantmännen). German customers come to Vandinter Semo to see how they work with their own eyes. It is all about trust.”

www.wageningenur.nl/oats

Delicious Fiber

Whole-wheat bread is healthier than white bread, yet not everyone likes the flavor of whole grain and phytate in the fiber can reduce the bioavailability of minerals. Together with European partners, TNO has developed solutions to these problems in the HealthBread project, for which they have been able to use their own barrier technologies.

The use of white wheat varieties, smart milling processes and long fermentation can help bakers create tasty high-fiber breads from which micronutrients, such as iron and zinc, are better absorbed by the human body. This was pointed out by TNO researcher Jan Willem van der Kamp, coordinator of the EU HealthBread project that was completed in 2014.

Wheat bran consist of two layers. The outer exterior, the pericarp, is mostly responsible for the whole grain flavor and color. The inner exterior, the aleurone fraction, less so, while it does contain most of the micronutrients. "Milling processes have been devel-

time," Van der Kamp explains. Furthermore, long fermentation allows for a richer flavor. The practices developed within HealthBread are currently being applied by bakers in Germany, Austria and Italy. TNO has recent-

ly started a follow-up project for Dutch bakers.

Extra fiber in cereal products also means more moisture retention. "Which makes it more difficult to keep a crunchy crust," says Van der Kamp. For this specific problem, TNO has developed several technological solutions, such as a patented barrier technology based on water-insoluble protein films that prevent moisture transfer.

www.healthbread.eu

'The bio-availability of micronutrients can be increased'

oped to obtain an aleurone-rich bran fraction," says Van der Kamp. "This fraction can be used to bake high-fiber bread with a less pronounced whole grain flavor and color." By using an extra-long fermentation process with this high-fiber dough, the bio-availability of micronutrients can also be increased. The barn's phytate binds these nutrients, but during fermentation the phytase enzyme breaks down phytate. "You can extend the fermentation process for the entire dough, for instance to one night, or for the barn fraction alone, which you can then add to the rest of the dough at a later



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