

Technology in using oat and oat ingredients

Introduction

Although oats have been part of the human diet for centuries, the principal use of oats has been as a feed grain. Their superior nutritional content and ready availability made oats the feed grain of choice until the mid-1900s. However, changes in farming practices, improvements in knowledge regarding animal nutritional requirements, and increased availability of low-cost ingredients that could be blended to provide high-quality feed formulations have caused oat usage as a feed grain to fall dramatically. Additionally, the low nutrient density due to the high hull content has been a significant factor.

In contrast, oat usage in human foods has increased as information on oats' beneficial nutritional properties has come to light. The authorization of the heart health claim for oats in the United States by the FDA is especially significant. Additionally, recent investigations on the health implications of minor oat constituents such as avenathramides have raised hopes that the nutritional benefits of oats in human diets may go well beyond those currently recognized.

Food uses

Before oats are used to produce oat products, the hulls are removed, leaving the oat groat. Traditional commercial oat products include rolled oats (whole-grain flakes), steel-cut groats, quick oat flakes, baby oat flakes, instant oats, oat bran, and oat flour.

Hot cereal is the primary food product produced from oats.. Rolled oats, which are produced by flaking whole groats, are the thickest of the standard oat-flake products; flake thickness varies from 0.51 to 0.91 mm depending upon the desired end use. The thicker flakes require longer cooking periods and maintain flake integrity for extended periods.

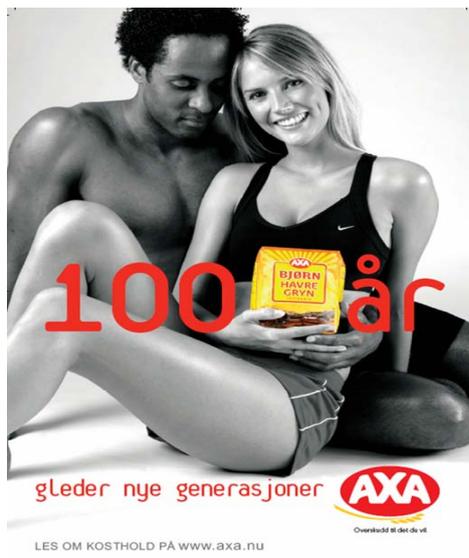


Fig 1. Example of rolled oat products.

Steel-cut groats are produced by sectioning groats into several pieces; they are used in the preparation of flakes and flour and as a specialty ingredient.

Quick oats are flakes produced from steel-cut groats. In this process, oat groats are typically cut into three to four pieces before the final steaming and flaking process. Quick oats, which are usually 0.36 to 0.61 mm thick, require less cooking time than the whole oat flake.

Instant oat flakes are produced from "instantized" steel-cut groats. Before cutting, the groats have been subjected to a proprietary commercial process that results in rapid cooking of the flakes. The flakes are typically 0.28 to 0.46 mm thick.



Fig 2. Examples of instant oat products

Baby oats are also produced from steel-cut groats, but the flakes are thinner and have a finer granulation than quick oats. These smaller, thinner oat flakes cook more rapidly than quick oats and have a smoother texture.



Fig 3. Examples of baby food products containing oat flour

Oat flour or oat meal is produced by grinding flakes or groats into flour for use as an ingredient in a wide variety of food products. Oat flour is a major component of infant foods. In many instances, this is a baby's first introduction to solid foods. Oat flour is a major constituent in granola bars, South American beverage products, and pancake mixes. Additionally, oatmeal is used as a thickening agent in soups, sauces, and gravies and as a meat extender.



Fig 4. Different products containing oat flour, bread mix, porridge mix and pancake mix

Cold cereals or ready-to-eat (RTE) products represent the second major use for oat products. The high fat and fiber content of oats limits the utilization of oats in this application, but a number of economically important products have been successfully introduced into the marketplace.



Fig. 5. Example of ready to eat oat products

Oat bran is the food produced by grinding clean oat groats or rolled oats and separating the resulting oat flour by sieving, bolting, and/or other suitable means into fractions such that the oat bran fraction is not more than 50% of the starting material and has a total β -glucan content of at least 5.5% (dry weight basis) and a total dietary fiber content of at least 16.0% (dry weight basis), such that at least one-third of the total dietary fiber is soluble fiber.

Oat bran is consumed as a hot cereal and is a main ingredient in many RTE cereals. Additionally, oat bran is used in a wide variety of bread, granola, and cookie products. Oat bran's popularity was driven by the recognition of the Coronary heart disease - benefits associated with β -glucan.

Oat products are used as ingredients in a wide variety of bread and baked products. These ingredients provide unique flavour and moisture retention characteristics, as well as enhancing the nutritional benefits of these products. It has been demonstrated that oat flour stabilized the fat component in breads. For the production of bread the baker can use different types of oat fractions, rolled oat, oat flour, whole oat and oat bran



Fig 6. Examples of bread containing oat.

Innovative oat products

Oatly (CeBa Foods AB, Lund) is a range of dairy products made of oats instead of milk. The products are milk- and soya-free, and most of them are entirely vegetable-based. Oat kernels and water are mixed and ground and a patented mix of natural enzymes is added. This gives a milk-like consistency, and some of the insoluble fibre is withdrawn while leaving the water-soluble fibre in the product. Finally, the mixture is homogenised to make the product smooth and even. The liquid oat base always consists of water and oats - nothing more, nothing less.

Oatly products can be used in the same way as you use traditional dairy products such as milk and cream



Fig 7. Different Oatly product

In OatWell® oat bran, β -glucan are present in high contents due to a careful stabilization process of oat bran. CreaNutrition/Swedish oat fibre www.oatingredients.com/ develops, produces and sells OatWell® oat bran products rich in β -glucan, up to 22%. Cereals with added OatWell® oat bran can be used as fortification in breakfast mueslis or designed as RTE cereals.

Primaliv™ (Skåne meierier, Malmö, Sweden), PrimaLiv consists of a cup with 200 ml forming fibres from oat, so called beta glucans. One cup is a good source of several nutrients and gives 4 grams of OatWell® beta glucans. Equivalent to three plates of oat-porridge. In 2002, Skånemejerier's PrimaLiv became the first product to be approved and marked in compliance of the new rules of the food industry for health statements. As a result, PrimaLiv becomes Sweden's first Functional Food and may be marketed with a so-called product-specific health statement.

Oatrim. (ConAgra, Quaker Oats, Rhône-Poulenc). Fat replacer with 5% beta-glucan and partly hydrolysed starch. Preparation of Oatrim involves the conversion of starch in oat flour or bran into amyloextrins by enzymatic hydrolysis. Oatrim consists primarily of amyloextrins and soluble fiber (β -glucan usually at 5–10% by weight) with low amounts of lipids, proteins, and minerals. Oatrim can be used in most foods as a powder or gel.

YOSA® (Bioferme, Finland). Yosa® is a great tasting, non-dairy oat product made from digestive-friendly oats and oat bran. The oats are fermented with a unique combination of probiotic bacteria (inc. Bifidobacterium lactis BB-12™ and Lactobacillus acidophilus LA-5™). These probiotics have scientifically proven benefits that can help regulate your digestive system. The dietary fibre of oats in Yosa, betaglucan, also facilitates the removal of cholesterol from the body and slows down the absorption of carbohydrates. Yosa has been granted the Heart Symbol of the Finnish Heart Association and the Finnish Diabetes Association.

Conclusion

New product development has the opportunity to expand oat utilization in the human diet. Oats have been primarily used as a component of breakfast. Development of oat products that serve as a side dish or main dish for other eating occasions could dramatically expand oat usage and the opportunities for consumers to increase their consumption of "oat soluble fiber." As usual, challenges are plentiful, for changing eating habits is "easier said than done."