

23 Noodles and Pasta

23.1 Pasta and Noodles in North America

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In America, noodles – with only a few exceptions – fall into the category of pasta. Pasta includes products such as spaghetti, macaroni, lasagne noodles, shells, fettuccine etc. These products vary greatly in shape and extrusion technology to create a desired shape. Most noodles are just variations in the shape of pasta. One exception is homemade-style egg noodles, which are produced in a non-dried and frozen form, but are a very small part of the pasta market in the U.S. In North America pasta is mainly produced from durum wheat, most of which is grown in Canada and the northern United States. However, frozen non-dried egg noodles that are produced to imitate homemade noodles can be made from soft or hard wheat flours. Durum is a vitreous kernel, amber in colour, that produces coarse semolina with properties that yield quality pasta products. Generally speaking, high-protein durum wheat is desirable because vitreousness results in a greater yield of high-quality semolina for pasta production. Quality pasta is generally produced from 100% durum flour and water as the primary ingredients. However, for various reasons non-durum flours may be added to replace part, usually a small part, of the durum flour. Other ingredients, such as eggs for egg noodles, are used to produce a variety of flavours and colours.

The process starts with the automatic press, which combines the mixing of flour, water and any other ingredients required for the specific product with kneading and extrusion of the dough. This is a continuous process followed by a shaping mechanism to determine the shape of the extruded product. After extrusion and shaping the pasta is conveyed to a drier for final moisture reduction to preserve the

product and achieve stability during distribution. Drying conditions (heat and humidity) must be carefully controlled in order to dry the pasta without altering the quality of the final product. After drying, the pasta is cooled at carefully controlled humidity to protect its quality. Pasta quality is determined by flour quality and process control. Flour is the main ingredient and the primary determinant of quality, assuming consistency in the process. Flour quality is determined by the vitreous properties of the wheat kernel, which maximize semolina output in milling. It is further defined by the ability of the semolina flour to be processed into quality pasta. This quality is further described by a desirable amber yellow colour in the wheat, a gluten structure that allows extrusion or sheeting into relatively thin, but strong sheets and an end product with acceptable cooking quality when the pasta is prepared for consumption. Colour is largely related to the genetics of the wheat and determined during wheat breeding programmes, when durum wheat varieties are developed. Cooking quality is defined by the surface and texture or stickiness of the pasta after cooking. Cooking qualities are mainly a function of protein quantity and quality. The protein and gluten levels of durum flour have been found to correlate with the quality of the pasta produced from the flour. Typically, durum flour with at least 12% protein is necessary to provide the quality characteristics required of most pasta. Protein quality is complex and more difficult to define. However, good correlations have been found between protein quantity – more specifically the quantity of gluten protein – and the cooking quality of pasta (Fabrini and Lintas, 1988). Numerous procedures have been suggested for evaluating pasta gluten (Fabrini and Lintas, 1988). The resilience of cooked pasta is largely determined by gluten characteristics, and Feillet *et al.* (1977) demonstrated that varieties with strong gluten exhibit high elastic recovery and

good cooking quality while those with weak gluten show low elastic recovery and poor cooking quality. A high glutenin-gliadin ratio or a high soluble protein content also improves cooking quality (Fabrini and Lintas, 1988).

To sum up, protein attributes are the primary determinants of the firmness, stickiness and cooking quality of pasta. Pasta quality tests include cooking tests to determine actual product quality, tests to evaluate wheat characteristics, milling tests and physical tests for flour quality (Fabrini and Lintas, 1988). Wheat evaluations include test weight, 1000-kernel weight and vitreous kernel content. Milling tests are used to determine extraction and the appearance and granulation of semolina. Other physical tests include protein, ash, moisture, falling number and pigment content. Wheat breeders use the Mixograph, sedimentation tests and protein evaluations to predict the performance of pasta from durum wheat cultivars. These tests also have applications as durum flour quality tests. Finally, pasta is evaluated for colour with a colorimeter, firmness with an instrument that measures force such as the Instron (Instron Corp., Canton, MA) or TA-XT2 (Texture Technologies, Scarsday N.Y.), cooked weight, and dry soluble residue left in the cooking water as compared to standards.

23.2 Asian Wheat Noodles

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23.2.1 Introduction

The Arabs claim to have been the first to use dried pasta, as a means of preserving flour during their forays across the desert.



Nevertheless, it is believed that noodles originated in the north of China as early as 5,000 BC. Their modern-day form has developed over the last 2,000 years; present-day noodles (*mian*) were a unique contribution by the Han Dynasty (206 BC to 220 AD), and then spread to other Asian countries. The relationship between noodles and pasta also goes back more than 700 years. It is believed that in the late 13th century, Marco Polo travelled to China and brought noodles back to Italy to add to his country's repertoire of pasta.

Noodles are strips or strands cut from a sheet of dough made from flour, water, and either common salt or a mixture of alkaline salts. They are one of the main staple foods consumed in East and Southeast Asian countries, representing up to 40% of total flour consumption. Though some Asian-style noodles are wheat-based, many others are made from ingredients such as rice flour, potato flour, buckwheat³⁹ flour, corn flour and bean, yam or soybean flour. Among the more popular varieties are China's cellophane noodles (made from mung-bean flour), egg noodles (usually wheat-based) and rice flour noodles, and Japan's *harusame* (made with soybean, rice or potato flour), *ramen* (wheat-based egg noodles) and *soba* (which contain buckwheat flour). Other Asian countries, including Korea, Indonesia, Thailand, Vietnam and the Philippines, have their own versions of the venerable noodle (Herbst, 1995). In recent years, Asian noodles have also become popular in many countries outside Asia.

This text will focus on Asian wheat noodles (rather than buckwheat noodles or starch noodles made from purified starch, generally from other plant sources such as rice, mung bean, or sweet potato).

23.2.2 Scientific Name for Asian Noodles

Until recently, the U.S. government required a noodle to contain flour, water, and eggs in order to be rightly called a noodle. Since most Asian noodles are not made with eggs, this left

³⁹ See footnote 25, chapter 16.3.3, page 194.