SHIMADZU

Application News

Material Testing System No.i236

Texture Analysis of "Soumen" Japanese Vermicelli

■ Introduction

The evaluation of the mechanical properties of foods, such as strength and hardness, is becoming widely used for the numerical comparison and control of food texture. This Application News introduces the tensile test and cutting test of Japanese soumen vermicelli to evaluate the texture.

Soumen vermicelli is originated in Nara Prefecture in Japan. It was made by hand by kneading wheat, salt, and water; applying food oil and starch; and then stretching, drying, and maturing. Nowadays, it is generally machine-made.

According to JAS (Japan Agricultural Standards) standards, noodles less than 1.3 mm diameter are "soumen," those from 1.3 mm to 1.7 mm diameter are "hiyamugi," and larger noodles are classified as "udon."

■ Testing Equipment and Specimens

Two types of commercially available soumen (Sample A, Sample B) were used as specimens for these tests. However, the diameters varied between 0.8 mm and 1.3 mm due to the degree of drying (the state in which it was sold). Therefore, the noodle diameters were measured with Vernier calipers to select specimens of approximately the same diameter.

The specimens were added to boiling water and boiled for three minutes and then washed in cold water for ten seconds. Ten specimens each of Sample A and Sample B were tested within five minutes.

Testing was performed using a Shimadzu EZTest tabletop tester (Fig. 1).

Fig. 1 EZTest Tabletop Tester

■ Tensile Test

The specimens were grasped in grips (sponge was attached to the grip faces to prevent destruction of the specimens), and the grips were mounted in the tester through universal joints. Tensile test was performed under the following conditions:

1) Force measurement — Load cell (1 N)
2) Extension measurement — Internal extensometer in tester
3) Test speed — 50 mm/min.

Fig. 2 and Fig. 3 show an overview of the grips and a specimen mounted in the tester.

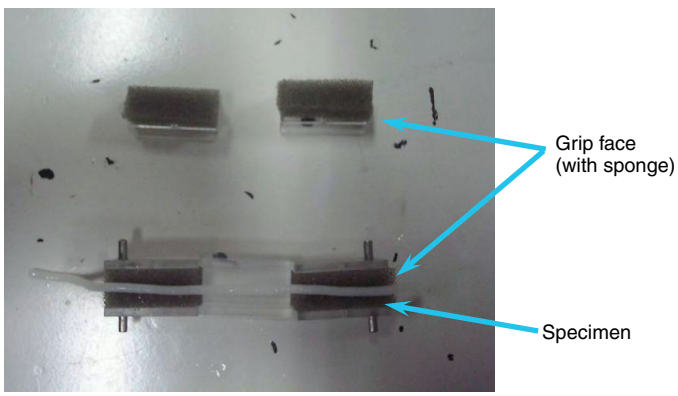

Fig. 2 Grips for Tensile Test

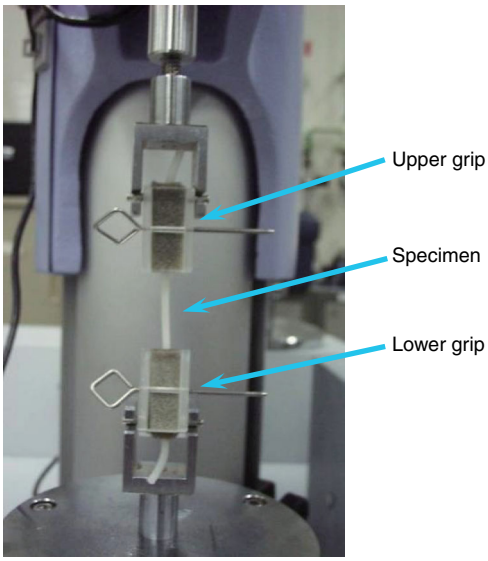

Fig. 3 Overview of Tensile Test

Fig. 4 shows the tensile test results as force-displacement (extension) curves. (Curves are superimposed for all ten specimens.)
The results indicate a maximum force of 164 mN and break displacement of 56mm for Sample A and 120 mN maximum test force and break displacement of 37.8mm for Sample B. Sample A exhibits greater extension and strength than Sample B. (All values are averages of ten samples.)

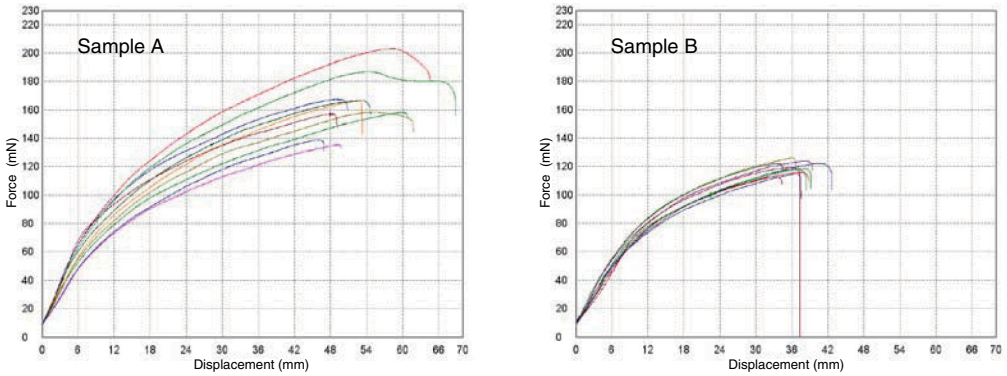

Fig. 4 Tensile Test Results

■ Cutting Test

Cutting test can be performed as an evaluation method that approximates biting through foods.
For cutting test , the specimen is placed on the compression plate and the cutting test jig (tooth-shape press: R 0.2 mm knife-edge tip) is pressed down on the sample from above. The test conditions are as follows:

1) Force measurement — Load cell (1 N)
2) Indentation measurement — Internal extensomete in tester
3) Test speed — 5 mm/minute

Fig. 5 shows a specimen mounted in the tester.

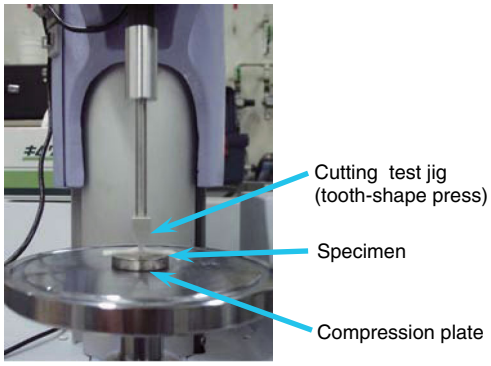

Fig. 5 Overview of Cutting Test

Fig. 6 shows the cutting test results as force-displacement (indentation) curves. (Curves are superimposed for all ten specimens.)
The results indicate a maximum force of 207 mN for Sample A and 129 mN maximum test force for Sample B. (All values are averages of ten samples.)

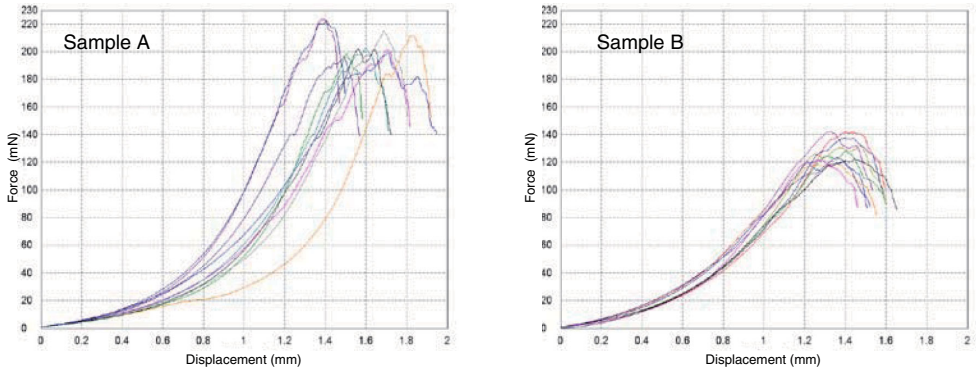

Fig. 6 Cutting Test Results

The tensile and cutting test results above provide a numerical evaluation that Sample A has a firmer texture than Sample B. The results confirm that the materials tester is effective for quantification for functional testing.

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