

This invention relates to a process for the preparation of dried pastas such as, for example, quick-cooking pastas or instant pastas.

5 Various processes have been described for the preparation of pastas having a reduced cooking time, for example of a few minutes in a microwave oven, or pastas which can be rapidly reconstituted for eating, for example by immersion in hot water or a hot stock.

10 One known process, which is described in FR-A-2 474 831, comprises extruding the pastas, gelatinizing them by cooking with steam under pressure and then drying them in hot air.

15 Another process comprises extruding the pastas in the required shape, precooking them for a few minutes in boiling water and then draining and drying them. However, it has been found that significant losses of material can occur during the precooking step.

20 The object of the present invention is to obviate this disadvantage by providing a process for the preparation of dried pastas in which the losses of starting material are reduced.

25 The process for the preparation of dried pastas according to the invention is characterized in that a mixture of water and a ground cereal is prepared, the pasta is shaped, the shaped pasta is thermally pretreated, the pretreated pasta is precooked in boiling water and the precooked pasta is dried.

30 It has surprisingly been found that the thermal pretreatment enables the losses of starting material occurring during the precooking of the pasta to be considerably reduced.

Another advantage of this process is that the dried pasta obtained has an improved quality and texture.

35 To carry out the process according to the invention, a mixture consisting of a ground cereal product and water

is prepared. The ground cereal product may be, for example, flour and/or semolina obtained by grinding grains of cereals, such as hard wheat, soft wheat, rice or corn. Such additives as fresh or dehydrated eggs, salt, spices, flavourings or emulsifiers may be added to the mixture. Water may be added in a quantity sufficient to obtain a mixture having a dry matter content of the order of 60 to 75% by weight.

The pasta may then be shaped, for example by extrusion of the mixture in a screw extruder or a rotating-bar extruder or by rolling, followed by cutting to give the pasta the required shape and size.

The pasta thus shaped may then be thermally pretreated. The pretreatment may be carried out, for example, by heating the pastas for 5 - 150 seconds to 80 - 200°C using a stream hot air flowing at 15 - 30 ms⁻¹.

The pretreatment may also be carried out by application of microwave energy, for example at an output of 400 to 1,300 W over a period of 50 to 500 seconds. The pretreatment may also be carried out with a stream of steam or with infrared radiation.

The conditions in regard to output, time and temperature under which the pretreatment is carried out may be selected within the above-mentioned limits in dependence *inter alia* upon the shape and size of the pastas to be pretreated and upon the difference between the temperature of the pastas issuing from the extruder or roller and the temperature of the water used for precooking.

It has been found that significant losses of starting material can occur during the precooking step. Now, these losses may possibly be attributable to an excessive difference between the temperature of the pasta issuing from the extruder or roller and the temperature of the precooking water.

The pasta issuing from an extruder or roller may be at

a temperature, for example 30 to 45°C, below the temperature of the water used for precooking, for example 97 to 100°C. When the pasta is introduced into the precooking water, the heat supplied by the water may be used first to
5 heat the pasta to a suitable temperature for precooking, for example 97 to 100°C, and thereafter solely to precook the pasta.

The result of this is that precooking does not start immediately after introduction of the pasta into the
10 precooking water. Now, it has been found that losses of material of the order 9 to 15% by weight can occur when precooking is carried out at a temperature below 97 to 100°C and/or when precooking does not begin immediately after introduction of the pasta into the precooking water.

15 It has been found that precooking which begins immediately at a temperature of at least 97°C enables both the structure of the pasta to be stabilized - by denaturing the proteins present at its surface - and a high-quality pasta having an improved structure and texture to be
20 obtained while at the same time reducing the losses of starting material.

Accordingly, the thermal pretreatment enables the interval between the temperature of the pasta issuing from the extruder or roller and the temperature of the precook-
25 ing water to be reduced or even eliminated so that precooking begins rapidly or even immediately at a temperature of at least 97°C.

The pasta thus pretreated may then be precooked, for example in boiling water. In particular, the pasta may be
30 precooked for 1 to 5 minutes in slightly acidified water having a pH of 5 to 6 and a temperature of 97 to 100°C.

The precooked pasta may then be dried, for example in a hot-air dryer at 80 to 90°C, by infrared radiation or by microwaves, over a period of about 1 to 8 hours so that
35 dried pasta having a dry matter content of 92 to 98% by

weight is obtained.

The process according to the invention for the production of dried pasta may be carried out discontinuously, semicontinuously or, preferably, continuously.

5 To carry out the process according to the invention continuously, the pasta issuing from the extruder or roller may be deposited onto a conveyor belt, for example in a layer having a thickness of several centimetres. The belt carrying the pasta may then be passed through a heating
10 tunnel, more particularly a hot air tunnel, in which hot air at 80 to 200°C for example is introduced from about the belt, passes vertically downwards through the belt and the pasta and is recovered by a fan situated beneath the belt. The pasta thus pretreated may then be continuously precook-
15 ed and dried.

The invention is illustrated in more detail by the following Example.

Example 1

20 A mixture containing 15 parts by weight hard wheat semolina and 4.7 parts by weight water is prepared. The mixture is extruded in a screw extruder and then cut to obtain pasta of the cornet type having a diameter of approximately 5 mm and a wall thickness of approximately
25 1.5 mm.

For thermal pretreatment, the pasta is arranged on a conveyor belt in the form of an approximately 2 to 4 cm thick layer. The belt is then passed at a speed of approximately 0.1 - 0.2 ms⁻¹ through a hot-air tunnel 90 cm
30 long and 20 cm wide of the type described above. Pretreated pasta is thus obtained at an output of 40 to 130 kg per hour.

The pretreatment temperature and the rate at which the hot air passes downwards through the layer of pasta are
35 varied as shown in the following Table. The pasta is then

cooked for 3 minutes in boiling water at 98 - 100°C/pH 5.5. The precooked pasta is drained and then dried for about 5 hours at 85°C to a dry matter content of 96% by weight.

Pasta samples corresponding to the various pretreatment conditions are taken. The losses of material occurring during the precooking step are measured in % by weight.

The results obtained are shown in the following Table which, for comparison, also shows the losses of starting material occurring during the precooking of a control sample prepared in the same way, but without the thermal pretreatment, and also the difference between the losses measured on the control sample and the losses measured on the pasta samples which have been thermally pretreated in accordance with the invention.

Example	Thermal pretreatment			Losses (%)	Difference (%)
	Time (s)	Temperature (°C)	Air flow rate (m/s)		
Control	--	--	--	10.03	--
A	9.4	190	20	8.25	17.8
B	7.6	190	25	7.80	22.3
C	17.3	130	25	6.88	31.4
D	30.0	135	29	6.47	35.5
E	35.0	148	21	6.47	35.5

It can be seen that the thermal pretreatment enables the losses of starting material to be reduced by at least 17.8%. This saving can be increased to 35.5% by a longer pretreatment time. It can also be seen that the best results are obtained by a relatively long pretreatment carried out at a relatively low temperature (30 - 35 seconds, 135 - 148°C).

Example 2

A mixture containing 80 parts by weight hard wheat semolina, 10 parts by weight pasteurized whole eggs and 1 part by weight emulsifier is prepared, after which water is introduced to give a dry matter content of approximately 69% by weight.

The mixture is extruded in a screw extruder and then cut to obtain pasta of the cornet type having a diameter of approximately 5 mm, a length of approximately 70 mm and a wall thickness of approximately 0.9 mm.

For thermal pretreatment, the pasta is arranged on a conveyor belt in the form of an approximately 2 to 4 cm thick layer. The belt is then passed at a speed of approximately $0.1 - 0.2 \text{ ms}^{-1}$ through a microwave tunnel equipped with a magnetron of which the output can be varied from 0 to 3 kW. The output and the pretreatment time are selected so as not to spoil the appearance of the pasta (through the formation of surface bubbles) while ensuring optimum pretreatment.

The pretreated pasta is then cooked for 2.5 minutes in boiling water at $98 - 100^{\circ}\text{C}$ /pH 5.5. The precooked pasta is drained and then dried for about 5 hours at 85°C to a dry matter content of 96% by weight.

Pasta samples corresponding to the various pretreatment conditions are taken. The losses of material occurring during the precooking step are measured in % by weight.

The results obtained are shown in the following Table which, for comparison, also shows the losses of starting material occurring during the precooking of a control sample prepared in the same way, but without the thermal pretreatment, and also the difference between the losses measured on the control sample and the losses measured on the pasta samples which have been thermally pretreated in accordance with the invention.

	Example	Thermal pretreatment Time (s)	Output (W)	Losses (%)	Difference (%)
5	Control	--	--	9.50	--
	A	71	1300	8.17	14
	B	150	1300	7.65	19.5
	C	262	400	8.55	10

10 The thermal pretreatment by microwaves thus enables the losses of starting material to be clearly reduced. In addition, texture analyses of the samples thus prepare indicate:

- that samples A and B and, to a lesser extent, sample C have a firmer texture than the control,
- 15 -
- that samples A, B and C have a far less sticky texture than the control.

 Accordingly, the present pretreatment also enables the texture of the pastas obtained to be improved. The
20 microwave pretreatment provides for complete coagulation and for rapid fixing of the gluten. Accordingly, a ground cereal low in gluten (content approximately 11% for example) may be used as such, i.e. there is no need to add a binder.

CLAIMS

1. A process for the preparation of dried pasta in which
a mixture of water and a ground cereal is prepared, the
5 pasta is shaped, the shaped pasta is thermally pretreated, the pretreated pasta is precooked and the precooked pasta is dried, characterized in that the shaped pasta is thermally pretreated before cooking.
2. A process as claimed in claim 1, characterized in
10 that the shaped pasta is thermally pretreated for 5 to 150 seconds at 80 to 200°C.
3. A process as claimed in claim 2, characterized in that the pretreatment is carried out with a stream of hot air flowing at 15 to 30 ms⁻¹.
- 15 4. A process as claimed in claim 1, characterized in that the pretreatment is carried out with microwave energy at an output of 400 to 1,300 W over a period of 50 to 500 seconds.
5. A process as claimed in claim 1, characterized in
20 that the pretreatment is carried out with a stream of steam or with infrared radiation.
6. A process as claimed in claim 1, characterized in that the pretreated pasta is precooked for 1 to 5 minutes in boiling water at 97 to 100°C having a pH of 5 - 6.
- 25 7. A process as claimed in claim 1, characterized in that the precooked pasta is dried to a dry matter content of 92 to 98% by weight by infrared or microwave radiation or by passage through a hot-air dryer at 80 to 90°C.



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