



Application Data Sheet

DSM Food Specialties B.V.

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Fromase® 3000 L

Fromase® 3000 L is a granulated microbial coagulant (endopeptidase) preparation derived from a selected *Rhizomucor miehei* strain and widely used in the cheese industry around the world. The product is of non-thermolability standard according to the DSM method of analysis.

BENEFITS

Microbial coagulant for all varieties of cheese

EU produced enzyme for guaranteed quality, traceability and supply

Label friendly coagulants: organic (non-GMO), vegetarian, kosher and halal

Consistent quality at a low price

ACTIVITY; FORMULATION AND RECOMMENDED DOSAGE

Activity: ≥ 3000 IMCU per gram

Formulation: granulate protease solution containing sodium chloride. Fromase® L is available in the following packing sizes: 20 kg.

For Cheese application the recommended dosage is 10 to 16 gram per 1000 liters of milk.

Because of the impact of application conditions like: renneting temperature, desired gel-strength at cutting, available coagulation time, milk composition and seasonal effects, the optimum dosage level is determined through testing in the specific application.

For Fermented Milk Products application the recommended dosage is 3 to 10 gram per 1000 liters of milk.

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WORKING MECHANISM AND FUNCTIONALITY

Fromase® L is an acid fungal protease mucoropepsin with a molecular weight of approximately 40.000 Dalton. The overall amino acid composition of Fromase® L is very similar to that of animal rennet. Its stability in solution is excellent between pH 3.0 and 6.5. The specific of Fromase® L BF on the beta chain of insulin is very similar to that of animal rennet, with a preference for those linkages involving aromatic amino acids. Like animal rennet, Fromase® L induces milk clotting through hydrolytic cleavage of the phenylalanine-methionine linkage of kappa casein (Phe-Met 105-106).

Effect of enzyme concentration

Animal rennet is known to follow the law of Storch and Segelke:

$$t = C1 * 1/[E] + C2$$

In which:

t = flocculation time

[E] = enzyme concentration

C1 = constant

C2 = constant depending on the type of milk used and the type of rennet.

The coagulation time is inversely proportional to the enzyme concentration. When however raw milk is used, Fromase® L does on observed varies with the different types of milk. It has been shown that all *Rhizomucor miehei* enzymes act in this way, corresponding in fact to competitive inhibition by an inhibitor present in raw milk which is however destroyed at a temperature above 78°C. This characteristic is especially evident in the manufacture of cheese from raw milk. Due to this inhibition the addition rate of Fromase® L in raw milk has to be increased with about 20-25% compared to calf rennet to obtain the same coagulation time.

Effect of pH

The pH profile of the Fromase range is ideal for all cheese types. Slight differences are visible when comparing different Fromase grades, calf rennet and FPC in the important range between pH 6.2 and pH 6.8. Generally: the higher the pH, the less active the enzyme.

Effect of Temperature

The temperature profile of the Fromase® range is ideal for all cheese types. At standard clotting temperatures (between 30°C and 35°C), performance of all Fromase grades are equal to calf rennet and FPC.

Effect of Calcium Ion Concentration

Fromase® XL, XLG and calf rennet have the same sensitivity to the calcium ion concentration, whereas Fromase® TL and L are slightly more sensitive.

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Inactivation of the Enzyme

If whey is to be processed further, it is essential to ensure that Fromase® is inactivated in whey. As long as excessive acidification by prolonged storage has been avoided before pasteurisation, Fromase® will be inactivated under the following conditions.

Grade	pH	Time	Temperature	Residual Act.
Fromase® L	6.0	15 sec	78 °C	<1%
Fromase® TL	6.0	15 sec	73 °C	<1%
Fromase® XL	6.0	15 sec	68 °C	<1%
Fromase® XLG	6.0	15 sec	68 °C	<1%
FPC	6.0	15 sec	73 °C	<1%
Calf Rennet	6.0	15 sec	70 °C	<1%

APPLICATION

Prior to addition of Fromase® L ensure that the milk is brought to the desired renneting temperature. If calcium chloride, starter culture and annatto cheese colour have been added, they must be homogeneously mixed throughout the vat prior to rennet addition.

Fromase® L (Granulate) BF must be dispersed in 10 to 20 parts of cool, chlorine free water. In situations with no chlorine free water available, alternatively 5% milk can be added to the water before dispersion of Fromase® Granulate. After a soaking-time of 20-30 minutes in water. Agitate the milk to ensure that the rennet is uniformly mixed throughout the milk; the time will vary with the design of the vat but should be in the region of 4 minutes. The curd should be ready to cut in about 25 to 45 minutes depending on the coagulation temperature, CaCl₂ dosage rate and the rennet dosage.

Method of analysis

The activity of Fromase® L BF is expressed in International Milk Clotting Units (IMCU) in accordance with the Relative Milk Clotting Activity Test (REMCAT) of the International Dairy Federation (IDF). In case of Fromase® the method ISO 15174 / IDF 176 2002 applies.

ALTERNATIVES

Fromase is available in several strengths, formulations and packing sizes. Fromase can be combined with ripening enzymes like Accelerzyme CPG® or Piccantase® in order to achieve different cheese flavours.

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SAFE HANDLING

A Material Safety Data Sheet (MSDS) is supplied with all products. For details on safe handling of enzymes please see the MSDS.

TECHNICAL SERVICE

DSM: a leading dairy player.

DSM is the dairy industry's leading supplier, catering to the needs of multinational companies as well as small local producers. We are dedicated to supplying solutions, not just products. We work closely with our customers to help them overcome specific market challenges. To achieve this, we combine years of experience with a dedication to innovation and the best technical support possible. We apply this approach to all dairy markets, including cheese, milk, fermented milk products and whey processing.

DSM services include:

- Technical in house know-how to support application development;

- Tailor made training possibilities;

- Technical Service.

For more information, please contact your local sales representative or send an e-mail to info.food@dsm.com

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