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EVALUATION OF THE QUALITY OF WHEAT WITH ADDED IMPROVERS

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Abstract: *One of the main indicators of quality of grain flours is the enzyme content. The most important enzymes on the wheat flour are the α - amylase and the β - amylase. Unique for wheat flour dough are its rheological properties, namely elasticity and extensibility, which are largely due to the properties of gluten formed during kneading and how it interacts with other components of flour and product ingredients. In the present paper are presented the experimental results regarding the falling index Hagberg and determination the main rheological properties - tenacity, extensibility, elasticity, and baking strengthfor differently wheat flour types produced, from 2021 production. The research is important for specialists in the field, in terms of the need to apply the corrections that must be made to flour in the technological process of baking, in order to obtain quality products. The main objective of this work was to improve the knowledge regarding the qualitative analysis of wheat and to improve the quality of flour by adding improvers in the field of the variability of the quality parameters of wheat, which is an annoying feature of the Romanian crops.*

Keywords: *corrections, enzyme, baking, technological process*

1. Introduction

The rheological properties of the dough play an important role in the production processes, in which the dough is subjected to the action of forces that cause tension and cause deformation. They express the deformation over time of the dough under the action of the external forces exerted on it. The dough possesses both the properties of a viscous liquid and those of a solidelastic, being considered visco-elastic.[1]

In Romania, the quality assurance of bakery products is a priority because many food producers consider the use of new and innovative enzymes that have a long history of study and use. When an enzyme is added, it is often destroyed during the heat-baking process. Enzymes are intended for a certain function, thus eliminating undesirable effects [2].

Wheat flour consists mainly of starch (ca. 70–75%), water (ca. 14%), and proteins (ca. 10–12%). The typical levels of amylose and amylopectin in starch are 25–28% and 72–75%, respectively [3]. In some countries, such as the U.S., France, Spain and England to make quality bakery products, industrial-grade fungal proteolytic preparations containing amylases are also used [4]. Physicochemical characteristics of seventy wheat flours of different species namely Einkorn (*Triticum monococcum*), Spelt (*Triticum spelta*) and common wheat (*Triticum aestivum*) were analyzed using different standard methods. The wheat grains were analyzed for moisture, ash, protein, wet gluten, sedimentation index, pH, acidity, fat, starch, falling number, damage starch and Glutograph parameters stretching and relaxation. The relationship between physicochemical characteristics and wheat samples were analyzed using the principal component analysis. For almost all the physicochemical data except moisture and damage starch were obtained

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significant differences between species [5].
As one of important consumable raw materials in our daily lives, wheat flour provides numerous nutrients, such as carbohydrates, protein, and minerals. However, the quality and safety of wheat flour products are sometimes challenged by the inferior quality parameters and adulteration, which cannot be easily detected and pose risks to human health [6,7].
The main quality parameters of wheat flour include its chemical composition, which is related to the moisture, protein, ash, and wet gluten contents of the flour, and technological parameters, such as the sedimentation value, falling number and rheological properties of wheat flour dough [8, 9].
A large variation in correlations between rheological properties of wheat dough and baking performance of the resulting breads were explored. Many factors in addition to rheological properties should be considered to develop a predictive model that could be used in the bake industry [10].
The bread obtained has a slower aging rate due to better gelatinization of starch and shortening of amylopectin chains that have a slower tendency to retrograde. Also, low doses of α-amylase improve core elasticity and porosity structure [11]. High doses, however, reduce the elasticity of the core and increase its stickiness, an effect seen at much lower doses of bacterial amylase than with malt or fungal amylase. This is explained by the higher thermostability of bacterial α-amylase and therefore the longer duration of action in the dough on the one hand, but also by the degree of polymerization of the formed dextrins, of 25 – 35. The addition of amylase alters the rheological qualities of the dough. Damaged starch grains absorb more water than intact grains [12, 13].
The alveographer provides information on the biaxial stretching rheological properties of the dough at constant hydration. The method is based on the tensile strength of a dough sheet maintained at rest for 20 minutes after which it is subjected to an air stream at constant pressure until it breaks. The air pressure inside the bubble is recorded until the bubble breaks and graphically extrapolated as a curve whose characteristics render the dough resistant to deformation. [14]. High W flour is high gluten-containing flour, which is most suitable for prolonged leavening [15].
Gluten, which is the protein part of a meal, is able to absorb water once and a half of its weight, so the stronger the flour, the higher the concentration of protein.
As scientific objectives this paper aims to: Description of the influence of amylases and parameters determined by means of the alveographer on the finished product; - Evaluation of the behavior of alpha-amylase before and after the addition of the improver; - Evaluation of the influence of the rheological behavior of the prepared dough made with the help of the alveographer Chopin; - Evaluation of changes in porosity, core elasticity and acidity in both breeder and non-added bread.

2. Matherials and methods

The research focused on determining the Hagberg drop Index and determining the main rheological properties - toughness, extensibility, elasticity and baking resistance to different types of wheat flour from wheat production in 2021.
The analyzed material is represented by the nine flour samples (five samples of white flour 650; 2 samples of black flour 1350 and two samples of whole flour 1500) after the addition of the enzyme preparation Belpan MOPA.

3. Results and discussion

Determination Falling Number. The results obtained from the determination of alpha-amylase activity for the 9 samples with the addition of Belpan MOPA and the nine samples of unadded flour are shown in figure 1.

A decrease in the drop index may be observed in the nine flour samples (five samples of white flour 650; 2 samples of black flour 1350 and two samples of whole flour 1500) after the addition of the enzyme preparation Belpan MOPA. In the case of white flour samples 650 after the addition of the enzyme preparation, the drop index of values between: 220÷280 - the amylase activity of flour is normal; 290 - the amylase activity of flour is weak, and the bread obtained from them is not developed, has small volume and dry core. In the case of samples of black flour 1350 after the addition of the enzyme preparation, the drop index of values between: 220 - the amylase activity of the flour is normal; 290 - the amylase activity of the flour is poor, and the bread obtained from it is not developed, has small volume and dry core.

The variation of falling number index for both non-improver and breeder-added flour can be seen in **Fig.1.**

Determination of rheological indicators using the Alveographer.

The quality of the dough after kneading was also determined with the help of the alveographer. The alveographer measures three parameters, namely: The maximum pressure required for the deformation of the sample, which represents the tenacity of the dough; the length of the curve, which represents the extensibility of the dough; these two parameters must be in a balance. The most important parameter is W, which shows the strength of the dough after kneading.

The graphical representation of the values of the parameters of the nine flour samples can be found in Figure 2 (a-i). According to Banu et al. (2000) the values of an alveogram for flour intended for bread are within the ranges: P - 60÷75mm; L - 130÷150 mm; G - 25÷30; P/L - 0,55÷0,65 and W - 200 10÷J. The values for parameter P are between 78÷103 mm for white flour 650 that is, they are higher and do not fall within the range specified by Banu C. there are no values for whole flour 1500 that are lower than this range; only the values for black flour 1350 fall. In the case of flour with a W greater than 250 as in white flour 650, the protein network is large and has as a consequence the ability to produce a highly leavened product. In the case of flour intended for bread it is recommended that W should have values between 170÷250 10 "J", and in the case of analyzes carried out in this study only one type of white flour 650 falls .

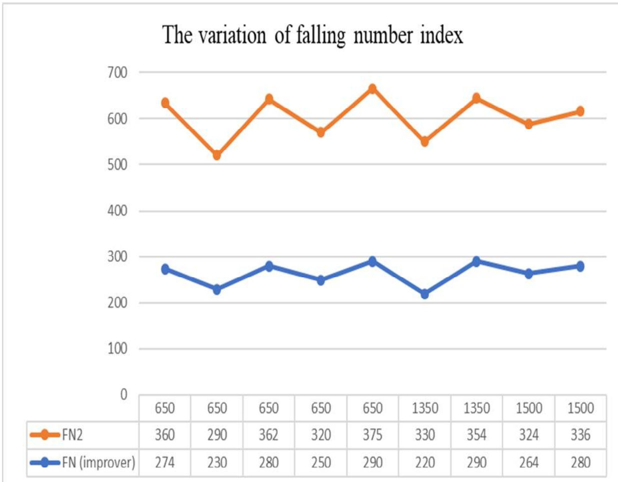
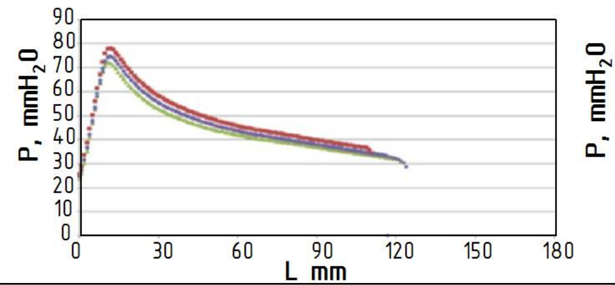
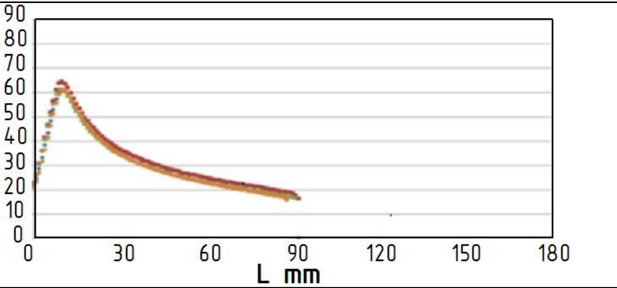


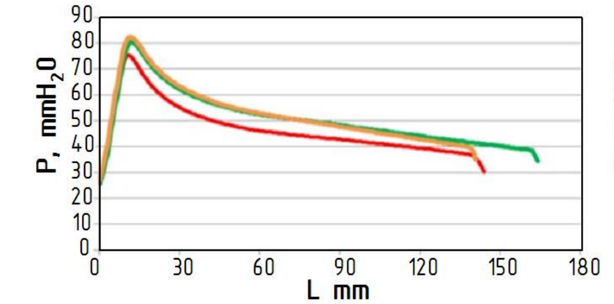
Fig.1. Variation of falling number index for both non-improver and breeder-added flour Belpan MOPA



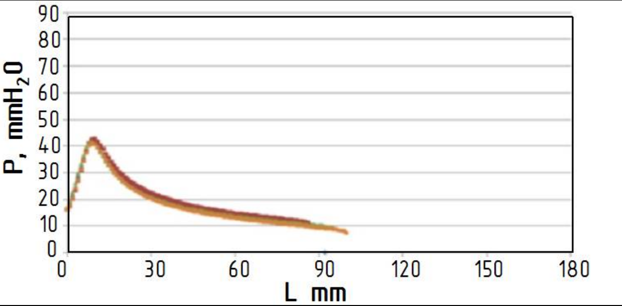
a. The alveogram F. 650 (lot 1)



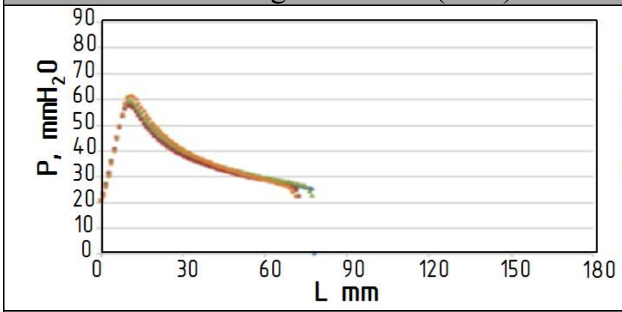
b. The alveogram F. 650 (lot 2)



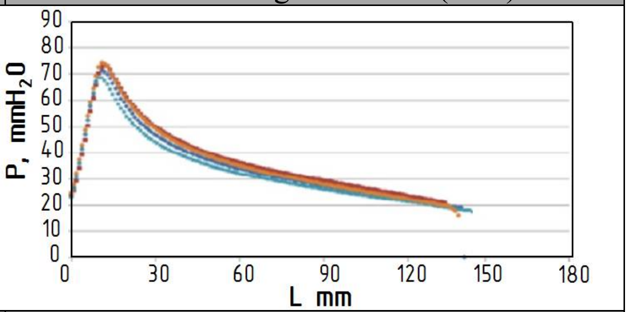
c. The alveogram F. 650 (lot 3)



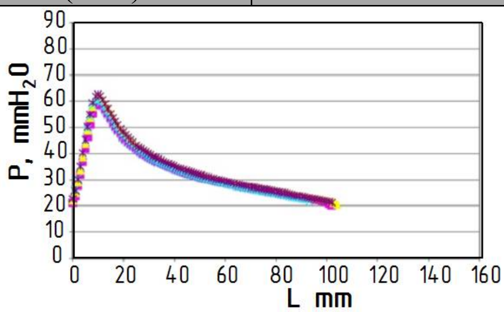
d. The alveogram F. 650 (lot 4)



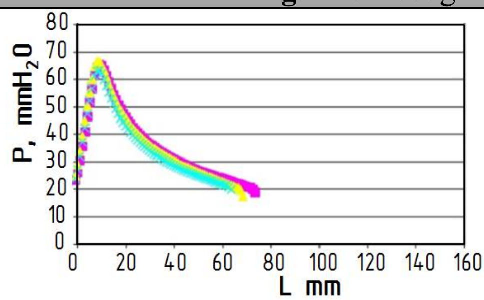
e. The alveogram F. 650 (lot 5)



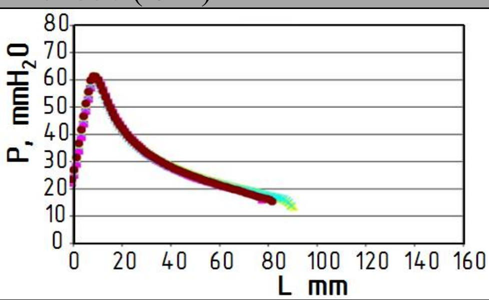
f. The alveogram F. 1350 (lot 1)



g. The alveogram F. 1350 (lot 2)



h. The alveogram F. 1500 (lot 1)



i. The alveogram F. 1500 (lot 2)

Fig. 2. Variation of rheological indicators

Sensory analysis

The sensory quality of the bread is shown in Table 3 and in figures 3,4,5, you can see the outer appearance, in the section, but also the porosity of the core.

Figura 3. White flour bread 650 with added Belpan MOPA

Fig. 4. White flour bread 1350 and 1500 with the addition of Belpan MOPA

Fig. 5. White flour bread 650 with no enzyme preparation added

Determination of core porosity

Porosity of bread (Figure 6) is an important physico-chemical parameter in the sensory analysis of a bakery product which provides information not only on the total volume of pores in the analyzed core but also on the degree of its assimilation by analyzing the structure and thickness of the pores, their uniformity.

The results obtained from the determination of porosity are listed.

Both porosity and elasticity are expressed as a percentage, the higher their value, the better the quality of the bakery products is considered and the more appreciated by consumers. Adding the percentage of enzymatic preparation to the dough resulted in an increase in the porosity of the bread represented in Figure 6.

Table. 3.

Sensory analysis of bread

Product quality indices	Characterization of finished products No addition	Characterization of finished products with the addition of Belpan MOPA
1. Form and volume	long shape, characteristic of loaf but flattened, with low volume	long shape, characteristic of loaf, symmetrical, well developed, unflattened or bulging
2. Color and appearance of the crust	the crust is beautifully browned, characteristic color of the assortment, the surface of the shell is smooth, glossy, without cracks or malfunctions, the shell is crispy;cracks;	products with uniform unshelled shell, characteristic color, smooth peel surface, no cracks;
3. **The degree of ripening, the condition and appearance of the core**	well-baked products, when striking the shell produces a specific, clear sound, characteristic of well-baked products, the core is elastic, when pressing with the finger returns to the original shape and when cutting with the knife the core does not stick to the blade;	well-baked products, when striking the shell produces a specific, clear sound, characteristic of well-baked products, the core is elastic, when pressing with the finger returns to the original shape and when cutting with the knife the core does not stick to the blade;
4. **Core porosity and structure pori**	the pore structure is fine, uniform, with a maximum of 3 gaps in the section;	the pore structure is fine, uniform, with a maximum of 2 gaps in the section;
5. **Flavor**	The product has flavor (smell) pronounced, characteristic of fermented and well-baked bread.	
6. **Taste**	Products with characteristic taste, weak sour-sweet, without foreign taste.	
7. **Foreign bodies**	The products do not have any foreign bodies	

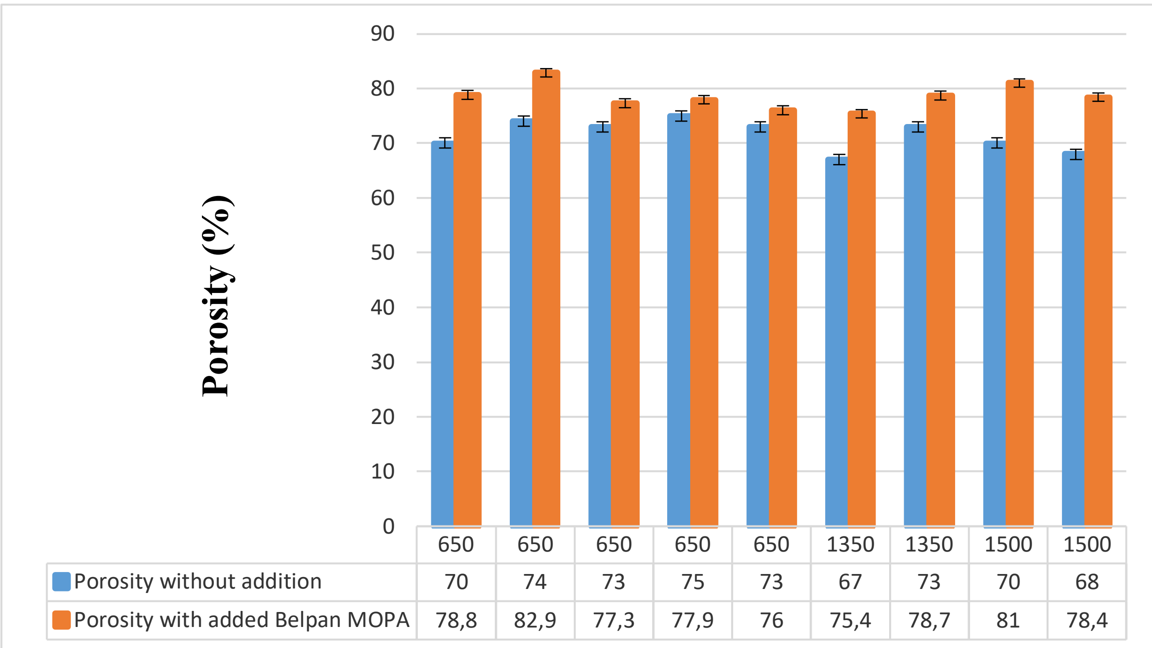


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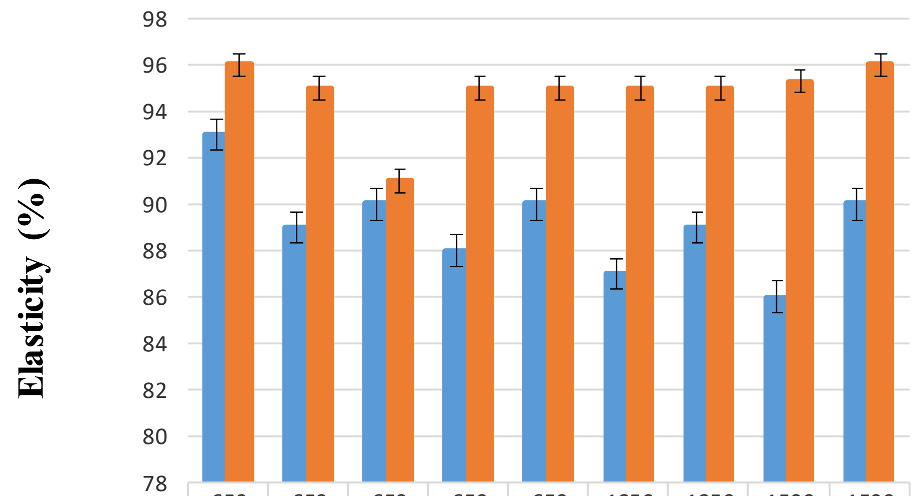
Fig. 6. Variation of porosity

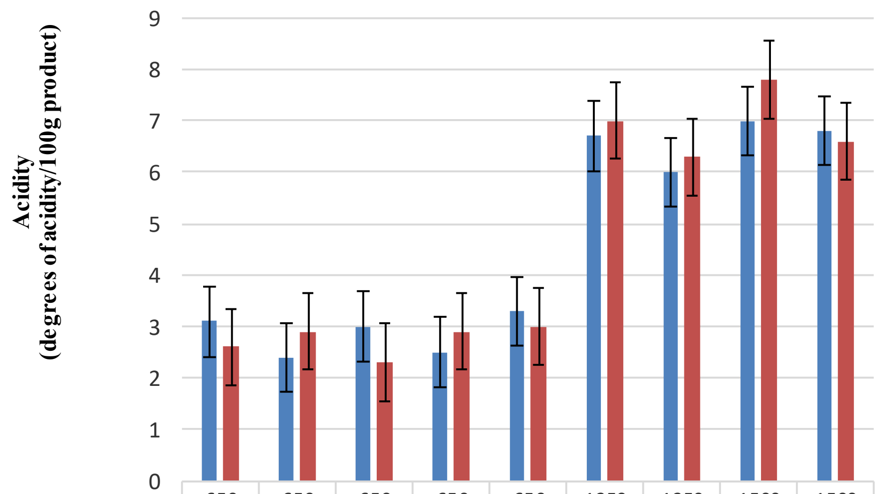
Determination of the elasiticity of the core. The elasticity of the core is based on determining the compressibility and relaxation of the core by pressing under certain conditions and measuring the height it returns to after removing the pressing force. The elasticity of the bread core improves but the differences are not large as shown in Figure.7.



	650	650	650	650	650	1350	1350	1500	1500
Core elasticity without addition	93	89	90	88	90	87	89	86	90
Core elasticity with added Belpan MOPA	96	95	91	95	95	95	95	95,3	96

Fig.7. Variation in core elasticity

Determination of the acidity of the bread.The acidity of the bread by the tritrimetric method has the following values given in fig.8. The variation in acidity is not significant with added enzymatic bread compared with non-added bread. The values are normal and fall within those mentioned in the literature and their variation can be seen in Figure 8**.**



	650	650	650	650	650	1350	1350	1500	1500
Acidity without addition	3,1	2,4	3	2,5	3,3	6,7	6	7	6,8
Acidity with added Belan MOPA	2,6	2,9	2,3	2,9	3	7	6,3	7,8	6,6

Fig.8 Variation of acidity

From the sensory analysis of bread obtained from flour 650; 1350 and 1500 (for which the color of the peel, the appearance of the peel, the porosity of the core, the smell, taste and general acceptability were assessed), it can be concluded that all samples are acceptable for consumption.
The ripening test for the improved bread produced well-developed products which do not present irregularity in the exterior appearance, pores well defined, but in the case of those without a breeder, a flattening of the bread volume was observed, but the appearance of the peel and the core were appropriate as seen in **Fig. 9.**

Fig.9. Bread without breeder (flattened)

At the porosity and elasticity level, no large differences were observed as a result of the graphical representation of the values obtained from analyzes carried out. The porosity of the samples can be seen in **Figure 10(a-c).**

a. The porosity of the improved white cloth	**b.7.** Porosity of white bread without breeder	**c.** The porosity of the improved black stalk

Fig. 10 (a-c). The structure of the bread with added/no breeder adios

4. **Conclusion**

Bread traditionally obtained without the addition of improvers at the industrial level imposes difficulty because it has a sticky dough that is difficult to handle on the lines, It imposes a certain time of leavening that differs from one batch of flour to another.at industrial novel no one assumes the creation of a new way of working according to the quality of flour that is different when supplying a new batch of flour.

It is therefore necessary to add improvers to regulate the quality of the flour in order not to impose difficulties in processing, but the addition of these improvers can also cause disadvantages when it is not dosed correctly.

In order to avoid this, it is necessary to carry out analyzes for the respective batch of flour with different quantity of breeder to choose the appropriate dosage according to the quality of the flour concerned. In the case of small businesses, the working times for each bread processing operation can be changed according to the parameters that flour has if it is intended to obtain traditional products that are currently in high demand.

From the analyzes carried out with the help of the Alveographer, it is noted that the most important parameter is the so-called force index W which must have values between 170÷250 in order to obtain a quality bread, values higher than 250 are addressed to products with long leavings, pastry.

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