STUDY ON QUALITY PARAMETERS AND ENZYMATIC ACTIVITY OF GRAIN MILL PRODUCTS REGION IN TRANSYLVANIA

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This paper aims at determining the main quality parameters of grain mill products in the Transylvania region, also studying and emphasizing the enzymatic activity of flour. Determination of quality characteristics of grain mill products entails establishing physical, chemical and sensory parameters and assessing them against the limits imposed by law.
Analysis was performed on samples formed by mixing basic medium extracted from different batches. Incremental size, sampling tools, how to extract them, the training sample and laboratory environments, packaging and labeling of samples were performed according to STAS 1068 69.
Determination of the fall (Falling Number), an empirical test that relies on the ability of endogenous α-amylase to reduce viscosity of the treated warm flour suspension is used, large scale milling and bakery industry to predict and assess the Baking quality of flour. In sprouted wheat, characterised by a low Falling number, dextrin produced by the action of α-amylase leads to a sticky bread core. Experiments suggest that the values fall turnover (FN) does not shrink in direct proportion to the percentage of germinating seeds. Amylolytic activity depends on the stage of sprouting of grains. Lack of α-amylase activity can be corrected by adding malt grain α-amylase or fungal α-amylase.

Keywords: quality control, parameters, grain mill products, α-amylase activity, Transilvania, food quality

JEL Cods: L15, O13, Q5, Q53

1. General aspects

Enzymes are used for a long time to convert complex carbohydrates in the fermentation processes. Except for sugar processing and use of glucose isomerase cyclodextrin glycodextriltransferase, enzymes are used for hydrolysing carbohydrates, with reducing the size of macromolecules as the main transformation suffered.
Enzymes carry all biochemical transformations. Amylase is an enzyme that hydolyzes amylose, breaking down a specific glycosidic linkage in starch to yield its degradation products in the form of oligosaccharides. Amylase participates in numerous biological processes such as maturation and germination of cereals or in the digestion of starchy substrates by animals and

microorganisms. They are, on the other hand, of significant importance in industry, where their ability to depolymerised starch is paramount in the preparation of glucose syrup or bread. The objective is to transform bakery flour, plus possibly other ingredients (yeast, salt, malt, milk fat) in food preparation and easily preserved by operation of alcoholic fermentation and baking. Alcoholic fermentation is a clear step to understand the role of amylase.

Amylolyze is the process of hydrolysis of starch under the action of α and β amylase. The process is particularly important in dough of flour because its sugars are insufficient to maintain throughout the fermentation in the technological bakery process. Bread obtained only from the fermentation of carbohydrates originating in the flour has a low volume, is dense and undeveloped. Maltose derived from starch hydrolysis is the main sugar that is fermented and thus provides the necessary amount of gas in the final part of the technological process. For this reason, the starch is considered as the main source of carbohydrates in the dough leavening process. In a normal bakery is 6 ... 12% hydrolysed starch in dough. Amylases allow the production of glucose and maltose, which are then fermented; a poor fermentation, resulting in an increase of less than bread. Low percentage of carbohydrates in the flour initial content (0.5 to 2%) involved a hydrolysis of starch in the proportion of 1-2%. The action of amylases in the dough is influenced by environmental conditions: the degree of hydration of the dough, temperature and state of degradation of starch granules. Baking dough cause a gradual increase in internal temperature, with dual action on enzymatic activity and physical state of starch. However, the surface temperature will be about 250 °C. During temperature increase, there is a short period or longer (depending on how baking is done) in which enzymes can act. Amylase is activated by adding water to the dough during the manufacturing.

Dough fermentation and, especially, the production of carbon dioxide are related to the presence of fermentable carbohydrates. The α-amylase activity has a significant effect on excessive water absorption capacity of the dough and the core training. An excessive activity causes an overproduction of dextrin, which leads to a colourless core with large pores, and a colourful crust. The ratio of α and β amylase activity influence the quality of bread. If there is an excess of α-amylase against β-amylase, not all dextrin will be hydrolysed and this leads to the formation of a sticky dough.

2. Experimental part

The determination principle consists in jellifying of flour suspension in a test-tube located in a boiling water bath and measurement of gel liquefaction degree under the influence of amylase. The falling time of grain and its products is the activity criterion of α-amylase enzyme which occurs in small quantities in grain when they are correctly grown and gathered in dry conditions. In conditions of increased cereal moisture, above 15%, especially when crops are gathered in unfavourable weather conditions, activation of α-amylase occurs, which results in starch damage. Dough made of such flour has disadvantageous physio-chemical properties which negatively influence the quality of bread. Therefore, the determination of the damage degree of grain and their products allows classifying and using cereals differently, for example:

- as feed
- in mixtures of damaged cereal and grain not affected by α-amylase
- development of individual technological processes with addition of “improvers” to avoid unexpected losses

2.1. Working mode

Falling-number Hagberg Method (Hagberg, 1961) is a method based on autolytic degradation of starch in starch milk by α-amylase. An increased α-amylase activity resulting in a low viscosity, which is defined as the time in which a metal rod falls through the starch gel. The method is used, broadly, to measure the trade of grain sprouting. Also, endogenous enzymes are known for their adverse effects when sprouting before harvest.

Pre-harvest sprouting of grain shows the effects of enzymes during germination and also influences the milling industry, bread and beer.

Index fall (Hagberg index) provides information on amylase activity (in α-amylase) and on the process of fermentation that occurs in wheat flour dough. Fall index values are inversely proportional to amylase activity.

Table 1. Index values fall and their influence on flour

Drop index **(in seconds)**	Comments
60 – 150	Increased amylase activity. This flour is made from sprouted grain bread and its use leads to the core that remains tacky and immature. It is almost useless, unless it is mixed, as appropriate, with other flours with high drop index.
150 – 220	Amylase activity superior to that which is normal. This requires a correction by mixing flour with the flour with the index falling sea or by using special methods of making bread
220 – 280	Normal amylase activity.
> 280 – 300	Low amylase activity. Using these results in bread flour that is not developed, small and middle volume too dry. Requires addition of diastases malt.

Drop method is used for the samples which contain starch as a substrate. It is based on rapid jellifying of flour suspension in a boiling water bath and measuring the gel liquefies under the action of α-amylase.

Equipments:

1. Falling Number Mill 3100 or 120 with a grid ϕ=0.8mm;
2. Falling Number device.

Method:

Crush 300 g of wheat to a mill Falling Number. The water bath device is inserted to mark water and bring to boiling temperature is maintained throughout the determination. Weigh 7 ± 0,05 g flour, are inserted into the tube viscometer were previously added 25 cm3 of distilled water at 200C with a rubber stopper and shake 20-30 times, until smooth.

With mixer viscometer loose particulate flour that joined the wall of the tube, then insert the tube with mixer viscometer bath water and start the device. Just after 5 seconds after inserting in the bathroom starts shaking suspension in the tube. After 59 seconds stir bring superior position (up or automatically) and after 60 seconds (5-55) falls under its own weight of flour heated gel at a speed that depends on the degree of liquefaction of starch gel.

Time measured from the time the tube viscometer bath water and stirs until it falls on a given distance, expressed in seconds and does the number of falls. Media repeated measurements differ by max ± 5%. The α-amylase activity Is relationship between the number of drop C inversely and expressed by calculating the „number of softening"
With the number of softening we may calculation the flour mixture with a certain number of falls, from lots of different qualities, so that the processing technology resulting in better quality products.

3. Results and discussion
Samples analyzed were purchased from different locations in the region of Transylvania. For each sample were made ten determinations of the index falls. The average value of determination is placed in the table below.

Table 2. Amylase activity

Sample	Determination value Ic (sec)	Normal value Ic (sec)	Observations
1- Gambas (Alba county)	250	220 – 280	Normal amylase activity.
2- Gambas (Alba county)	220	220 – 280	Normal amylase activity
3- Gambas (Alba county)	217	220 – 280	Normal amylase activity.
4- Aiud (Alba county)	243	220 – 280	Normal amylase activity.
5- Ghirbom (Alba county)	276	220 – 280	Normal amylase activity
6- Blaj (Alba county)	336	220 – 280	Low amylase activity. Using this flour has resulted in bread that is not developed, with low volume and very dry pulp.. Require the addition of diastatic malt.
7- Craciunel (Alba county)	225	220 – 280	Normal amylase activity.
8- Valea Lunga (Alba county)	375	220 – 280	Low amylase activity. Using this flour has resulted in bread that is not developed, with low volume and very dry pulp.. Require the addition of diastatic malt.
9- Blaj (Alba county)	319	220 – 280	Low amylase activity. Using this flour has resulted in bread that is not developed, with low volume and very dry pulp.. Require the addition of diastatic malt.
10- Valea Lunga (Alba county)	322	220 – 280	Low amylase activity. Using this flour has resulted in bread that is not developed, with

Sample	Determination value Ic (sec)	Normal value Ic (sec)	Observations
			low volume and very dry pulp.. Require the addition of diastatic malt.
11-Lancram(Alba county)	264	220 – 280	Normal amylase activity.
12- Lancram(Alba county)	282	220 – 280	Normal amylase activity.
13-Lancram(Alba county)	252	220 – 280	Normal amylase activity.
14- Galda de Jos(Alba county)	270	220 – 280	Normal amylase activity.
15-Galda de Jos(Alba county)	212	150 – 220	Medium activity of alphaamylase
16- Ighiu(Alba county)	193	150 – 220	Medium activity of alphaamylase
17- Ighiu(Alba county)	195	150 – 220	Medium activity of alphaamylase

4. Conclusions

Determination of the fall (Falling Number), an empirical test that relies on the ability of endogenous α-amylase to reduce viscosity of the suspension treated warm flour is used, large scale milling and bakery industry to predict, assess the Baking quality of flour. Falling number – index drop is inversely proportional to α-amylase activity of flour and acceptable field depends on cereal product. In the wheat sprouted, with a low Falling number, dextrin formed by α-amylase action leads to a bread with sticky core. It was found from experiments that the values fall turnover (FN) do not shrink in direct proportion to the percentage of seeds germinate. Amylolitic activity depends on the stage of sprouting of grain. Lack α-amylase activity can be corrected by adding malt grain or fungal α-amylase.

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