Importance of Starch Damage in Wheat and Milling Industry

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Wheat, which is the most consumed nutrient among cereal products, has maintained its indispensable place and importance in human nutrition as a strategic product throughout the ages. Grain products, one of the indispensable basic needs of people living in both developed and developing countries, meet a large part of the daily energy requirements of the human body. In addition, wheat and flour production activities have once again revealed the economic value of the flour industry and the need of countries in terms of food security, shown with the food crisis that started in 2007 and the global economic crisis that started and continued in 2008.

At the beginning of the chemical and physicochemical properties sought in wheat and flour or semolina produced from wheat, the agricultural products that were the subject of the most international trade in history; amounts of water, ash, protein, gluten, gluten index, Zeleny sedimentation, starch and starch damage.

The amount of starch, which is the main component in wheat flour at the highest rate, has a very important effect on bakery

products. Starch interacts with the other components and forms the dough structure. Water absorption, one of the most important functional parameters of starch, affects the quality and texture of bakery products. While intact starch granules have the ability to absorb approximately 0.33 times their weight in water, damaged starch granules can absorb water as much as their own weight.

How does starch damage happen?

Starch grains are found in a regular and organise structure between the protein networks in the endosperm. However, they completely or partially lose their structure during the milling of wheat. The resulting flour contains damaged starch and undamaged starch granules in varying proportions. The ratio and texture will vary depending on the grinding system and the adjustment of the rollers-,

The amount of starch damage has become an important quality parameter of interest to all sectors based on grain production, especially in recent years. After the inevitable effect of starch damage on the final product was revealed, it has become a routine analysis in many bread production industries and grain quality control laboratories.

In order to obtain dough of suitable consistency, the absorption of flours containing excessively damaged starch should be reduced. Excess starch damage reduces the bread volume, affects the quality of the bread by spoiling the crumb properties. For a good bread making, the flour to be used must contain a certain level of damaged starch. When there is not enough gluten to cover the large amount of surface area that occurs, an excessive increase in this ratio reduces its ability to hold gas and adversely affects the fermentation process.

Effects of starch damage

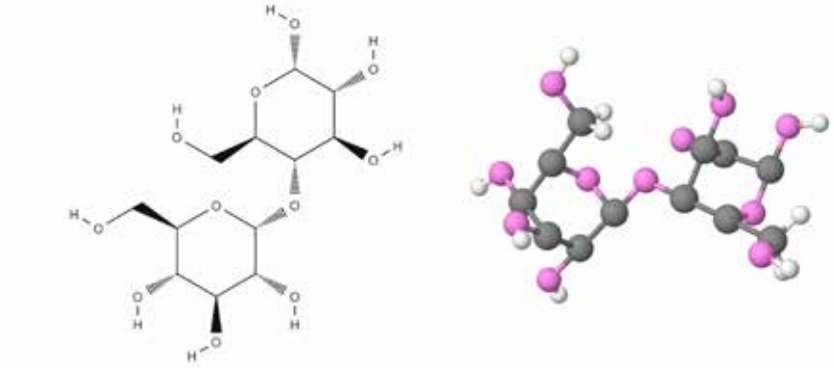
The amount of damaged starch has an important place in the quality parameters for the pasta industry. During pasta making, damaged starch forms a substrate for amylase. They increase

Result of Damaged Starch Analysis Solution

the amount of substance that passes into the cooking water by breaking down and cause turbidity. Semolina, which is a grinding product with low starch damage, is preferred in the pasta industry.

For the biscuit industry, soft grain structure, lower protein and higher starch ratio form the appropriate quality feature. The amount of starch damage affects the cracking rate of biscuits. The amount of damaged starch is directly related to the enzyme activity. Alpha and beta amylase enzymes in wheat can only break down damaged starch. Considering that different products are obtained by using different properties of wheat fractions in different ways, it is essential to determine the optimum damaged starch property in order to produce the product under optimum conditions.

Considering the high quality parameters of flour yield and grinding quality for the millers who first process the wheat; the distance adjustment of the rollers used in flour production should be made. The amount of damaged starch, which will constantly change due to factors such as various blending ratios in the raw material, tempering amount, tempering time, aging of the rollers, heating of the rollers, roller rotations, sample flow amount, must be kept under control by constantly testing during production.



Bastak's starch damage analysis

Instead of long and difficult analysis to determine the damaged starch value, Bastak 15000 SDCheq analyses the amount of iodine absorbed by the starch granules with a very small amount (1 g) of sample using the electrochemical amperometric method. Dough fermentation conditions, the amount of water removal of the dough, the rheological properties of the dough, the baking performance of the dough, the aroma formation of the final products, the production of standard flour, the breaking rate of biscuits, the prevention of aging of the rollers can be determined.

Bastak 15000 SDCheq performs the analysis in five steps. In the first stage, the analysis solution is automatically brought to the world standard temperature of 35°C. In the second step, the iodine content of the analysis solution is measured and the solution color starts to change from transparent to yellow. In the third step, the analysis sample is poured automatically. In the fourth stage, the amount of iodine absorbed by the starch granules is measured and the solution turns black. In the final stage, the damaged starch value is seen in current %AI and other special units (UCD, UCDc and Farrand) on the high resolution touch screen. The SDCheq device, which has the ability to automatically calibrate and clean itself before each test, complies with AACC 76-33, ICC No.172, AFNOR V03-731 standards.