World Bulletin of Management and Law (WBML)
Available Online at: https://www.scholarexpress.net
Volume-20, March-2023
ISSN: 2749-3601

RESEARCH ON THE USE OF ENZYMES IN FLOUR MILLING

Baymatova Nazokat Rukhiddinova
Tashkent Institute of Chemical Technology

Article history:

Received:	January 11th 2023
Accepted:	February 11th 2023
Published:	March 20th 2023

Abstract:

The objectives of this study were to inactivate the enzymes ɑ-amylase, lipase, protease and peroxidase in flour with supercritical carbon dioxide, as well as to optimize the conditions of enzymatic processing. Inactivation of enzymes is important due to the undesirability of some flour enzymes that cause adverse reactions during storage in the form of unpleasant rancidity of flour, and, at the same time, shortening the shelf life of flour. This article provides basic information about the study of the use of enzymes in flour production.

Keywords: enzymes, enzymatic activity, proteins, supercritical fluids, wheat flour

The use of enzymes began much earlier than their ability to catalyze reactions was recognized and their chemical nature was known. The first fully enzymatic industrial process was developed in 1960. Starch processing, which is carried out in two stages, includes dilution of the polysaccharide using bacterial ɑ-amylase, followed by saccharification catalyzed by fungal glucoamylase. Numerous enzymes present in the fractions of bran and wheat kernel germ initiate many chemical changes affecting the composition and functional properties of whole grain flour. In general, wheat flour consists mainly of macronutrients such as starch, water, proteins and non-starch polysaccharides such as lipids and ash, and also contains several technologically important enzymes, mainly amylases, proteases, lipoxygenase, polyphenol oxidase and peroxidase. In addition, there are three most important groups of enzymes in relation to the baking process: enzymes that hydrolyze carbohydrates, such as cellulase, amylase and pentosanase , enzymes that hydrolyze proteins, such as proteases, and enzymes that affect fats and oils. Mainly lipases and lipoxygenases. Although the enzymes are inactive during the storage of grain and flour, they become active when water is added and thus play an essential role in determining the functional properties of flour.

One of the problems faced by the food industry is the stability of whole grain flour during storage. The development of hydrolytic and oxidative rancidity during storage reduces the organoleptic parameters, as well as the compositional and functional properties of flour. For these reasons, maintaining the quality of whole grain flour used in the development of products and recipes is a difficult task for flour milling companies and the food industry. The accumulation of free fatty acids in flour during storage is positively associated with the initial lipase activity of flour. Reduction/inactivation of lipase activity may be one of the methods of reducing the accumulation of free fatty acids. Another class of enzymes, peroxidases, which are oxidoreductase enzymes, use hydrogen peroxide or organic hydroperoxides as oxidants. Peroxidase also plays an important role in bleaching carotenoids during dough kneading and may be the cause of undesirable browning of flour. Previous studies have used various heat treatment methods, including steaming, microwave heating, and passing through infrared and gamma radiation, to reduce enzyme activity. The disadvantage of these methods is the use of high temperatures, which, in addition to high energy consumption, also affect the quality of the food product. Conventional applications of heat treatment cause loss of nutrients and undesirable changes in organoleptic properties. Moreover, an excessively high concentration of protease in wheat flour can lead to the complete destruction of the protein structure of gluten, and a small amount of the enzyme ɑ-amylase is necessary for the breakdown of starch, which then provides an adequate supply of fermentable sugars. This is often provided by the addition of malt or commercial preparations of fungal or bacterial ɑ-amylase. However, if there is an excess of the enzyme, starch is broken down into dextrins and simple sugars, resulting in a sticky, difficult-to-process dough, from which bread with a moist, sticky crumb is obtained.

The development of the bread process was an important event in the history of mankind. After the 19th century, with the mechanization of agriculture, the quality of bread increased, and its price decreased; thanks to this, white bread became a commodity available to almost everyone. An important aspect that contributed to the development of the bakery market was the introduction of industrial enzymes into the baking process, where baking enzymes represent an important segment of the industry. Baking involves the use of enzymes from three sources: endogenous enzymes in flour, enzymes associated with the metabolic activity of dominant microorganisms, and exogenous enzymes added to the dough. The addition of enzyme improvers to flour and dough is a common

World Bulletin of Management and Law (WBML)
Available Online at: https://www.scholarexpress.net
Volume-20, March-2023
ISSN: 2749-3601

practice for standardization of flour, as well as baking aids. Enzymes are usually added to change the rheology of the dough, gas retention and the softness of the crumb in the production of bread, to change the rheology of the dough in the production of confectionery and cookies, to change the softness of the product when baking cakes and to reduce the formation of acrylamide in bakery products. Enzymes can be added individually or as complex mixtures that can act synergistically in the production of bakery products, and their levels are usually very low.

It is common practice to use mixtures of enzymes, some of which are commercially available. Enzymes can act individually or show a synergistic effect. The trend is to select and control the use of complex mixtures of enzymes that can act synergistically and may have a better effect (than individually used) on various components of flour. Recent advances in understanding dough forming and general baking processes at the molecular level have drawn attention to improvements that can be achieved by using more specially selected enzymes individually or in combination. Usually, to get answers to more complex questions, an integrated experimental plan and optimization are needed, followed by chemical analysis, rheological experiments and baking tests. The use of a combination of enzyme preparations of amylase, xylanase and lipase has been reported by various authors. It is claimed that this specific mixture increases the volume of bread and its shelf life. The use of α-amylase and glucose oxidase instead of bromate led to a significant improvement in the extensibility of the dough and the volume of bread. The addition of commercial enzyme mixtures with the activity of α-amylase and lipase to obtain bread samples by the yeast-free dough method positively affected the preservation of bread and led to the formation of a more thermally stable amylose-lipid complex compared to the control bread. The use of a combination of enzymes suppressed retrogradation of amylopectin, and this effect was closely associated with a decrease in the rate of crumb strengthening.

The combined use of various enzymes classified as gluten-cleaving (e.g. proteases) or adjuvants such as amylases and xylanases with a group of crosslinking-stimulating enzymes such as transglutaminases and glucose oxidase has also been studied. Bread of the best shape could be obtained after the use of gluten-splitting or auxiliary enzymes, and the combination with transglutaminase led to an improvement in texture and rheological properties. Crumb density, which can further lead to staling, may be the result of transglutaminase action, but it can be eliminated by the opposite effects of amylase, xylanase and protease.

REFERENCES:

1. Ильянес А. Введение. В; Илланес А. (ред.) Ферментативный биокатализ. Принципы и приложения. Спрингер; 2008. с. 19-56
2. ван Оорт, М. Ферменты в пищевых технологиях – введение. В: Уайтхерст Р.Дж., ван Оорт М. (ред.) Ферменты в пищевых технологиях, второе изд. Чичестер: Уайли-Блэквелл; 2010. с. 1-17
3. Фальч Э.А. Промышленные ферменты – разработки в области производства и применения. Достижения биотехнологии 1991;9(4) 643-658
4. Поулсен П.Б., Бухольц К. История энзимологии с упором на производство продуктов питания. Пришли: Уитакер Дж.Р., Ворاген А.Дж., Вонг Д.В.С. (ред.) Справочник по пищевой энзимологии. Нью-Йорк: Марсель Деккер; 2003. Глава 2.
5. Петерсен СБ. Белковая инженерия: проектирование и разработка в наномасштабе. В: Straathof AJJ, Adlercreutz P. (eds.) Applied Biocatalysis, второе изд. Амстердам: Академические публикации Харвуда; 2005. с. 263-310.
6. Батлер Д.П., Ван дер Маарел М.Э.К., Стинекен П.А.М. Ферменты, действующие на крахмал. В: Элиассон А-К. (ред.) Крахмал в продуктах питания. Структура, функции и приложения. Кембридж: Издательство Вудхед; 2004. Глава 4.