

## CHANGES IN THE PROTEIN-PROTEASE COMPLEX OF GERMINATED GRAINS OF LEGUMINOUS CROPS

**Nurzhan Muslimov<sup>1\*</sup>, Askhat Dalabaev<sup>1</sup>, Aigul Timurbekova<sup>2</sup>,  
Abilkhan Sadibaev<sup>3</sup>, Almaz Moldakarimov<sup>4</sup>, Yerman Spandiyarov<sup>3</sup>**

<sup>1</sup>**Astana branch of the LLP "Kazakh Research Institute of Processing and Food Industry",  
Akzhol 26, 010000 Nur-Sultan, Republic of Kazakhstan**

<sup>2</sup>**Faculty of Technology and Bioresources, Kazakh National Agrarian Research University,  
Abay Avenue 8 050010, Almaty, Republic of Kazakhstan**

<sup>3</sup>**Faculty of Technology, Taraz Regional University named after M. Kh. Dulaty,  
Tole bi street 60, 080000 Taraz, Republic of Kazakhstan**

<sup>4</sup>**Faculty of Food Technologies, JSC "Almaty Technological University",  
Tole bi street 100, 050012, Almaty, Republic of Kazakhstan**

\*e-mail: [n.muslimov@inbox.ru](mailto:n.muslimov@inbox.ru)

### Abstract

The possibility of using sprouted grains of legumes and their hidden raw material potential for the production of functional drinks was studied. As known, legumes have a rich protein composition, which, when germinated as a result of fermentation of the protein complex by a protease, is split into polypeptides and amino acids, and is further hydrolyzed to ammonia, carbon dioxide and water, which significantly reduces the quality characteristics of the finished product. In this regard, we studied the dynamics of the enzymatic process that occurs in the grain mass during the germination of legumes. The aim of the research was to study the enzymatic activity (protease) depending on the timing of germination and the consequences of changing the amino acid composition of the grain of legumes of domestic breeding varieties (soybeans, peas and chickpeas).

The object of the study is legumes: soybean varieties "Ivushka"; peas of the "Aksary" variety; chickpea varieties "Satti". Determination of protease activity in the grain of legumes during germination was carried out using casein as a substrate. Spectrophotometric readings were determined at a wavelength of 660 nm on a ShimadzuUV-1900 i spectrophotometer (Japan).

Regarding the dependence of the activity of protease A (mE/g) on the duration of germination t (days) of legume grains, the results showed that an increase in the germination time of grains of legumes as a result of active hydrolysis of peptide bonds in the protein leads to an acceleration of the fermentation process - protease activity, forming peptones, polypeptides and free amino acids. When talking about the structure of the amino acid composition of legumes in terms of essential and nonessential amino acids, the results of studies of pea varieties "Aksary" showed that a proportional increase in the time of germination of pea grain from 2 days to 8 days changes the structure of the amino acid composition, which leads to a wave-like change in the mass fraction and concentration of essential and non-essential amino acids. The results of studies of soybean variety "Ivushka" showed that in the first days of germination, the total mass fraction of the amino acid composition decreases to the minimum values on the fourth day of germination, however, on the fifth day of germination, an explosive increase in the concentration of amino acids is observed, reaching maximum values on the sixth day. After that, there is an active decrease in the concentration and mass fraction of nonessential and indispensable amino acids. The results of studies of chickpea varieties "Satti" depending on the timing of its germination showed that the original chickpea grain contains more amino acids than the content of amino acids during germination. With a high mass fraction and concentration of non-essential and essential amino acids in the feedstock, a sharp decrease in values is observed on the second day of germination. A further increase in the time of germination of chickpea grain up to four days led to a slight increase in the values of the mass fraction and concentration of nonessential and essential amino acids.

The process of fermentation of the protein complex of leguminous crops by protease during germination has been studied. As a result, it was found that protease enzymes significantly change the qualitative characteristics of the protein complex, reducing the values of the mass fraction and concentration of the amino acid composition. The enzymatic activity (protease) was studied depending on the timing of germination and the consequences of changes in the amino acid composition of the grain of legumes of domestic breeding varieties (soybeans, peas and chickpeas).

**Key words:** *Functional drinks, Protein-protease complex, Germinated grain, Protease, Germination time, Amino acid composition, Concentration.*