1. Prospects for the use of plant analogue of myoglobin in plant-based meat products

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Introduction. In order to ensure mass transition of the population to the consumption of plant analogues of meat products, their organoleptic properties need to be improved. Therefore, it is important to search for substances which can reproduce the organoleptic characteristics of the meat product[1], especially indicators of appearance and taste.

Materials and methods. Plants contain symbiotic and non-symbiotic hemoglobin proteins, which are partially similar to hemoglobin of animal origin. Symbiotic plant hemoglobins, which are also known as leg-hemoglobins, are in the root tubers of legumes. For use in analogue products (for example g beef forcemeat), a gene encoding soybean leg-hemoglobin was synthesized using the *Pichia pastoris* yeast gene. This combination allowed to obtain high percentage of the final preparation (substance) LegH Prep, which contains 65% of soy leg-hemoglobin (rest of the proteins are produced by *Pichia pastoris*) [2, 3].

Results. During the manufacturing of the meat product, myoglobin, the heme protein unfolds with the release of heme cofactor. As a result, the cofactor catalyzes series of reactions which convert amino acids, nucleotides, vitamins and sugars into a highly specific and diverse set of flavoring and aromatic compounds, the combination of which creates the aroma and characteristic taste profile of meat. Soy protein of leghemoglobin (LegH) (Glycine max) is similar by its structural characteristics to myoglobin. In plant-based meat, this ingredient is developed during cooking, releasing the heme cofactor to catalyze reactions which can transform biomolecules (amino acids, nucleotides, vitamins and sugars) into a number of compounds which reproduce the unique taste and aroma of meat.

Although the sequence of amino acids in the primary structure of the leghemoglobin protein differs significantly from their sequence in hemoglobin and myoglobin, the three-dimensional structure of this compound is very similar to them. In addition, the heme cofactor, which is associated with leghemoglobin (heme B), is identical to the heme found in animal meat. Leghemoglobin iron has a bioavailability equivalent to iron from meat hemoglobin when added to the food matrix.

In food industry, leghemoglobin obtained from soybean roots or by microbial fermentation is used by the company “Impossible Foods” to give the desired "meaty" taste to some commercial plant-based meat products.

Conclusions. Microbiological production of flavoring food additives for meat analogues can provide advantages in comparison with chemical synthesis and natural extraction, including low-cost raw materials, controlled cultivation processes and product specificity, as well as higher productivity and reliability.

References

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