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The manuscript is devoted to theoretical and experimental substantiation of the scientific principles of repetitive flavor formation or recovery in food systems. The systematized information on the participation of enzymes and flavor precursors has showed the prospects for developing processes of formation *in vitro* for Green Leaf Volatiles flavors. The scientific and practical approach called the technology of food products flavored *in situ* has been developed on the basis of the results. The use of aromas of lipid emulsions extracted from fresh or pretreated fruits and aqueous suspensions of plant homogenates in the biosynthesis has been studied. The manuscript provides scientific and practical recommendations for cooking flavored foods.

## INTRODUCTION

One of the trend priorities in the flavoring industry is to ensure maximum level of original aroma in food products. This is evidenced by regular updates in the legislation provisions, regulations, and terms relating to flavorings. Relevant studies are oriented on reducing the amount of additive flavorants in food and, along with it, the search for alternative ways of improving the organoleptic profile. Modern scientifically-based production technologies of natural flavorants, the efficient use of raw material potential in restoring the lost flavor, development of new approaches to flavoring process are increasingly important. Flavorant business is profitable, innovative and still being studied. International companies spend on food flavoring research and development about 8% of their total annual sales. A human's reaction on food flavor is currently being studied, particularly, in the products that contain reduced content of salt, sugar and fat; this issue can be found in cross-cultural studies of food preferences, and neuro-gastronomy. Flavor perception is important for improving the appetite and secretion of gastric juice, human's health and preventing chronic diseases like obesity and diabetes. The trend towards healthy organic food development is being supported in the world where the use of non-organic aromatic substances is not acceptable.

One of the trends in reformulating the product with natural flavor is copying out the natural processes in its formation. Enzymatic cleavage of polyunsaturated fatty acids is one of the ways of fresh flavor formulation in many fruits. Lipids and polyunsaturated fatty acids may be the precursors of various aromatic compounds. Major achievements in the study of flavor formulation mechanisms in fruits *in vivo*

comprise the reactions of both  $\alpha$ - $\beta$ -oxidation and lipid enzymes and oxygenase ones.

The biosynthesis of the aroma compounds by lipoxygenase has been shown on tomatoes, cucumbers, olives, bell peppers, apples, citrus fruits, and strawberries. This approach is used in the microbial synthesis of C<sub>6</sub>-C<sub>9</sub> aldehydes, alcohol-flavorings imparting specific "green, fresh" aroma - Green Leaf Volatiles (GLVs), which is made from vegetable oil wastes on an industrial scale. Systematic studies on food flavoring «in vitro» have not been found in publications. The implementation of this approach by using the original set of vegetable raw material enzymes is the task of the present research. Due to high activity and instability of their components aromatic substances react on even the most minor changes in the quality of raw materials and all the mistakes in the process of technological treatment.

Flavoring processes in most food technologies are necessary and system researches in this field are of sufficient demand. The issue of creating scientific bases for obtaining products with a pleasant natural aroma for children, elderly people, and patients with obesity and chronic disorders is still of great importance.

In the production of many food products a wide variety of approved food additives is used. These substances changing the appearance, structure, chemical and physical properties, influencing the flavor and aroma slow down the microbial and oxidative damage. The most important requirement for many food products is the safety for human health. In a society there is an irrational fear of chemicals - "Chemophobia" - the fear of "chemistry". Today, biotechnology allows purposefully enhance the ability of a living organism to produce a particular reaction for getting the product without the use of food additives.

Enhanced demand on natural flavorings and flavored products determines the relevance of research in this area. Natural flavoring components are obtained by physical methods (distillation, concentration in vacuum, supercritical CO<sub>2</sub> extraction, etc.). But the plant raw material potential is insufficiently used in this respect. Instrumental methods enable to extract only a limited amount of easy volatile fractions, the mass fraction of which in fruits is close to its maximum. Aromatic components present in fresh fruits are in low concentrations (1-10 mg%) and they are practically not trapped by modern instrumental methods, that is a specific problem for flavor identification.

Fresh flavor of many fruits and vegetables is partially lost or greatly changed after heat treatment. As for possible reformulation of fresh flavor in products there is a theory based on the enzymatic processes of their formation. According to this theory aroma reformulation depends on the presence of flavoring precursors and enzymes. The intensive study of the influence on enzymes flavor in genetically modified raw materials, the experience of fresh flavor reformulation in foods by enzymatic reactions has not been developed. Awareness of the reaction process mechanism allows managing the process of food products flavoring without the use of flavorants.

The development of flavoring industry in last decade is associated with issues of natural aroma substances, searching for new components from which it could be

possible to extract natural aromas or restore them. To solve the problem of creating an attractive aroma in a food to satisfy nutritional needs requires radical changes in food composition that is characterized with original natural aroma.

The research is aimed at theoretical and experimental substantiation of the flavor reformulating technology based on the enzymatic reactions of raw materials in processed products.

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