

## ANALYSIS OF FOOD ADDITIVES IN THE PRODUCTION OF SAUSAGES

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### Abstract

*Portulaca oleracea L., considered by many a weed, is in fact a plant with multiple food and medicinal values, and with a specific adaptation to stress conditions.*

*Grown in water supply option conditions, the plant has a C4 type metabolism, but in drought conditions, it uses the way of closing the stomata during the day, achieving a CAM type metabolism. The high values of the stomatal conductance recorded in the dark and the high content of malic acid in the leaves especially in the morning, indicate this adaptation. Plants exposed to water stress also showed higher values of suction force and higher percentages of bound water.*

**Key words:** *sausages, food additives, meat, ready-to-eat, convenience food*

### INTRODUCTION

A general definition of food additives [1] states that it is any substance that is not normally consumed by itself as food or used as a characterizing food ingredient, irrespective of its possible nutritional value, which is deliberately added, for technological reasons, to food during its production, processing, preparation, treatment, packaging, transport or storage causes, or can reasonably be expected to, cause the substance or its products to become, directly or indirectly, an ingredient of the food. Hence, it can be assumed that it is supposed to improve the taste and aesthetic qualities or extend the shelf life of the product and give the product the features expected by the consumer.

An ADI (Acceptable Daily Intake). It is a certain indicator aimed at securing and protecting consumers. ADI, i.e. the acceptable daily intake of additional substances, the consumption of which during the day while complying with the standards, is not harmful to health, even when consuming the substance every day throughout life. The ADI is based on 1 kg of body weight per day.

Unfortunately, many manufacturers add a lot of improvers of various types and in large quantities. At the same time, it should be remembered that the ADI must be met in one product, while if during the day we eat 3 or 4 products that contain the same food additive, we will undoubtedly exceed the ADI.

A prime example would be E250 (sodium nitrite) which is a preservative, ADI for nitrate ions is 0.07 mg/kg BW / day (0.1 mg NaNO<sub>2</sub> / kg bw / day) [2]. Nitrite can accumulate in the body, which poses a high health risk. The following information can be found in the literature on the subject:

"Nitrite reacts with the secondary and tertiary amines in the meat to form nitrosamines. Nitrosamines are carcinogenic, (...). It is estimated that at a dose of 5 µg / g they induce tumor development in experimental animals." [3] The work aims to present the general characteristics of the composition of sausages, used in products available in retail chains in Poland.

## **MATERIALS AND METHODS**

### **Overview of the composition of the product**

The use of food additives is not necessary for the production of sausages, but it facilitates production and reduces the costs incurred by the product therefore it is allowed. The basic ingredients of sausages should be meat, spices, fat, and water. However, to reduce production costs, increase production efficiency and intensify the taste, manufacturers use flavor enhancers (such as monosodium glutamate, and yeast extract), and preservatives such as nitrite. To increase efficiency and reduce production costs, manufacturers add hydrocolloids, i.e. thickeners and gelling agents, such as starch, vegetable proteins, and others. Thickening agents are also added to prevent water syneresis, it is most often starch. Producers also reach for antioxidants, dyes, and aromas, which are not needed in a "real", non-adulterated product. For this work, a "real" product should be understood as sausages,

A sausage is a homogenized sausage, classified as a type of food ready-to-eat. It belongs to the group of products that are convenient and quick to prepare. Particularly liked by parents and people who live in a constant rush, because it does not require special attention in preparation. In addition, it is a product suitable for consumption both hot and cold. In the cold version, it is undoubtedly a quick snack. However, the consumption of hot dogs requires their preparation, starting from heating in water or a pan, and ending with hot dogs or sausages baked in puff pastry.

### **Starch**

Starch is a natural polysaccharide that, thanks to its various properties, plays

various roles in food production. In most cases, it is a cheap filler and leak absorber, or possibly to prevent water syneresis. However, it is also responsible for the sensory properties of the products to which it is added (depending on the type or modification of starch, it can improve other qualities of the product). However, it is a safe substance that poses no threat to the consumer, except for his wallet. Because when buying these very sausages, the consumer gets a large part of the starch[4].

### **Phosphates**

Diphosphates (E450), Triphosphates (E451), and Polyphosphates (E452) - all phosphate preparations enable the reduction of storage leakage in meat products. This is extremely important from the producer's point of view, because such meat, sausage, is prettier and, consequently, the eyesight does not suggest to the consumer that there may be something wrong with the product, that it may be of poor quality. The addition of phosphates allows not only to add more water to the product, but even to reduce the humidity of the surface of the products, thanks to which the products do not shine too much despite the long storage time, and this also makes them seem better than they are. [5].

### **Flavor enhancers**

Monosodium glutamate (E621) - an additive that improves the palatability of some dishes. What is extremely important, there are currently no unambiguous studies that would confirm that monosodium glutamate can hurt the body. Headaches, excessive sweating, hot flashes, and heartburn in people who consume large amounts of monosodium glutamate are often mentioned. However, many of these people combined foods

containing monosodium glutamate with hot spices or a lot of salt, which can also cause similar side effects. [6].

### **Nitrates and nitrites**

Research conducted in 1975 by L. Bilczuk on the consumption of sodium nitrite for a longer time showed that in the rats on which the studies were carried out, there was [7]:

- inhibition of weight gain,
- increased weight of the spleen,
- lowering the weight of the adrenal glands;
- lowering the level of vitamin A in the liver with the level of vitamin E unchanged;
- decrease in hemoglobin level;
- increase in the amount of methemoglobin.

Consuming too high doses of sodium nitrite can lead to adverse changes in the body. Taking too high doses of different substances does not necessarily mean that the manufacturer adds too much of the substance during production. As already mentioned, this may be the result of consuming several types of products with a specific additive or the excessive consumption of a given product by the consumer [8].

### **Acetates**

Based on the research conducted by A. Malicki on the use of lysozyme and sodium acetate to extend the shelf life of poultry meat, it can be seen that sodium acetate is an effective preservative that protects the product for a long time. Sodium acetate (E262) does not prevent the growth of bacteria, but even reduces the number of coliforms and *Escherichia coli*, and therefore extends the shelf life in terms of microbiology and organoleptics [9].

### **Citrates**

It has been found in the literature that the addition of sodium citrate (E331) does not accelerate the nitrosation of meat dyes, but improves the consistency of the product. On the other hand, the addition of citric acid in the amount of 0.2% increases the degree of dye conversion and lowers the level of residual nitrites, but also slightly worsens the consistency of the meat after heat treatment. Therefore, these substances cannot fully replace sodium ascorbate [10].

### **Sugar and glucose syrup**

These are ingredients that are not necessary for the production of sausages. The very definition of hot dogs contradicts these substances. However, since man is addicted to sweet taste and, in addition, sugar participates in the non-enzymatic browning reaction, they are unfortunately added. It is worth noting that they also increase the nutritional value of the product, making it much caloric than it should be.

### **Hydrocolloids**

Hydrocolloids are compounds that are added to increase the performance of the product as they are designed to absorb water and prevent syneresis. An example is a carrageenan, a polysaccharide that has been isolated from red seaweed. Its functions in food, in addition to the indicated general functions of hydrocolloids, include: providing products with the desired consistency, maintaining the proper structure of products, and preventing emulsion delamination [11].

Based on the research carried out on processed cheese by Sołowska et al. it can be seen that the amount of added carrageenan may have different effects on the final product. This product may be characterized by greater lubricity, and

lower hardness, but the study also showed that the addition of carrageenan reduces the stability of the structure. It is worth mentioning that carrageenans are substances that are completely non-digestible by the human body, but at the same time they do not reduce the level and digestibility of proteins in any way. [12].

Guar gum (E412) is another hydrocolloid used in the production of sausages. In the literature on the subject, it was found that guar gum has a potentially positive effect in the technological

context. However, studies have also been carried out showing that exposure to prolonged or intensive contact with this component by inhalation (e.g. at the workplace) or by the oral route may cause an immunoglobulin E-dependent allergy, and therefore may lead to anaphylactic reactions. [13].

Moreover, it has been proven that an anaphylactic reaction can also occur as a result of exposure to guar gum contained in drugs. An example would be the case of a patient who had a local anesthetic applied to the mucosa and guar gum was used as a gelling agent. This resulted in severe generalized urticaria. [14].

Another hydrocolloid contained in the analyzed product is semolina (from wheat). It is a product that absorbs water extremely easily, which allows you to increase the weight and volume of the product by using water. Undoubtedly, the addition of even a small amount of semolina brings economic benefits to the producer. However, since the sausage is a homogeneous product, it is impossible to feel the structure of the groats while eating.

### **Ribonucleotides**

Disodium 5'-ribonucleotide (E635) is a flavor enhancer obtained by combining other flavor enhancers (disodium guanylate - E627 and disodium inosinate - E631). Disodium 5'-ribonucleotide (E635) has a synergistic effect (increasing the effectiveness of shaping the desired taste) with monosodium glutamate, importantly, it is increasingly used as an alternative to monosodium glutamate. Its addition can be seen in products such as potato chips, ready-made dinner dishes, powdered soups and sauces, and meat products. Currently, there is no conclusive scientific evidence that disodium 5'-ribonucleotide causes side effects after ingestion.

It was found that disodium 5'-ribonucleotide (E635), like its constituent disodium guanylate and disodium inosinate, is not genotoxic, mutagenic, or carcinogenic. Therefore, there is no Acceptable Daily Intake (ADI) limit for it. The only consequence of consuming products containing disodium 5'-ribonucleotide may be an increase in the level of uric acid in the blood. This is because during the digestion process, disodium guanylate and disodium inosinate, which are part of the disodium 5'-ribonucleotide, are broken down in the human body into uric acid, causing their concentration in the blood to increase. However, if your kidneys are functioning properly, there is no need to worry [15].

### **Soy protein**

The purpose of the addition of this substance was most likely to improve the nutritional value of the product. It is undoubtedly a much cheaper source of protein than wholesome meat, but in the table with the nutritional value on the packaging, it is not necessary to specify

what part of the protein was of plant origin and what was the animal origin.

### **Emulsifiers**

Emulsifiers, i.e. mono- and diglycerides of fatty acids esterified with citric acid, are added primarily to impart a silky and thick consistency, making the product more attractive to the consumer. At the same time, the technological process is significantly shortened, which brings additional economic benefits. Emulsifiers do not have to be used in the production of sausages if good quality raw materials are used in the production and the technological process is carried out carefully, however, they are present in most of the products currently available on the market[16].

### **Aromas**

As many as three additional substances were used in the analyzed product, which can be included in this category, namely flavors (whether natural or artificial), smoke flavor, and spice extracts. There is nothing wrong with their addition, of

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course, but salt has also been added. It would be worth considering whether it would be more beneficial to add more spice instead of flavorings as this could positively alter the sensory characteristics of the product.

### **Summary and Conclusions**

The selected food additives described in the above text indicate their different origin, and thus the various uses of food ingredients. They can have a positive effect on the product and the human body as well as a negative one. The additives used may be necessary to add so that the product meets all food safety requirements and can be a product with a longer shelf life. However, many manufacturers add cheaper substitutes for the basic raw material and many additives (not necessary in the traditional production method) to reduce production costs while reducing the nutritional value of the product and its quality

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