

# THE ROLE OF WATER IN FOOD PRODUCTS

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**Abstract:** *Food is an indispensable factor for humans and animals, because it provides the energy and substances necessary for developing the metabolic processes, which generate the body's growth. It is the source and regulator of exchange processes between the body and the environment. Since ancient times man has received the necessary nutrients from the environment but the operation and maintenance of the body physiology constantly needs energy. In this work we focus on the chemical composition of food, and more specifically, on the amount of water contained in food products (humidity), as a factor influencing the stability and quality of food products.*

**Key words:** *food, humidity, quality, water.*

## 1. Introduction

In contemporary times, the great variety of foods available, their complex chemical composition, the risk of disease through food intake have changed the environment in which man operates, have led to a review of conceptions on food, increasing its rational character and preventive health factor. These new conceptions have stressed the responsibility of those who sell food both in terms of the nutritional value of the products sold and especially of their state of innocuity.

Among the multiple factors of aggression and carriers of pollutants, we mention: soil, water, air, product recipes, processing techniques, microorganisms and others.

Any environmental perturbation can influence man's health by means of food products.

Environmental influences over food raw materials - finished product at different times, the relationship food - cause

environmental changes that disrupt the healthiness of the product for human consumption. [6]

Factors influencing food quality may be internal, such as the chemical composition of the product, the atomic structure and degree of integrity, biological properties, physical properties, or external: mechanical stress during handling products, ambient air composition, air temperature, air humidity, light and other radiation, packaging, microorganisms, storage.

## 2. Objectives

In this paper, our objectives are:

- Identifying the role of water in food products;
- Identifying and setting methods for determining the water content in food.

## 3. Water in food products

The human body process chemical substances comprised in food products.

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The types of substances contained in products are very different, just like their proportion. In most cases, a group of chemicals prevails in food, which determines the classification of the food: mainly protein (dairy, eggs, meat, fish and their products processing), mainly lipid (fat food), mainly carbohydrate (cereal and derivatives, grain legumes, vegetables and fruit, sugar and sugar products).

Some foods are composed almost exclusively of a single substance, but generally contain five main groups of chemicals: water, minerals, carbohydrates, lipids and proteins. Also, the food products contain vitamins, pigments, acids, enzymes, tanning substances, essential oils, alkaloids, hormones etc.

Not all foods have a significant nutritional potential, but, in turn, they have taste properties, aromatic and other favorable properties that influence the process of nutrition.

The water used in food production must meet the same conditions and water quality. As agent technology, water does not influence the water content of the product; it is used just for the technological process. For example, pasta is made from grief flour with 14% humidity. [5]

All foreign substances in water, once entered in the food, stay there, even if during the technological process water is removed from the product.

Depending on the way they enter and can be found in food, substances in the food products composition can be grouped as follows:

- Native - found naturally in raw materials, are foreseeable, known, controllable. Can be inorganic (water, minerals, inorganic acids) or organic (carbohydrates, lipids, proteins, organic acids, pigments, enzymes, vitamins etc.).
- Additions - are allowed in certain doses and certain types of food, can be

predicted and controlled. These are the alimentary additives that may be: organoleptizante substances (sweeteners, dyes, thickeners, etc. flavoured). [1]

- Accidental - are random and refer to all foreign substances, more or less toxic, affecting the safety of food. There are mandatory and voluntary international standards that regulate the doses permitted as regards foreign substances in food. Such food may accidentally contain pesticides (insecticides, herbicides, fungicides, etc.)

As a native substance of food, water is the most dynamic element, ranging - depending on the product - within the limits from 0.05 to 95%. Water with minerals, carbohydrates and proteins is a development environment and because of this, micro-foods rich in water alter slightly. Food stability is inversely proportional to the water content and that is way the lesser the latter is, the greater the food stability.

Drinking water is consumed as such, it exists naturally in foods, enters the structure of the food recipes or is used in the technological process. To be consumed, water must meet a set of quality criteria, must present maximum purity. Water from rivers or groundwater must be purified, an operation quite difficult given the very high pollution with wastes from human activities, urban waste etc. existing today. The mandatory standards on the protection of life, health and the environment, contain provisions for drinking water.

#### **4. The role of water in the body**

Among the components of the body, water occupies a primary place because it enters into the composition of all cells and tissues, representing the environment in which the entire chemical and physicochemical phenomenon related to vital functions takes place. All reactions in

the body occur only in the aqueous medium, allowing water to establish links between different substances and between body and environment. It is essential for living organisms whose vital activity decreases greatly if the amount of water is below normal. [1]

Water is the chemical component with the highest content in the body, which can be considered as a dispersion medium for the other substances. In children's body, water content is up to 87% of the body weight and for adults up to 70%. Man continuously loses water through breathing, sweat, urine etc., about 2 to 3 litres per day, in accordance with the climate, season, physical effort etc. If you lose 10% of the water, the formation of urine is disrupted, whereas a loss of over 20% sharply slows down metabolic processes and may trigger even death.

If one eats food but does not drink water, death occurs within 7 days.

Water removed from the body is replaced by consumption of drinking water, various beverages and the water contained by food. Man needs 2-3 litres of water daily to ensure its body's fluid balance.

In the body of plants, animals and humans, water has a multiple and complex role:

- it carries crude saps from the root to leaves and the saps prepared in leaves to different storage tissues. Using the blood plasma, it carries nutrients to cells and tissues.
- it absorbs inorganic and organic substances in soil and plant organisms in the digestive tract for humans and animals. It is an important factor that links body and environment.
- it creates the necessary environment for biochemical reactions in the body by hydrolysis, hydration etc. It provides H<sup>+</sup> ions and OH<sup>-</sup> needed to maintain acid-base balance, enzyme activity etc. It participates directly to the reactions of

synthesis and degradation from the body. It has a high solubility power and determines the formation of molecular and colloidal solutions in the body.

- it favours the ionic dissociation of various substances by a high dielectric constant.
- it has an important role in the thermoregulation processes, in the processes of sweating and elimination of substances by excretion.

The amount of water in the body varies with age, physiological status, geographical region, intensity of metabolism. [3]

Young tissues contain a greater quantity of water than the old ones. The amount of water generally decreases with age and this is due to the increased organic matter content of the cells. Physiologically, active tissues contain a greater quantity of water than the tissue support or protection.

The amount of water in plants depends, to a great extent, on external factors. Long periods of drought in plants bring about fading; whereas in a normal rainfall regime, they remain turgid. The amount of water in plants depends on the ratio existing between the amount of water absorbed and the ooze.

The water content suffers variations during the day and the night, dropping during the day and increasing during the night, reaching the peak in the morning.

### **5. The importance of water content**

Water content is different from one food product to another and has a decisive influence on some of their characteristics. It varies between 0.05% for sugar, 0.1% sunflower oil and up to 88% fresh milk consumption and 85-95% fruits and vegetables.

Allowable water content for different products is determined by standards or is subject to contractual arrangements. The stipulations in the standard are the ones

which set the necessary moisture for industrialized foods (cereals, meat, cheese, sugar and sugar products, dehydrated products etc.).

The control of water quantity and quality determines a series of quality characteristics for foods products, such as: the degree of freshness (meat, eggs, fish, fruits, vegetables etc.), identify counterfeits (milk, wine, spirits, natural juices, meat Minced etc.), manufacture of different types within the same product (cheese, spirits etc.) prevention of degradation or alterations (grain, meal, sugar, tobacco, black tea), identification of optimal packing, storage and storage for different types of products, improving their quality through various methods of decreasing water content. [4]

Products that have high water content are easily perishable, provide favourable conditions for pathogen development and therefore their preservation for a long time requires special low temperatures. This category includes meat and fish, which are easily which are easily attacked by rotting bacteria from the fruits and vegetables which are attacked by enzymes.

A decrease in water content of some products below the normal can cause a drop in value of those products, such as fruits and vegetables.

The water content in meat varies inversely proportional with fat, depending on the state of fattening: - 60-70% veal, pork 50,6-73%, 65,5-70,9% chicken. For the meat processing industry, some technological characteristics are important: the hydration capacity, the water retention capacity, the ratio water / protein, which determine processing and organoleptic properties of products. Blended meat retains water and can therefore be spoofed by addition of water over the amount stipulated in the rules.

As regards fresh fish, the muscle tissue is generally rich in water and poorer in fat

than the warm-blooded animals. Water content is variable (between 58,6-82,1%), and acids in fish are lower.

The amount of water contained by eggs varies with the species of bird, between 70-73%. Chemical composition of the white: 85.4% water, 13% proteins, fat, mineral salts to, and that of the yolk: water 52%, proteins 17%, 30% fat, 1% mineral salts, etc. Eggs progressively lose water content. [5]

The chemical composition of milk differs from other foods both in relation to water / dry matter and in terms of quality, containing proteins, lactose, fat, mineral salts, vitamins, enzyme, antibodies etc.

Water is the medium for dispersing substances in the milk composition. The amount of water varies with animal species, between 81-88%.

The types of cheese are classified as cheese with soft paste (fresh), cheese fermented with soft paste, with paste and cheese with semi hard paste. The soft paste of these types of cheese is due to the high water content, over 55%; the semi hard paste has a lower water content, between 40-50%; those with hard paste, under 45% water.

The honey from our country has among the lowest water content in the world, namely 20%. Honey which has high water content (over 25%) cannot be preserved for long because it alters.

Sugar has some physical and chemical characteristics which determine its quality: a quantity of sucrose between 99,75-99,6%, a maximum of 0.25 reducing substances, water content etc. 0,05-0,1%. A higher content of reducing substances affects the stability during storage due to the fact that a higher water content triggers the agglomeration of sugar crystals and even some hydrolytic processes. Sugar should be kept in clean, dry rooms, at temperatures up to 20<sup>0</sup> C and a relative air humidity of maximum 75%.

Fresh fruits and vegetables have high water content (74-95% 80-90% vegetables and fruits), which induces a state of softness and freshness during their trade circulation stage. They have a chemical composition that gives a specific nutritional value: water, carbohydrates, organic acids, mineral salts, enzyme, vitamins, fats and proteins in small quantities. The high water content allows their preservation by freezing, which ensures the maintenance of nutritional properties for a long time; otherwise they are easily perishable. Also juicy fruits and vegetables are used for extracting natural juice. Fruits and vegetables, whose water content decreases, wrinkle, fade and lose their taste properties. [5]

In brewery, water is still considered a raw material for the finished product due to the high proportion (88-94%) and because its composition influences the sensory attributes of the finished product. There are types of beer obtained by using soft water (Pilsner) and others with hard water and high content of chlorides (Dortmund) or calcium sulfate (bitter). Other producers use water with high calcium carbonate content and low sulfur (Beer type Munich and Dublin).

Modern water treatment techniques currently applied to amend the salts, acidity and composition will produce water with the desired composition, regardless of the features of the rough water. [2]

By determining the water content, one can recognize counterfeit wine, which has water added. Additions of more than 10% water can influence acidity and decrease the wine alcohol. Wine becomes watery, without consistency and does not produce a pleasant sensation, heats in the back of the mouth and stomach after being swallowed. If less than 10% water is added, the forgery cannot be detected by tasting. These additions are prohibited by law and punishable as such.

Alcoholic drinks have low water content. The drink is a concentrated solution of concentrated ethyl alcohol in water, up to 96.6%. Natural spirits are obtained by diluting the drink with water, with or without addition of essences, flavourings and sugar. They can be falsified by adding water.

When harvested, the tobacco sheets have moisture content above 80%. Drying is necessary to prevent degradation and keep moisture content below 20%. Leavening is a process of respiration and sweat loss of up to 16% of dry substance of the sheets, at a temperature of 32<sup>0</sup>C for 48 hours and a relative air humidity of 75-85%. Drying can be done in the sun in the shade with the draft, to fire directly or indirectly, in facilities with air conditioning etc. [3]

The grain quality depends on various factors and water content. A grain detached from the mother plant continues to breathe. Keeping them requires a preconditioning certain cleaning conditions and low moisture, optimum water content 14% (below this limit physiological processes unfold extremely slowly). When the water content is over 15%, the deterioration process accelerates.

Keeping the grain dry in stores can be done naturally or artificially. The relative air humidity in storage spaces must be at least (65-75%) and temperatures must be low.

## **6. Methods for determining water content in food**

The determination of water content and dry matter in food is important because they allow:

- Assessing the nutritional value of products;
- Assessing the possibilities of storage time and preservation of these products;
- Determining freshness of products;
- Verifying compliance formulation by the manufacturer; [1]

- Identifying product tampering attempts by illegal water addition.

The water content is an indicator of food quality assessment, representing a criterion of stability. Standards or quality standards for food goods specify the percentage of water content in the form of moisture (direct expression), as maximum percentage (% max.) or as total amount of solids produced (indirect), or as a minimum limit (% min.). [2]

The methods for determining water content in food are of two types, depending on the nature of the compound resulting from the determination.

\* Direct methods, which can be:

- Methods based on distillation (stripping organic solvents);
- Electrometer methods.

\* Indirect methods, such as:

- Slow method, the drying in the oven at 103 °C;
- Rapid method, the drying in the oven at 130-150 °C;
- Flame drying method or another direct source of heat;
- Thermo-balance method.

Direct methods are based on separation, retention, and measuring the water from the sample by directly reading on a scale, the water content and percentage expression relative to initial mass of the sample. [4]

These methods are fast, but have a lower degree of accuracy than indirect methods.

## 7. Conclusions

The imbalance between food intake and the body needs may determine underlying metabolic changes, as the human body is influenced by a series of factors such as environmental pollution and stress. An insufficient amount of basic nutrients (proteins, carbohydrates, lipids, vitamins, mineral salts, water) exerts negative

influences on health and human activity, and decrease work capacity, increasing the seriousness of metabolic disorders.

A rational scientific diet ensures the achievement of a permanent balance between body needs and the quantity of nutrients consumed by food.

The study of food came relatively late in the field of scientific research, although the link between diet and health has been emphasized since ancient times.

To extend the duration of life and maintain health at the highest levels, it is necessary to have good nutrition, balanced essential nutrients, reduce consumption of food, have much movement in the fresh air, avoid stress, a well-developed physical and intellectual activity, cope with occupational health.

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