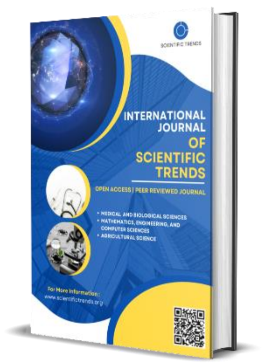
International Journal of Scientific Trends- (IJST)
ISSN: 2980-4299
Volume 3, Issue 02, February, 2024
Website: https://scientifictrends.org/index.php/ijst
Open Access, Peer Reviewed, Scientific Journal

Dietary Carbohydrates, their Chemical Properties

Sultonova Husnidakhan Hasanjon kizi
2nd-Year Student of Gulistan State University
Department of Food Technology Faculty of Production



Abstract
Food science is an applied branch of science that deals with the study of food production methods. The modern food industry receives dozens of products with their own amazing technologies, equipment and equipment. With the participation of these enterprises, grain, flour, cereals, compound feed, bread, pasta, confectionery, oil and fat, sugar, meat, dairy, canned products, alcohol, beer and other food products necessary for human consumption are produced.

Keywords: Useful food products, legumes, seafood, carrots, avocado, mineral fertilizers, nitrate, nitrite.

Introduction

Modern food technology is based on almost all fundamental sciences. Complex processes such as processing raw materials and turning them into finished products are based on the laws of physics, chemistry, biochemistry, microbiology and other sciences. A person with deep knowledge in these areas can become a real knowledgeable technologist.

According to the currently accepted classification, carbohydrates are divided into 3 groups: monosaccharides, oligosaccharides and polysaccharides

Monosaccharides

Usually monosaccharides consist of 3-9 carbon atoms. The most common are pentoses and hexoses. According to their functional properties, they are divided into aldoses and ketoses.

Monosaccharides include glucose, fructose, galactose, arabinose, xylose and D-ribose.

In moist fruits, freely available glucose (grape sugar) contains 12% in grapes, 5-6% in plums, cherries, 36% in honey).

Pure fructose is contained in honey by 37%, and in grapes- by 5.5%.

Galactose-milk sugar is a component of lactose, which is found in milk in plant tissues and seeds.

Arabinose is a part of pectin and mucous substances, gums, hemicellulose.

Xylose (wood sugar) is found in cotton husks and corn milk. Xylose is a part of pentosan.

A special place among monosaccharides is occupied by D-ribose. Being a universal component as a biologically active substance, it is responsible for transmitting information about offspring. -

ribonucleic (RNA) and deoxyribonucleic (DNA) acids; they are part of ATP and ADP, on the basis of which energy is accumulated and distributed.

Polysaccharides

Oligosaccharides. The molecule of polysaccharides of the first composition contains from 2 to 10 monosaccharides interconnected by a glucoside bond. These include disaccharides, trisaccharides, etc. is included.

- Of the disaccharides, maltose, sucrose and lactose are common in nature.
- Maltose, α-glucopyranosyl-(1,4)-α-glucopyranose, is formed by the breakdown of starch.
- The most common disaccharides include sucrose. It consists of a molecule of α-d-glucose and β-d-fructose.
- Lactose disaccharide is found only in milk and consists of β-D-galactose and D-glucose.

Inside the trisaccharides, raffinose consists of fructose, glucose and galactose. The largest amount of sugar is found in beets and legumes.

From a physiological point of view, polysaccharides are divided into two parts. Polysaccharides that perform a structural and backup function. The polysaccharide, which performs a structural function, includes cellulose, and glycogen and starch, which perform a backup function.

Starch consists of two parts-amylose and amylopectin (c6h10o5)p. Amylose is 10-30%, amylopectin is 70-90%. Amylose is bound by α-1,4 bonds, the branched part is bound by α-1,6 bonds.

Glycogen is widely distributed in animal tissues and is highly branched in structure.

Cellulose (or fiber) makes up the skeleton of branches and leaves that are commonly found in plants. Cotton and filter paper are made of pure cellulose

Wood is half made up of fiber and its associated lignin. Lignin is a high molecular weight phenolic substance.

Cellulose is a polymer whose molecule consists of 600-900 glucose residues (the average molecular weight is 1-1. 5 million).

In the cellulose molecule, glucose has a linear structure bound by a β-(1,4)-glycoside bond. Cellulose is not broken down by digestive enzymes, forming cellodextrins and cellobiose during hydrolysis by herbivorous organisms with cellulase enzymes secreted in the intestine.

Dextrans are glucose homopolysaccharides, the main part of which is associated with the α-(1,6) - glucoside bond, and dextran is formed from sucrose under the action of the enzyme destransaccharase, which is synthesized in bacteria.

Pentosans are cellulose-like polysaccharides consisting of xylose, arabinose and other pentoses.

Inulin is a high-molecular polymer, soluble in water. Precipitates in alcohol. Hydrolysis leads to the formation of fructose and partially glucopyranose.

Plants, fungi and yeasts produce fructose under the action of the enzyme inulase.

Mucous and sticky substances (Gums) are colloidal substances that form a viscous solution. These include sticky substances that come out of damaged areas of cherries, plums and apricots.

The composition of cherry glue consists of galactose, mannose, arabinose, glucuronic acid and partially xylose.

Gums are widely used in industry as a binder and thickener. It is used as an emulsifier in cosmetics and in the preparation of pharmaceutical creams, in the food industry as a paste, stabilizer.

Pectin substances. These substances consist of a galactouronic acid residue bound by an α-(1,4)-glucoside bond, which is a common heteropolysaccharide in fruits and plant juice.

The carboxyl group of galactouronic acid is divided into the following groups depending on the degree of esterification:

— protopectin is insoluble in water, has a complex structure. It also contains cellulose, arabinose, galactan, and protein substances.

- pectin acid is a substance that is less esterified than semigalacturonic acid;
- pectin-pectin acid is completely esterified.

Water-soluble pectin forms a colloidal solution. Protopectin does not dissolve in water. The molecular weight is 20-30 thousand.

Hemicellulose isolated from different plants differs in structure. In the tree and seeds, they are linear polymer glucomannans consisting of β-d-mannose and β-d-glucose, a compound bound by a β-(1,4)-glycoside bond. Grass and wood contain a β-(1,4)-glycoside bond consisting of xylopyranose.

The physiological significance of carbohydrates.

Carbohydrates are the main source of energy for the human body and are important for cells, tissues, brain, and heart. As a result of the biological oxidation of carbohydrates (fats and partially proteins), energy is released and accumulated in the cell in the form of adenisine triphosphate acid. 1 g. when carbohydrates are oxidized, 16.7 kJ (4 kcal) of energy is released.

Some carbohydrates have biological activity. For example, heparin prevents blood clotting, and hyaluronic acid prevents bacteria from passing through the cell wall.

Glucuronic acid, on the other hand, combines with toxic substances to form a complex non-toxic substance that is excreted from the body.

Human carbohydrate reserves are small, they make up 1% of body weight. It is rapidly decreasing as a result of labor activity.

The daily norm is 400-500 g. 80% starch.

Digestible and non-digestible carbohydrates. According to nutritional value, carbohydrates are divided into digestible and non-digestible. Digestible carbohydrates include mono - and oligosaccharides, starch, and glycogen. Nonabsorbable ones include cellulose, hemicellulose, inulin, pectin, marmalades and mucus.

When a person eats, carbohydrates are broken down and absorbed in the intestine either into fats or glycogen. Fat accumulation occurs when an excess of simple sugars is consumed and energy is not consumed.

Carbohydrate metabolism includes the following processes:

1. Disaccharides and polysaccharides are broken down in the gastrointestinal tract to monosaccharides, absorbed into the body and enter the bloodstream.
2. In tissues, mainly in the kidneys, glycogen is synthesized and broken down.

3. Glucose is anaerobically cleaved to form pyruvate.
4. Pyruvate is involved in aerobic respiration.
5. Hexoses turn into one whole.
7. Formation of carbohydrates from carb-free foods. These include pyruvic acid, lactic acid, glycerin, amino acids, etc.

Indigestible carbohydrates are called nutrient tissue and perform the following functions:

- accelerates the work of the intestine;
- prevents the absorption of cholesterol;
- suppresses putrefactive bacteria;
- prevents lipid metabolism disorders leading to obesity;
- helps to remove toxic substances from the body;

The lack of indigestible carbohydrates leads to cardiovascular diseases, impaired intestinal function. The daily norm is 20-25 grams.

Methods of Analysis

Increased understanding of the important role of oligosaccharides in biological recognition processes has given rise to the development of methods for analyzing the structure and stereochemistry of complex oligosaccharides. The complexity of the analysis of oligosaccharides lies in the fact that they can be cleaved and bound using various types of bonds, unlike peptides and nucleic acids. The high charge density of most polysaccharides and oligosaccharides and the relative variability of sulfate esters in glycosaminoglycans exacerbate these difficulties.

For simple linear polymers such as amylose, the state of glycoside bonds is determined by treating the initiating polysaccharide with methyliodide in an alkaline medium, as a result of which all free hydroxyl groups are methylated and the acid becomes stable. The methylated polysaccharide is hydrolyzed in acid. The free hydroxyl groups in the monosaccharide derivatives thus obtained are those involved in the formation of glycoside bonds in the initial polymer. Exoglycosidase enzymes, the specificity of which is known, are used to determine the sequence of monosaccharide subunits and existing fragments: they, in turn, separate monosaccharide residues from the non-regenerating end of the chain. The specificity of these exoglycosidases often makes it possible to determine the position and stereochemistry of each bond.

To analyze the structure of the oligosaccharide part of glycoproteins and glycolipids, the oligosaccharide part is cleaved using purified enzymes. Glycosidases break O- or N-oligosaccharide bonds, and lipases remove lipid heads. In addition, o-glycoside-bound glycans can be separated from glycoproteins by treatment with hydrazine. There are several methods for separating the resulting sugar mixture into separate components (Fig.7-36), including for separating proteins and amino acids: batch precipitation with solvents and ion exchange and chromatography with size exclusion. Purified lectins attached to a solid base are often used in affinity chromatography to separate sugar mixtures.

During the hydrolysis of oligosaccharides and polysaccharides, a mixture of monosaccharides is formed under the action of strong acids, which can be determined by chromatographic methods; thus, the overall composition of the polymer can be determined.

Methods of carbohydrate analysis. To fully characterize refined carbohydrates in the first stage, it is sometimes necessary to use four analytical approaches.

Oligosaccharide analysis is increasingly performed using high-resolution mass spectrometry and NMR spectrometry. Matrix laser desorption ionization mass spectrometry (MALDI) and tandem mass spectrometry can be used to analyze polar compounds such as oligosaccharides. The MALDI method is so sensitive that it allows you to determine the mass of ions (in this case, whole oligosaccharide chains; the tandem mass spectrometry method determines both the mass of ions formed when glycoside bonds are broken and their fragments. NMR data (inserts 4-5) help to determine the sequences of monosaccharides, bond positions and configurations of anomeric atoms, especially when it comes to medium oligosaccharides. For example, the structure of the heparin field, its spatial model is shown in the figure. 7-22 were fully identified using NMR spectroscopy. Automated methods and special procedures are used to systematically determine the structure of oligosaccharides.

However, cleavage of an oligosaccharide with several types of bonds is still much more difficult than cleavage of a protein or nucleic acid in a linear manner.

REFERENCES

1. M. G'. Vasiyev, Q. O. Dadayev, I. B. Isaboyev, Z. Sh. Sapayeva, Z. J. G'ulomova "Oziq-ovqat texnologiyasi asoslari" Toshkent "Voris-nashryof'2012

2. "Makaraon mahsulotlari texnologiyasi" Ravshanov S.S.Mirzayev J.D. Toshkent-2020, 260 b.

3. T.Xudoyshukurov, B. Atoyev, M.R.Muxtorova «Научно-теоритечеcкий основы технологии производства продукции на предриятиях общественного питания » МКИ 1981 йил, 224 с,

4. "Cavity Ring-Down Spectroscopy" - Martyn D. Wheeler, Stuart M. Newman, Andrew J. OrrEwing and Michael N. R. Ashfold, J. Chem. Soc. Faraday Trans., 1998, 94(3), 337-351.

5. Antidepressant-Like Activity of Sonchus oleraceus in Mouse Models of Immobility Tests. //Journal of Medicinal Food. 2010, 13(1): -p. 219-222.