The importance of food analysis to promote biology essay

Science, Biology

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Introduction

The analysis of food has grown rapidly in last few years1. Food analysts have derived a great importance in the analysis of food, because this helps to obtain information about the composition, appearance, texture, flavour, shelf life, etc of food1. This has also guaranteed the following: The quality of food produced1. Determine the nutritional content of food stuffs2. Help to protect the consumers' health2. Detect spoilage which may be biological or chemical such as browning, rancidity, etc2. The standardisation of products on the market that is making the product uniform2. Helps in discovering components occurring naturally and their quantity in foods. For example, cyanide in cassava2.

The analysis of food component

Food analyses are generally performed on edible portion of food, discarding the nonedible portion unless the compositions with respect to the total sample (edible and nonedible) weight are needed3. Also, moisture of food is relatively large among the same kinds of foods. Therefore, values are corrected on the basis of dry matter (values of anhydrous material) or values of moisture contents are used in evaluating the analysed value3. In the analysis of food, the composition can be specified in different ways depending on the properties of the food, analyst's interest and type of procedure used4: specific atom (e. g. Carbon, Hydrogen, Oxygen, Nitrogen, Sulphur, Sodium, etc); specific molecules (e. g. Sucrose, tristearin, Water, etc); types of food component (e. g. Carbohydrates, Vitamin, Fat, Minerals, Protein); specific substances (e. g. peas, flour, milk etc) 4. The analysis of food begun in the nineteenth century where analysts such as Accum and Hassall used microscopes to identify food component and to detect adulteration. As time goes on, consumers were more concerned over the quality and composition of food as important to the health, well-being and their safety4. Therefore, various modern types of food analytical technique have been developed, including electrophoresis, chromatography, spectroscopy, rheological techniques and sensory evaluation to be able to analyse complex food materials and these has raised a legal standard, quality assurance and the determination of nutritional value4. This paper discusses the analysis of food based on the components of food such as Carbohydrate, protein, minerals, vitamins and water.

Analysis of Carbohydrate

Carbohydrate (starch) is a major component in many foods. Carbohydrate (starch) is present in high concentration in cereal grains, in potatoes and in root such as cassava. Carbohydrate containing materials (starch) is the starting material for the many products like glucose syrups, modified starches, etc which find wide application in food and industrial use. Starch analysis, its by-products and the factory wastewater is necessary to assess the separation procedure5. Qualitative and quantitative analysis is used in the determination of composition of carbohydrate in food, beverages and their ingredients. Qualitative analysis determines the accurate composition of the ingredient labels while quantitative analysis ensures that the added components are listed in the proper order on ingredient labels and also ensures that the amount of specified components of consumer interest, for example, β-glucan, are proper and that caloric content can be calculated6. Qualitative and quantitative analyses can be used to detect the adulteration of food ingredient and products6. Analytical methods used in the analysis of carbohydrate follow the succession: qualitative colour test, adaptation of the colour test for reducing sugars based on reduction of Cu(II) to Cu(I) (Fehling test) to quantitation of reducing sugars, qualitative paper chromatography, quantitative paper chromatography, gas chromatography (GC) of derivatized sugars, qualitative and quantitative thin layer chromatography, enzymic methods and high performance liquid chromatography (HPLC). Modern methods are being introduced and refined such as nuclear magnetic resonance, near-infrared (NIR) spectrometry, Immunoassays, fluorescence spectrometry, capillary electrophoresis and mass spectrometry, these are

the new methods recently introduced for the analysis of carbohydrates6, 7. Carbohydrate is a great source of energy to the body, therefore, it composition in food is necessary to be determined to promote a healthy diet.

Analysis of protein

Proteins are building blocks of life and it is need in all the cells in the body to help repair cells and make new ones6, 8, 11. Protein in a healthy diet is important for growth and development during childhood, adolescence and pregnancy8. The Kjeldahl, Dumas (Nitrogen combustion), and infrared spectroscopy methods are commonly used in the analysis of protein in food6, 9. Other methods used include Biuret method, Lowry method, Dye-binding method, Bicinchoninic Acid method and Ultraviolet 280nm Absorption Methods but are widely used in research laboratories working on protein6, 11. Proteins have a significant role in food, e. g. gliadin and glutenins in wheat flour for bread making6.

Analysis of Minerals

Minerals help the body to develop, grow and stay healthy. Minerals are inorganic elements content of food (excluding carbon, hydrogen, oxygen and nitrogen) that remain ashes when foods are incinerated10. The analysis of minerals in foods can be done using chemical methods10. Some of them include titrimetry, colorimetry, Flame photometry, Atomic Absorption Spectroscopy (AAS), Inductively coupled plasma (ICP) emission spectroscopy4, 10. Minerals are significant for their nutritional value, toxicological potential and interaction with the texture and processing of

foods. This makes it important to analyse minerals to know and control their concentration levels in foods10.

Analysis of Vitamins

Vitamins are relatively low-molecular weight compounds in humans. As a source of nutrient, living organism obtain vitamins from organic matter6. These are required in small quantities for normal metabolism6. Humans cannot synthesize most vitamins, therefore, there is need to obtain them from food and supplement6. Low level of vitamins in the body lead to deficiency diseases, e. g. lack of ascorbic acid (vitamin C) leads to a disease called Scurvy6. The analysis of vitamins can be classified as follows6: Bioassays involving humans and animals. Microbiological assays making use of protozoan organisms, bacteria, and yeast. Physicochemical assays that include spectrophotometric, fluorometric, chromatographic, enzymatic, immunological, and radiometric methods. The analysis of vitamins in food plays a vital role in determining animal and human nutritional requirement.

Analysis of water

Water is a major component of food. Water exists in different form in food; free, absorbed and bounded form10. In the analysis of water, various precautions are taken to minimise losses or gains of moisture10. The choice of analytical method depend on the expected water content, volatility or sensitivity to heat of other food component, instrument availability, speed requirement, necessary accuracy and the aim of the analysis. One of the most suitable methods for the analysis of water in food is Karl Fischer10.

Water is an important component of food to enhance a healthy diet. The amount of water in food is a determinant for its nutritive value and taste12.

Conclusion

A healthy diet must contain all the basic components of food. Therefore, the analysis of food is important to ascertain the components in a particular food to promote a healthy diet. The analysis of food is internationally accepted and well established process which has reveals both the healthy benefits and risks in food.