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Review article

Food Analysis

A nano review about food and cosmetics analysis and its importance

Yasotha Selvan^{*1}, Dr. Kamalakannan Dhanabalan¹, Dr. R. Manivannan², Jagadeswaran Chandrasekar³, Kowshik Srinivasan⁴, Mohanraj Selvam⁴, Muthuraman Muthusamy⁴, Sumithraj Ravichandran⁴

¹Head and Professor, ²Professor and Principal, ³M. Pharm Scholar, ⁴Scholar
Excel college of pharmacy, Komarapalayam, Namakkal Dist-638183. Tamil Nadu, India.

*Corresponding Author: Yasotha Selvan
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ABSTRACT

The analysis of food and cosmetics is crucial for ensuring public health, safety, and product quality. For food, analytical techniques focus on detecting harmful elements, verifying nutritional value, maintaining product quality, and ensuring regulatory compliance. Similarly, cosmetics are tested for safety, efficacy, and uniformity, among other attributes. Both sectors also place increasing emphasis on the environmental impact of products and the ethical concerns associated with their production and testing. Comprehensive analytical protocols serve to authenticate product claims, validate shelf-life, and sometimes even eliminate the need for animal testing. Through rigorous analysis, regulatory agencies and manufacturers can guarantee that food and cosmetic products meet established standards and are safe for public consumption and use.

Keywords: Food Analysis, Cosmetics Analysis, Regulatory Compliance, nutritional content, Quality control.

INTRODUCTION

FOOD ANALYSIS

“FOOD ANALYSIS” is the scientific process of examining food products to determine their composition, quality, safety, and authenticity. This involves various techniques and methods to assess factors such as nutritional content, presence of contaminants, flavor compounds, shelf life, and adherence to labeling regulations. Food analysis is crucial for ensuring that the food we consume is safe, nutritious, and accurately labeled. It also helps regulatory bodies enforce food safety standards and allows manufacturers to maintain product consistency and quality.¹

WHY NEED FOR FOOD ANALYSIS?

Food analysis is the discipline dealing with the development, application and study of analytical procedures for characterizing the properties of foods and their

constituents. All food products whether raw or processed are analyzed to provide information about a wide variety of different characteristics, including their composition, structure, physicochemical properties and sensory attributes. In fact the food is analyzed for a variety of reasons, e.g. compliance with legal and labeling requirements, assessment of product quality, determination of nutritive value, detection of adulteration, research and development.²

Food safety is an issue of prime importance. With the growing concerns about the food and health safety, the food regulatory authorities in different countries have imposed stringent mandatory norms for the presence of various toxicants, which if present beyond a prescribed residual level might prove hazardous to human health. Moreover, with the implementation of WTO and globalization, it has become important that all food products for export out of the country should meet the regulatory norms of the

prescribed limits of different toxicants in various food products. As, government bodies regulate the permitted levels of contaminant compounds; much of this advancement has been driven by increased sensitivity and specificity of determination technique e.g. using analytical instruments.

Food Analysis serves as a unique and invaluable tool for all food scientists, technologists and regulatory authorities for quality assurance and control of food products, to study the different aspects of food products.³

FOOD IS A COMPLEX MATRIX CONSISTING OF DIFFERENT COMPONENTS. THESE COMPONENTS CAN BE CATEGORIZED INTO DIFFERENT CATEGORIES WHICH ARE LISTED AS GIVEN BELOW⁴

- **Nutrients:** e.g. Proteins, Amino acids, Total cholesterol, Trans Fats and Lipid profile, Carbohydrates, Sugars, Dietary fiber, Vitamins, Minerals etc. Depending upon the food products some of them may be present at high concentration levels while others may be present at low concentration levels of parts per million.
- **Additives:** e.g. Colors, Dyes, Stabilizers, Antioxidants, Flavors and Fragrance, Preservatives, etc.
- The additives are added to the food products for the purpose of giving the food products desired appearance, texture, flavor and extending the shelf life. The additives are usually present at very low concentration levels.
- **Adulterants:** They are added intentionally to the food products mostly for the purpose of cost benefits and they may be present at higher as well as lower amounts. They may be safe or sometimes highly toxic, such as, argemone in mustard oil, sudan red in chillies, animal cholesterol in ghee, low cost vegetable oil in high cost vegetable oil etc.
- **Contaminants and Toxicants:** Toxicants can be classified into Physical toxicants (e.g. glass, wood, metal, insect matter etc.); Biological toxicants such as microbes and pathogens; and Chemical toxicants such as residual pesticides, residual antibiotics, mycotoxins, and environmental pollutants like PAH (polycyclic aromatic hydrocarbons), PCB (polychlorinated biphenyls), Dioxins, toxic metals etc. Most of the times these contaminants are not added intentionally but find their way into the food products from environmental pollution or if proper practices are not being followed during agriculture, animal breeding, storage or processing. The various toxicants are present at low levels of concentration and if present beyond a certain prescribed level of concentration in food products may prove to be highly toxic or carcinogenic to humans.

OBJECTIVES OF FOOD ANALYSIS

- Reason advanced instrumentation required in food analysis.

- Outline principles of instrumental techniques used in food analysis.
- Describe applications of instrumental technique in analysis of macro and micro food components.

IMPORTANCE OF FOOD ANALYSIS,^{4,5}

- **Consumer Safety:** Food analysis helps identify potential contaminants, pathogens, allergens, and chemical residues in food products, ensuring that they are safe for consumption.
- **Nutritional Information:** Accurate nutritional analysis provides consumers with essential information about the content of nutrients, calories, and other components in their food, aiding in making informed dietary choices.
- **Quality Control:** Food analysis ensures that products meet quality standards, helping manufacturers maintain consistency in taste, texture, color, and other sensory attributes.
- **Regulatory Compliance:** Regulatory authorities use food analysis to enforce labeling regulations, ensuring that products are correctly labeled with accurate ingredient lists, nutritional information, and allergy warnings.
- **Shelf Life and Stability:** Analyzing the chemical and microbial aspects of food helps determine its shelf life and appropriate storage conditions, reducing the risk of spoilage and foodborne illnesses.
- **Authenticity and Fraud Detection:** Analysis can identify fraudulent practices such as adulteration or mislabeling, safeguarding consumers from purchasing counterfeit or misrepresented products.
- **Research and Development:** Food analysis supports the development of new products by assessing the impact of formulation changes, processing methods, and packaging on the final product's quality and safety.
- **Traceability:** By analyzing food products, it becomes possible to trace the origin of ingredients and monitor the supply chain, which is crucial for identifying the source of contamination in case of recalls.
- **Allergen Detection:** Food analysis helps identify potential allergens in products, protecting individuals with food allergies from accidental exposure.
- **Public Health:** Reliable food analysis contributes to overall public health by preventing foodborne illnesses and ensuring that the food supply is safe and nutritious.

COSMETICS ANALYSIS

“COSMETICS” as products "intended to be applied to the human body for cleansing, beautifying, promoting attractiveness, or altering the appearance without affecting the body's structure or functions".

COSMETIC ANALYSIS

“COSMETICS ANALYSIS” involves examining the ingredients and formulation of cosmetics products to assess their safety, efficacy and potential health effects. This can involve evaluating the potential risks associated with the

ingredients, such as skin irritation, allergic reaction, or even cancer.⁶

WHY NEED FOR COSMETICS ANALYSIS?

Cosmetics analysis is essential to ensure the safety, quality, and effectiveness of cosmetic products. It helps identify potential health risks, allergens, and contaminants in the products. Additionally, analysis ensures that the product's ingredients are accurately labeled, and that the claims made by the manufacturer are backed by scientific evidence. This process safeguards consumer health and ensures compliance with regulations in the cosmetics industry.^{7,8}

IMPORTANCE OF COSMETICS ANALYSIS

- **Product Safety:** Cosmetics are applied to the skin, hair, nails, or mucous membranes, and therefore, ensuring their safety is of paramount importance. Cosmetic analysis helps identify potential hazards, such as harmful ingredients, contaminants, or microbial growth, which could cause adverse effects or allergic reactions in users.⁹
- **Regulatory Compliance:** Cosmetics are subject to regulations and guidelines set by various authorities, such as the Food and Drug Administration (FDA) in the United States, the European Commission, and other regional regulatory bodies. Cosmetic analysis helps ensure that products meet the required standards and comply with labeling, ingredient, and safety regulations.¹⁰
- **Quality Control:** Cosmetics analysis plays a vital role in maintaining product quality. It helps assess the physical properties, stability, formulation integrity, and overall performance of cosmetic products. By conducting rigorous quality control testing, manufacturers can ensure consistent product quality and minimize variations between batches.
- **Ingredient Integrity:** Analysis of cosmetic ingredients helps verify their authenticity, purity, and concentration. This is particularly important to detect the presence of counterfeit or adulterated ingredients, which could potentially harm consumers or undermine the efficacy of the product.¹¹
- **Product Development and Innovation:** Cosmetic

analysis is essential during the product development and innovation stages. By analyzing different formulations, ingredients, and product prototypes, manufacturers can optimize their products for improved performance, stability, and safety.¹²

- **Claims Substantiation:** Cosmetic analysis helps validate the claims made by manufacturers regarding product efficacy, such as anti-aging properties, skin hydration, or sun protection. Through rigorous testing, manufacturers can provide scientific evidence to support their claims and build consumer trust.¹³
- **Consumer Confidence:** Rigorous cosmetic analysis helps build consumer confidence in the safety and quality of cosmetic products. By ensuring that products undergo thorough testing and comply with regulations, consumers can make informed choices and trust that the products they use are reliable and safe.
- **Product Recall Prevention:** Early detection of potential issues through cosmetic analysis can help prevent product recalls and mitigate any harm or liability to consumers. By identifying problems in the manufacturing process or formulation early on, corrective actions can be taken to avoid widespread product issues.¹⁴

CONCLUSION

Cosmetics lifeblood is cosmetics quality materials, thus it must be used with caution. The best way to lessen skin issues is with cosmetics items. Cosmetics have excellent potential for the future. recurring purchase positions for beauty salons range from Rs. 40000 to 60,000. and the annual purchase position for the minority is below 10,000 (6%) cosmetics parlour. It is very evident that Spending on cosmetics appears to be global trend.

Comprehensive analytical protocols serve to authenticate product claims, validate shelf-life, and sometimes even eliminate the need for animal testing. Through rigorous analysis, regulatory agencies and manufacturers can guarantee that food and cosmetic products meet established standards and are safe for public consumption and use.

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