Journal of Advances and Scholarly Researches in Allied Education
Vol. 18, Issue No. 3, April-2021, ISSN 2230-7540

A Review on Food Packaging and Storage in Munger District of Bihar

Dr. Suman Lata*

M.A and PH.D, Dept. Of Home Science, T.M.B.U, Bhagalpur

Abstract - Food would be impossible to fathom without a packet! It may be fresh-from-the-farm cereals, processed food from a high-tech company, or just cow's milk. Food packaging can be found almost anywhere. Packaging, being a huge industry, has its own set of concepts, technologies, benefits and drawbacks, processes, harmful effects, and costs. Furthermore, it is a rapidly evolving technology that has progressed from basic paper and cardboard packaging to space-age intelligent packaging systems. It took more than 300 years for food packaging to reach its current state. Since then, a variety of packing materials have been used. Each type of packaging material has a distinct purpose in the packing process. Also, packaging materials such as biodegradable or edible packaging may meet the world's demand for natural and environmentally friendly meals, which is a major worldwide problem today. With the introduction of novel food packaging technologies such as active packaging, aseptic packaging, smart packaging, bioactive packaging, and edible packaging, which are research trends, the food packaging business has changed to a large extent in recent years.

Keywords - Packaging Material, Food Packaging Techniques, Novel Packaging Technology, Food Packaging law, Food Safety.

----------X----------

INTRODUCTION

Packaging has evolved from a simple need to an art and science over the last few decades. Packaging technology is taught through packaging courses by institutions, While packaging is still largely concerned with enclosing or protecting things for storage, delivery, sale, and use, it is also used to entice customers. It also describes the process of package design, evaluation, and manufacture. While proper packaging is necessary to preserve food's basic characteristics (temperature, colour, taste, texture, and so on), food safety is also a critical function of packaging. It's also critical that the packing material is food-grade and does not pose a food-safety risk.

Packing: Food packing is done to protect food ingredients from numerous direct and indirect pollutants, as well as damage, leakage, and other problems. Food packaging also helps keep food fresh and safe throughout the supply chain.

Packaging: Packaging is usually done as a last step, after which the packed goods/products are placed into larger boxes, courier bags, bubble envelopes, cardboard, cartons, or other containers. The terms packing and packaging, on the other hand, are frequently used interchangeably.

A product's presentation is called packaging. It's all about the end product's appearance, colour, design, or presentation wrapped in a material to entice customers. Customers are enticed by packaging, which influences their purchasing decision.

In recent years, the packaging business has seen significant transformation. Products used to be wrapped in gunny bags, metal cans, and glass jars a few decades ago, but now they are generally found in neatly packaged attractive packaging. In recent years, new food packaging has improved not only the shelf life of goods, but also their safety and quality, as well as boosting consumer convenience.

HISTORY

Egypt appears to be the forerunner in terms of food packing. Mummies were well stocked, including food! Egypt was a pioneer in the usage of paper (from Papyrus plant). There are further allusions to the use of paper for food packaging (that included vegetables and spices). Only natural materials, such as leaves, animal skins, bark, coconut shells, and dried vegetable skins, were available and used for packing in prehistoric times. Reed baskets, wooden boxes, wooden barrels, woven bags, and other items were used in the following generations. Water storage containers and pottery vases were added later.

Tinplate was first used for packaging in the 18th century. In 1817, the first corrugated box was

commercially made in England. Gairrealised that he could manufacture prefabricated paperboard boxes by cutting and creasing them. Bakelite closures on bottles and clear cellophane over wraps were among the early twentieth-century packaging innovations that increased processing efficiency and improved food safety. Aluminum and polymers were later included.

Traditional packaging couldn't withstand the demands of World War II, therefore in the 1940s, the Military Standard or "mil spec" (military specs) was created. PVC (polyvinyl chloride) transformed food packaging. It produced a seal without sticking to the container, food, or itself. It possesses a low permeability to oxygen, water vapours, and tastes, although its toxicity has been questioned. Food packaging has become a specialist sector in the twenty-first century. (2006, Foodservice Packaging Institute)

NEED OF PACKAGING

Why food packaging? This question has as many answers as there are different sorts of food packs! While a special 'Mil-grade' type of tough food packaging was developed during World War II, when food was lost due to poor packaging, single-use cone cups, plates, and other items were widely used to feed workers on the Works Progress Administration's remote dams, bridges, and roads in the United States in the 1930s, to save money and make transportation easier. Dr. Samuel J. Crumbine, a Kansas public health official, watched one of his tuberculosis patients sipping from a common dipper and water bucket (a publicly shared manner of drinking water) on a train in 1908. A small girl stood behind his patient, drinking from the same dipper and bucket. This prompted him to go on a quest to outlaw the use of publicly shared or common utensils in public areas. Lawrence Luellen saw the trend and created a disposable paper cup! There are numerous requirements for storing, carrying, transporting, preserving, maintaining temperature, economizing, and glamorizing food, as well as numerous packing and carrying options.

SIGNIFICANCE OF FOOD PACKAGING

Food packing has a number of advantages. Breakages, vibrations, temperature, heat, and humidity are all protected by good packaging. Water, dust, pollutants, direct touch, microorganisms, and other contaminants are all protected by packaging. All of these characteristics help the food product last longer. Packaging gives the packages a pleasant look and glamourizes them for marketing purposes, as well as making them convenient for the user. Labels on the packets include particular information about the contents, such as production and expiration dates, nutrient values, and manufacturer information. Furthermore, some packets may contain particular software, such as anti-theft devices. Appropriate packaging also aids in the categorization, grouping, and storing of products.

TYPES OF PACKAGING

There are 3 levels of packaging:

- Primary
- Secondary
- Tertiary.

PRIMARY PACKAGING

"Primary packaging" refers to the packaging that comes into contact with a product the most.Its primary objectives are to safeguard the product and to inform or attract customers.The product determines what constitutes primary packaging. A pop can, for example, is primary packaging (because it's the most common way to transport soda), while a corrugated box containing a camera and its accessories is primary packaging (because it's the most common way to buy it).

In other words, we can say that the primary packing material comes into direct touch with the contents of the package. It protects and holds the merchandise. The smallest unit of distribution or use is usually this. For example Chips packet.

SECONDARY PACKAGING

The packaging used to ship things that had previously been packaged. Its primary objectives are to protect products and brand them during shipping. It's also utilized in retail settings like grocery shops as display packaging. 12-packs of soda cans, the corrugated box that a half-dozen camera boxes ship in, and the display stand for a newly released Blu-Ray movie are all examples of secondary packaging. Primary and secondary packaging, as you can see, sometimes overlaps. Secondary packaging and tertiary packaging may overlap.Outside of the primary packaging, there is secondary packaging. It's also used to group together primary packages.

TERTIARY PACKAGING

The most common package used by warehouses to ship secondary packaging. Its postal purpose is to ensure that shipments are appropriately protected while in transit. Consumers are rarely exposed to tertiary packaging. Pallets used to transport bulk

goods, corrugated pads used to separate layers of boxes, and stretch wrap used to protect stacks of cartons are all examples i.e. Tertiary packaging is the material which holds secondary packages. It is used for bulk packaging in order to ease handling, transportation, distribution, shipping or storage. Example: Wooden crates, cardboard cartons, etc.

OBJECTIVES OF FOOD PACKAGING

There are three major Objectives of packing:

- Protection
- Preservation
- Promotion

The major purpose of food packaging is to protect food products from external effects such as biological, chemical, and mechanical harm, to enclose the food and preserve it in its original state, and to attract customers by providing ingredient and nutritional information.Convenience, traceability, and tampering or pilferage detection are among secondary packaging features that are becoming increasingly important. Food packaging's purpose is to fill and present food in a cost-effective manner that meets industry criteria as well as consumer expectations, demands, and wishes, while ensuring food safety and reducing environmental impact (Coles 2003, Marsh and Bugusu, 2007).

EFFECTIVE FOOD PACKAGING

Packaging of food articles should be done in a way that chances of contamination, reaction with packed material, decomposition etc is avoided. Packaging must be done in appropriate way or as per the norms so recommended by Food and Drug Authority India.

It should protect the food from microbiological contamination as well as physical harm such as breakage, leakage, and pilferage while in transit or storage. It should be tamper-proof; it should restrict the ingress or egress of water vapour, gases (e.g., O2, CO2, N2, ethylene), and other volatile substances that contribute to odour; and it should aid in the compression and bulk reduction of specific commodities.It should not be hazardous and should resist chemical transfer between the food packed and the packaging material. It should be easy to print or label. It should make handling, storage, and transportation easier. It should also aid in product distinction, branding, and advertising.

PACKAGING MATERIAL

As previously said, packaging must be durable, appealing, cost-effective, and non-toxic. It must serve as a physical barrier to keep food from contamination while also preserving nutrients by preventing food from coming into contact with oxygen, carbon dioxide, or humidity. Physical, chemical, biological, and thermal stability, impermeability to liquids, and unique qualities such as X-Ray resilience are all significant properties of packing materials. The shape, size, colour, stacking options, label printing, cost, environmental attributes (e.g. recyclability, carbon imprint), handling properties, and other factors all influence the type of packaging used, so it's important to think about the shape, size, colour, stacking options, label printing, cost, environmental attributes (e.g. recyclability, carbon imprint), handling properties, and so on.

PACKAGING MATERIALS

Various packaging materials are in use. Some of the important ones are discussed here.

Glass: Because it is non-toxic, non-leaching, easy to clean, non-reactive to food/chemicals, non-porous, and relatively inexpensive, glass is a common packaging material. It is eco-friendly since it can be reused and recycled. Except for the fact that it is breakable, hefty, and brittle, it is an ideal material. It is commonly used for liquids and sauces and is used to make bottles and jars. Glass bottles are often used to hold cold drinks, wine, pickles, jams, ketchups, and squashes.

Aluminum: Itis the most abundant metal on the planet. It's light, glossy, sturdy, long-lasting, and recyclable. It has excellent barrier qualities.It's used to make cans, metallic trays, and forms for ready-to-cook foods that can withstand high and low temperatures, making them suitable for both frozen and heated meals. Aluminum foils can be used for direct food packaging as well as lamination of paper or plastic for improved strength, heat stability, and moisture, grease, air, and odour barrier. Soups, herbs, and spices are typically packaged in them.

Plastic: Plastic is a generic word for a variety of comparable synthetic materials that are frequently used in food packaging. It's durable, lightweight, airtight, and recyclable. Plastic bags extend the product's shelf life and keep it fresh. Plastic bags can be used to store items that are exceptionally moisture-free for a long time. Because it's transparent, we won't have to open it to see what's within. It can be used to manufacture bags, wraps, bottles, tubs, buckets, containers, re-sealable

pouches, and other packaging materials. Bags can help keep food from becoming soggy in humid environments since they are airtight. Its downside is that it is non-biodegradable.There are also concerns about leaching and diffusion of substances like Bisphenol A and DEHA (diethylhexyl adipate) from plastics into food. that may be carcinogenic.

Paper: Paper is a traditional packing material made from cellulose-based components (eg. wood). It allows air, water vapour, and gases to pass through (oxygen). It has a low tear resistance. Paper is used to make a variety of bags and boxes for various applications. These are used to transport dry food items including sugar, salt, flour, and bread. Paper can also be used to construct light, colourful exterior covers for products stored in plastic or metal containers. Snacks, spices, nuts, and even cups for drinking liquids can all be stored in various sorts of cardboard cans. Paper trash can be composted, burned (with energy recovery), recycled, or biodegraded.

Tetra packs: Traditionally, these were a tetrahedron-shaped plastic-coated paper carton, but aseptic packaging technology allowed for cold chain delivery and storage of dairy, beverages, cheese, ice creams, and prepared foods.

Pouches: A variety of pouches made of high-quality, long-lasting, and environmentally safe materials are available. Spout pouches, zipper pouches, printed stand up pouches, reusable pouches, and so forth are examples. Their appealing design adds to the attractiveness. They also have food labelling, such as manufacturing dates, expiration dates, nutrient content, logos, and messages, among other things.

Retort Pouch: The United States Army Natick R&D Command, Reynolds Metals Company, and Continental Flexible Packaging developed the retort pouch. A retort pouch is a plastic and metal foil laminate pouch with 3 or 4 wide seals usually created by aseptic processing, allowing for the sterile packaging of a wide variety of drinks, ranging from water to fully cooked, thermo-stabilized meals such as Meals, Ready-to-Eat that can be eaten cold, warmed by submerging in hot water, or by using a heater, lighter in weight and less expensive to ship. Food is sealed into the retort pouch after it has been prepared (raw or cooked).Inside retort or autoclave equipment, the bag is heated to 240-250°F (116-121°C) for many minutes under high pressure. This method reliably destroys all common germs (especially Clostridium botulinum) and keeps the food from deteriorating.

Wood: Wood is commonly used to package fresh produce, although its use in the packaging of processed items is limited. The most popular uses for wood in food packaging include barrels for wines, beers, spirits, salted fish, and brined vegetables; wooden crates, especially for returnable bottles; tea chests; small decorative boxes for items aimed at a tourist or gift market; and pellets.

Vegetable Fibers and Cloth: Food packaging is made of cotton, jute, linen, and sisal, among other materials. These materials are not often used for tiny retail or consumer containers, but are more commonly utilised as shipping containers to transport greater amounts of food. Foods marketed in specialty markets, such as tourist gifts, such as beautiful packets created from locally manufactured jute or cotton material, which may have strong promotion potential, are one usage for cloth packs. Textile containers have no substantial moisture, odour, or air barrier qualities, and do not protect foods against mechanical damage such as crushing or puncturing, as well as microorganisms, insects, rodents, or birds.

INDIA'S LEGISLATION ON FOOD PACKING

Food business operators must comply with the stated packaging standards as of July 1, 2019, according to India's Food Safety and Standards (Packaging) Regulations, 2018, which came into force on December 24, 2018 with publication in the Gazette of India. General and particular standards for food packaging materials used in India are included in the rules. The Indian Standards (IS) for paper and paperboard materials, metal and metal alloys, and plastic materials, as developed by the Bureau of Indian Standards (BIS), must be followed. Inks used on food packaging must also adhere to the relevant BIS standard. Schedule IV of the Indian regulations lists materials that are suggested for packaging different categories of food, such as milk and milk products etc. India’s food packaging regulations ban the use of recycled plastics in food packaging, as well as the use of newspaper to pack or wrap food.

FOOD PACKAGING TECHNIQUES

Packaging today plays a critical role in the quality of food products by protecting them from physical, chemical, and environmental hazards. The following are the different packaging techniques (Brennan, 2006; Fellows, 2002; Majid et al. 2018):

Vacuum packaging: It is the most basic and widely used type of packaging, having been used for many

years. It's a process in which food is packaged in a low-permeability material, and then a vacuum is formed by drawing out the air in the package before closing it. The package collapses around the product as the air is expelled. This packaging technique's main goal is to extend the shelf life of food goods. Because of the reaction with air in the package, products with a high fat content go rancid. As a result, vacuum packing appears to be a potential strategy for reducing the amount of oxygen available within the box.

Aseptic packaging: It is the process of filling a commercially sterile product into a sterile packaging material in a sterile environment while making sure the packing materials are sealed and tight enough to avoid contamination. Prior to filling, sterilizing by various means is performed to kill microorganisms present in the packages. Sterilization of packaging material is a vital step in the aseptic packaging method. In aseptic packaging, the product is heated to an ultra high temperature (UHT) for a predetermined period of time, then cooled and passed through a closed system to the packaging machine, where it is filled into a sterile packing material under sterile conditions.

Modified Atmosphere Packaging (MAP): This is a process in which the internal atmosphere of food containers is altered by replacing air with a predefined mixture of gases before sealing. It's commonly accomplished by using an inert gas. Nitrogen, carbon dioxide, and oxygen are used commercially for MAP. Nitrogen gas, which is odourless, tasteless, colourless, nontoxic, and non-inflammable, is commonly utilised to modify the atmosphere. The changed atmosphere in MAP can be made in two ways.

(1) In case of flexible packages like pouches the air is replaced from the package by flushing with predetermined mixture of gas before sealing.

(2) In case of trays, the air is removed by vacuum pump and the predetermined mixture of gas is introduced before sealing.

The alteration extends the shelf life of the products while also protecting them from spoilage, dehydration, oxidation, weight loss, and freezer burn. It's usually used to describe lightly processed or fresh foods that are still breathing.

Active packaging: Active packaging entails the introduction of specific additives into the polymer, packaging film, or packing containers with the goal of preserving and extending product shelf life (Day, 1989). This sort of packaging is used to replace traditional food processing methods such as high heat treatments, dehydration, brining, acidity, and preservative addition (Lopez-de-Dicastillo et al., 2011). When packaging performs a specific purpose in food preservation other than providing barrier properties to external environments, it is considered active (Roonie, 1995; Hotchkiss, 1995).

Bioactive packaging: Bioactive packaging is a new packaging technology that has a direct impact on consumer health by resulting in healthier packaged foods. Enzyme encapsulation, enzyme immobilisation, microencapsulation, and nanoencapsulation all use biopolymers to store desirable bioactive principles in ideal conditions until their eventual release into the food product (Lopez-Rubio et al., 2006; Majid et al., 2016). By taking into account the individual product or functional substance characteristics or requirements, this technique maintains the bioactive substance until their regulated or rapid release within the packed food during its storage term, or prior to its consumption.

Edible packaging: Edible films and coatings are made from agricultural waste and/or waste from the food industry, adding value to the product. Such packaging material satisfies the global need for natural and environmentally acceptable foods. Biopolymers comprised of polysaccharides including cellulose, starch, chitosan, pectins, gums, alginates, and animal and plant origin proteins are used to create edible films or coatings. Though this technology does not totally replace traditional packaging materials, it can lower the cost and weight of traditional packaging. These packaging materials can help with food preservation by acting as a barrier to gases and moisture, as well as regulating the release of food additives and nutrients into the packaged food (Campos et al.2011).

EFFECTS OF TOXINS

Leaching: Certain non-food packaging materials have harmful effects on food. PET (Polyethylene Tetraphathalate) is a form of plastic extensively used in soft drink, water, and juice bottles. PET bottles may leach chemicals like antimony trioxide into liquids. Other toxins, such as Di(2-ethylhexyl) adipate (DEHA), may cause liver poisoning and have been linked to cancer in humans. PVC, which is used in clear food packaging, has been labelled a dangerous product because it is an endocrine disruptor. Polystyrene, which is found in egg cartons, throwaway coffee cups, and retail cheese and meat packaging, leaches the chemical styrene, which can

cause developmental and reproductive issues.. Polycarbonates used in baby bottles, various food and drink containers contains many chemicals including Bisphenol-A (BPA) that leach into food causing breast and prostate cancer, insulin resistance and chromosomal damage. (US Environmental Protection Agency, 2015). Metallic Contact:Certain metals (such as aluminium and lead in the past) can come into contact with food and produce toxicity, as well as a metallic taste. Physical Agents: Physical agents such as packing pins, metal bits, and wooden shrapnel, among others, can be dangerous if they slip into food and are consumed.

NEW DEVELOPMENTS

Many high-tech, innovative packaging innovations are surfacing in the packaging sector nowadays. Oxygen scavenging substances (such as ferrous oxide, ascorbic acid, sulfites, catechol, and others) react with oxygen and lower its concentration. Food (for example, fruits) would have their oxidative breakdown delayed, extending their shelf life. Microbial development can be inhibited by using carbon dioxide absorbers and emitters in fresh meat, poultry, cheese, and baked items. Hygroscopic compounds can assist manage moisture and water activity in items like sweets and candy, decreasing microbial growth.Antimicrobials are also utilised to improve the quality and safety of processed foods by minimising surface contamination. Exothermic reaction is produced by self-heating packing (calcium or magnesium oxide and water). Plastic coffee cans, military rations, and on-the-go food platters have all been made with it.Time temperature indicators, ripeness indicators, biosensors, and Radio Frequency Identification are examples of active and intelligent packaging components that have a bright future.The time and temperature experienced by the indicator and neighboring meals are combined in time temperature indicators. Some rely on color-changing chemical processes, while others rely on dye migration through filter medium. The indication can help signal potential food degradation to the extent that these physical changes in the indicator match the rate of food degradation.Nanotechnology is the study, manufacturing, and manipulation of structures, devices, and materials with lengths ranging from 1 to 100 nanometers. This improves the barrier qualities of the polymer, making it stronger, more flame resistant, with improved thermal properties and greater surface wetability and hydrophobicity. Innovative packaging solutions for barrier and mechanical qualities, disease detection, and active and intelligent packaging could all benefit from nanotechnology innovation.

CONCLUSION

While food packaging is an important part of the food industry and aids in the safe storage of food and beverages, it may also be a source of food safety concerns. When heated, certain packaging materials, such as certain types of plastic, polythenes, and Styrofoam, can produce toxins that are harmful to consumers. Irradiated packaging materials (together with food) might introduce harmful nonfood chemicals into the food. Food packaging uses a variety of materials, such as dyes for colorful label printing and glues and adhesives to hold the package tight. To adequately protect customers, the competent body certifies each of these food packaging materials individually, submitting them to stringent testing processes.

Food packaging is essential since it gives food its commercial shape, colour, texture, transit capability, and shelf-life! It aids in the preservation of food processing benefits after the procedure is completed, allowing food to travel long distances. Labeling is an important part of packing since it provides all of the necessary information about the product. When choosing a meal package, cost and environmental concerns must always be taken into consideration. Huge technology advancements are on the horizon, making food packaging nearly as intelligent as the consumer.In response to lifestyle changes, convenience, and rising demand for food quality and safety, food packaging techniques are constantly improving. Food packaging extends the shelf life of packed foods while maintaining their sensory qualities, quality, and safety, with current research focusing on food packaging that is environmentally sustainable. However, in addition to being environmentally friendly, innovative food packaging methods should be founded on proper cost-benefit assessments in order to minimise product costs without harming food shelf life.

REFERENCES

(1) Ansari IA, Datta AK. An overview of sterilization methods for packaging materials used in aseptic packaging systems. Food and Bioproducts Processing. 2003; 81(1):57-65.

(2) Brennan JG. Food Processing Handbook. Edited by James G. Brennan. 2 nd Edition, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim. 2006; 2:300.

(3) Day BP. Extension of shelf-life of chilled foods. Eur Food Drink Rev. 1989; 4:47-56.

(4) Dept. of Industry, Government of Bihar, Food Processing Section

(5) Dept. of Health and Human Services (U.S.). Report on carcinogens. 11th ed. Research Triangle Park, N.C. National Toxicology Program, Public Health Service, HHS, 2005.

(6) Kerry JP, O'grady MN, Hogan SA. Past, current and potential utilisation of active and intelligent packaging systems for meat and muscle-based products: A review. Meat science. 2006; 74(1):113-130.

(7) Kirwan MJ. Paper and paperboard packaging. In: Coles R, McDowell D, Kirwan MJ, editors. Food packaging technology. London, U.K.: Blackwell Publishing, CRC Press, 2003, 241-281.

(8) Marsh K, Bugusu B. Food packaging-roles, materials, and environmental issues. Journal of food science. 2007; 72(3):R39-55.

(9) Peltzer M, Wagner J, Jiménez A. Migration study of carvacrol as a natural antioxidant in high-density polyethylene for active packaging. Food Additives and Contaminants. 2009; 26(6):938-46.

Corresponding Author

Dr. Suman Lata*

M.A and PH.D, Dept. Of Home Science, T.M.B.U, Bhagalpur