To study and analyse the different packaging materials on shelf-life study of banana (Musa paradisiaca var. Robusta): A Review

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Abstract. Packaging plays an important role to maintain the shelf life of banana thereby providing nutritional and market value alongside to the farmer losses as well. The present review study is to determine how different banana cultivars' shelf lives were affected by the materials used for packaging. The banana cultivars, referred to locally as Robusta var., were packed using five different materials a perforated low density polyethylene bag, dried banana leaf, gunny bag, brown paper bag, cling wrap, and no packaging material. Three replications of a factorial combination were used in the Randomized Complete Block Design experiment. Every four days, a variety of physical characteristics were evaluated, such as weight loss, pulp hardness, pulp dry matter, pulp to peel ratio, peel colour, pulp thickness, decay, and loss % of marketability. The present review revealed on different packaging materials to increase shelf-life banana, latest packaging technologies used in banana's packaging and future research in banana packaging would reveal.

Keywords: Banana, Shelf life, Nutritional value, Packaging, Physio-chemical analysis.

1. Introduction

Banana (Musa paradisiaca) belonging to the family Musaceae is the largest herbaceous flowering plant. The eighth-most-traded fruit in the tropical region, bananas are the most commonly consumed fruit and are regarded as the primary source of fibre and potassium. [1].

1.1 Botany

The banana is a tall herb that may grow to a height of 15 metres rather than a tree. The cultivars differ significantly in terms of fruit quality, disease and insect resistance, plant form, and plant and fruit sizes. A ripe banana is usually sweet to taste; Cooking plantains and bananas is an exception to this rule. Plantains are hybrid bananas that either have remnants of male flowers or have a deteriorated male flowering axis. Unlike bananas, plantains are always fried before eating and have a greater carbohydrate content. Compared to sweet bananas, the two types of plantains French and Horn produce less fruit per plant. Whether or not the male components of the inflorescence are present varies throughout the groups. Because they are inexpensive and packed with nutrients, bananas are a highly sought-after fruit. It is eaten as raw or ripe fruit, either uncooked or cooked. Bananas are high in vitamins, especially vitamin B, and high in carbohydrates. It is also a good source of magnesium, calcium, phosphorus, and potassium. The fruit has no fat or cholesterol and is easily digested. Baby food is initially made from powdered bananas. When used consistently, it lowers the risk of heart disease and is recommended for those who have gastroenteritis, arthritis, high blood pressure, ulcers, and kidney issues. The fruit can be processed to create wine, Red Banana, Manoranjitham (Santhana vazhai) and Ladan are also cultivated in hills [2].

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**Table 1. Taxonomical classification of Banana**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Scientific name</th>
</tr>
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<tbody>
<tr>
<td>Kingdom</td>
<td>Plantae</td>
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<tr>
<td>Subkingdom</td>
<td>Tracheobionta</td>
</tr>
<tr>
<td>Super division</td>
<td>Spermatophyta</td>
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<tr>
<td>Division</td>
<td>Magnoliophyta</td>
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<tr>
<td>Class</td>
<td>Liliopsida</td>
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<tr>
<td>Subclass</td>
<td>Zingiberidae</td>
</tr>
<tr>
<td>Order</td>
<td>Zingiberales</td>
</tr>
<tr>
<td>Family</td>
<td>Musaceae Juss</td>
</tr>
<tr>
<td>Genus</td>
<td>Musa L.</td>
</tr>
<tr>
<td>Species</td>
<td>Musa x paradisiaca L.</td>
</tr>
</tbody>
</table>

### 1.2 Agro Climatic conditions

The appropriate agroclimatic conditions needed for bananas in tropical regions flourish in conditions with 75–85% relative humidity and temperatures between 15 and 35 degrees Celsius. It prefers tropical, moist lowlands and can grow up to 2000 metres above mean sea level. This crop is grown in India in a variety of conditions, from dry mild subtropical to humid tropical, by selecting the appropriate cultivars. Chilling injuries happen at temperatures below 12°C. More than 80 km/h winds damage the crop. The monsoon season, which typically brings 650–750 mm of rain and spans from June to September, is essential to the rapid vegetative growth of bananas. Strictly a few varieties, including "Hill banana," a Strictly a few varieties, including "Hill banana," are grown at greater altitudes [3].

Rich, deep loamy soil with a pH of 6.5 to 7.5 is normally preferred for the growth of bananas. Banana soil should be very wasteful, sufficiently fertile, and wet. Strong, calcareous, saline soils are not ideal for the growth of bananas. Bananas grow best on soil that is rich in natural material, has a high nitrogen content, a suitable phosphorus level, is neither too basic nor too acidic, and contains a lot of potash [4].

With 97.5 million tonnes produced annually, banana cultivation on an Indian scale is a major natural product crop in the world. Millions of people in India rely on it for their jobs, with a national average of 33.5 T/ha and a total yearly production of 16.91 million tonnes from 490.70 thousand hectares. With 60 T/ha, Maharashtra leads the country in production. In India, bananas account for 37% of the total production of organic products. In India, bananas make up 20% of the total area planted to crops. Maharashtra is the most efficient state in India and ranks second in the region [5]. With 50,000 hectares of banana land, Jalgaon is one of Maharashtra's major bananas developing regions. But the great majority of bananas are grown by planting suckers. Innovation in horticulture is developing very quickly. Accurate global banana production statistics are difficult to get since smallholder ranchers often spearhead banana development and trade the informal, often untraceable, banana sector. Most bananas are grown in Africa, Latin America, and Asia. India and China are the largest producers, with an average annual production of 29 million tonnes and 11 million tonnes, respectively, between 2010 and 2017.[5]

Both nations' production mostly caters to their own markets. Other major producers are Ecuador and Brazil, with an average of 7 million tonnes each, and Philippines, between 2010 and 2017, with an average of 7.5 million tonnes per year.

### 2. Nutritional Value

Plantains and bananas are high in nutrients, including potassium, calcium, salt, magnesium, carbohydrate, sugar, and vitamins A and C. Plantains are nutritionally low protein food material but relatively high in carbohydrates, vitamins and minerals [6]. Further nutritional compositions & constituents are discussed in table no. 3.

**Table 2. Different Nutritional value of Banana [6]**

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Value (%)</th>
<th>Nutrients</th>
<th>Value (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>89</td>
<td>Sugar</td>
<td>12</td>
</tr>
<tr>
<td>Water</td>
<td>74</td>
<td>Glucose</td>
<td>48</td>
</tr>
<tr>
<td>Protein</td>
<td>1.1</td>
<td>Fructose</td>
<td>40</td>
</tr>
<tr>
<td>Total Lipid</td>
<td>0.3</td>
<td>Maltose</td>
<td>&gt;1</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>21.8</td>
<td>Starch</td>
<td>5</td>
</tr>
<tr>
<td>Magnesium</td>
<td>30</td>
<td>Fibre</td>
<td>2</td>
</tr>
<tr>
<td>Potassium</td>
<td>38.5</td>
<td>Calcium</td>
<td>8</td>
</tr>
<tr>
<td>Calcium</td>
<td>8</td>
<td>Iron</td>
<td>0.4</td>
</tr>
</tbody>
</table>

### 3. Economical Importance

As banana are inexpensive and packed with nutrients, bananas are a highly sought-after fruit. It is eaten as ripe and raw fruit, as well as prepared and...
fresh. Bananas are high in vitamins, especially vitamin B, and high in carbohydrates. It’s furthermore a good source of calcium, magnesium, phosphorus, and potassium. The fruit has no fat or cholesterol and is simple to digest. Baby food is initially made from powdered bananas. When used consistently, it is indicated for those with high blood pressure, arthritis, ulcers, gastroenteritis, and renal disease as well as those at risk of heart disease. The fruit can be processed to make chips, banana puree, jam, jelly, juice, wine, and halwa [7]. After the harvested pseudostem’s leaf sheaths are removed, the delicate stem with the inflorescence is extracted and consumed raw. When preparing bananas, commonly referred to as plantains, have a high carbohydrate content and a chemical makeup similar to potatoes. Pots, purses, and wall hangers are a few items manufactured from banana fibre. Trash from bananas can be utilised to manufacture paper and rope. Eating plates made of banana leaves are hygienic and beneficial [8]

4. Post Harvest Management

The greatest post-harvest management practices can increase the fruit’s quality and shelf life. The primary post-harvest activities are grading, packaging, storage, selling, and washing and curing [9]. After being cut from the bunch, the banana hands are cleaned in clear, running water to get rid of any collected dust and debris. The PHM of banana is given illustrate on flow chart in Fig. 1.

Fig.1 Post Harvest Management of Banana [9]

4.1 Post Harvest Losses of Banana

The Bananas are climacteric fruits that don’t keep well without proper storage degrades the qualities due to it produces ethylene and possesses a high respiration rate after harvest, completing it very perishable and susceptible to losses after harvest. According to reports, postharvest losses from marketing and storage of bananas can be as high as 80%, as in the case of Rwanda [10]. Research on postharvest loss in bananas is scarce, according to a review [11], and the problem is worse in southern and eastern Africa. Postharvest management must so receive the same consideration as production techniques (Kader, 2005). According to [12], mechanical, physiological, pathological, or environmental factors are often the main causes of postharvest loss in fruits. Secondary causes, primarily from weak quality control and technology applications, contribute to the losses. One of the main issues impeding the increase of banana production in Africa is said to be a significant postharvest loss brought on by insufficient and ineffective postharvest handling techniques. Similar to this, production limitations combined with a lack of postharvest and marketing infrastructure such as cold storage, packaging, pre-packaging and distribution, post-harvest treatment, and washing facilities have been linked to low productivity and significant postharvest losses of bananas in Ethiopia [13].

4.2 Causes of Post harvest losses at wholesale level

The bulk of wholesalers (60%) similarly cited mechanical damage as the primary reason for banana loss at the wholesale level, with the remaining 25% and 15% citing incorrect maturity and failure to pulp softening, respectively. Bananas at whole sale markets may sustain mechanical damage as a result of the handling, packing and marketing procedures used from fruit harvest through transportation and marketing. [14], suggest that fruits can readily sustain bruising, cutting, breaking, impact wounds, and other types of injuries that result in fruit degradation due to inappropriate handling, inappropriate containers, incorrect packaging, and improper transportation. [15], observed similar findings, indicating that mechanical damage to bananas occurs more frequently during whole sale and retail marketing than during harvesting in the supply chain. The unregulated atmosphere in the ripening rooms may be the cause of the pulp's failure to soften during the ripening process. It has been suggested that low temperatures, inadequate ethylene, and very low humidity can result in irregular and incomplete banana ripening [16]. The early removal of fruit from the ripening room may also be the cause of this. It is suggested that fewer fully ripe banana fruits will take longer to ripen than fully ripe ones. It has been
observed that ripening rates depend in part on the fruit's maturity, handling temperature, and growing weather.

The top secondary factors that increased banana loss, according to wholesalers' responses, were uncontrolled ripening environments, inadequate packaging during transit, and long-distance shipping. When banana bunches are transported without any sort of cushioning material, the fruits are susceptible to mechanical damage that might lead to losses [17]. This is especially true as the current assessment found when fruits are transported over large distances on unpaved roads. Careless handling during off-loading and ripening is one of the elements that wholesalers believe contributes less to increased banana loss. This could be as a result of the wholesalers' lack of knowledge on how their handling techniques affect the quality of the bananas they buy and ultimately generate losses throughout the supply chain. The shelf life is increased by packaging that keeps the product separate from the outside world and works to maintain conditions that, if not sterile, at least limit exposure to diseases and pollutants [18].

### 5. Processing & Uses

Unpeeled bananas are a good source of fibre, potassium, and vitamin B6. You can eat banana fruit fresh or cooked as a vegetable. In addition, the fruit can be processed to create a range of food products. To make a puree, ripe fruits can be pulped and pureed in ice cream, infant food, yoghurt, cake, bread, and nectar. Ripe bananas can be used as toppings for baked goods, fruit salads, or dried and consumed. They can also be sliced and bottled with syrup. Unripe green bananas can be cut and deep-fried to make chips. It is also possible to dry and grind whole green grapes into flour. Ripe bananas can be fermented to make vinegar and alcoholic drinks [24].

#### 5.1 Banana Flour & Powder

Plantains, cooked bananas, and green, unripe bananas can all be used to make flour. Fruits are peeled by hand and cut into pieces that are 5 to 10 mm thick. The slices will be spread out on mats or bamboo to dry in the sun framework, on cement floors, on a roof, on corrugated iron sheets, or just on the swept, bare earth. They can also be dried in ovens, over fires, in cabinet dryers, tunnel dryers, or other types of solar dryers [25].

#### 5.2 Chips & Crisps

There are numerous techniques for making plantain or banana chips. Unripe bananas and plantains can usually be thinly sliced (1.2–0.8 mm thick) either vertically or transversely. The slices are submerged in either potassium or sodium metabisulphite solution (to enhance the final product's colour or avoid discoloration) and cooked at 180–200°C in hydrogenated oil. To prevent rancidity, the fried slices are brushed with a mixture of salt and antioxidants, such as butylated hydroxytoluene. As an alternative, fried chips are between 1.5% and 2.0%. The oil content, look, texture, and flavour of the chips are all influenced by the temperature and duration of the frying process. The chips need to be sealed in to keep them from absorbing moisture and becoming mushy, use moisture-proof containers [25].

#### 5.3 Jam & Jelly

The several techniques for making jam and jelly have been utilised. Fully ripe or overripe fruits are used in one jelly-making technique. Fruits are hand-peeled and sliced or pieced into 2 cm pieces. The slices are cooked at 60° for one hour. One pound of bananas equals one pint of brix sugar syrup (454 g to 0.5681). After straining, the clear solution is heated to a boil until it solidifies. It is necessary to adjust the pH to 3.5. The set can be enhanced by adding pectin. The following is a commercial formula for making banana jam: Ten gallons of water, two hundred pounds of sugar, and twelve ounces of cream of tartar. They are 110°C heated and 2.5 gallons of lemon juice (you can use citric acid in place of the lemon juice to bring the jam's pH down to 3.5) are added. Until the mixture has the right consistency, it is heated to 107°C [26].

#### 5.4 Banana Figs

When using fully ripe fruits with a sugar content of around 19.5%, sulphurous acid treatment is applied after peeling, and the fruits are dried as quickly as feasible. There have been descriptions of several drying devices that use temperatures between 50 and 82°C for 10 to 24 hours to produce dried figs with a yield of 12 to 17% of the fresh banana on the stem and a moisture content ranging from 8 to 18% [27]. A solar heat collector installed on the top of one Australian factory helps to supplement the heat needed to dry bananas. Another method for drying bananas is osmotic dehydration, which entails submerging a 1/4-inch-thick banana in a 67–70-degree sugar solution to extract its water content. Brix for the 8 to 10 hours is then spent vacuum-drying at 65 to 70°C for five hours at a pressure of 10 mm Hg. Compared to other processes, the end
products have a substantially reduced moisture content 2.5% or less [28].

5.5 Banana puree

Peeling and pulping ripe bananas is the first step in making banana purée. The pulp can then be preserved in one of three ways: aseptic canning, acidification followed by regular canning, or quick-freezing [29]. Aseptic canning is the method used to process the majority of purées worldwide. Ripe fruits that have been peeled are transported to a pump that pushes them through a plate with 1/4-inch holes. From there, the fruits pass via a centrifugal de-aerator, homogenizer, and receiving tank with a 29-inch vacuum [30]. This helps avoid oxidation-induced discoloration by removing air. After that, the purée is put through a sequence of scraped surface heat exchangers, where steam sterilises it, it cools down a little, and it is eventually heated to filling temperature [31]. After the purée has been sterilised, it is aseptically placed into closed, steam-sterilized cans [32].

6. Packaging Importance & role

Packaging plays an increasingly important role in consumer communication and branding, and packaging design is becoming increasingly important. Understanding consumer psychology is crucial to properly communicating communication goals, since it helps producers better understand how consumers react to their packaging. This essay seeks to explore this matter. [34]

In order to maintain the highest quality of fruit upon harvest, proper monitoring of postharvest management during harvesting, shipping, and storage is necessary. This applies to both fresh and processed fruit. Farmers in Ethiopia are often compelled to discard their harvest in a little amount of time because of a rain-fed farming system, inadequate storage space, restricted transit options, and the potential for significant losses (Haidar and Demisse 1999; Tigist et al. 2011). Bananas are traditionally packaged using nested packaging, which uses dried banana leaves and teff straw; nevertheless, the usefulness of these materials has not yet been studied and documented. The coordinated process of getting things ready for delivery, distribution, storage, sale, and final usage is called packaging. Food product distribution and marketing require high-quality packaging. It is difficult to overstate. It is essential that packing and logistics receive enough attention given the emphasis on export promotion. To assist farmers in marketing their produce in a safe and economical way for both domestic and international markets, a thorough set of packaging criteria for fresh fruits and vegetables is necessary. In Asia, food packaging has long been done with banana leaves. For packaging and analysing the shelf life of banana, packaging plays an important role. There is few appropriate packaging for conserving the shelf life and better protection from contamination. The packaging product mainly used for banana packaging includes Brown paper bag- Because of its higher sulphur and lower lignin content, recycled the primary benefit of recycled brown paper is its exceptional durability due to its reduced lignin concentration and higher sulphur content. Compared to other materials used in most planes, this stronger type of paper is far more durable and piercing resistant. Many types of wood, including oak, bamboo, and pine, can be used to make brown paper.[14]

Jute bag-One vegetable fibre that can be spun into robust threads is jute. In addition to being the most extensively used natural fibre after cotton, jute is also among the least expensive. China, India, Bangladesh, and other hot, humid regions are home to the majority of the plants used to make jute. There are numerous benefits to using jute bags rather than plastic ones, such as Jute bag is robust. They emit extremely little carbon dioxide and uses a very small amount of water, thereby leaving virtually little environmental trace. They are also entirely compostable and biodegradable with greater strength quality. Because of their reusable properties, they are better for the environment. The PWL, peel colour, peel and pulp thickness, pulp to peel ratio, pulp stiffness, dry matter content of the pulp, decay loss, and marketability were all significantly (P ≤ 0.05) impacted by packaging, altered environment brought about by the polyethylene bags decreased rate of weight loss.[14]

When banana fruits were packed in polyethylene bags, there was a greater reduction in weight loss than when the fruit samples were packaged in low-density polyethylene bags. It was discovered that fruits without packaging lost far more weight than fruits enclosed in plastic films. It was discovered that the optimum method for increasing the shelf life and preserving the qualitative characteristics of banana fruits was to utilise HDPE and LDPE bag packaging. [14].
### Table 3. Diff. packaging & shelf life

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Packaging</th>
<th>Shelf-life (days)</th>
<th>References</th>
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<tr>
<td>2.</td>
<td>LDPE</td>
<td>10.25</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>HDPE</td>
<td>9.8</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Banana leaf</td>
<td>9.65</td>
<td>[33]</td>
</tr>
<tr>
<td>5.</td>
<td>Cardboard</td>
<td>9.45</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Newspaper</td>
<td>8.45</td>
<td></td>
</tr>
</tbody>
</table>

### 7. Storage and Transport

From the tropics, bananas are shipped across great distances to international markets. Fruit is harvested before it reaches maturity in order to maximise its shelf life. The fruit needs to be handled carefully, shipped in a refrigerated container, cooled, and transported quickly to ports. The intention is to stop the bananas from releasing ethylene, which is a natural ripening agent. This method permits a 3- to 4-week storage and transportation period at 13 °C (55 °F). After arriving, bananas are treated with a small amount of ethylene and kept at roughly 17 °C (63 °F). The fruit ripens over a few days and is then distributed for the ultimate sale. At home, ripe bananas keep well for several days. Bananas that are too green can be placed in a brown paper bag. Fresh bananas must be marketed correctly in order for the buyer to receive them in optimal condition. This includes using the ideal humidity and temperature levels as well as the right packaging and handling techniques. According to [18], careful treatment during harvesting can minimise mechanical damage and decrease waste later on from microbial attack. The most crucial physical postharvest management technique is handling and storing products at low temperatures [19]. Bananas are traditionally packaged using nested packaging, which uses dried banana leaves and teff straw; nevertheless, the usefulness of these materials has not yet been studied and documented. The process of putting a banana that is actively respiring inside a polymeric film package to change the amount of carbon dioxide and oxygen in the environment inside the package is known as modified atmosphere packaging (MAP) for fresh bananas. In order to affect the metabolism of the Depending on the object being packaged or the activity of organisms that decompose things, it is often best to create an environment with low oxygen content and/or high carbon dioxide content. This will increase the product's storability and/or shelf life. MAP significantly increases moisture retention in addition to altering the environment, which may have a bigger impact on maintaining quality. Additionally, packaging keeps the food separate from the outside world and contributes to maintaining circumstances that, if not sterile, at least lessen exposure to pollutants and pathogens, thus extending the produce's shelf life [20]. By using various locally available packaging materials and enhancing postharvest handling practices, it is possible to minimise the loss of bananas. Thus, the purpose of this study was to determine how well-suited various packing materials were for increasing the shelf life of bananas. Evaluating the impact of packaging materials on the physical quality of three different banana cultivars was the study's specific goal. UV light is mainly restricted to surface applications due to its weak penetrating characteristics, but it has potential as a post-packaging treatment. A UV-irradiated beef steak, for instance, has a longer shelf life of 12 to 28 days when enclosed in PE pouches with a modified environment that is maintained at 1 °C with 70% O2, 20% CO2, and 10% N2. (Djenane, Sanchez-Escalante, Beltran, & Roncales, 2001). UV radiation is frequently paired with ozone treatment, which is used to sterilise packages used in aseptic processing. Ozone primarily interacts with polymer surfaces, causing breakdown of the polymer chains and the creation of functional groups containing oxygen, which alters surface characteristics such as polarity and surface tension. Bananas is commercially treated after harvest by immersing them in solutions containing benomyl, thiabendazole (TBZ), or imazalil. For over 20 years, these fungicides have been utilised to manage post-harvest diseases. The pathogens have become resistant to these fungicides, human health, and the environment as a result of this extensive usage. Benomyl has been categorised by the US Environmental Protection Agency as potentially human consumption. [21]

### 8. Marketing

Horticultural produce development is mostly dependent on marketing. A major worry is the lack of appropriate marketing strategies, organisational structures, and processing plants, which otherwise
have a great chance of producing indigenous goods to the point of self-sufficiency a deterrent to the nearby farmers. Having an effective marketing strategy is essential to ensuring that farmers receive fair prices. It is evident from the current situation that the producers are not giving the many aspects of marketing enough thought. Typically, the producers work on production for the full year and part of it resulting in a small share of the price that consumers pay for the fruit to the pre-harvest contractors. In the market yards, bananas are sold to wholesalers and pre-harvest contractors. Alternatively, the food is shipped straight to various cities [22].

9. Conclusion

The delicate texture and high moisture content of banana, banana fruits are particularly to mechanical injury. If the tissue is treated in an adverse environment, it will become softer and more prone to bruising, which will accelerate the demise of microorganisms. Problems with quality and safety assurance, including improper temperature control, inconsistent quality within containers, market sanitation, transportation-related issues, and negligent handling during loading and unloading, were found to be the primary causes of fungal pathogen development and the resulting losses of banana fruit in the study area. Similar tendencies were observed in the disease intensity when comparing the percentage of fruit damaged with higher damage, and infections were noted in stores. In retailers' shops, fruit damage percentages reached 56.2%, while the corresponding disease incidence and severity were 54.2% and 34%, respectively. Fungal diseases that have been discovered may have their origins in hygienic issues in the market and mechanical damage brought on by improper handling throughout supply chains. A close integration of all stakeholders along the banana fruit value chain becomes important to avoid mechanical injury and concomitant microbiological deterioration. Packaging is a crucial step in the lengthy and intricate process that connects the producer to the consumer. Pallet containers, bulk boxes, crates, cartons, baskets, hampers, and bags are useful containers for handling, marketing, and moving fresh produce. Plastics are now widely used as effective packaging materials. In addition to being economical, they shield the fruits from dampness, microbial illness, and weight loss while also regulating the amount of ethylene in the container. When it comes to packaging, smart materials must be affordable in comparison to the product's value, consistent, accurate, repeatable within their operating range, safe for food contact, and kind to the environment. Building brand recognition for the company and its brand depends heavily on the packaging. A well-designed package can help the business reach its objectives. In a market where competition is fierce, a company's brand position can be strengthened by effective packaging. A corporation should concentrate on and survey these six components (colour, materials, form, and size, graphic, and handy) if it wants to draw customers' attention to its packaging.

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Conflict of Interest

The authors declared no conflict of interest.

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