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Packaging Material of Horticultural Produce to Keep Fresh and Safe During All Conditions

Gondane S.G.[1]* and Thorat A.R.[2]
[1] Assistant Professor, CSMSS, College of Agriculture, Kanchanwadi, Aurangabad (M.S.)
[2]Ph.D. Research Scholar, Mahatma Phule Krushi Vidyapith, Rahuri, (M.S.)
Corresponding Author*: gondanesanjivani5@gmail.com

SUMMARY

Packaging of horticultural produce proving fresh and attractive products. Maintaining temperature, gas mix and moisture in the packaging are important elements to create an efficient extension of the shelf life of horticultural produce. Containment is the most basic function of a package. Packaging provides protection of food from adulteration by water, gases, and microorganisms. An exciting innovation in active packaging is the potential for the controlled release of antimicrobials from packaging materials. Antimicrobials incorporation in packaging materials could extend shelf life by preventing spoilage and bacterial growth. Active packaging material provide interactive controls between the food, package and packaging atmosphere to achieve and retain optimal atmospheric conditions inside packages. Various active packaging technologies have been developed and are commercially available for a range of horticultural products including fruits, vegetables and flowers.

INTRODUCTION

Fresh horticultural produce has limited shelf life ranging from just few hours to few weeks at ambient storage conditions. Fresh-cut fruits and vegetables are produce that are minimally processed and altered by peeling, slicing, or chopping with or without washing. Packaging does more than simply provide a barrier to outside influences. It can control, and even react to, events taking place inside the package. Active packaging performs traditional functions of packaging such as providing barriers to moisture vapor and gases, preventing product contamination from outside, and making food handling and identification easy (Ahvenainen, 1996; Ozdemir and Floros, 2004)

Different types of packages and packaging materials for packaging fresh products

Natural Materials

Baskets and other traditional containers made from bamboo, rattan, straw, palm leaves, etc are used throughout the developing world. Both raw materials and labour costs are normally low and if the containers are well made they can be reused.

From Wood

a) Pallets

Pallets can deliver fresh produce to consumer. Standard size pallets occupy truck & van space. Holds heavier loads & more stress. Single pallet carries 20 -100 individual packages. Standard pallet size: 48 x 40”

b) Pallet beans

Wooden pallet bins are used to move produce from field to pack house.More efficient double-wide pallet bins (48 in. x 80 in.).

c) Wire bound crates

Used for snap beans, sweet corn & other commodities that requires hydro cooling. These having sturdy, rigid & very high stacking strength. Open space for cooling & ventilation. Re-used, dissembled after use & shipped back to packer.

d) Wooden crates and lugs

Used for apples, stone fruit, & potatoes. Due to tare weight & advanced material available ituse reduced.

e) Wooden baskets and hampers:

Wire-reinforced wood veneer baskets & hampers of diff. sizes – strawberries, sweet potatoes. These baskets and hampers are durable and reusable and used by local growers only.

Corrugated Fiber Board

Containers are made from solid or corrugated card board. Made from 3 or more layers of paperboard. Completely recyclable that makes it eco-friendly. CFB are used for mango, citrus, tomato, cucumber, ginger cabbage, melons, potatoes, pumpkins transport. For heavy items CFB are less suitable. Due to pressure or on stacking CFB may get deformed. Cold temp & high RH reduces its strength.

Paper and Mesh Bags

Consumer packs of potatoes & onions are packed in paper bags. For garlic, cabbage, citrus & sweet corn sturdy mesh bag used widely, because of its low cost, good ventilation. Large bags do not palletize well, small bags do not efficiently fill space inside CFB and less protection against rough handling are some limitations.

Pulp Containers

Made from recycled paper pulp & starch binder. Small consumer packages of fresh produce.Available in variety of shapes & sizes. Inexpensive in standard sizes. They absorb surfacemoisture from small fruits & berries. Pulp containers are biodegradable & recyclable.

Plastic Bags

Plastic bags (polyethylene film) used for fruits & vegetables consumer packaging. Very low cost, automated bagging machines further reduce packing cost. Film bags are clear and easy to inspect inside product. Film material maintains correct mix of O_2, CO_2 & water vapour inside the bag. Shelf life of fresh produce is considerably extended. Plastic bags are Printable with graphics. Available in wide range of thicknesses & grades.

Shrink Wrap

Individual seal packaging involves the use of heat shrinkable film (usually HDPE) that is wrapped around the individual unit of fruits and vegetables. It is used to packed Cabbage, broccoli, potatoes, sweet potatoes, apples, onion, sweet corn, cucumbers, tropical fruits. Provide a good surface for stick-on labels,

Rigid Plastic Packages

Clamshells: Packages having top & bottom are formed from one / two pieces of plastic. Made from molded polystyrene. Gaining popularity due to inexpensive, versatile, provide excellent protection to produce and pleasing consumer package. Used for high value produce viz., small fruit, berries, mushrooms, etc., or items that easily damaged by crushing. Also used for precut produce & prepared salads. Packaging material companies are developing starch-basedpolyethylene substitutes which degrades in 20 years or less.

Plastic Field Boxes

Made of polyvinyl chloride or polyethylene. Durables & can last for many years and can nest inside each other when empty.

Vacuum Packaging

In vacuum packaging, the product to be packed is put in a vacuum bag that is then evacuated in a vacuum chamber and then sealed hermetically in order to provide a total barrier against air and moisture. Prevents corrosion, oxidation, moisture, drying out, dirt, attraction of dust by electric charge, ultra violet rays & mechanical damages, fungus growth or perishability etc. Useful for tropical countries with high atmospheric humidity.

Edible Packaging

Edible film or coating is simply defined as a thin continuous layer of edible material formed on, placed on, or between the foods or food components. Package the integral part of the food, which can be eaten as a part of the whole food product. Selection of material act as barrier to moisture & gases, mechanical strength, physical properties, & resistance to microbial growth. Edible packaging are lipids, proteins & polysaccharides or a combination of any two or all of these.

Active Packaging

Packaging is termed as active when it performs some desired role other than to provide an inert barrier to the external environment. The goal of developing such packaging is to create a more ideal match of the properties of the package to the requirements of the food. Active packaging can be created by using oxygen scavengers, carbon dioxide absorbent/ emitters, ethanol absorbent/ emitters, appropriate absorbents material is placed along side the fresh produce.active modification technique is the use of CO_2 or ethyl absorbers (scavengers) within the package to prevent the build-up of the particular gas within the package. Compounds like hydrated lime, activated charcoal, magnesium oxide are known to absorb carbon dioxide while iron powder is known to absorb carbon dioxide. Potassium permanganate & phenyl methyl silicon is used to absorb ethylene within the packages.

Controlled Atmosphere Packaging

This refers to a storage atmosphere that is different from the normal atmosphere in it composition, wherein the component gases are precisely adjusted to specific concentration and maintained throughout the storage and distribution of the perishable foods. This CAP is the enclosure of food in a gas impermeable package inside which the gaseous environment with respect to CO_2, O_2, N_2, water vapour and a trace of gases has been changed and is been selectively controlled to increase shelf life. O_2 scavengers and ethylene absorbers with CO_2 release agents could be classified as CAP during the early stages of storage life of packaged product. If the composition of atm. in CA system is not closely controlled or if the storage atm. is accidentally modified, potential benefit can turn into actual disaster.

Modified Atmosphere Packaging

Modified atmospheric conditions are created inside the packages by the commodity itself and/or by active modification. MAP is a enclosure of food in package in which the atmosphere inside the package is modified so that the composition is other than that of air. Modification can be achieved by removing air and replacing it with a controlled mixture of gases. Nitrogen is used frequently in MAP to reduce the concentration of other gases in the package.Method for extending shelf-life of perishable & semi-perishable food products by altering relative proportions of atmospheric gases that surround the produce.Commodity generated or passive MA is evolved as a consequence of the commodity's respiration. MA containing between 2-5% O_2& 3.8% CO_2 have been shown to extend the shelf life of a wide variety of fruits & vegetables. Few types of films are routinely used for MAP, the important ones are polyvinyl chloride, (PVC), polystyrene, (PS), polyethylene (PE) and polypropylene (PP).

CONCLUSION

Packaging is an emerging area in the field of post-harvest handling of fresh horticultural produce to not only for product preservation and protection but also for safe transportation of products during storage and handling. Packaging requires to contain foods, protect foods from the environmental factors, for convenience in handling, storage and marketing, and to communicate information to consumers about the food inside the package. Packaging material provides protection of produce from water, gases, microbes, dust, and punctures, and other foreign infections. Packaging and packaging material also allows for consumers to enjoy food the way they want, at their convenience with ease.

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