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A Review Study on Technologies to Prolong the Shelf Life of Fresh Tropical Fruits

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ABSTRACT: Southeast Asia, a typical tropical area, is a major exporter of a broad range of fruits throughout the globe. Fresh fruit sales have been steadily increasing, providing an opportunity for Southeast Asian nations to boost their national revenue. Tropical fruit exports, on the other hand, have constraints such as a short shelf life and difficulties preserving quality due to tropical climatic conditions and Southeast Asia's lack of established postharvest technology. One of the primary aims of postharvest technology research is to extend the shelf life of fresh fruits despite retaining its quality. As a consequence, it's crucial to figure out what factors impact fruit shelf life. The fundamental qualities of tropical fruits, external factors, postharvest treatments, as well as microbial contamination all have an impact on their shelf life. Southeast Asian countries have lately granted funds to agricultural research organizations in order to create novel postharvest technologies, minimize postharvest losses, and maintain exports quality of the fruit in order to enhance total sales of tropical fruit plantations. This research looks at how postharvest technology for tropical fruits has evolved in Southeast Asian countries, as well as how the key factors for extending the shelf life of tropical fruits might well be found.

KEYWORDS: Fruit Quality, Postharvest Technology, Shelf Life, Southeast Asia, Tropical Fruit.

1. INTRODUCTION

Fresh fruit provides opportunities for Southeast Asian countries to diversify their products, eliminate poverty, as well as enhance rural regions. Fresh fruits include several key nutrients (vitamins, carbs, organic acids, fibers, antioxidants, as well as minerals). The worldwide commerce in tropical fruits is increasing as people become more aware of the health advantages of eating fresh fruits. Between 1995 and 2004, the global consumption of tropical fruits grew by about 40%. (FAO, 2004). Tropical natural product creation must be extended universally as the total populace develops. In 2050, the total populace is supposed to contact nine billion individuals. Accordingly, to take care of the world's rising populace, the current degree of food creation needs be raised by 70%. (FAO, 2009). Southeast Asian countries like Indonesia, the Philippines, and Thailand are huge tropical organic product cultivators, representing 66% (178 million tons) of world organic product yield in 2004[1], [2].

Postharvest losses, which can lead to lower fruit output but also quality deterioration, are indeed an obstacle to international tropical fruit trade in Southeast Asia [3]. Tropical fruits have such a limited shelf life, which accounts for the majority of losses of postharvest. Furthermore, the Southeast Asian region's hot and humid environment hastens the losses [4]. Fresh fruit postharvest loss is 2445 percent in poor nations and 220 percent in affluent ones, respectively. Undeveloped postharvest technologies provide a significant problem in poor nations when it comes to accumulative the fruit’s shelf life [5]. Such losses or suffers have a number of negative consequences for tropical fruit farm sales, national revenue, consumer pricing, and the nutritional quality of the fruits[6]–[9]. It's critical to keep the freshness of fresh fruits once they've been harvested. A commonsense way to deal with limit postharvest misfortunes and protect the nature of new tropical organic products is to utilize reasonable postharvest innovation.

The essential objective of postharvest innovation is to keep the nature of the item from breaking down and to expand the time span of usability of the yields [10]. Expanding food accessibility

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without expanding crop yield is conceivable through lessening postharvest misfortunes by broadening timeframe of realistic usability [11]. Decreased postharvest misfortunes ought to be viewed as an essential need, especially in Southeast Asia [12]. The difficulties that Southeast Asian nations confront in international tropical fruit commerce are addressed in this study. Also, the need of deciding crucial causes and potential postharvest innovations for drawing out the time span of usability of tropical organic products has been accentuated [13]–[18].

1.1. Southeast Asia's Fruit Trade with the Rest of the World:

Despite having abundant natural resources, Southeast Asian nations remain impoverished. The effect of the tropical environment on fresh fruit production, postharvest losses, and inadequate postharvest technology are the primary causes of poverty [19]. Asia is the world's largest producer of tropical fruits, accounting for more than half of all fresh fruit output worldwide. (UNIDO, 2014). Tropical and subtropical environments with 75-85 percent relative moistness (RH) as well as typical temperatures of 25–35°C allow a wide range of fruits and vegetables to thrive in Southeast Asia [20]. Fruit production in Southeast Asia is hampered by significant postharvest losses (45 percent).

As far as land utilization, development, work creation, unfamiliar money receipts, capital arrangement, and the stock of made items for the market, the horticultural area has made critical commitments to Southeast Asian economies [21]. Agribusiness utilizes around 40-75 percent of the whole work force, while around 65-80 percent of the populace lives in country locales (Bautista, 2002). In 2002, the agribusiness business contributed around 18% to the (GDP) of Southeast Asian countries. Clients' interest for new natural products has become both locally and internationally because of expanding information on a sound way of life and solid wholesome advantages (Huang, 2004) [22]. Development in the agribusiness area of economical and fair exchange of new natural products is additionally a potential for Southeast Asian countries to support GDP.

Major tropical natural products (mango, papaya, pineapple, and banana) as well as less tropical natural products (lychee, durian, rambutan, guava, and zest organic products) have been shipped from Southeast Asian countries to the rest of the world quite a long time. There are infallible essentials in some Southeast Asian countries. The Philippines, Indonesia, Thailand and Vietnam are among Southeast Asian countries that address the issue of tropical organic products. Asia provides the bulk of the world's total natural product manufacturing (UNIDO, 2014). Given the lack of price guidelines for new natural products in bringing countries, the essential market in Southeast Asian regions such as Singapore, Hong Kong, Taiwan and Japan still has a small share in the United States, Canada and Europe.

To protect its residents, the European Union, Japan, and the United States have severe quality principles for bringing in organic products. New tropical natural product exporters experience troubles since quality and food handling are ordered by government regulations in global business sectors (e.g., severe guidelines on the utilization of agrochemicals and their most extreme lingering levels) (UNCTAD). Thus, how much natural products sent out from Asia falls behind that of other significant natural product creating regions, for example, Central America, which represents 33% of world commodities, and South America, which represents 37% of worldwide products (ESCAP).

There are some issues to be addressed in Southeast Asia to help with new tropical natural product manufacturing and commodity volumes. In recent years, much of Southeast Asia has made significant progress in the improvement of post-harvest activities. Southeast Asian countries should, again, proceed with the decline in post-harvest misfortunes. Most Southeast Asian countries have one of the lowest rural exploration power ratios on the planet, which affects agricultural outcome values and hinders the improvement of agricultural innovation.

New soil products in Southeast Asian regions experienced 42% post-harvest losses. The short time frame of the realistic utility of tropical natural products, as well as the misfortunes during each progression, such as assembling, harvesting and dispersal, are essential drivers. Absence of capacity, handling and market structure can lead to a high level of waste (100 per cent of the completed result). Incorrect pressing or care, lack of cold storage in warm and moist areas, and irregularities that result in overabundance, all add to post-harvest losses. Domestic distribution and export of horticultural products continue to be severely hampered by major infrastructure restrictions.

Agricultural techniques in nearly all Southeast Asian nations are still based on traditional ways, while a few small-scale farms with inadequate postharvest expertise employ a combination of traditional and contemporary methods. Since Southeast Asian countries require storerooms for tropical organic produce, neighborhood markets abound to collect tropical natural products, and the harvest is sold at very nominal rates. Successful destruction in the development of tropical natural products in Southeast Asian countries requires correspondence and division of thought between farmers, postharvest engineers, food technologists and public authority. With the further development of innovations suitable for post-harvest strategies, post-harvest misfortunes can be reduced and usability extended.

In Southeast Asian countries, a postharvest innovation research method should be created to harness post-harvest progress on homesteads with limited scope and increase understanding of post-harvest across the board. The created countries have intensive and efficient postharvest techniques to stretch realistic utility deadlines, as well as directed ranchers and highly developed market chain frameworks. In order to make up for the lost time for industrialized countries, Southeast Asian states should try and contribute assets for post-harvest upgradation taking into account the circumstances. As a result, with the assistance of contemporary methods and sophisticated research, postharvest losses may be reduced.

1.2.Factors Affecting Tropical Fresh Fruits' Shelf Life:

Fruits have a limited shelf life, which is an inherent disadvantage of the distribution system. Exporting perishable agricultural or tropical goods requires a significant amount of transit time. The exceptional properties of new natural products as well as the level of external conditions, microbiological impurities, physical ailments, mechanical damage, and post-harvest treatments, all add to their short time frame of realistic utility. The time frame for the realistic usefulness of a commodity not entirely set in stone by a variety of factors. Despite the fact that it is difficult to pinpoint each one of the factors affecting the time period of natural products' usefulness, it is hypothetically conceivable to limit the effect of each part on the time frame of realistic utility.

1.3.Contamination by Microbes and Illness:

Insects, rodents, growth and microorganisms can all add to the biodegradation. In unfortunate countries, organic decay and disease are the main sources of post-harvest misfortune. Supplements, such as natural substrates, and high water function are two basic requirements for the growth of organisms, and natural products are excellent substrates for microorganisms. Microorganisms effectively contaminate and spread through new food due to an unfortunate protective structure in tissues and an excess of supplementation and moisture. Impurity affects

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the content. Since most parasites develop best at temperatures anywhere in the range of 25 °C and 30 °C, growth is restricted at temperatures above 40 °C, and bacterial death is conceivable.

Since the ideal temperature for microbial impurity is the normal temperature in tropical regions, microorganisms can immediately stain new natural products in the tropics. Mango is a climax biological product with a shelf life of more than ten days if the parasite does not attack it. The two most serious parasitic diseases of tropical and subtropical natural products such as mango, banana, papaya, and avocado are fine mold and anthracnose which are common in humid regions. In fact, even in industrialized countries, contamination causes about 20% to 25% of food grown from the ground to decay during post-harvest handling. Physiological and capacity conditions, especially in the post-harvest phase in tropical regions, accelerate the improvement of previously recorded diseases.

1.4.Methods of handling:

Fresh fruits and vegetables suffer from bruising, shattering, wounding, and other types of damage as a result of poor handling, inappropriate packaging, and incorrect packing during transit. In Southeast Asian nations, simple procedures for harvesting, transporting, and packing tropical fruits expose the crops to mechanical harm. Handling techniques may affect the content and quality of fruits by determining the degree of diversity in maturity and physical damage. In Southeast Asia, new innovations are being made to extend the time frame of realistic utility of tropical organic products [23]. Assurance of ideal collection growth, minimizing mechanical wounds, use of valid postharvest treatments, and use of ideal temperature and relative humidity during all market phases are essential variables to maintain and extend utility quality and time span of natural products [24]. In Southeast Asia, post-harvest advances are expected to be used to support manufacturing and quality. Such advances may delay the usefulness of natural products, allowing excellent food to be shipped far away. Many post-harvest advances, including cooling chains, pressing, controlled air (CA), heated medications, and coverings, have recently been made in the right commercial setting or horticultural exploration laboratories [25]. Usability, fruit qualities, and environmental variables should all be considered when using postharvest technology.

1.5.Treatment with heat:

Thermal treatment is a very easy technique for controlling food quality degradation. Tropical and subtropical natural products are much of the time treated with heat somewhere in the range of 30°C and 50°C for 10 minutes to 24 hours, and it is powerful against a wide scope of bugs and organism (Department Agriculture of Malaysia). Boiling water treatment, then again, is limited to a little scope of temperatures and time stretches, with the qualities being unequivocally reliant upon the ware. Organic products' wholesome quality and tangible characteristics are impacted by high temperatures. To stay away from quality misfortune, the ideal blend of fitting temperature and openness term ought to be laid out. Sped up organic product maturing, expanded weight reduction, decreased organic product hardness, and an expansion in the brix of organic products are completely brought about by erroneous temperature and plunging time settings during heat treatment.

1.6.Packaging innovations:

New tropical natural products such as avocados, mangoes, and oranges are often pressed into plastic boxes, plastic packs, or the layered paper that limits Thailand. They are not difficult to deal with at all through appropriation and promotion on the grounds that they protect natural products from microbiological disease and transport damage, as well as minimize the effects of forgiving care. Natural products are regularly shipped in unpacked condition. Understanding the physiological features of fresh produce that have a major effect on shelf life is required for the development of packaging that is suitable for handling fresh food.

1.7.Controlled environment:

The ideal blend of gases for dragging out the timeframe of realistic usability of natural products inside the directed degrees of CO_2, O_2, N_2, and ethylene during capacity is alluded to as controlled environment (CA) treatment. The composition of the gases varies according to the kind of tropical fruit. High CO_2 concentration and low O_2 content are important variables in prolonging shelf life. Various methods including low-temperature storage and light treatment are expected to extend the upside of Ca by preventing collapse and broadening the time frame of the actual utility of natural products. It is possible to utilize both MAP and CA packaging at the same time. CA offers an optimal environment of O_2 and CO_2 around packed food, while MAP produces a constant atmosphere of O_2 as well as CO_2 around the fruit.

2. DISCUSSION

The current emphasis on post-harvest remediation is to limit the use of synthetic substances over a period of time to treat ecosystems that are harmless, so that new biological products of usability. Microbial poisons and pesticide deposits must disappear from organic products. Buyers are becoming more aware of the well-being and health benefits of food sources, and there is a developing pattern among them to disregard artificially treated dinners. Illumination is the most common method of introducing food for controlled measurement of ionizing radiation. It is currently used to clean new organic produce in north of 40 countries around the world. Light can help monitor the spread of bugs, reduce the amount of destructive or waste microorganisms, and dial back or stop normal natural cycles, including maturation, germination, and growing in new food sources. Illumination, as with other safety methods, combines superb food hygiene, behavior and planning principles as opposed to separation.

As radiation sources, high-energy electron bars such as UV, gamma and infrared are used. UV-C treatment with a frequency of 190 to 280 nm is effective in suppressing microbial advancement on the outer layer of new food, and is used in specific organic produce post-harvest. In green produce including onions, yams, apples, peaches, citrus natural products, peppers, tomatoes, carrots, and strawberries, a simple dose of UV-C light causes post-harvest dilution. The use of gamma light to broaden the time frame of realistic utility is an issue with illumination innovation. Excessive relaxation of tissue occurs with high doses. An unobtrusive dose of gamma illumination extends the time frame of realistic utility while bringing down ascorbic corrosive levels. Biological product items must have the option to tolerate the dose of illumination required for infectious prevention. The ideal illumination measurement for different natural products fluctuates depending on the object, and some natural products are shockingly safe.

3. CONCLUSION

Post-harvest innovations are needed to extend the time frame of realistic utility of new natural products to increase trade to Southeast Asian countries. With a longer time frame of realistic utility, worldwide tropical natural product exchange could be expanded to Southeast Asia, allowing public wage growth and thriving. New post-harvest innovations are currently being created in Southeast Asian countries with rich common assets. The fundamental goal of Post-Harvest Advances is to prevent product quality disruption along the post-harvest range and to guarantee the greatest quality incentive for tropical new organic products. The efforts of

Southeast Asian countries through postharvest advances such as cooling chains, bundling, hot treatments, and coverings have yet to expand into tropical natural product efficiency. In addition, this multitude of drugs cannot be applied to tropical natural products due to the messy characteristics of tropical organic products. Table 6 shows which post-harvest innovations were retained for the different tropical organic products. Table 7 summarizes the progress of the development status, status, and time period of usable innovation for each organic product in Southeast Asia. Recent concerns in post-harvest advances have centered on eco-adjusting treatments to reduce substance use in broadening the time frame for realistic utility of new natural products. In light of the fact that each treatment has its own intrinsic disadvantages, mixed drugs are more compelling than single drugs. Thus, compound medicines have an incredible potential to produce the best results to broaden the time frame of actual usefulness of biological products.

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