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Chapter 1 : Postharvest - Wikipedia

Postharvest Technology of Horticultural Crops Short Course June & , at the UC Davis Activities and Recreation Center (ARC) This course covers the biology and current technologies used for handling fruits, nuts, vegetables and ornamentals in California and is designed for research and extension workers, quality control personnel, and business, government or academic.

Post harvest technology is inter-disciplinary topic applied to agricultural produce after harvest for its protection, conservation, processing, packaging, distribution, marketing, and utilization to meet the food and nutritional requirements of the people in relation to their needs. It has to develop in consonance with the needs of each society to stimulate agricultural production ; prevent post-harvest losses, improve nutrition and add value to the products. In this process, it must be able to generate employment, reduce poverty and stimulate growth of other related economic sectors. The process of developing of post harvest technology and its purposeful use needs an inter-disciplinary and multi-dimensional approach, which must include, scientific creativity, technological innovations, commercial entrepreneurship and institutions capable of inter-disciplinary research and development all of which must respond in an integrated manner to the developmental needs. This can be achieved through the support of Open Access Journals , Editorial team, more scientific societies 21 Days rapid review process with valuable 3. The OMICS International event participants are typically high-level decision makers representing various parts of the industry and many participants are repeaters who know each other. Conferences and Symposiums of OMICS International enlightens your research path by gathering scientific professionals from across the globe to discuss the recent scientific discoveries done followed by the interactive sessions through B2B meetings and scientific partnering. The importance and significance of OMICS International Conferences can be gauged by the fact that it has made huge advancements over the course of time and is continuing to influence various sectors. Importance of Post-harvest technology lies in the fact that it has capability to meet food requirement of growing population by eliminating avoidable losses making more nutritive food items from low grade raw commodity by proper processing and fortification, diverting portion of food material being fed to cattle by way of processing and fortifying low grade food and organic wastes and by-products into nutritive animal feed. Post harvest technology has potential to create rural industries. This process has resulted in capital drain from rural to urban areas, decreased employment opportunities in the rural areas, balance of trade in favor of urban sector and mismatched growth in economy and standard of living including the gap between rural and urban people. It is possible to evolve appropriate technologies, which can establish agricultural based rural industries. The purpose of post harvest processing is to maintain or enhance quality of the products and make it readily marketable. Prime example of post harvest processing of agricultural products is rice, a major crop in India. Paddy is harvested and processed into rice. Due to old and outdated method of paddy milling, improper and inefficient methods of storage of paddy, rice, transport and handling we lose about nine percent of production. The traditional methods of storage are responsible for about six percent losses. It is estimated that percent of horticultural crop such as vegetables and fruits perish due to lack of proper methods of processing and storing. Proper methods of processing, storage, packaging, transport and marketing are required for export of crops such as jute, tea, cashew nuts, tobacco, mango, litchi, nut, spices and condiments. One of the attributes to this post harvest system , as it is now constituted, is the large amount of wastage it involves. Losses of food crops refer to many different kinds of loss produced by a variety of factors. These include weight loss, loss of food values, loss of economic value, loss of quality or acceptability and actual loss of seeds themselves. The priority areas in food processing are, 1. Processing of special fruits and nuts like, banana, litchi, mango, pineapple, makhana etc. Large scale introduction of mini rice mill in villages and mandies coupled with semi-modern parboiling plant for paddy to have higher head rice recovery with better quality bran. Oil production from bran with a chain of collection mechanism for supplying raw material for the plant. More emphasis on the use of power ghani or expeller in place of Kolhu for higher recovery. Establishment of dal mills in pulse growing belt as a village cooperative program. Emphasis on cottage industry involving village women for the manufacture of food products. Popularization of low cost engineering storage structures. Starch production from maize and potato and simultaneous oil production from maize. Strengthening of research base with adequate financial support. Emphasis on production of value added products from locally available fruits and vegetables. The post harvest industry includes the following main components 1. Harvesting and threshing 3. Utilization by consumer including home processing Other allied components of the system include:

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Chapter 2 : Postharvest Technology | Tools for Applied Food Science | theinnatdunvilla.com

Optimizing Yields by Utilizing Food Technology. Controlling the post harvest process starts with at the farm. Choosing the best food technology for farming and using superior cultivators that have a long post harvest life can minimize spoilage.

Milyanfan , Kyrgyzstan The most important goals of post-harvest handling are keeping the product cool, to avoid moisture loss and slow down undesirable chemical changes, and avoiding physical damage such as bruising , to delay spoilage. After the field, post-harvest processing is usually continued in a packing house. This can be a simple shed, providing shade and running water, or a large-scale, sophisticated, mechanised facility, with conveyor belts , automated sorting and packing stations, walk-in coolers and the like. In mechanised harvesting, processing may also begin as part of the actual harvest process, with initial cleaning and sorting performed by the harvesting machinery. Initial post-harvest storage conditions are critical to maintaining quality. Each crop has an optimum range of storage temperature and humidity. Also, certain crops cannot be effectively stored together, as unwanted chemical interactions can result. Various methods of high-speed cooling, and sophisticated refrigerated and atmosphere-controlled environments, are employed to prolong freshness, particularly in large-scale operations. Regardless of the scale of harvest, from domestic garden to industrialised farm, the basic principles of post-harvest handling for most crops are the same: Postharvest shelf life[edit] Once harvested, vegetables and fruits are subject to the active process of senescence. Numerous biochemical processes continuously change the original composition of the crop until it becomes unmarketable. The period during which consumption is considered acceptable is defined as the time of "postharvest shelf life". Postharvest shelf life is typically determined by objective methods that determine the overall appearance, taste, flavour, and texture of the commodity. These methods usually include a combination of sensorial , biochemical , mechanical, and colorimetric optical measurements. A recent study attempted and failed to discover a biochemical marker and fingerprint methods as indices for freshness. The Process of developing of post harvest technology and its purposeful use need on inter disciplinary and most multidimensional approach which must include scientific creativity, technology innovation and institutional capable of interdisciplinary research. Postharvest physiology[edit] Postharvest physiology is the scientific study of the physiology of living plant tissues after they have denied further nutrition by picking. It has direct applications to postharvest handling in establishing the storage and transport conditions that best prolong shelf life. An example of the importance of the field to postharvest handling is the discovery that ripening of fruit can be delayed, and thus their storage prolonged, by preventing fruit tissue respiration. This insight allowed scientists to bring to bear their knowledge of the fundamental principles and mechanisms of respiration, leading to postharvest storage techniques such as cold storage, gaseous storage, and waxy skin coatings. Another well-known example is the finding that ripening may be brought on by treatment with ethylene.

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Chapter 3 : Institute of Post Harvest Technology Sri Lanka

In agriculture, postharvest handling is the stage of crop production immediately following harvest, including cooling, cleaning, sorting and theinnatdunvilla.com instant a crop is removed from the ground, or separated from its parent plant, it begins to deteriorate.

Appropriate production practices, careful harvesting and proper packaging, storage and transport all contribute to the good produce quality. Once a crop is harvested, it is impossible to improve its quality. The horticultural crops, because of their high moisture content are inherently more liable to deteriorate especially under tropical conditions. Moreover, they are biologically active and carry out transpiration, respiration, ripening and other biochemical activities, which deteriorate the quality of the produce. Proper post-harvest Processing and handling is an important part of modern agricultural production. Post-harvest processes include the integrated functions of harvesting, cleaning, grading, cooling, storing, packaging, transporting and marketing. The technology of post-harvest handling bridges the gap between the producer and the consumer â€” a gap often of time and distance. Post-harvest handling involves the practical application of engineering principles and knowledge of fruit vegetable physiology to solve problems. Utilizing improved post-harvest practices often results in reduced food losses, improved overall quality and food safety, and higher profits for growers and marketers. It is estimated that 9 to 16 percent of the product is lost due to post-harvest problems during shipment and handling. Mechanical injury is a major cause of losses. Many of these injuries cannot be seen at the time that the product is packed and shipped, such as internal bruising in tomatoes. Other sources of loss include over-ripening, senescence, the growth of pathogens and the development of latent mechanical injuries. Losses during post harvest operations due to improper storage and handling are enormous and can range from percent. Post harvest losses can occur in the field, in packing areas, in storage, during transportation and in the wholesale and retail market. Severe losses occur because of poor facilities, lack of know-how, poor management, market dysfunction or simply the carelessness of farmers. Proper storage conditions, temperature and humidity are needed to lengthen the storage life and maintain quality once the crop has been cooled to the optimum storage temperature. Both quantitative and qualitative food losses of extremely variable magnitude occur at all stages in the post-harvest system from harvesting, through handling, storage, processing and marketing to final delivery to the consumer. Although the subject of food losses had been on the agenda of many meetings, it was not until the world food conference and the 7th special session of the UN general assembly that special attention was given to it. In response, the FAO conference approved the establishment of a special action program for the prevention of food losses. Initially, this program focused on staple food grains but, since , at the request of the FAO conference, additional attention has been given to perishable food commodities; roots. Estimates of the post-harvest losses of food grains in the developing world from mishandling , spoilage and pest infestation are put at 25 percent; this means that one-quarter of what is produced never reaches the consumer for whom it was grown, and the effort and money required to produce it are lost- forever. Fruit, vegetables and root crops are much less hardy and are mostly quickly perishable. And if care is not taken in their harvesting, handling and transport, they will soon decay and become unfit for human consumption. Losses of sweet potatoes, plantain, tomatoes, bananas and citrus fruit are sometimes as high 50 percent or half of what is grown. Reduction in this wastage, particularly if it can economically be avoided, would be of great significance to growers and consumers alike. Losses occur in all operations from harvesting through handling, storage, processing and marketing. They vary according to the influence of factors such as the perish-ability of the commodity; ambient temperature and relative humidity which determine the natural course of decay; fungal and bacterial decay; damage by pests-insects, rodents and birds; the length of time between harvesting and consumption; and practices of post-harvest handling, storage and processing. Some of them are: Growing plants need a continuous water supply for both photosynthesis and transpiration. Bad effect may be caused by: Too much rain or irrigation, which can lead to brittle and easily damage leafy vegetables and to increased tendency to decay. Lack of rain or irrigation, which can lead to low juice content and thick skin in citrus fruits. Dry condition followed by rain or irrigation, which can give rise to growth cracks or secondary growth in potatoes or to growth cracks in tomatoes. On the other hand, too much fertilizer can harm the development and postharvest condition of produce. Some of the effects are: Lack of nitrogen can lead to stunted growth or the yellow-red discoloration of leaves in green vegetables such as cabbage. Lack of potassium can bring about poor fruit development and abnormal ripening. Calcium â€" moisture imbalance can cause blossom end rot in tomatoes and bitter pit in apples. Boron deficiency can lead to hollow stem in cabbage and cauliflower and the cracking of outer skin in beets. These are some of the common soil nutrition problems that can be readily identified at harvest. The problem of fertilization balance in soil and its effect on crops is complex and depends also on other conditions such as temperature, moisture, acidity of the soil and reactions among different fertilizer chemicals. Thinning of fruits also helps in increasing total soluble solid contents TSS of the fruits. It helps in control of soilborne diseases. Weeds also compete with crops for nutrient and soil moisture. Their collection and removal are crucial factors in the reduction of postharvest losses. Pesticides and herbicides are used as sprays or soil applications to control weeds, disease and insect pests. They are dangerous because they can damage produce by producing spray burns if used incorrectly, and they can leave poisonous residues on produce after harvest. Strict observance of the recommended delay between the last spraying and the harvesting is required in order to keep poisonous spray residues from reaching the consumer. Growth-regulating chemicals are used in the field mainly to improve the marketability of fruit in order to control the time of fruit set and to promote uniform ripening. They are of little importance to small â€"scale production. Their effective use requires specialist knowledge, and they are mainly applicable to large-scale commercial production. However, tropical grown oranges develop poor colour. This seems to be related more to the lower diurnal temperature variation that occurs in the tropics rather than to the actual temperature difference between the tropics and subtropics. Soft tissue in mango is caused by convective heat. Consequently, mulching is necessary to avoid this problem. It has been proved that in khasi mandarin rough lemon as the rootstock produces good quality fruits than tanyum as the rootstocks. Beside, while using rough lemon as rootstock, the fruit tends to become much bigger but lesser sugar: In apple, rootstocks have tremendous effect on quality of the produce. Besides, citrus grown in shade are less susceptible to chilling injury in further storage. Whatever the scale of operations or the resources of lab our and equipment available, the planning and carrying out of harvesting operations must observe basic principles. To harvest a good quality crop in good condition. To keep the harvested produce in good condition until it is consumed or sold. To dispose the crop to a buyer or through a market as soon as possible after harvest. As the scale of commercial production and the distances between the rural producer and urban consumer increase, more exacting requirements will have to be met in regard to training and supervising labour. It is economically sound in terms of return to invest more in proper packing and handling of the produce before it leaves the produce before it leaves the farm. Growers will have to train their own field labour, accepting whatever support local extension workers are able to provide. General training should be given for everyone concerned with harvesting and field handling. General training should include: Wooden containers with rough edges, splinters, protruding nails or staples. Over packing containers which are to be staked. Damaging produce with long fingernails or jewellery. Dropping or throwing into containers at a distance. Throwing, dropping or rough handling of field containers. Placing the produce directly on to the soil, especially wet soil. Using dirty harvesting or field containers contaminated with soil, crop residues or decaying produce: Contact with oil, gasoline, or any chemicals other than those used specifically for authorized post- harvest treatments. Workers allocated to specialized tasks, such as crop selection and harvesting, and the postharvest selection, grading and packing of the crop should be given specific training. Specific training will include demonstration and explanation of: Clipping, cutting or digging. Some, such as root crops, can be harvested and sold over a long period, or stored on the farm to await favorable prices, others, such as soft berry fruits, must be marketed as soon as they are ready or they will spoil. When the decision to harvest has been made, the best time of day must be considered. The aim is to dispatch the produce to market in the best possible condition, which is as cool as possible, properly packed and free from damage. The basic rules to observe are: Wet produce will overheat if not well ventilated, and it will be more likely to decay. Some produce may be more subject to damage when wet, e. Produce left exposed to direct sunlight will get very hot. For example, aubergine and potatoes left exposed to tropical sunlight for four hours can reach temperatures of almost 50 degrees Celsius. Produce for local markets can be harvested early in the morning. For more distant markets, it may be an advantage to harvest in the late afternoon and transport to market at night or early the next morning. Maturity indices are important for deciding when a given commodity should be harvested to provide some marketing flexibility and to ensure the attainment of acceptable eating quality to the consumer. Maturity indices for selected fruits and vegetables Sl.

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Chapter 4 : Produce Fact Sheets - UC Postharvest Technology Center

Post-harvest technology stimulates agricultural production, prevents post-harvest losses, improves nutrition and adds value to agricultural products thereby opening new marketing opportunities and generating new jobs while stimulating growth of other related economic sectors.

Breadcrumb Post-harvest technology Apples that taste juicy all year round. Cut flowers that stay fresh in the vase for two weeks. Avocados that ripen just when you want to eat them. Suppliers of fruit, vegetables and cut flowers aim to offer year round, top quality fresh produce. Controlling quality and shelf-life At what temperature should roses be transported? How do I prevent pears becoming too soft? And what should I do to get avocados into the store at the moment they are ripe enough to be consumed? Suppliers of fruit, vegetables and cut flowers aim to deliver top quality products throughout the year: A challenging task because of the factors of seasonality, globally-based growers, and long transportation and storage times. This enables them to meet consumer demands and establish significant cost and sustainability benefits in the chain. Benefits such as year-round availability, waste reduction, reduced power consumption and reduced use of preservatives. With an intelligently-applied heat shock , for example, you can kill unwanted insects, eliminating the need for hazardous gases. Our expertise ranges from ageing and decay to maturity, taste and flower development. We work with various models and biomarkers for predicting quality. We also have expertise in the areas of temperature management, moisture control, DCS-storage technology, Controlled Atmosphere, Modified Atmosphere packaging, transport technology, energy management and cold store design. Our approach is multidisciplinary and focusses primarily on solving supply-chain problems. Our work employs the latest scientific insights. Except for carrying out research and innovation projects, companies can hire us for consultancy, process management and in-house training in the area of post-harvest technology. For fruit, this process is monitored by measuring ethanol production. This innovative approach extends product shelf-life by three months and ensures higher quality. Other project examples include quality monitoring throughout the chain and sea transport of cut flowers.

Chapter 5 : Post Harvest Technology

The journal is devoted exclusively to the publication of original papers, review articles and frontiers articles on biological and technological.

As a result, farmers have started growing more produce. However, maintaining food quality and quantity during the transfer of the produce from the fields where it is harvested to the table where it is consumed has been a challenge. During the transfer process, known as the post-harvest phase, produce can lose its freshness and spoil at a rate of up to 50 percent. Researchers at Felix Instruments- Applied Food Science have been working on developing much needed post harvest tools and techniques which can be used to minimize the spoilage rate. Optimizing Yields by Utilizing Food Technology Controlling the post harvest process starts with at the farm. Choosing the best food technology for farming and using superior cultivators that have a long post harvest life can minimize spoilage. Genetic engineers have developed plants strains that are resistant to some of the post harvest changes. This has helped improve the spoilage rates associated with post harvest handling. Research into understanding the biology of processes as well the environmental conditions involved in the deteriorations of produce has also led to the development of specific tools. The developers and scientists at Felix Instruments-Applied Food Science understand that crops are living tissues that undergo natural changes after they are harvested. While this natural process cannot be stopped, it can be delayed and manipulated with the use of these tools and instruments. Ethylene is a hormone that controls the growth and development of a plant by fluxuating the levels of ethylene exposure to the produce, it is possible to positively effect the rate at which the produce ripens. Besides exposure of ethylene, the ripening process is also influenced by whether the produce is inflicted by disease or damage, temperatures fluctuations, and also water loss. The post harvest phase is further complicated by the fact that some changes are desirable while others are not. For example, the loss of color chlorophyll is desirable for vegetables but not for fruits. Consumers prefer the post harvest color changes in fruits as the color represents an increase in carotenoids, which provide nutritional value. Besides color, changes in the carbohydrate, protein, amino acids and fat levels in produce are acceptable in some fruits and vegetables and undesirable in others. Therefore, post harvest technology has to be designed to manipulate the individual produce changes. By developing specific tools that can manipulate storage temperatures and ethylene exposure, and minimize injury and disease, as well as controlling the water loss that are affordable and that can be used widely has been a challenge. However, advances in packaging design, storage environment design and modification of transfer time have been used to minimize spoilage and prevent post harvest losses. Researchers have developed food packages and techniques to pack the produce that has helped to slow down spoilage. Packages are now designed to absorb ethylene and maximize moisture retention as needed. Different crops require optimal temperatures and regular venting of ethylene, while other crops require the ethylene to ripen to the desired level. During storage, produce is prone to fungal and microbial infection that leads to disease and increased spoilage. Researchers have been developing ways to control and modify atmosphere in the locations the produce is stored, which is harmless to humans and can reduce decay caused by fungus, and control damage and diseases caused insects. Crop handling at the retail location or at warehouses has also been shown to impact ripening. Researchers have developed technology systems that manipulate ripening by adjusting the temperature and the atmospheric conditions in the storage units to ripen the produce to the desired levels. Besides the development of post harvest tools, food safety has also an area where researchers are conducting studies. Food and Drug Administration FDA developed principles to ensure that microbial hazard is prevented during the handling of the produce. Using Plant Science to Develop Post-Harvest Technology From a global perspective, there has been an increase in research around the development of post harvest tools. Felix Instruments- Applied Food Science is honored to particiapate and aid in both the research for Postharvest Technology, as well as the practice in efficient practices regarding Postharvest Technology. Technology for farming has improved which has lead to increases in crop production. The crops need to make it to the consumers in a safe, timely manner with minimal loss. It has become imperative that infrastructure is improved to minimize the loss of produce during storage processing and the retailing of crops, as this is where most of the loss occurs. Researchers are looking at ways to improve infrastructure, from improving efficiency in refrigerated rails cars to improving road services that limit long waits for trucks transporting produce. Overall, research has played and will continue to play an important role in the development of post harvest technology that have been developed to manage the rate of loss of produce due to spoilage.

Chapter 6 : Postharvest Biology and Technology - Journal - Elsevier

Post-harvest technology. Apples that taste juicy all year round. Cut flowers that stay fresh in the vase for two weeks. Avocados that ripen just when you want to eat them.

Previous - Next The chemical components and nutritive value of maize do not lose their susceptibility to change when the grain is harvested. Subsequent links in the food chain, such as storage and processing, may also cause the nutritional quality of maize to decrease significantly or, even worse, make it unfit for either human and animal consumption or industrial use. Drying Maize harvesting is highly mechanized in developed countries of the world, while it is still done manually in developing countries. The mechanized system removes not only the ear from the plant but also the grain from the cob, while manual harvesting requires initial removal of the ear, which is shelled at a later stage. In both situations, maize is usually harvested when its moisture content is in the range of 18 to 24 percent. Damage to the kernel usually during the shelling operation is related to moisture content at harvest; the lower the moisture content, the less the damage. Changes in the physical quality of the grain are often a result of mechanical harvesting, shelling and drying. The first two processes sometimes result in external damage, such as the breaking of the pericarp and parts around the germ, facilitating attack by insects and fungi. Drying, on the other hand, does not cause marked physical damage. However, if it is carried out too rapidly and at high temperatures, it will induce the formation of stress cracks, puffiness and discoloration, which will affect the efficiency of dry milling and other processes Paulsen and Hill, In tropical countries, drying is sped up by bending down the upper part of the plant holding the ear, a practice that also prevents the kernels from becoming soaked when it rains. Storage stability depends on the relative humidity of the interstitial gases, which is a function of both moisture content in the kernel and temperature. Low moisture content and low storage temperatures reduce the opportunity for deterioration and microbial growth. Aeration therefore becomes an important operation in maize storage as a means of keeping down the relative humidity of interstitial gases. Significant maize losses have been reported in tropical countries. Losses of up to 10 percent have been found, not including those losses caused by fungi, insects or rodents. If these were included, losses could go up to 30 percent in tropical humid areas or 10 to 15 percent in temperate areas. Schneider reported post-production losses in Honduras of 6. Losses due to fungi mainly aspergillus and penicillium are important for both economic and health reasons because of aflatoxins and mycotoxins de Campos, Crespo-Santos and Olszyna-Marzys, In a survey on maize sold in rural markets in Guatemala, Martinez-Herrera found considerable contamination by several fungi. Among these, some Aspergillus species, well known as aflatoxin producers, were frequently present. There is evidence that maximum aflatoxin contamination of maize in Guatemala is during the rainy season. These data as well as data from several other studies strongly indicate the need to dry maize before storage. Diverse drying systems and equipment are available, using various sources of energy including solar energy Herum, A number of factors must be considered such as temperature and air velocity, rate of drying, drying efficiencies, kernel quality, air power, fuel source, fixed costs and management. Drying is an important step in ensuring good quality grain that is free of fungi and micro-organisms and that has desirable quality characteristics for marketing and final use. Drying Methods Layer drying. In this method, the harvested grain is placed in a bin one layer at a time. Each layer of grain is partially dried, before the next is added, by forcing air through a perforated floor or through a duct in the bottom of the bin. To improve efficiency, the partially dried grain is stirred and mixed with the new layer. An alternative is to remove the partially dried grain and dry it completely in batches. One of the problems with this and other methods of drying is in finding a way to mix low-moisture grain with high-moisture grain to get the desired equilibrium in the final product. Spoilage often occurs in this attempt. Sauer and Burroughs reported that equilibrium was more than 80 percent complete in 24 hours. Methods have been developed to detect highmoisture maize in mixtures with artificially dried maize. Since drying installations are costly, few maize producers, particularly small farmers, can afford to have their own. Portable batch dryers are useful since they can be moved from farm to farm. The principle behind these dryers is the continuous flow of grain through heated and unheated sections so that it is discharged dry and cool. The equipment is the central point in grain storage depots. Storage Biotic and non-biotic factors The efficient conservation of maize, like that of other cereal grains and food legumes, depends basically on the ecological conditions of storage; the physical, chemical and biological characteristics of the grain; the storage period; and the type and functional characteristics of the storage facility. Two important categories of factors have been identified. First are those of biotic origin, which include all elements or living agents that, under conditions favourable for their development, will use the grain as a source of nutrients and so induce its deterioration. These are mainly insects, microorganisms, rodents and birds. Second are non-biotic factors, which include relative humidity, temperature and time. The effects of both biotic and nonbiotic factors are influenced by the physical and biochemical characteristics of the grain. Changes during storage are influenced by the low thermal conductivity of the grain, its water absorption capacity, its structure, its chemical composition, its rate of respiration and spontaneous heating, the texture and consistency of the pericarp and the method and conditions of drying. Nutrient losses have been reported in maize stored under unfavourable conditions. Quackenbush showed carotene losses in maize stored under different temperature and moisture conditions. In other studies common and QPM maize were stored in different types of containers with and without chemicals. After six months samples were examined for damage by insects and fungi and for changes in protein quality. In both types there was some damage to the unprotected maize but not to that stored with chemicals. Protein quality was not affected Bressani et al. Other changes subsequent to drying and storage included a decreased solubility of proteins; changes in nutritive value for pigs; changes in sensory properties Abramson, Sinka and Mills, ; and changes in in vitro digestibility resulting from heat damage Onigbinde and Akinyele, Although damage caused by insects and birds is of importance, a great deal of attention has been paid to the problems caused by micro-organisms, not only because of the losses they induce in the grain, but more importantly, because of the toxic effects of their metabolic by-products on human and animal health. Studies on the nutritional effects of insect infestation of maize are not readily available. In the first study, protein efficiency ratio PER decreased after three months from an initial value of 1. In the second study, threonine decreased from 3. These researchers also reported that the damaged maize was less efficient in complementing food legumes. Also of nutritional significance was an increase in uric acid from 3. Thiamine losses were detected as well. About 38 percent of the untreated grain control was damaged by insects. This did not, however, affect its protein quality. Several research studies have identified an association between insect damage and toxin contamination e. Christensen measured selected changes in United States No. Changes in condition were evaluated by appearance, fungal invasion, germination percentage and final fat acidity value. The samples with The maize stored with However, large variability in the insect-fungi interaction was observed. Some maize-growing regions have experienced extensive insect damage to maturing ears with no occurrence of aflatoxin, while other areas with equivalent insect damage have exhibited relatively broad incidences of the toxin in kernels at harvest. Many studies have been conducted to assess the nutritional value of mouldy maize. Although some increase in B-vitamin content has been reported, possibly as a result of the metabolites of the micro-organisms, the damage to animal health far exceeds any beneficial change in chemical composition. Several researchers have studied the impairment in nutritive value of mould-damaged maize. It is difficult, however, to decide whether these effects were caused by fungi-produced toxins or by a loss in nutrients in the substrate because of their utilization by the micro-organisms. Christensen and Sauer reviewed the effects of fungal invasion on cereal grains. They found that it reduced both the quality and grade of the grains through loss of dry matter, discoloration, heating, cooking, mushiness and contamination by mycotoxins. Microbial indices of fungal invasion and seed deterioration include visible damage, seed infection, number of fungal propagules, evolved carbon dioxide and decrease in seed germination and ergosterol content. Inhibition of atlatoxin contamination Two ways of preserving maize from being destroyed by aflatoxin contamination have been under investigation. One is to inhibit growth of Aspergillus flavus or Aspergillus parasiticus and the other is to remove the aflatoxins after they have been produced by the Aspergillus infection. Most researchers have concentrated on the inhibition of fungal growth, and some chemicals have already been found effective in storage conditions. This, however, does not solve the problem of field contamination by moulds, since the airborne spores of the organisms are readily available in the environment. The spores can germinate on the cob and infect the inner tissues under optimum temperature and moisture conditions. Therefore, other researchers have pursued the possibility of detoxification. Roasting has been shown to be effective in reducing aflatoxin levels, depending on the initial level of the toxin as well as on roasting temperatures Conway and Anderson, Higher temperatures may cause up to 77 percent aflatoxin destruction; however, it is well known that heat also destroys the nutritive value of the material. Tempering aflatoxincontaminated maize with aqua ammonia and then roasting it may be a simple and effective way to decontaminate it. Valuable results using ammonia have been reported. It is difficult, however, to remove the smell of ammonia from the treated grain. Other more complex methods have been tried. For example, Chakrabarti showed that aflatoxin levels could be reduced to less than 20 ppb using separate treatments with 3 percent hydrogen peroxide, 75 percent methanol, 5 percent dimethylamine hydrochloride or 3 percent perchloric acid. These treatments, however, induced losses in weight and also in protein and lipids. Other methods include the use of carbon dioxide plus potassium sorbate and the use of sulphur oxide. A process that has received some attention is the use of calcium hydroxide, a chemical used for lime-cooking of maize Bressani, Studies have shown a significant reduction in aflatoxin levels, although the extent of reduction is related to the initial levels. Feeding tests with mouldy maize treated with calcium hydroxide have shown a partial restoration of its nutritional value. Appropriate harvesting and handling can do much to reduce fungal contamination of maize and can thus prevent the need for chemical decontamination measures, which not only increase the cost of the grain but cannot completely restore its original nutritional value. In this respect, Siriacha et al. Shelling encourages fungal contamination as it causes damage to the kernel base, which is rough compared with the rest of the grain. Corn on the cob, even with its high levels of moisture, resists fungal contamination relatively well. Classification of grain quality To facilitate marketing and to identify the best uses for the various types of maize produced throughout the world, measures of grain quality have been identified, although they may not be accepted by all maize-producing countries.

Chapter 7 : postharvest technology

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Chapter 8 : Post-Harvest Technology - University College of Anuradhapura

Post-Harvest Quality. Post-harvest management and quality is important to most fruit and vegetable growers. Growers of leafy greens, for example, often face challenges with keeping their vegetables fresh and crisp because of the way they are packaged and sold.

Chapter 9 : Welcome - UC Postharvest Technology Center

postharvest losses and waste include use of cultivars with longer postharvest life, use of an integrated crop management system that maximizes yield and quality, and use of proper harvesting and postharvest handling procedures to maintain quality.