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Post-Harvest Profile in Sultanate of Oman

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Abstract

To control the fruit and vegetables crops quality, knowledge and understanding of fruit and vegetables crops postharvest behavior and characteristics are necessary. Sultanate of Oman give considerable attention to the cultivation and development of fruit and vegetables crops. Ministry of Agriculture developing different research programs that aiming to improve productivity and quality of fruit and vegetable crops. The ministry of Agriculture also aimed to reach sustainable production of some important crops like date palm, banana and tomato. In addition, it contribute to the farmers by providing information knowledge of modern agriculture techniques and introducing high yielding varieties.

Introduction

The Sultanate of Oman occupies the southeastern part of the Arabian Peninsula and shares borders with the United Arab Emirates, Saudi Arabia, and the Republic of Yemen. It extends along the Gulf of Oman and the Arabian Sea. The country has a coastal line of almost 1,700 km, from the Strait of Hormuz in the north to the borders of the Republic of Yemen in the south-west, overlooking three seas: the Persian Gulf, the Gulf of Oman and the Arabian Sea. The Sultanate occupies about 309,500 sq. km equivalent to approximately 31 million hectares. The cultivable area has been estimated at 2.2 million ha, which is 7% of the total area of the country.

With the exception of Dhofar region, which has a strong monsoon climate and receives warm winds from the Indian Ocean, the climate of Oman is extremely hot and dry most of the year.

Summer begins in mid-April and lasts until October. The highest temperatures are registered in the interior, where readings of more than 53 °C (127.4 °F) in the shade are common. On the Al Batinah plain, summer temperatures seldom exceed 47 °C (116.6 °F), but, because of the low elevation, the humidity may be as high as 90 percent. The mean summer temperature in Muscat is 33 °C (91.4 °F), but the *gharbi* (literally, western), a strong wind that blows from the Rub al Khali desert , can raise temperatures from the towns on the Gulf of Oman by 6 °C (10.8 °F) to 10 °C (18 °F). Winter temperatures are mild and pleasant, ranging between 18 and 26 °C (64.4 and 78.8 °F).

Because the plateau of Al Jabal al Akhdar is porous limestone, rainfall seeps quickly through it, and the vegetation, which might be expected to be more lush, is meager. However, a huge

reservoir under the plateau provides springs for low-lying areas. In addition, an enormous wadi channels water to these valleys, making the area agriculturally productive in years of good rainfall.

Dhofar, benefiting from a southwest monsoon between June and September, receives heavier rainfall and has constantly running streams, which make the region Oman's most fertile area.

Agro-Climatic Conditions

Agro-climatic conditions in the Sultanate are classified as arid to extremely arid. Two main agro-climatic zones are recognized in the Sultanate based on the parameters which influence crop water requirements and efficient use of water, land and water resources potential and cropping patterns:

- Northern Oman including Batinah Coastal plain, Interior Oman and Dahira plains, Jebel Akhdar and Sharqiya plains.

- Southern Province, (Dhofar) including Salalah plain, Dhofar Jebel and Najd.

1. Production and Cultivation Areas

A wide range of crops are cultivated in the Sultanate. The permanent tree crops particularly Dates, lime and mango occupy the largest part of the cultivated land followed by fodder crops such as alfalfa and Rhodes grass, followed by vegetables and other seasonal crops (Table 1).

The cultivated area was 64314.7 ha in 2008, of which 28598.7 ha consisted of annual crops and 35716 ha consisted of permanent crops. Both fruit and vegetable production represent together almost 64.1% of the volume of total agricultural production in Oman. Over half the agricultural area is located in the Batinah Plain in the north, which has a total area representing about 3% of the area of the country (MA, 2008).

The aim of the Ministry is to achieve self-sufficiency in the main commodities of fruits, vegetables and field crops through the agricultural research strategy in crop pattern, which is based on selected crops to have the priority for research.

Table 1. Crop areas versus production in the Sultanate (MA, 2008).

Crop	Area (ha)	Area (%)	Production (Tons)	Production (%)
Fruits	35716.0	55.5	327625	28.3
Fodders	16276.0	25.3	662539	57.3
Vegetables	5732.0	8.91	141095	12.2
Field crops	6590.7	10.29	24567	2.2
Total	64314.7		1155826	

2. Priority of Crops.

Crop Priority is set according to the agricultural importance and agriculture policies. Agricultural importance takes in consideration the followings: the main region of production, total yield, yield per unit area, price/ton, net income/feddan, water use efficiency, imported and exported quantities of a crop or commodity.

The agricultural selected crop priority is as following:

Fruit: - Date palm, lime and other citrus species, mango, banana, coconut, papaya, grapes, deciduous crops in mountain areas.

Vegetables: Tomato, onion, garlic, potato, watermelon, cucumber, sweet melon, squash, carrots, hot pepper.

Field crops: Wheat, barley, maize and legumes.

Forages : Alfalfa and Rhodes grass.

3. Imported and Exported Products

The main distribution of fruit and vegetables in country is at Mawaleh market which located at Muscat capital where all fruits and vegetables from different region are marketed. Storage of all fruits and vegetables are in main storage place at Mawaleh markets and then are distributaed to different counties. While the export of fruit and vegetables of the regions are marketed to different counties for example UAE, Soudi Arabia, Kuwait, also some of fruits and vegetable are export to Europe and Japan. Import of fruits and vegetable are from different regions around the word for stance, Holland France, UAE, Soudi Arabia ect.

Quality Management Systems

Quality standards and specifications for some fresh products are available and updated frequently by the Directorate General for Specifications and Measurements (DGSM), Ministry of Commerce and Industry. There are 38 Omani specifications of fruits, vegetables and nuts available.

1. Current Status of the Post-Harvest Sector

General Overview of the Post-Harvest Chain

The available information suggests that more than 90% of Agricultural production in Oman is practiced on small farms, which are less than 4 ha (DAS, 2002). Thus producers are responsible for all activities related to growing, harvest, handling and marketing of their produces. However, there are relatively a very few number of specialized farms that have their own facilities in order to practice some sort of post-harvest techniques such as grading, treatment of fruits and packaging as requested by destined market.

Markets are mostly local or close by (less than 500 km), in which care is taken to determine the stage of ripening at which harvest takes place in order to minimize losses, which growers are aware of. Those losses, which might occur during and after harvest or those due to delay in marketing.

There are two central markets in the Capital (Muscat), which are mainly specialized for fresh fruits and vegetables. Grain and dry seeds are traded through local markets. This market receives all local and imported products.

Apart from farm initial grading, depending on the distance to markets, and packaging there are no other post-harvest techniques that are adopted. Packaging is normally done using carton or wooden boxes. Crates are also common for tubers and large leafy products. In some cases net bags are used.

2. Post-Harvest Units and Centers

Market and wholesale facilities are available in the Sultanate. As well as long-term cooled stores are available in certain areas particularly in the capital (Muscat). In addition, to the presence of few large scale commercial farms, which adopt post-harvest steps. There are some specialized centers for certain crops such as Dates and Banana.

Dates Handling in the Sultanate

Date palm trees numbers in the Sultanate is about 6,486,628. The total Dates production is about 219,771.80 tons and the average production of Dates per Date palm tree is about 33.9 kg (MA, 2008). The table 2 shows area cultivated under date palms indifferent regions of Oman.

Table 2. Date palm area cultivated in different regions in the Sultanate versus the production (MA, 2008).

Location	Date palm Numbers (%)	Production (%)
Al-Batinah	43.4	44.1
Al-Sharqiya	21.5	18.8
Oman Interior	14.7	18.0
Al-Dhahira	12.7	12.9
Muscat	5.2	4.6
Musandam	2.2	1.7
Dhofar	0.33	0.06

There are more than 200 cultivars of Date palm in the Sultanate but the commercial varieties are perhaps not more than 20 cultivars. The Omani cultivars are generally divided into three groups depending on time of fruit ripening. However, the difference is not distinct and is sometimes affected by climatic factors in various regions of the Sultanate.

Dates Pre and Post Handling

Dates take special attention by the Ministry of Agriculture , which has a strategy for Date palm development. The Ministry has launched an ambitious project in which, machines to process and pack Dates are distributed (subsidized by 50%) to farmers and small packers to establish small Date packing houses in an effort to introduce new techniques and ideas of the current pattern of consumption which requires modern attractive packages to fulfill consumers demands.

Private Companies Working in Dates Industry

There are about 8 companies investing in Dates in the Sultanate. These are:

- Tomoor Oman.
- Oman Modern Farm.
- Angara Trading.
- Billah Supply & Crops.
- Omani Dates Flake Factory.
- Muscat Overseas Agriculture.
- Muscat Food Industries.

Banana Handling in the Sultanate

Banana cultivated area in the Sultanate is 2642 ha (6.3% among fruits) and producing about 28,890 tons (10.3%) (MS, 2009). The most common cultivar is ‘Cavendish’ and have been studied and described for vegetative and bunch characteristics. Banana is highly developed and regulated through the strategy of the Ministry of Agriculture.

Banana Units

There are specialized Banana ripening and packing house in the Southern governate (Salalah) of the Sultanate and cold storage facilities in the central markets. In addition, to a receiving unit at Suwaiq on the Batinah Coast. Some farmers have initiated their own ripening rooms and chambers at their fields.

Banana Post-Harvest Practices

Bananas are a very high risk and demanding crop that requires constant attention to production, personnel and marketing management. Harvesting bananas is a big task and involves carrying heavy bunches, weighing more than 50 kg to the trailers. Particular care and training is

needed to avoid injuries to workers and damage to fruits.

Since, bananas deteriorate rapidly in hot sun, thus reducing their shelf life; farmers adopt the following steps to prevent this deterioration:

Pre-Harvest stage

- Plants are checked regularly and all rubbing leaves are removed or turned aside.
- The bunches are covered by plastic bags opened from both sides after complete development of the inflorescence (bagging) to prevent the fruits to be damaged by sunburn, spray residues, insects and birds.
- Incomplete hands are removed after bloom to increase the weight of the other hands.
- The bunches are not left ripened on the tree.

Harvest stage

- Bunches are harvested at light green stage.
- Banana is harvested with complete hands and when the fingers are fully developed.
- Bunches are collected in a shade area to be ready for packing.
- Padding is used to protect bunches during transport in the trailers or during storage.
- Washing.
- Banana are washed in water tanks and disinfected by using antifungal solutions in packing houses.
- Storing and Ripening.
- Farmers store banana bunches in well closed rooms at 15-19oC and relative humidity 85-95% for 24 hours in the first stage. Ethylene gas is used for ripening.
- Packing and Transport.

  Banana after ripening process are transported directly to the markets. Some refrigerated trucks are used to transport produce from collection centers to marketing outlets. Farmers also use their trailers to transport their commodity to the market but they use padding to prevent damages to the fruits.

Tomato Handling in the Sultanate.

Tomato is considered one of the main vegetables grown in the Sultanate. The area cultivated under tomatoes is 974 ha constituting about 14.3% from the total cultivated vegetables. The total tomato production is about 41925 tons (25.7% of total vegetable production).

Tomato Post-Harvest Practices

The bulk of the fresh market tomatoes are mature green stage because they tolerate rough handling better than the riper stages and hold the longest in storage, shipping, and on the supermarket shelf. In the industry, this is referred to as having a low shrinkage rate.

Steps of Tomato Harvesting

- Picking.

  Tomatoes are picked at 2 stages depending on the ripening. These stages are:

  1. Mature green: a white to yellow 'star' on the blossom end.
  2. Breaker, pink, and red: The breaker stage occurs within 24 hours of the mature green stage and is easily distinguished because the blossom end is pink.

  Farmers collect the fruits when completely developed or when it has reached the suitable degree of ripening. The fruits are picked without making any mechanical injury, while the damaged fruits are discarded.

- Sorting and Grading.

  The preliminary sorting take place at the field. The fruits with symptoms of infection of disease or infestation of insects as well as sun burn are discarded. As well as the up-normal fruits. This process is necessary to remove culled tomatoes and to separate the fruits into lots of uniform ripeness, consistency, size and appearance.

- Storing.

  Farmers traditionally don't store tomatoes. They directly take the fruits to the market after harvest. However, some new advanced farms store tomatoes depending on the ripening stage.

  1. Green ripened tomatoes: Stored at temperature range between 12-14℃, which will reach the fully ripening stage after 20-25 days. Relative humidity at 85-95%.
  2. Partial ripened tomatoes: Stored at 10-12℃, which will reach the complete ripening after 15 days.
  3. Hard red tomatoes: Stored between 8-10℃ for one week.

- Packing.

  Tomatoes are packed in different sizes, materials, and shapes and then transported to markets.

Private Companies Working in Tomato Industry.

There are about 2 companies to our knowledge investing in tomatoes industry in the Sultanate. They are Ali and Abdul-Karim Company for food stuff and Al-Khabora. Both companies produce ketchups. However, most of their tomato concentrate were imported from outside the country.

Problems in the Post-harvest

Specific Problems

- Rough handling
- Inadequate cooling
- Temperature maintenance.
- Lack of sorting to eliminate defects before storage.
- Use of inadequate packaging materials.

General Problems

- Lack of specialized and advanced research in the post-harvest technologies.
- Shortage of Post-harvest facilities.
- Non-existence of educational courses at and at undergrounds level in universities.
- Lack of training to producers and workers on Post-harvest sectors technologies.
- Non awareness of consumers and public.
- Lack of private sector investment in post-harvest.

Conclusions and Recommendations

Conclusions

At present post-harvest technology in the Sultanate is mainly concerned with harvesting, collecting and preparing cereals, fruits and vegetables for trading, storing or processing. Post-harvest process is an integral function rather than separate entity. Therefore, efforts to preserve food should be adopted aiming in minimizing the factors that lead to deterioration by this integral function. These processes include drying, salting, sugaring, smoking, fermentation, even in refrigeration, packaging, freezing and storage. Prevention or decreasing post-harvest losses allows consumer to have access to more food product. The post-harvest activities are an integral part of the food production system. Most often post-harvest losses are considered symptoms rather than problems. Detection of the cause is therefore, essential for deciding measures to prevent that cause. Such measures may be taken by small farmers (producers), private traders, cooperative organizations, marketing procedures and handling and transportation undertakers.

Recommendations

- Improved markets. It can be either through private or cooperative, agricultural companies.
- Improved communications. Including feeder roads to make easy movement of produce possible
- Study the pre-harvest treatments to get good quality of fruits

- Studies to identify special standards mechanism of gathering or harvesting the fruits of different crops.
- Encourage farmers to use primary cooling for storage of agricultural products.
- The identification of crop species which will bring about the highest prices at home and abroad.
- Intensification of research for the protection of crops and the harvested produce from losses due to pests, diseases and weeds at pre and post-harvest stages.
- The preservation techniques of crops to maintain quality from the field to consumer, including package and storage.
- Development of proper infra-structures for most commodities such as cold storage facilities, packaging agencies and appropriate handling procedures.
- Identification of the correct stages of fruit harvest for each crop.
- Conducting training and educational programs to farmers and small producers.

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