Application of ISO 9000 quality standards and hazard analysis critical control point (HACCP) system to the date palm packaginghous for food safety and high quality

E.EL-Tanboly and M. A. EL-Hofi
Dairy and Food Technology Department, National Research Centre, Dokki, Cairo, Egypt. Email: tanboly1951@yahoo.com

ABSTRACT

The application of TQM by ISO 9000 quality standards and HACCP system will be essential maintaining and even expanding date palm packaginghouse export market, Pressures for quality assured products from the United States and European buyers. TQM is a broad management concept and log-term business philosophy that stresses meeting a "right first time, zero defect". Both ISO 9000 quality standards and HACCP system embody a great part of the TQM. The application of this preventive oriented approach would give the food producer better control over operation, better manufacturing practices and greater efficiencies, including reduced wastes. TQM by ISO 9000 & HACCP were introduced for the date palm line at packaginghouse for Preserved Foods , Egypt for safe and good quality foods products.

INTRODUCTION

Date processing enjoys a high economic importance in the world. Dates have nutritive values and are consumed in large quantity in all parts of the country. The main aim of the date palm packing to produce high quality and safe foods. To assure the safety of the food, establishing a system based on a continuous management including total quality management (TQM), Good Hygiene Practices (GHP) and good manufacturing practices (GMP), is essential. Therefore, Hazard Analysis and Critical Control Points system (HACCP) should be examined (Bennet *et al.,*1999). HACCP is defined as "an effective system based on GHP and GMP, for providing safe and healthy foods" (Pierson and Corlett, 1992).

HACCP is an effective system because this food safety system is designed to provide the information flow for preventive and corrective actions and can easily be established on the production lines of all kinds of foods (Unnevehr and Jensen, 1998). Safe and healthy products can be served to consumers by eliminating the safety risks after determining the critical control points by hazard analysis and establishing the necessary preventive and corrective actions (Pierson and Corlett, 1992). Whole dates are harvested and marketed at three stages of their development. The three stages are as follows: Khalal, Rutab and

Tamar:. Fruit harvested at Tamar stage is non-perishable, i.e. micro-organisms cannot grow on it, moisture uptake and its consequences, and changes in color and taste occur during storage. Most of the dates varieties are harvested after the fruit has undergone the process of ripening and drying on the palms. Fruit at the Tamar stage is ideal for marketing as "dried" dates. This fruit is used for preservation and year-round consumption and also for the production of various types of products, e.g. cakes, sauces and components of

granules or date honey. The first step to establish the HACCP system in date palm packing line should be to form the flow diagram of the production line. In this way, critical control points (CCP)can be determined on the flow diagram sample and hazard analysis can be performed. A sample flow diagram and packing operations for the process of Rutab and Tamer date palm packing line. The given sample flow diagram must be verified by the Quality Control (QC) or Quality Assurance (QA) Department of the plant.

This paper focuses on the flow diagrams based on the production line of date palm packing and hazard analysis can be performed at Date Palm Packaginghouse in Egypt.

MATERIALS AND METHODS

Development and implementation of HACCP system.

The steps used to develop and implement the HACCP system as appropriate to particular industry under consideration as described by Stevenson & Bernard (1999) as follows.

Prerequisite Programs.

Good Manufacturing Practices (GMP) Good and Hygiene Practices (GHP). Basic environmental and operating condition as described in the Wallace and Williams (2001).

Application of HACCP seven principles and FAO (2001) recommended 12 task in development of HACCP plan for date palm packing processing line based on (Figure 1)

RESULTS AND DISCUSSION

All the stages of implementation were followed stage by stage, all the procedures necessary of control and checking were established to check and confirm if HACCP / ISO 9000 system is implemented in accordance with the principles of the codex and standard ISO 9000/2005. The analysis of the risks was carried out to identify the hazards which can occur in the cycle of production, the preventive measures were established, CCPs and OPRP was determined and posted at the factory, the critical limits for each CCP were defined and validated. A monitoring system is established to be ensured if the critical limits are respected and OPRP are mastered. The recordings relating to this monitoring are held up to date. Procedures of checking were established to confirm if plans HACCP/ISO 9000 are effective (internal audits). Thus documentation concerning all the processes, the procedures, measurements and the recordings were appropriate with the nature and the size of the company.

Implementation of HACCP plans and Operational Prerequisite programs (Figure 1).

1. HACCP team.

A multidisciplinary team was composed of seven persons possessing different skills related to quality assurance, production, engineering, microbiology and so on. Members of this team have been trained very thoroughly on the HACCP and ISO 9000.

2. Product description.

Whole dates are harvested and marketed at three stages of their development.

1. Khalal: Physiological mature, hard and crisp, moisture content: 50 - 85 %, bright yellow or red in color, perishable;
2. Rutab: Partially browned, reduced moisture content (30 - 45 %), fibers softened, perishable;
3. Tamar: Color from amber to dark brown, moisture content further reduced (below 25 % down to 10% and less), texture from soft pliable to firm to hard, protected from insects it can be kept without special precautions over longer periods.

3. Identify Intended Use (Task3)

The normal expected use of the food was described. With regards to possible acceptable risk level for a food safety hazard it has to be stated for which group of population the food is intended (Untermann, 1999). The intended use need to be stated or informed whether the food need to be prepared prior consumption. Besides that sensitive consumers too need to alert which adequate information on allergenic ingredients if it were used to prepare the product.

4. Flow diagram.

Flow diagrams have been prepared taking into account all aspects of the process in the scope of the HACCP system. The flow diagrams were checked on site by the HACCP team (Figures. 2and 3).

5. Onsite confirmation and verification of process flow (Task 5)

The HACCP team shall perform onsite verification on the accuracy and completeness of the flow diagram. Besides that the team also was trained to check the conformity of flow diagram is correct for any shift pattern that normally takes place in processing plant (Slatter, 2003). The onsite assessment normally involves participation of respective responsible personnel to explain the processing nature and the operation procedure during assessment (Tables 1 and 2) . During the assessment, any additional documentation required for on-site review was examined (Motarjemi, 2000).

Each step was checked and to ensure that all relevant information regarding potential hazards to the process and products are identified. If any modification required, it were amended immediately and documented. After the five preliminary tasks have been completed, the seven principles of HACCP are applied to construct the HACCP plan (Corlett, 1998).

6. Hazard Analysis on the Production Line

After constituting the flow diagram to determine the critical control points (CCP), hazard analysis can be performed (Scott and Moberg 1995). Possible risks that may occur during the production must be taken into account and necessary preventive actions must be determined.

7. Critical Control Points (CCP) on the Production Line

After hazard analysis, determined risks should be considered by decision tree if they are critical control points or not. Then, factors that constitute the hazard should be determined. Parameters used during monitoring critical control points, critical limits, preventive and corrective actions, and production and operation instructions and responsibilities of the staff should be well defined (Codex Alimentarius Commission, 1993). To monitor these activities, necessary forms and records should be kept as an archive for internal and external audits (Annon, 1998). Inspection and storage of fruits date (raw materials); sorting; cleaning; washing; drying; transporting to the packinghouse, and serving/distributing the markets, are the critical control points in the packaging lines (Tables 3 and 4).

7.1 Harvesting the fruits date

Harvesting the fruits date entails the use of experienced workers, or investment in aluminum ladders, in attaching ladders to the palms permanently or in purchasing mechanical appliance to lift workers to the top of the palm. Rain can cause damage to the fruit and impair its quality due to rotting, fermentation and insect infestation. On the other hand, the fruit purchases raw materials from several contractors. The production requires a stock monitoring program and raw materials should be purchased as closer as possible to the production time (Bryan, 1992)

Fruits date raw materials that have microbiological loads over critical limits must be avoided to ensure food safety and quality. Toxins synthesized by microorganisms; and pesticides, chemical residues and foreign materials found in these raw materials are also potential risks for consumer health.

7.1.1 Control

The fruits date raw materials must therefore be protected against rain with the help of wax-covered paper or nylon sleeves. Harvesting must be faultless and clean, since it significantly affects the rest of the process (packing and marketing). Harvesting the fruit straight into containers suitable for transport to the packinghouse prevents the infection of the fruit by the soil and sand under the palm and ensures that the fruit arrives in good condition, and that it is not crushed.

Fruits date raw materials should be purchased in accordance with the “Raw Material Acceptance Criteria” determined by QC/QA Department. QC/QA staff members have to reject unsuitable raw materials. Microbiological, physical and chemical characteristics that raw materials must have corresponding and critical limits should be determined in “Raw Material Acceptance Criteria”. Contractor having quality certificates like ISO Quality Assurance Systems and HACCP system should be preferred. QC/QA staff member have to control the expiration date of the packaged foods. Ripped, pierced, damaged and abnormal shaped packages have to be refused.

7.1.2. Monitoring and Keeping Records

During monitoring the inspection and acceptance of fruits raw materials, responsibilities of the department staff and controllers, inspection methods and instructions have to be clearly brought up for consideration “Raw Material Control Procedures”. QC/QA staff members should keep the acceptance records and fill the necessary forms .

7.2 Storage of fruits date Raw Materials In the packinghouse

In the packinghouse there are a number of processes, designed to improve or maintain fruit quality. These processes are: fumigation, washing, storage, refrigeration, hydration, dehydration and curing. Fumigation must not be carried out when the fruit is fresh, harvested at the Khalal stage, or when stored under deep refrigeration. The substance most frequently used for fumigation is methyl bromide (CH3 Br), which makes most of the insects come out before they are killed by the gas. The concentration of the gas is 30 ppm, i.e. 30 g methyl bromide in 1 m3 of air. The time recommended for fumigation is 12 - 24 hours. The temperature must be above 16^{o}C. It is important for the air to swirl within the fumigation installation, in order for it to spread uniformly within the chamber. In the storehouses the produce must be protected from recontamination by pests (insects and rodents). The surfaces and packages must be well made in order to withstand being loaded, shaken on the way and unloaded. Today, the temperature commonly used for long-term preservation of dates of several varieties is - 18^{o}C (0^{o}F). This temperature decreases possible water loss and also decreases the sugar crystallization and skin separation phenomena.

Storage under conditions of 26 % humidity or higher requires a temperature of o^{o}C enabling a storage period of 6 - 8 months; the storage period can be more than 1 -year if humidity is less than 26 %; if humidity is

less than 20 %, dates can be stored at 25ºC for up to 1-year; and high sugar content coupled to high humidity tends to aggravate the situation of fruit going bad.

7.2.1. Possible Risks

Because of insufficient and improper storage conditions, rapid microbial growth can be seen. Cross contamination of the pathogen microorganisms from storage places to production area is another important hazard (Bryan, 1992).

7.2.2. Control

"Storage of fruits date Raw Materials" should be determined by QC/QA department for proper storing.

7.2.3. Monitoring and Keeping Records

QC/QA staff members are responsible for proper storing conditions. Temperatures and relative humilities of the storage places should be monitored by thermocouples and hygrometers continuously. Temperatures and relative humilities of the storage places, and changes in these parameters should be recorded; when necessary, these parameters should be reset. Sanitary and hygienic conditions of the stores are very significant to avoid the contamination. In addition, hygienic barriers might be used and stores should be cleaned and sanitized periodically, and records mentioned in "Storage of fruits date Raw Materials", should be kept for archive and audits.

7.3 Washing Fruits

Dates exposed to various types of contamination of physical, chemical or/and microbiological nature. Physical factors: Sand and soil - both as a result of sand storms in many regions where dates are grown, and soil sticking to fruit lying on the ground. Chemical factors: These are especially remnants of pesticides, some of which can be removed by washing. Microbiological factors: External cleaning of the fruit by washing removes some of the microbiological pollution, also excretions of birds, which may spoil the fruit.

Clean water must be used and care taken that all the fruit is washed. Other methods exist, such as damp towelling attached to sloping mechanical shakers. While the fruit is still hanging, it can be cleaned by water spray, accompanied by the use of fine swivelling brushes, but they must be dried before being packed. When the fruit is packed immediately after washing, it is important to dry it in drying cubicles or by means of large fans.

Washing and rinsing periods, chlorine concentrations, temperatures and pressures of washing and rinsing water should be adequate to remove dirtiness and to decrease the microbial load.

7.3. 1. Possible Risks

An inadequate washing program causes non-removal of physical, chemical and microbiological hazards present in natural flora of fruits. Potable water should be used for washing process, otherwise, fruits can be contaminated by unclean water. An effective rinsing is very crucial to remove chlorine from fruits.

7.3. 2. Control

A detailed "Raw Material Washing Program" should be prepared by QC/QA department for considering parameters such as the concentration of chlorine, washing and rinsing period, pressure and temperature of water according to the type of the raw material.

Generally, 50-125 ppm active chlorine is adequate for eliminating the microbial risks of the fruits and vegetables (Aran *et al.,* 1987). For very dirty raw materials 1-5 ppm active chlorine should be added to the final rinsing water (Aran *et al.,* 1987). To avoid the contamination from water used for washing, water analysis (chemical and microbiological) should be performed by authorized laboratories periodically.

7.3. 2. Monitoring and Keeping Records

QC/QA department is responsible for an effective washing and rinsing. "Raw Material Washing Program" should be applied completely. Water analysis reports should be kept for archive and audits.

7.4 Washing and Rinsing the Equipment

Dirty equipments are one of the main sources of physical and microbiological contaminations. Therefore, an effective equipment cleaning program should be applied (Bryan, 1992).

7.4 1. Possible Risks

Hazards at this step are closely related to the effectiveness of the washing program. If the washing program is inadequate, it is impossible to remove physical, chemical or microbiological hazards. On the other hand, inadequate rinsing causes non-removal of detergent, chlorine and caustic from equipment.

7.4. 2. Monitoring and Keeping Records

Concentration of active chlorine, caustic or detergent used, washing and rinsing periods, temperatures and pressures of washing and rinsing water should be clearly determined. General cleaning of equipment used in production should be periodically done by caustic solutions. Because has toxic effect on health, it should be checked whether it was removed completely from the equipment or not after rinsing. Presence of caustic on the equipment can be detected by a test in which the colorless phenol phytalein turns into purple when dropped on the surfaces if caustic is still there (Troller, 1993).

7.5 Metal Detectors

7.5 1. Possible Risks

It is possible that metal particles can contaminate the fruits during production. These metal particles may come from raw materials that are not properly handled during harvest and may cause physical hazards.

7.5. 2 Control

Control is done by metal detectors.

7.5 3. Monitoring and Keeping Records

QC/QA department staff should constitute a detailed "Metal Detector Manual". In this manual, dimensions of metal particles that metal detector should determine must be given (Mortimore, 1994). QC/QA staff member, responsible for this operation, should periodically check the detector by test and should calibrate it frequently.

7.6 Distributing

7.6 1. Possible Risks

Because of unsuitable distributing conditions, microbiological growth and spoilage of meal may occur.

7.6 2. Control

Distributing of fruits should be performed according to "Distributing Procedure" stated by QC/QA department. During transportation, temperature of the fruits should be -20ºC for Rutab and 5ºC for Tumer. To ensure that, fruits should be distributed in boxes (Bryan, 1992).

7.6 3. Monitoring and Keeping Records

Final product should be placed into boxes and distributed as soon as possible after production. Lids of the boxes should be closed tightly and checked. Also refrigerator conditions must be ensured for fruits products. Loading of the boxes into the cars should be done according to the distributing route.

8. Keeping Records and Verifying

QC/QA department should ensure to avoid the potential hazards in all steps of the process by stating preventive and corrective actions. Effectiveness of the HACCP system can be stated by verifying. All the activities taken place in HACCP system should be kept as records and forms, and archived for periodic internal and external audits. Audits are performed by Production Management Department and government officials dealing with food safety (Annon., 1998).

CONCLUSION

HACCP should be considered as a system based on Good Hygiene Practices (GHP) and Good Manufacturing Practices (GMP). GMP and GHP applications include building, environment arrangements and personnel hygiene and behaviors. Sanitary and hygienic conditions of the plant can be improved.

For serving high quality and safe products to the consumers, inspecting the raw materials purchasing, storing the raw materials at proper conditions, using well cleaned equipments in all steps of the fruits date packing process, according to receipts stated by department while storage are determined as critical points. Distribution also should be performed according to distributing instructions.

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Tables

Table (1): Green or ripe dates (Rutab) Packing Operations

Production steps	Description
1	Fruit Harvesting
2	Fruit reception & Weighing
3	Grading & Selecting
4	Storage at 5°C / fumigation
8	Dry sorting
9	Water soaking
10	Fruit spray washing
11	Fruit sorted on conveyor
12	Fruit spray washing
13	Fruit Freezing
14	Fruit packed into either: *Bulk Pack (in cardboard boxes) 5 kg **Retail pack (box, placed in two layers, separated by cellophane, weighing 220 g - 250 g.)
15	Bags or boxes transfer to labeling department
16	Bags or boxes moved on conveyor to the labeler
17 17 (i) 17 (ii)	Bags or boxes labeled Glue Label
18	Coding Fruit packed with ink jet printing with date of production and expiry date
19	Cardboard tray manually
20	Bags placed on tray by hand
21	Trays is labeled
22	Trays is shrink wrapped
23	Fruit frozen and storage at -20°C/ Humidity 70%
24	Transportation for distribution
25	Distribution

Green or ripe dates (Rutab): Partially browned, reduced moisture content (30 - 45 %), fibres softened, perishable;

Table (2): Tamer Packing Operations

Production steps	Description
1	Fruit Harvesting
2	Fruit reception & Weighing
3	Grading & Selecting
4	Storage at 5°C / fumigation
8	Dry sorting
9	Water soaking
10	Fruit spray washing
11	Fruit sorted on conveyor
12	Fruit spray washing
13	Fruit Drying
14	sorting second time
15	Production Dates lines:
15 (i)	Bulk Packing line
15 (ii)	Pitting/Pressing Line
15 (iii)	Thermo pack Line)
15 (iv)	Date juice (Dibs)
16	Fruit packed into either: 50g, 100g, 200g and 500g in PET polyethylene bags or varying sizes boxes (1kg, 2kg, 3kg, 5kg and 10kg)
17	Bags or boxes transfer to labeling department
18	Bags or boxes moved on conveyor to the labeler
19 19 (i) 19 (ii)	Bags or boxes labeled Glue Label
20	Coding Fruit packed with ink jet printing with date of production and expiry date
21	Cardboard tray manually
22	Bags placed on tray by hand
23	Trays is labeled
24	Trays is shrink wrapped
25	Fruit storage at 5°C
26	Transportation for distribution
27	Distribution

Tamar: Color from amber to dark brown, moisture content further reduced (below 25 % down to 10% and less), texture from soft pliable to firm to hard, protected from insects it can be kept without special precautions over longer periods.

Table 3. Rutab date fruits HACCP analysis chart

Step	Activity	CCP No.	Hazard Nature	Preventative Measure	Procedure	Corrective Measure	Responsibility
1.	Rutab Date Fruits Harvesting. Weighing		Loss of weight Equipme nt Defect	Check balance Calibration Periodical maintenance	?? Inform Maslaha Maintain	Adjust Calibrate Maintain	Maintenance?? Maslahat Maintenance
1.1	Sample for acceptance		Incorrect sampling by Date Fruits damage	Improper sampling Effective supplier assurance	QC to check	Train committee	QC1
1.2	Sample for independents laboratory	1	Pesticides/fungicides Heavy metals, Patulin	Effective supplier assurance	QC to take Sample per supplier	Change Supplier Inform purchasing	Purchasing Dept.??
1.3	Sample for internal QC laboratory	1	Staph. MC4 *Bacillus cerius*	Effective supplier assurance	QC to take sample per supplier	Inform supplier	Purchasing Dept.??
2	Grading & Selecting		Date Fruits damage	Good Manufacturing Practice	PR2 visual check	Inform labour supervisor	
2.1	Storage at 5°C / fumigation						
2.2	Dry sorting		Improper sorting by labors Fruit damage Foreign bodies	Good Manufacturing Practice Effective supplier assurance	visual check ??	Inform labour supervisor ??	
3	Water soaking						
3.1	Raw water	2	Portability of water Pesticides, Heavy metals, Pathogenic presence	Chemical analysis Chemical analysis Chemical analysis Microbial analysis	QC sample to QC lab QC1 sample to outside lab QC sample to QC lab	Contact water supply company for discussions	

Step	Activity	CCP No.	Hazard Nature	Preventative Measure	Procedure	Corrective Measure	Responsibility
3.2	Soaking process		Microbial contamination of water Foreign bodies	Check water in basin Effective soaking	to check to check	adjust drain rate adjust/repair air flow	Line supervisor Line supervisor
4	Spray washing		Foreign bodies	check soaking process (nozzles, conveyor)	to check to check	clean nozzles adjust conveyor rate	Line supervisor Line supervisor
5	Conveyor sorting		Improper sorting by labors Fruit damage Foreign bodies	Good Manufacturing Practice	to check	Inform labour supervisor	
☒ 6.	Spray washing		Foreign bodies	check soaking process (nozzles, conveyor)	to check to check	clean nozzles adjust conveyor rate	Line supervisor Line supervisor
☒ 7.	Dry sorting		Improper sorting by labors Fruit damage Foreign bodies	Good Manufacturing Practice Effective supplier assurance	visual check ??	Inform labour supervisor ??	
☒ 8	Freezing						
8.1	Screening in finisher		Broken seeds and fibers Microbial Contamination	Check screen integrity Check screen clean	to check	inform maintenance inform sanitation	
8.2	cooling in chiller		Outgrowth of spore due to slow cooling Microbial contamination	Effective temperature control Effective cooling time ????? Check chiller clean Check leaks in tubes Take sample of pulp for analysis	to record temperature to record time to check sanitation to check sanitation	adjust temperature	re-cool or dispose re-cool or dispose Inform sanitation

Step	Activity	CCP No.	Hazard Nature	Preventative Measure	Procedure	Corrective Measure	Responsibility
9	packing		Microbial Fermentations Plasticize contamination	Check cleaning of packages Check type of plastic used		Fast freezing and chick program Inform supplier	sanitation
9.1	Bulk Pack (in cardboard boxes) 5 kg		AS (14 (3)				
9.2	Retail pack (box, placed in two layers, separated by cellophane, weighing 220 g - 250 g.)		AS (14 (3)				
9.3	50kg plastic drum		AS (14 (3)				
10	Rutab Date freezing & storage	3	Spoilage or Fermentation of Rutab Poor Temperature cantonal Ineffective freezing process change of organoleptic properties	Microbiological analysis check thermometer check freezing cycles physical measurements		Foot freezing Adjust temp at - 18 C repair or replace reject or re use	
11	Boxes on conveyor		Broken bags / boxes Loss of production Conveyor defect	quick removal of broken bags / boxes effective boxes can tool check of speed conveyor	as above	Replace detector two every hour increase light source inform maintenance	

Step	Activity	CCP No.	Hazard Nature	Preventative Measure	Procedure	Corrective Measure	Responsibility
12	Visual inspection for fill level and bags / boxes defects	4	bags / boxes damage Loss of production glass and other foreign boding low or high level of filling	quick removal of damage bags / boxes) effective bottles *** GMP check of filler	as above	Replace detector two every hour increase light source inform maintenance	
13	Labelle tray		wrong label, wrong design poor print quality label cooked wrong size label not glue on bottles, label missing	flow specification	as above	inform supplier	as above
14	shrink wrap		wrong size wrong gauge inconsistent gauge	check roller size, cleaning check gauge check film type check tunnel temp.	as above	inform supplier calibrate gauge inform supplier adjust temp. calibrate thermometer	
15	Transportation to warehouse					check transportation system	storage Dept.
15.1	Product of warehouse		loss of production	Audit for first infest autorotation		Improvement of storage conditions	storage Dept.
16	Transportation for distributor		Exposure of predict to adverse environmental condition like dust, rain, direct sunlight Loss of production	cover with suitable cover for production from rain and direct sunlight			
17	Distribution		Loss of production	Record customer / delivery details		following specification of distribution	selling Dept.

Figures

Five Preliminary Steps

(Task 1) HACCP team Assembling

(Task 2) Product Description

(Task 3) Identification of products intended use

(Task 4) Construction of flow diagram

(Task 5) Onsite verification and confirmation of flow diagram

Seven HACCP Principles

(Task 6) Conduct a Hazard Analysis

(Task 7) Determine the Critical Control Points (CCPs)

(Task 8) Establish Critical Limits

(Task 9) Establish CCP monitoring procedures

(Task 10) Establish corrective action

(Task 11) Establish Verification Procedures

(Task 12) Establish Documentation and Record Keeping

Figure 1: 12 task sequence steps for HACCP application

Fruit harvesting
â
Fruit reception & Weighing
â
Grading & Selecting
â
Storage at 5oC / fumigation
â
Dry sorting
â
Water soaking
â
spray washing
â
Sorted on conveyor
â
Spray washing
â
Freezing
â
packing
â
Coding & Labeling
â
frozen and storage at -20oC/ Humidity 70%
â
Transportation
â
Distribution

Figure 2. The main procedures to Green or ripe dates (Rutab) Packing

Fruit harvesting
â
Fruit reception & Weighing
â
Grading & Selecting
â
Storage at 5oC / fumigation
â
Dry sorting
â
Water soaking
â
spray washing
â
Sorted on conveyor
ß
Spray washing
â
Drying
â
Sorting
â

Vacuum Packing
â
In PET polyethylene bags 50g, 100g, 200g Boxes (1kg, 2kg, 3kg, 5kg and 10kg)
â
Coding & Labeling
â
Shrink wrapped
â
Storage at 5oC
â
Transportation
â
Distribution

Figure 3. The main procedures to Tamar dates Packing