

# HACCP Manual for Afghan Grape Pack Houses

Hazard  
Analysis  
Critical  
Control  
Points



ROOTS of PEACE



MINISTRY of AGRICULTURE,  
IRRIGATION and LIVESTOCK



The World Bank

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## CONTENTS

1	Introduction .....	2
2	Definitions and Terms used in HACCP .....	3
3	HACCP on the Farm .....	4
3.1	Water.....	4
3.2	Chemical Use and Storage on the Farm.....	4
3.3	Maximum Residue Levels (MRLs).....	5
4	HACCP in the Pack House .....	7
4.1	The Pack House .....	7
4.2	The Carton Store .....	8
4.3	Implements in the pack house .....	9
4.4	Pack House Hygiene .....	10
5	Rodents and Insect Control .....	14
6	Conclusion .....	16
7	ANNEXES.....	18
7.1	ANNEX 1 - TRAINING REGISTER.....	18
7.2	ANNEX 2 - NAME REGISTER FOR TRAINING EVENTS.....	19
7.3	ANNEX 3 - PACK HOUSE INSPECTION REGISTER .....	20
7.4	ANNEX 4 - MEDICINE/PLASTER REGISTER.....	21
7.5	ANNEX 5 - BATHROOM CLEANING REGISTER .....	22
7.6	ANNEX 6 - PERSONAL HYGIENE REGISTER .....	23
7.7	ANNEX 7 - PEST CONTROL/TREND REPORT .....	24
7.8	ANNEX 8 - CHEMICAL SPRAY REGISTER.....	25
7.9	ANNEX 9 - EXAMPLE OF A PACK HOUSE CLEANER: SPOREKILL.....	26

# 1 Introduction

The purpose of this Hazards Analysis and Critical Control Points (HACCP) manual is to inform and instruct producers, merchants and pack house staff on what HACCP is, the practical application thereof and the importance of applying the HACCP principles to the production and packing process.

The HACCP system is a preventative approach to controlling food safety. Philosophically, HACCP moves away from reliance on end point testing to a more proactive, preventative approach to control potential hazards. When utilizing HACCP, hazards are identified, associated risks are assessed, critical control points are specified, criteria for compliance are clearly defined and methods for control are identified and implemented. The importance of applying HACCP is that it assures that food produced in a facility, such as a grape pack house, is safe for human consumption. This assures a continuing good relationship with buyers and consumers and the continuing success of the grape marketing enterprise.

## **A HACCP system is applied through the 7 principles of HACCP:**

**Principle 1:** Identify the potential hazard(s) associated with food production at all stages, from growth, packing and distribution, until the point of consumption. Assess the likelihood of occurrence of the hazard(s) and identify the preventative measures for their control.

**Principle 2:** Determine the points/procedures/operational steps that can be controlled to eliminate the hazard(s) or minimize its likelihood of occurrence. There are the the Critical Control Points (CCP).

**Principle 3:** Establish critical limit(s) which must be met to ensure the CCP is under control.

**Principle 4:** Establish a system to monitor control of the CCP by scheduled testing or observations. Establish a schedule of inspections and keep records of the inspections and actions taken to bring CCP into control. See inspection record examples in ANNEX.

**Principle 5:** Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control.

**Principle 6:** Establish the procedures for verification which include supplementary tests and procedures to confirm that the HACCP System is working effectively.

**Principle 7:** Establish documentation concerning all procedures and records appropriate to these principles and their application. See example records in ANNEX.

## 2 Definitions and Terms used in HACCP

**Critical Control Point (CCP):** A point, step or procedure at which controls can be applied and a food safety hazard can be prevented, eliminated or reduced to acceptable levels.

**HACCP:** A system which identifies specific hazards & preventative measures for their control.

**Hazard:** The potential to cause harm. Hazards can be biological, chemical or physical.

**High Pressure Hoses for Cleaning:** Any hydrostatic pressure wet cleaning device working with an overpressure of more than 6 bar ( $= 6 \times 10^5$  Pa), which is the normal overpressure of tap water system.

**Illegal Residue:** Substances (i.e. chemicals, drugs, food additives) remaining on or in a product in commerce that exceed tolerances established by regulatory authorities. This also includes substances for which no tolerance has been set or which is not *Generally Recognized as Safe* (GRAS)

**Pathogen:** A food, water or airborne organism of public health significance that can cause illness in humans.

**Pesticides:** Compounds classified as such by the regulatory authorities of the location where a product is produced or shipped. These include, but are not limited to, fungicides, insecticides, rodenticides and herbicides.

**A Step:** Any stage in food production and/or manufacture including raw materials, their receipt and/or production, harvesting, transport, formulation, processing, storage, etc.

**Quality Program:** A logical sequence of actions designed to assure specific product quality specifications are met.

**Quality System:** The organizational structure, policies, programs and procedures needed to manage product quality.

**Risk:** An estimate of the likely occurrence of a hazard.

**Traceability:** The ability to establish the production history of all components of a product.

**Undesirable micro organism:** Any micro organism that is a pathogen, causing product spoilage, or is an indicator of unsanitary conditions.

*“Contamination remains the biggest threat to food safety, be it chemical, biological or physical.”*

### 3 HACCP on the Farm

The food safety hazards in grape crop production are biological, chemical and physical. Preventing contamination at the farm level requires knowledge and care in handling grapes to prevent them coming into contact with sources of contamination. Because water can be a carrier of contamination, its quality must be known so that appropriate steps can be taken to prevent contamination. To prevent contamination by chemicals used on the farm, all chemicals should be applied and stored with special care. This section provides additional information and advice on preventing contamination on the farm. Examples of food safety hazards are:

#### Biological Hazards

- Pathogenic bacteria in soil, water and from poor hygiene practices, e.g. Salmonella, *E. coli*.
- Pathogenic bacteria e.g., Salmonella, *E. coli* from contamination with animal matter.

#### Chemical Hazards

- Chemical contaminants and heavy metal content of water used for irrigation, fertilization, pesticides or in contact with any part of the crop.
- Pesticide Residues e.g. exceeding specified Maximum Residue Level (MRL), caused by incorrect use, incorrect application of agricultural chemicals.
- Contamination with mineral oils, e.g. diesel, oil.

#### Physical Hazards

- Living and Dead Insects
- Personal articles
- Hair
- Glass

#### 3.1 Water

Water must be tested for chemical, biological and microbial contamination. This is to be done at a registered and reputable laboratory which is legally entitled to issue certificates dealing with water quality.

#### 3.2 Chemical Use and Storage on the Farm

The storage and record keeping on all chemical and fertilizer applications is an important means of assuring that food produced on the farm is safe for human consumption. Such storage and record keeping has become a prerequisite for marketing agricultural products in certain markets. See example record of chemical use in Annex 8. Records must be kept of chemical storage and use stating:

- Name and amounts of chemicals stored in the storage place.
- Product used in each application
- Date of application
- Volume applied
- Reason for application

All chemicals on the farm must be kept in a secure, dry and lockable place (special building, room or cabinet/cupboard).The chemical store should be labeled as such and must be locked at all times. (See photos below.) If the floor is in a poor condition, the chemical store must be fitted with shelves or the chemicals must stand on pallets off the ground. No Entry to unauthorized personnel will be permitted and a sign board showing this should be visible. The chemicals in the store must be labeled and included in the recordkeeping practices described above.

**Chemical store door with warning signs and shelves in store showing chemicals stored off the ground**



**3.3 Maximum Residue Levels (MRLs)**

Grapes being marketed to certain markets will be tested at a toxicity laboratory to determine if they contain any pesticide residues exceeding the Maximum Residue Levels (MRLs) allowed by health authorities. The table below shows the MRLs for the chemicals typically used on grapes. The use of any other chemicals must be checked against a data base of known MRLs as this is a Critical Control Point in HACCP.

Maximum Residue Levels (MRLs) for Chemicals used in Grape Production	
Sulfur	50PPM
Copper Oxychloride	20PPM
Gibberellic Acid (GA)	GA has no MRL as it is sprayed early for berry enlargement

Here are recommendations for use of other chemicals commonly-used in grape production:

- Wettable Powder (WP) not to be used after berries reach 5mm size
- Wettable Sulphur. The only danger is visual residue at time of packing.
- The Safety period before harvest for Dry Powder is 14 days

GA can cause eye and skin irritation and lower gastric tract problems; so, care should be used to avoid contact with GA while applying it to grapes.



## 4 HACCP in the Pack House

HACCP in the pack house is tied to the whole process of production and must be seen holistically. Biological, chemical and physical food safety hazards in the grape packing process are similar to those on the farm. Additional sources of contamination in the pack house come from the additional chemicals used in the pack house for cleaning and pest control, lubricants and hydraulic oil and possibly from sulfite in sulfur sheets. Additional physical hazards arise from the additional workers and the building itself. Examples of food safety hazards are:

### Biological Hazards

- Pathogenic bacteria, e.g. E.coli and Salmonella from poor hygiene practices and environment

### Chemical Hazards

- Cleaning chemicals
- Lubricants and hydraulic oil
- Pest control chemicals
- Sulphite (Sulphur sheets) – allergen

### Physical Hazards

- Living and dead insects
- Personal articles, e.g. jewelry, watches, sizing rings
- Plaster from walls and ceiling of pack house
- Pieces of fiber, towel
- Glass (for example, from broken light bulbs)
- Hair
- Wood from broken/damaged boxes or pallets
- Dust in packaging
- Stones
- Metal pieces from badly maintained clipping scissors

### 4.1 The Pack House

The pack house should be constructed in a manner that facilitates keeping it clean and protecting it from animal infestation.

- Window sills should be sloping slightly and corners should be rounded to prevent dust gathering.
- This also applies to ventilation holes. The ventilation holes should be covered with fine mesh to prevent birds or insects entering.
- The floor must be able to drain easily and facilitate water removal.
- Water hoses must be available for power-washing the pack house floors, walls and equipment.
- Two separate doors must be available. One for the personnel to enter the pack house and other for fruit to enter and leave.
- Plastic curtains in front of doors will help prevent insects, dust and heat from entering the pack house.

- A cemented area around the pack house will minimize the carrying of sand and other undesirable substances into the pack house.
- No dogs, cats or birds are to be allowed in or near pack house.
- Drainage pipes should be closed off with wire mesh
- Regular pest control with the aid of traps must be applied.
- Litter bins must have lids.
- Clearly marked bins for discarded fruit must be provided.
- Signs must be displayed prominently in the pack house showing
  - No Eating
  - No Smoking
  - Wash hands
  - Movement of machinery

#### Different signs to use in pack house



#### 4.2 The Carton Store

- The Carton Store should be directly linked to the pack house with only a door allowing access to the carton store.
- The same Hygiene principles apply to the Carton Store as the Pack House.
- Neatness in the store is imperative and serves to keep cartons clean, dust free and clear of other foreign matter.
- Cartons must be packed on pallets to avoid contact with the floor.
- The carton store must be monitored for rodent and insect activity.
- A fire hydrant or fire extinguisher must be available near the carton store.

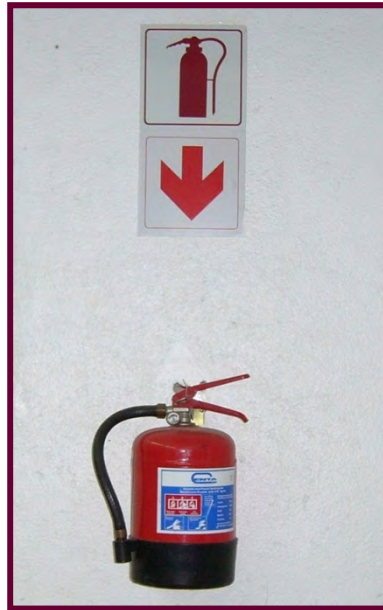
### 4.3 Implements in the pack house

- The packing system must be designed to facilitate cleaning and disinfection.

Fire hydrant



Powder fire extinguisher



A Modern Pack House



- All lights in the pack house must have covers (Perspex or Plastic) to prevent glass falling in the product and must be within easy reach for cleaning purposes.
- Scales must be covered when not in use – to protect against dust.
- Harvesting baskets (lugs) must be sterilized before taking them to the vineyard. Two baths are used for this purpose. The first contains the sterilizing agent (see Annex 9 on Sporkill as an example of a general cleaning agent for pack houses). The picking baskets are washed in the first bath. The second contains clean water to wash off any residue and dirt.
- Clipping Scissors must be sterilized before use in the pack house. Two buckets or bowls are used with the 1st containing the sterilizing agent and the second containing clean water for rinsing. Paper towels can be provided for drying of scissors.
- Picking baskets and scissors must be cleaned regularly during the packing day.
- The pack house should be equipped with a water system which can preferably be used under high pressure to clean and disinfect the pack house after each day's work.
- Cleaning agents used must not contain chloride (See Annex 9 on Sporekill as an example of a general cleaning agent for the pack houses)
- The loading-out area door should have a plastic curtain.
- An inspection schedule must be in place. See Annex 3 for example of cleaning schedule.
- All cleaning agents must be kept in a separate clearly marked area.
- Cleaning equipment such as brooms, mops and buckets must be color coded e.g. red for cleaning bathrooms and blue for cleaning the pack house.
- All water should be of a potable quality and tested before the season by a recognized laboratory.
- Firefighting equipment should be available in the pack house.

#### **4.4 Pack House Hygiene**

Pack house hygiene is extremely important as it is the first line of defense against contamination.

##### **Personal facilities for personnel**

- Bathrooms must be cleaned and inspected regularly.
- Bathroom must have:
  - liquid soap dispensers
  - disposable paper towels
  - dustbins with lids
  - Visible signing in relevant languages

## Example of signs



## Eating facilities for personnel

- Eating facilities must be separate to the pack house
- Hand basins must be installed at the entrance to the pack house for use after eating.
- Personnel must wash their hands before entering the pack house
- These basins must be fitted with liquid soap dispensers and disposable paper towels **B**

## Basins at an entrance of a pack house



## Provide paper hand towels



- Dustbins with lids must be supplied, emptied and sterilized on a daily basis.
- Separate facilities where personal belongings can be stored during working hours must be available.

## Hygiene for pack house personnel

- Place food safety signs such as no eating, no smoking and wash hands in visible places in the pack house.

- Hands must be washed every time personnel enter the pack house or after they have used the bathroom. Hands must be washed with an approved disinfecting soap.
- No jewelry such as earrings, chains or rings except for wedding rings and watches.
- Hair must be covered by mop caps.
- Beard and moustache should be covered.



- Finger nails to be kept short and clean.
- Any cuts or abrasions or non infectious sores must be kept effectively covered by a colored first aid dressing (plaster).
- Colored gloves should be used to cover dressings on hands.
- Smoking in designated areas only.

### Health Issues

- Staff must exclude themselves from the pack house if they are suffering from any disease or condition liable to be transmitted via food, including:
  - Sores, boils or infected cuts,
  - Any Intestinal infection,
  - Following contact with anyone suffering from any of the above conditions.
- Protective clothing should be clean at all times and in a good condition.
- Clothing should not have outside pockets due to food contamination hazards.
- Pesticides and associated equipment should not be allowed to come into contact with food, food containers, packing material or working surfaces.
- Any mixing of pesticides should take place external to the pack house perimeter.
- Any Pesticide spillage should be reported to the pack house manager immediately.
- Pest control equipment must be kept in such a condition that there can be no spillage or leaking of material.

### Hand Washing

- Hands must be washed after visiting bathrooms and amenity areas.
- Always wash hands after handling pesticides.
- Whenever dirty or contaminated.
- Hands must be washed on entering any food associated area.
- Approved liquid soap must be used.
- Paper towels and covered dustbins to be provided.

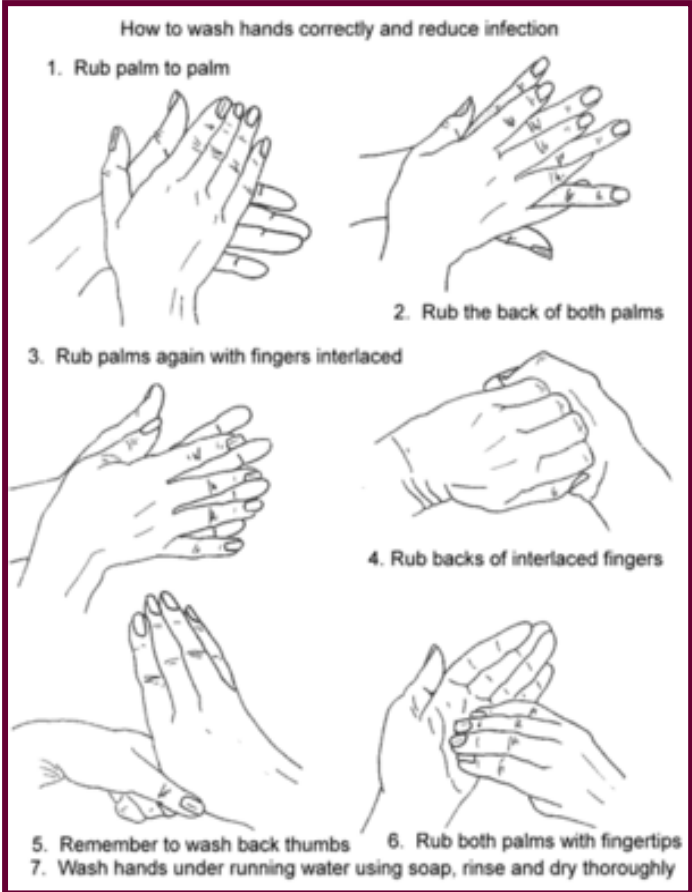
**Example washroom layout and signage**



**Dispenser for hand sanitizer**



**Sign for hand washing instructions**



## 5 Rodents and Insect Control

Rodents and insects are common around pack houses; therefore, it is important to combat them to prevent contamination of food in the pack house. The pack house manager will develop a plan for monitoring and controlling insects and rodents. The plan will include a description of the types of control and monitoring units are used, their location in the pack house. On a pack house plan, name each area in the pack house and mark where each insect or rodent control unit is. Number and indicate the type of each insect or rodent (bait station) control unit or monitoring unit on the plan. The pest control plan will include a schedule for inspecting and maintaining the insect and rodent control units, a form for recording observations and actions taken and will give the name of the person responsible for making the inspections and maintaining the control units.

- Identify areas where rodent activity inspection is to be held.
- External rodent traps must be installed around the outside of the pack house.
- Internal rodent traps must be installed in high risk areas inside the pack house.
- Insect monitors (sticky board type) can be installed inside the pack house.
- Moth pheromone traps can be suspended inside the pack house.
  - Electric insect killing equipment can be used as long as there is no danger of contamination of grapes – insects falling into grapes or cartons.
  - Conduct regular inspections and maintenance of insect and rodent traps.
  - On inspection, the responsible person must complete a rodent and insect activity form and sign it.
- **See example of rodent activity form in Annex 7**

**Electric insect killing device**



**Sticky board insect trap**



### **Use of pesticides in the pack house**

- Accredited pesticides must be used in and around the pack house.
- Only use pesticides as prescribed.
- The use of safety equipment must be adhered to.
- After use pesticides must be stored in the designated area.
- Hands must be washed after use



- When pesticides are used in and around the pack house an action report is required stating:
  - Reason for use
  - Area of use
  - Method of application
  - Commercial name of pesticide
  - Quantity of pesticide used
  - Name of applicator
  - Date of follow up inspection

Rodent Trap

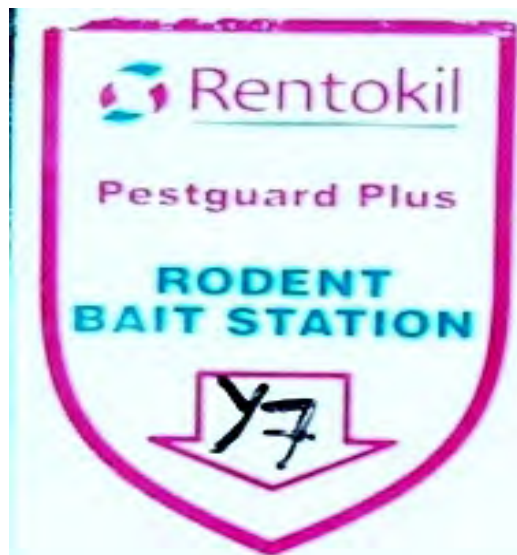


**NB:** All baits and pesticides must meet the client standards

### Bait Stations

- Must be weather resistant and non absorbent
- Access panel must be securely attached i.e. lockable
- Strong enough to resist entry by non target species like cats and dogs
- Entrance holes which only allow target animals
- Internal design should prevent spillage
- Should not be attractive to children – no bright colors
- Proper precautionary statement must be displayed on box
- Date of inspection of bait boxes must be clearly recorded inside the lid of the box with permanent marker, inspector's name to be noted at each visit
- Keys to prevent access to the interior of box to be left on site in the care of the pack house manager
- Positions of bait stations must be marked on a floor plan of the pack house.
- Sign boards should be used to indicate the location of rodent bait stations. See example sign below.

**Example of board marking rodent bait station**



## **6 Conclusion**

The process of implementing a HACCP strategy in the Afghan Table Grape Industry is part of our responsibility as producers and packers to our receivers and the fruit buying public. We must ensure that that Food Safety is treated with as much importance as Production and Packing. Implementing the 7 HACCP Principles (summed up in the question "What can go wrong?") ensures that we can deliver grapes to our markets without fear of contaminants, be they Microbial, Biological or Physical. Having a properly implemented HACCP Plan goes a long way to ensure eventual accreditation for GLOBALGAP which is the prerequisite for entry of grapes to Class 1 markets.

HACCP is not just a checklist of tasks; it must be a mindset which ensures Food Safety from the Vine to the Table.





### 7.3 ANNEX 3 - PACK HOUSE INSPECTION REGISTER

Date: \_\_\_\_\_ This inspection should be carried out once per day.

Name of responsible person: \_\_\_\_\_

Order No	Area/Item	Condition	Problem	Signature of
1	Packing material store			
2	Pack house floor			
3	Empty Picking baskets			
4	Clipping tables			
5	Grading area			
6	Weighing station			
7	Packing tables			
8	Closing area			
9	Labeling area			
10	Toilets			
11	Hand wash area			
12	Lights and light covers			
13	Area around the pack house			









## 7.7 ANNEX 7 - PEST CONTROL/TREND REPORT

Name of responsible person \_\_\_\_\_

Date \_\_\_\_\_ This inspection should be carried and recorded 3 times a week.

Name of Pest	Quantity found	Signature
Rats		
Mice		
American Cockroach		
German Cockroach		
Ants		
Stored product moths		
Stored product beetles		
Fish moths		
Birds		
Others		

### Infestation detail record

The following information should appear on the Infestation Record:

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• 0 = Nil Infestation</li> <li>• R = Rats</li> <li>• M = Mice</li> <li>• C = Cockroaches</li> </ul> | <ul style="list-style-type: none"> <li>• CR = Crawling Insects</li> <li>• SPI = Stored Product Insects</li> <li>• B = Birds</li> </ul> |
|--|--|



## 7.9 ANNEX 9 - EXAMPLE OF A PACK HOUSE CLEANER: SPOREKILL

### **SPOREKILL'S ACITIVITY IS TESTED AND PROVED BY VARIOUS SOUTH AFRICAN RESEARCH INSTITUTES\* AGAINST PLANT & HUMAN PATHOGENIC MICRO-ORGANISMS**

**Plant pathogenic bacteria:** *Acidovorax, Clavibacter, Erwinia, Pseudomonas, Ralstonia, Streptomyces, Xanthomonas, Xylophilus*

**Other pathogenic bacteria:** *Acinetobacter, Agrobacterium, Bacillus, Bordetella, Clostridium, Corynebacterium, E. coli, Haemophilus, Klebsiella, Lactobacillus, Micrococcus, Ornithobacterium, Pasteurella, Proteus, Pseudomonas, Salmonella, Shigella, Staphylococcus, Streptococcus, Vibrio*

**Plant pathogenic fungi:** *Alternaria, Aspergillus, Botrytis, Cercospora, Colletotrichum, Fusarium, Geotrichum, Mildews, Monilinia, Penicillium, Phoma, Phytophthora, Pythium, Rhizoctonia, Sclerotinia, Sclerotium, Septoria, Stemphylium, Verticillium*

**Other pathogenic fungi:** *Aspergillus, Candida, Saccharomyces, Trichophyton*

**Also various viruses, mycoplasma, and algae.**

#### **SOUTH AFRICAN RESEARCH INSTITUTES**

- ARC-Infruitec-Nietvoorbij
- ARC-Plant Protection Research Institute
- ARC-Roodeplaat
- Outspan (Capespan)
- South African Bureau of Standards (SABS)
- University of Pretoria
- University of Stellenbosch
- University of the Free State
- Du Roi QMS and Pathological Services

- CRI (Citrus Research International)

## Material Safety Data Sheet

### ICA International Chemicals Pty Ltd

28 Planken Street  
Plankenbrug Industrial +27-(0)21-8869812 (Tel)  
Stellenbosch +27-(0)21-8868209 (Fax)  
7600  
South Africa

**1) Date issued:** 29/10/2003

**2) Material Identification:**

**Product name:** Sporekill

**CAS number:** See section 3

**Molecular formula:** Mixture

**Chemical name:** (active) N,N- Didecyl-N,N-dimethylammonium Chloride

**3) Hazardous component:**

**Chemical name:** N,N- Didecyl-N,N-dimethylammonium Chloride

**CAS no:** 7173-51-5

**Approx.Wt%:** 12 %

**Exposure Limit:** None established

**4) Potential Health Effects:**

**Primary route of entry:**

Skin contact: (X) Eye contact: (X) Inhalation: (X) Ingestion: (X)

**Effects of overexposure:**

Based on animal test data on this material and adjusted for the percentage active concentration, the following effects can be anticipated: Direct skin contact can produce slight irritation. Direct eye contact will produce severe damage to eyes. Inhalation of spray mist is toxic and can cause irritation and damage. Ingestion may cause immediate burning, pain in the mouth, throat and abdomen, and swelling of the larynx.

**Overexposure that may aggravate existing conditions:**

No effects indicated.

**Material listed as carcinogen:**

National Toxicology Program: No

I.A.R.C Monographs: No

O.S.H.A: No

**5) First Aid Measure:**

**Skin contact:**

For skin contact, wash with plenty of running water and soap if available for 15 minutes. Remove and clean contaminated clothing and shoes.

**Eye contact:**

For eye contact, immediately flush eyes with running water for at least 15 minutes. Hold eyelids apart to ensure rinsing of the entire surface of the eyes and lids with water. Get medical attention.

**Ingestion:**

If swallowed, give 3-4 glasses of milk, egg whites, gelatine solution (if unavailable, water). DO NOT induce vomiting. If vomiting does occur, give fluids again. Get medical attention to determine if vomiting or evacuation of stomach is necessary.

**Inhalation:**

Remove person to well ventilated area away from spray mist.

**Note to physician:**

Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsion may be needed.

**6) Fire and Explosion information:**

**Flash point:** 64C

**Decomposition temperature:** Not known

**Self ignition:** Not known

**Lower explosion limit:** Not known

**Upper explosion limit:** Not known

**Extinguishing media:** Carbon dioxide, Dry Chemical, Alcohol foam, Water.

**Special fire fighting procedures:** None

**7) Accidental release measures:****Measures after spillage/leakage/release:**

Dike and contain spill with inert material (sand, earth, etc.). Transfer the solid and liquid to separate container for recovery and disposal. Where allowed by Federal, State or local regulations, the simplest method of disposal involves dilution to low concentrations in order to allow the biocide to degrade naturally. At levels below 10 parts per million (active), no detrimental effects on functioning waste treatment systems or the environment have been noted.

**8) Special precautions for handling :**

**Packaging or bottling material; Recommended;** Plastic **To be avoided;** Metal

**9) Exposure controls / Personal protection**

**Ventilation:** None

**Respiratory protection:** Prevent inhaling spray mist

**Protective gloves:** Use rubber gloves, when needed, to prevent skin contact.

**Eye protection:** Wear safety glasses with side shields under normal use conditions.

**Other protective equipment:** Running water to treat possible exposure.

**10) Physical and chemical properties**

**Form:** Limpid liquid, colourless, foaming

**Colour:** Clear

**Odour:** Slight bitter smell, Bitter taste

**Melting point:** Not applicable

**Boiling point:** Not known

**Specific gravity:** ~1 kg/L at 20C (IP 365)

**Bulk density:** Not applicable

**Viscosity:** 70 at 25C (Brookfield)

**Copper Corrosion:** 1 (IP 154)

**Water solubility:** Soluble

**Ph-value:** 5-8

**Compatibility:** Not compatible with concentrated anionic compounds.

**Tolerance:** Tolerant of both acid and alkaline medium (3,5 - 9 pH).

**Inert chemicals:** Does not contain phenol, iodine, aldehyde, hypochlorite or Bromide.

**ICA International Chemicals Pty Ltd**

**11) Stability and reactivity:****Stability:**

Stable (X) Unstable ( )

**Conditions to avoid:** Not known

**Dangerous polymerization:** No

**Dangerous incompatibility with water:** No

**Dangerous Reactions:** With Strong oxidizing agents

**12) Toxicology information:**

**Sporekill:**

Acute oral LD50(Rat): > 4000mg / Kg

Acute dermal LD50(Rat): > 2000 mg / Kg

Acute Eye Irritation (OECD 405): "Risk of serious damage to eyes" & code "R41"

Acute Dermal Irritation (OECD 404): "Irritating to skin" & code "R38"

Acute Inhalation LC50 rat: 0.161 mg/L air

Skin Sensitisation Guinea Pig (OECD 406): "non sensitizer"

**Mutagenicity**

Salmonella: not mutagenic with or without metabolic activation

**Not mutagenic**

For Didecyldimethylammonium Chloride: (Ames, CHO/HGPRT, CHO, DNA Synthesis )

**Rat:**

No evidence of chromosomal damage in the bone marrow of rats treated with 2000 mg/kg (12% active).

**Reproductive toxicity:**

rat: not teratogenic

treatment with 40 to 210 mg/kg on days 6 to 15 gestation (12% active)

**Rat:**

For Didecyldimethylammonium Chloride: no reproductive effect for treatment at or below mild toxic effects level.

Not castogenic in Chinese hamster ovary cells with or without metabolic activation.

**Subchronic toxicity:**

Dermal rat:

Test period : 90 days

For Didecyldimethylammonium Chloride: no systemic toxicity

**Chronic toxicity:**

Oral dog:

Test period: 1 year

For Didecyldimethylammonium Chloride: no target organ effects

**Pharmacokinetics:**

Dog:

For Didecyldimethylammonium Chloride: this material does not accumulate in body tissues

**13) Ecotoxicology and Ecology information**

**Fish toxicity (LC50):**

Salmon:

Test period : 96 hours

For Didecyldimethylammonium Chloride (100% active): 1mg/l

**Toxicity for Daphnia (EC50):**

Daphnia magna:

Test period : 48 hours

For Didecyldimethylammonium Chloride (100% active): 0,94 mg/l

**Dietary Toxicity Test:**

LC50 oral : > 5620 ppm

For Didecyldimethylammonium Chloride (100% active): (bobwhite quail and mallard duck)

**Acute contact LD50 to Honeybee**

*Apis mellifera:*

LD50 > 100 µg a.i./bee ("relatively non-toxic")

For Sporekill (12% active)

**14) Transport:**

Not classed as a Dangerous Good by the South African and Australian Code for The Transport of Dangerous Goods by road, rail and air.

**WHO classification:** "U" (Unlikely to present hazard in normal use)

**EU Danger symbols & Risk Phrases:** Xn; R22 C, R34

**15) Disposal considerations**

**Disposal**

Product: Dispose of in compliance with all Federal, State and local laws and regulations. Incineration is the preferred method.

Packaging: Dispose of container after thorough rinse. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incineration, or if allowed by authorities, by burning.

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**This information concerns only the product conforming to its specifications and limits to the uses herein stated. This sheet complements the technical sheet of use but doesn't replace it. The information contained on this sheet is based on knowledge of the product on date of publication. It is given in good faith.**



