LESSON 4
OLIVE FOOD SAFETY AND QUALITY HAZARDS

What are food safety and quality hazards?

Food Safety hazards may be defined as:

Any **biological**, **chemical** or **physical** substance or property that can introduce into the product an unacceptable health risk to the consumer.

Biological hazards are defined as any:

- Bacteria, viruses, moulds and parasites and other micro-organisms which cause illness if ingested by consumers.

Chemical hazards are defined as any:

- Naturally occurring chemicals: (eg. Aflatoxins) as well as,
- Added Chemicals: (eg. Pesticides, Herbicides, Fertilisers, Cleaning chemicals, Heavy metals, Petrochemicals).

Physical hazards are defined as:

- Any naturally occurring or added physical contaminant or property of the olive that may cause an unacceptable health risk to the consumer.

Food Quality hazards may be defined as:

Any **biological**, **chemical** or **physical** substance or property that can alter the quality of the product making it unacceptable to the consumer.

Biological hazards may be defined as any:

- Bacteria, moulds, parasites and other micro-organisms that may reduce the quality or grade of the extracted oil but pose no health risk to the final consumer.

Chemical hazards may be defined as any:

- Naturally occurring or added chemicals that may reduce the quality or grade of the extracted oil but pose no health risk to the final consumer. (eg. Tastes and odours in extracted oils due to gum leaves or ants in harvested olives.)

Physical hazards may be defined as any:

- Naturally occurring or added physical contaminants in harvested olives that may either reduce the quality or grade of the extracted oil or reduce the efficiency of processing but pose no health risk to the final consumer. Examples of physical contaminants include, sticks, stones, branches, leaves, glass, tools, coins, metals, etc.

Examples of food safety and quality hazards

Biological

Reported outbreaks of botulism

Location	Source	Effect
Italy - 1982	Home prepared mushrooms under Olive oil	2 cases - type B toxin (no deaths)
Canada - 1985	Home bottled chopped garlic in olive oil	36 cases - type B toxin (no deaths)
US -1989	Home bottled chopped garlic in Olive oil	3 cases - type A toxin (no deaths)
Italy - 1993	Commercially produced sliced, roasted eggplants in oil	7 cases - type B (no deaths)
UK - 1998	Home preserved mushrooms bottled in oil, imported	2 cases - type B toxin **(1 DEATH)**

(*Reference: Communicable Disease Surveillance Centre 1998*)

Physical

Virgin olive oil processed and sold in Australia between 1999 and 2005 have been reported as being contaminated with sediments and residues from incomplete settling or separation during processing.

Chemical

Metal Contaminants
An extra virgin olive oil sample contained 141 micrograms/kg lead. Which is above the proposed European Commission maximum limit for fats and oils of 100 micrograms/kg.

(*Reference MAFF UK - Number 138 December 1997-METALS IN COLD PRESSED OILS*)

Hydraulic Fluids
Virgin olive oil batches processed in Australia during the 2001 processing season have been reported as being contaminated with hydraulic fluids from harvest machinery.

Formic Acid
Virgin olive oil batches processed in Australia during the 1999 and 2005 processing seasons have been reported as being contaminated with Formic Acid from ants contaminating olives and processing equipment.

Polycyclic Aromatic Hydrocarbons (PAHs)
Spanish Pomace Oil imported into the UK in 2001 was reported to be contaminated with Polycyclic Aromatic Hydrocarbons (PAHs). It contained levels up to 60 times greater than those normally found as background contamination in UK vegetable oils

Listed below are further examples of Food Safety and Quality hazards that may occur in the olive growing and harvesting processes.

Olive Growing process

Critical Step	Potential Hazard	Cause	Preventive or Control Measures
Site and Premises	Chemical Contamination (Persistent Chemicals)	Persistent chemicals present in soil	Determine level of persistent chemicals in soil by reviewing history of property or performing analysis on olives to identify contamination with persistent chemicals.
Pest and Weed Control	Chemical Contamination (residues)	Unregistered chemicals. Exceeding MRL (chemical application technique) Not observing withholding period	Use only registered (or off label registered) chemicals. Use chemicals as per label instructions. Staff training (Chemical Accreditation Course). Maintain Spray Diary.
	Physical Defects (damaged fruit, broken skins)	Insect or bird damage to fruit. Vermin damage on younger trees	Integrated Pest Management Procedures (IPM). Use only registered (or off label registered) chemicals. Use chemicals as per label instructions. Staff training (Chemical Accreditation Course). Maintain Spray Diary. Bird / vermin control. Grove Inspection.
Mulching	Chemical Contamination (residues and persistent chemicals)	Chemically contaminated mulch contacting and contaminating fruit.	Use only approved mulches. Work procedures, Staff training. Grove Inspection.
	Biological Contamination	Biologically contaminated mulch contacting and contaminating fruit.	Use only approved mulches. Work procedures, Staff training. Grove Inspection.
Fertilising	Chemical Contamination (persistent chemicals, heavy metals)	Fertiliser contacting fruit	Use only approved Fertilisers (free of heavy metals). Work procedures, Staff Training. Grove Inspection.
	Biological Contamination	Manure contacting fruit	Work procedures, Staff Training. Grove Inspection.
Irrigation (may include fertigation)	Chemical Contamination (persistent chemicals)	Contaminated water contacting fruit	Irrigation technique (surface or below surface irrigation). Water testing, Work procedures, Staff Training.
	Physical Contamination	Contaminated water contacting fruit	Irrigation technique (surface or below surface irrigation). Water testing, Work procedures, Staff Training.
	Biological Contamination	Biologically contaminated water contacting fruit	Irrigation technique (surface or below surface irrigation). Water testing, Work procedures, Staff Training.

Critical Step	Potential Hazard	Cause	Preventive or Control Measures
Pre-harvest Inspection (Grove Inspection)	Chemical Contamination (residues)	Not observing with-holding periods or label instructions	Spray Diary Inspection (for with-holding periods and registered chemicals). Work procedures, Staff training.
	Physical / Chemical Reduced Yield Chemical	Reduced oil yield due to inadequate pre-harvest inspection procedures	Pre-harvest grove inspection Procedures. Staff Training.

Olive Harvesting Process

Critical Step	Potential Hazard	Cause	Preventive or Control Measures
Pre-harvest Inspection (Equipment Preparation)	Chemical Contamination (Oils, greases, petrol, hydraulic fluids, olive juices and sap)	Hydraulic system leakages during harvest. Petrol and oil leaks during harvest. Lubricants on equipment surfaces Contaminated harvesting equipment	Maintenance and cleaning of harvest equipment. Work procedures, Staff training.
	Physical damage	Damaged harvest equipment (sharp edges etc.)	Harvest equipment inspection / maintenance. Work procedures, Staff training.
	Biological Contamination	Contaminated harvest equipment	Hygiene of harvest equipment. Work procedures, Staff training.
Harvest	Chemical Contamination	Hydraulic fluid leaks in harvesting equipment Lubricant and petrol leaks of harvest equipment Olive sap and juices contaminating olives due to rough handling of trees.	Harvest equipment maintenance procedures. Harvesting procedures. Staff training.
	Physical Defects (burst, splits, broken skins)	Harvesting technique	Harvest procedures, Staff training.
	Physical Contamination (leaves, sticks, stones, soil)	Harvesting technique	Harvest procedures, Staff training.
	Biological Contamination	Contaminated harvest equipment. Harvest techniques	Hygiene of harvest equipment. Harvest procedures, Personal Hygiene, Staff training.

Critical Step	Potential Hazard	Cause	Preventive or Control Measures
Pack	Chemical Contamination	Contamination from bins, crates or boxes	Bin, crate, box washing procedures, Staff training.
	Physical Contamination	Contamination from bins, crates or boxes	Bin, crate, box washing procedures, Staff training.
	Physical Damage	Over filling bins, crates or boxes Damaged bins, crates or boxes	Packing procedures. (Packing depth < 50 cm). Bin, crate, box inspection procedures, Staff training.
	Biological Contamination	Contamination from bins, crates or boxes	Bin, crate, box washing procedures, Staff training.
Storage	Chemical degradation (Enzymatic reactions)	Elevated storage time, temperature and humidity	Storage procedures (< 25 °C, <75% humidity and no greater than 7 days from harvest to processing), Staff Training.
	Chemical Contamination	Contamination from storage area or cold room	Storage Procedures, Storage area hygiene, Staff Training.
	Physical Contamination	Contamination from storage area or cold room	Storage Procedures, Storage area hygiene, Staff Training.
	Biological Growth (Mould)	Elevated storage time, temperature and humidity	Storage procedures (< 25 °C, <75% humidity and no greater than 7 days from harvest to processing), Staff Training.
Transport (to processing plant)	Chemical Contamination	Contamination from transport	Transport procedures (do not transport olives with hazardous substances). Staff training. Approved Transport supplier.
	Chemical Degradation	Overheating during transport Excessive delivery times	Transport procedures (use covered bins or transport), (< 25 °C, <75% humidity and no greater than 7 days from harvest to processing) Staff training. Approved Transport supplier.
	Physical Contamination	Overheating and rough handling during transport Excessive delivery times	Transport procedures (use covered bins or transport), Staff training. Approved Transport supplier.
	Biological (Mould) Growth	high transport / storage temperature, high transport / storage humidity, excessive transport / storage time	Storage and Transport procedures (< 25 °C, <75% humidity and no greater than 7 days from harvest to processing), Staff training. Approved Transport supplier.

Control of Potential Safety and Quality Hazards

Control of potential Food Safety and Quality Hazards in your grove may include:

- Developing practices and procedures that minimise or eliminate the hazard;
- Training staff to ensure they understand what is required of them;
- Reviewing procedures to ensure they are controlling the hazard;
- Testing your olives to ensure the hazards are effectively controlled;
- Calibrating measuring equipment used in your grove; and
- Keeping records so that you can develop your operations to meet your needs.

Site and Premises

Persistent Chemicals

Persistent chemicals may be broken into two groups:

- Old deregistered chemicals; and
- Heavy Metals.

Old deregistered chemicals may be present in your grove due to past practices, or use. Olives grown in groves with old deregistered chemicals present in the soil may become contaminated. The risk of contamination is higher for olives that make contact with the ground, as the persistent chemicals may be present in dirt on the olive's skin. As there are Maximum Residue Limits for these chemicals in olives the amount of chemical in the olive is more important than how much is in the soil.

Examples of persistent chemicals include:

Chemical	Residue Limit	Chemical	Residue Limit
Aldrin	ND*	Heptachlor	ND*
BHC (alpha and beta)	ND*	Hexachlorobenzene	ND*
Chlordane	ND*	Lindane	ND*
Total DDT (DDD, DDE and DDT)	ND*	Methoxychlor	ND*
Dieldrin	ND*	Toxaphene	ND*
Endrin	ND*		

*ND: Not Detectable (*Reference: National Registration Authority December 2001*)

Heavy metals may be naturally present in soils or may have been introduced through the use of fertilisers (especially phosphate) and soil improvers (such as gypsum). Cadmium and lead are the heavy metals of most concern to horticulture products. Most cadmium in soil is in insoluble forms, so uptake by plants is low. Uptake does increase where soils are saline or acidic, low in zinc or organic matter, and if irrigation water is salty. Root crops and leafy vegetables tend to take up more cadmium than other horticulture crops including olives.

Examples of Heavy Metals include:

Heavy Metal	Residue Limit	Heavy Metal	Residue Limit
Antimony	1.0 mg/kg	Mercury	0.03 mg/kg
Arsenic	ND*	Selenium	1.0 mg/kg
Cadmium	ND*	Tin	150.0 mg/kg
Copper	10.0 mg/kg	Zinc	150.0 mg/kg
Lead	0.5 mg/kg		

* ND: Not Detectable
(*Reference. Australian and New Zealand Food Authority Food Standards Code, Standard A12*)

You will need to visit the FSANZ Website to be up to date with the latest Heavy Metal requirements for Olives. http://www.foodstandards.gov.au/foodstandardscode/

What do I need to do?

- Assess your grove to determine if there is a potential for contamination of your olives with persistent chemicals or heavy metals. (When you perform any analysis keep the analysis results in a safe place.)
- Manage contaminated groves by preventing olives from coming into contact with contaminated areas.
- Legally dispose of persistent chemicals.

Pest and Weed Control

Chemical Control

Incorrect storage of chemicals can lead to contamination of tools, equipment and water supplies in your grove. These contaminated items may then contaminate your harvested olives.

Only registered chemicals (including off label permits) should be purchased and used in your grove. Registration of chemicals and label instruction may change. Annual checks of chemical labels and registrations will avoid illegal chemical use.

What do I need to do?

Purchasing and Storing Chemicals

- Only purchase chemicals from an Agsafe accredited supplier;
- Store chemicals in a secure area in their original containers;
- Establish and maintain a Stock Usage Record that lists, the chemical's name, the date of opening, the batch code and/or expiry or manufacture date. (See below for an example Stock Usage Record. Keep chemical records in a safe place.

Example Stock Usage Record

Date Opened	Product Name and Description	Batch Number or Identification and Expiry Date	Initials
6/1/00	*Farmoz Miti-Fol. Ec Miticide (25 kg purchased from IAMA)*	*1234589* *M – 2/5/00*	*GR*
	Monsanto Roundup (10 L purchased from Wise Farmers)	*221133* *M – 10/11/99*	*MM*
24/2/01	*Farmoz Miti-Fol. Ec Miticide (25 kg purchased from IAMA)*	*1234598* *M – 2/1/01*	*MJ*

Using Chemicals

Incorrect usage of chemicals can lead to contamination of harvested olives. Examples include using unregistered chemicals, incorrect mixing and application of chemicals, use of un-calibrated equipment to mix and apply chemicals, spray drift from adjacent crops and not observing with-holding periods.

What do I need to do?

- Only apply chemicals under the supervision of an accredited person.
- Use only registered chemicals (including off label permits) according to label instructions.
- Calibrate equipment used to apply chemicals at least annually. Record the date of calibration and the name of the person conducting the calibration.
- Record all chemical treatments (insecticide, herbicide and fungicides) in your grove, detailing: date applied, chemical used, dilution rate, total volume made up, application rate, application method, location and size of treated area (use the block reference from your grove plan), withholding period or date safe to harvest and the name of the person applying the chemical. (See below for an example Grove Application Record. Alternatively your chemical supplier may provide you with a spray diary).
- Keep Grove Application Records in a safe place.

Example Grove Application Record

Date/Time applied Date safe to harvest	Block Ref & Area (Ha)	Grove Stage & Weed Pest or Disease Targeted	Chemicals & Additives Used Mulch or Fertiliser used	Recommended Rate / Ha	Dilution Rate / 1000 Ltrs	Total volume of chemical made up Ltrs	Litres of spray applied / Ha Kg Mulch or fertiliser applied / Ha	Wind Strength & Direction	Temp (°C)	Operator
8/10/00 *15/10/00*	*A1, A2* *1 Ha*	*Non-bearing* *Mites*	*Miti-Fol EC+*	*500g / Ha*	*100g /1000L*	*5000L*	*5000L/Ha*	*Still*	*21*	*GR*
6/11/00 *12/3/01*	*B1 – B16* *½ Ha*	*Non Bearing*	*Fresh Manure*				*5000 kg*			*MM*

Registered Chemicals

National Registration Authority

for Agricultural and Veterinary Chemicals

Product Enquiry Results

Select a Product Code to view details of the Product.

Product Code	Product Category	Product Name
31393	AgChem	ROUNDUP HERBICIDE BY MONSANTO
31394	AgChem	ROUNDUP CT BROADACRE HERBICIDE BY MONSANTO
31396	AgChem	SQUADRON HERBICIDE BY MONSANTO
31399	AgChem	NUFARM GLYPHOSATE 360 HERBICIDE
31401	AgChem	FARMCO GLYPHOSATE 360 HERBICIDE
31814	AgChem	SURFLAN 500 FLOWABLE HERBICIDE
39276	AgChem	APL GLYPHOSATE 360 HERBICIDE
40521	AgChem	COUNTRY GLYPHOSATE 360 HERBICIDE
45289	AgChem	GLYCEL 360 HERBICIDE
46019	AgChem	RICOCHET 360 HERBICIDE
46020	AgChem	RANGER 360 HERBICIDE
46021	AgChem	HARPOON 360 HERBICIDE
46064	AgChem	SANOS 360 NON SELECTIVE HERBICIDE
46673	AgChem	SUPERWAY GLYPHOSATE 360 HERBICIDE
47207	AgChem	FARMOZ MITI-FOL EC MITICIDE
47234	AgChem	DAVID GRAYS GLYPHOSATE 360 HERBICIDE
47848	AgChem	CM GLYPHOSATE 360 HERBICIDE
48068	AgChem	GENEREX GLYPHOSATE 450L
48070	AgChem	GENEREX GLYPHOSATE 360L
48201	AgChem	KELTHANE MF MITICIDE
48447	AgChem	AGCHEM GLYPHOSATE 360 HERBICIDE
48482	AgChem	ROUNDUP DRY HERBICIDE BY MONSANTO
48518	AgChem	ROUNDUP BIACTIVE HERBICIDE BY MONSANTO
48600	AgChem	NOMIX G READY-T0-USE, NON-SELECTIVE HERBICIDE
48630	AgChem	NUFARM WEEDMASTER HERBICIDE
49011	AgChem	OZTEC GLYPHOSATE 360 NON SELECTIVE HERBICIDE
49101	AgChem	SUMMIT GLYPHOSATE 360 HERBICIDE
49102	AgChem	SUMMIT GLYPHOSATE 450 HERBICIDE
49419	AgChem	KEN-UP HERBICIDE BY KENSO
49507	AgChem	OZCHEM GLYPHOSATE 360
49614	AgChem	DALGETY GLYPHOSATE 360 NON SELECTIVE HERBICIDE
49909	AgChem	NUFARM WEEDMASTER 360 HERBICIDE
50523	AgChem	QUANTUM GLYPHOSATE 450 HERBICIDE
50536	AgChem	NIHIL NON SELECTIVE HERBICIDE
50856	AgChem	ARTFERN GLYPHOSATE 360 HERBICIDE
51144	AgChem	TOMEN SELECT HERBICIDE
51166	AgChem	ROUNDUP CUSTOM HERBICIDE BY MONSANTO

51266	AgChem	TRIGGER DRY-FLO 840 BROAD SPECTRUM HERBICIDE
51620	AgChem	CHEMAG GLYPHOSATE 360 HERBICIDE
51962	AgChem	ROHM AND HAAS KELTHANE EC MITICIDE
52190	AgChem	SELECT HERBICIDE
52430	AgChem	NUFARM CREDIT BROADHECTARE HERBICIDE
52473	AgChem	PESTMASTER AQUA-TECH GLYPHOSATE 360 HERBICIDE
52755	AgChem	ROTAM ROPHOSATE 360 GLYPHOSATE HERBICIDE
52894	AgChem	NICH-FOSATE HERBICIDE
53246	AgChem	RICHGRO GLYPHOSATE 360 HERBICIDE
53290	AgChem	ECHEM GLYPHOSATE 360 HERBICIDE
53494	AgChem	NET-CHEM GLYPHOSATE 360 HERBICIDE
53576	AgChem	NUFARM WEEDMASTER DUO DUAL SALT TECHNOLOGY HERBICIDE
53798	AgChem	NUTURF RAZOR SHARP HERBICIDE
53852	AgChem	4FARMERS GLYPHOSATE 360 HERBICIDE
53877	AgChem	CROP CARE GLYPHOSATE 360 HERBICIDE
54028	AgChem	GULLF AG CLEARUP 360 HERBICIDE
54461	AgChem	HALLEY GLYPHOSATE 360 HERBICIDE
54593	AgChem	DOW AGROSCIENCES KELTHANE EC MITICIDE
54904	AgChem	GULLF AG CLEARUP BIO 360 HERBICIDE

56 Products extracted.

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(*Reference: National Registration Authority web site (www.apvma.gov.au), December 2001*)

Search Results

You searched for permits using the following criteria.
Crop/Animal contains "OLIVE"
[14] permits were found.

To read the permit documents, the Adobe Acrobat reader is required.

Back to Main Search Page

Permit ID	Type	Description	Status	Date Issued	Expiry Date
PER3821	AG	Mineral spray oil / Olives / Scale insect pests	CURRENT	04-Oct-00	31-Dec-03
PER3822	AG	Methidathion / Olives / Various scale insect pests	CURRENT	28-May-01	31-Dec-03
PER3823	AG	Chlorpyrifos / Olives / Various insect pests	CURRENT	05-Jun-01	31-Dec-03
PER3824	AG	Dimethoate / Olives / Various bugs	CURRENT	31-May-01	31-Dec-03
PER3826	AG	Fenthion / Olives / Various insect pests	CURRENT	31-May-01	31-Dec-03
PER3830	AG	Natrasoap insecticidal soap spray / Olives / Lace bug	CURRENT	04-Oct-00	31-Dec-03
PER3832	AG	Alpha-cypermethrin / Olives / Various insect pests	CURRENT	09-May-01	31-Dec-03
PER3833	AG	Metalaxyl-M / Olives / Phytopthora root and crown rot	CURRENT	03-May-01	31-Dec-03
PER3836	AG	Copper hydroxide / Olives / Fungal leaf spot and fruit rot.	CURRENT	28-Mar-01	31-Dec-03
PER3839	AG	Copper oxychloride / Olives / Various fungal diseases	CURRENT	28-Mar-01	31-Dec-03
PER3840	AG	Pendimethalin / Olives / broad spectrum weeds	CURRENT	23-May-01	31-Dec-03
PER3842	AG	Fluazifop-P / Olives / Grass weeds	CURRENT	23-May-01	31-Dec-03
PER3844	AG	Glufosinate-ammonium / Olives / Broad leaf weeds	CURRENT	23-May-01	31-Dec-03
PER4199	AG	Fenamiphos / Olives / Nematodes	CURRENT	30-Mar-01	29-Mar-03

(*Reference: National Registration Authority web site www.apvma.gov.au December 2003*)

As Permits expire or become renewed over the life of this document you will need to be aware of the current permits.

The above permits may not be the current issued Off Label Permits, you can obtain a current list from the Australian Olive Association Web Site www.australianolives.com.au or visit www.apvma.gov.au

Mulching and Fertilising

Heavy metals and other persistent chemicals in mulches and fertilisers may chemically contaminate olives. Physical contact of olives with mulches and fertilisers may also cause biological contamination of the fruit.

What do I need to do?

- Obtain specifications or written assurances from suppliers of mulches or fertilisers that their product is suitable for your requirements. Ensure that the mulch or fertiliser does not contain heavy metals or persistent chemicals.
- To reduce microbiological levels, compost or age animal manures before application to the grove. Note: aging should be for a period of at least six months.
- Develop an application procedure that minimises or prevents manure or fertiliser contacting your olives. Maximise the period between application of organic materials and harvest.
- Store, apply and dispose of mulches and fertilisers in a safe way the minimises the risk of direct contamination of olives or indirect contamination through the water supply.
- Record the application of all mulches and fertilisers detailing: date applied, product used, location of treated area (use the block reference from your grove plan), application rate and the name of the person applying the chemical. (See above for an example Grove Application Record. See the Olive Care Reference Manual for a blank record that you may use as a template. Alternatively your chemical supplier may provide you with a spray diary).
- Keep Grove Application Records in a safe place.

Example Grove Application Record

Date/Time applied Date safe to harvest	Block Ref & Area (Ha)	Grove Stage & Weed Pest or Disease Targeted	Chemicals & Additives Used Mulch or Fertiliser used	Recommended Rate / Ha	Dilution Rate / 1000 Ltrs	Total volume of chemical made up Ltrs	Litres of spray applied / Ha Kg Mulch or fertiliser applied / Ha	Wind Strength & Direction	Temp (°C)	Operator
8/10/00 *15/10/00*	*A1, A2* *1 Ha*	*Non-bearing* *Mites*	*Miti-Fol EC+*	*500g / Ha*	*100g /1000L*	*5000L*	*5000L/Ha*	*Still*	*21*	*GR*
6/11/00 *12/3/01*	*B1 – B16* *½ Ha*	*Non Bearing*	*Fresh Manure*				*5000 kg*			*MM*

Irrigation

Water used for irrigation in your grove may be contaminated with chemicals or micro-organisms.

Chemical contamination may occur in industrial and agricultural areas due to run off from contaminated land.

Microbiological contamination occurs in dams and waterways due to run-off and the entry of animals into the waterway. Bores or wells may be contaminated by seepage from septic systems, while rainwater tanks may be contaminated by dead animals in the tank as well as faecal mater on roofs and in gutters.

If irrigation methods allow water to contact olives a food safety or quality hazard may occur. Avoiding overhead spray irrigation methods minimises this potential hazard.

What do I need to do?

- Prevent water contact with olives by using trickle irrigation or mini sprinklers.
- If these irrigation techniques are unavailable, monitor water quality. Employ a registered laboratory to analyse water quality at least once every 12 months. The water quality analyses should include residue testing.
- If water quality analyses are performed store analysis results in a safe place.

Pre-harvest (Grove) Inspection

Pre harvest Inspection is the final control point in the growing process to control chemical residues on harvested olives. Inspection of your Grove Application records for with-holding periods and registered (including off label permit) chemical use will assure that MRL's[1] (Maximum Residue Limits) are not exceeded.

Careful timing of harvesting controls olive yield, oil content and other quality attributes. Pre-harvest inspection procedures should be developed to ensure harvest occurs when maximum quality and quantity can be had from the grove.

What do I need to do?

- Develop Pre-harvest inspection procedures. (Ensure a Grove Application Record inspection for withholding periods and registered chemicals are included in your pre-harvest inspection procedure.)
- During the pre-harvest inspection ensure the olives meet the Product Quality requirements listed in your Product and Handling Specification.

Note: You will need to visit www.apvma.gov.au
To obtain the current MRL's - Maximum Residue Limits for Olives.
The List below was correct as of 30 June 2003.

[1] The Maximum residue Limits for fresh olives are:

Carbaryl	Less than 10 mg/kg of olives
Chlorpyrifos	Less than 0.05 mg/kg of olives
Cypermethrin	Less than 0.05 mg/kg of olives
Diazinon	Less than 2.0 mg/kg of olives
Fenthion	Less than 1.0 mg/kg of olives
Fluazifop-butyl	Less than 0.05 mg/kg of olives
Glufosinate & Glufosinate ammonium	Less than 0.1 mg/kg of olives
Glyphosate	Less than 0.1 mg/kg of olives
Methidathion	Less than 1.0 mg/kg of olives
Paraquat	Less than 1.0 mg/kg of olives
Pendimethalin	Less than 0.05 mg/kg of olives

(Ref. *Australian and New Zealand Food Authority Food Standards Code, Standard A14.*)

Pre-harvest Equipment Inspection

Contamination of olives by oils, greases or petrochemicals from mechanical harvesters or on harvest mats is not removed from the olive during oil extraction procedures. Harvesting equipment must be well maintained to assure olives are not contaminated. All equipment used for harvest should also be hygienic and free from sharp edges and protrusions that may damage olives.

At the start of the harvesting season all equipment used must be inspected, cleaned and maintained to prevent or minimise contamination and damage to harvested olives.

What do I need to do?

- Develop an Equipment Maintenance and Hygiene Procedure that ensures harvest mats and other harvest equipment are cleaned before use and have no sharp edges or protrusions that may damage harvested olives.
- Develop a Pre-Harvest inspection procedure that ensures all equipment used in the harvesting process is maintained, hygienic and suitable for use.

Harvesting Olives

During harvest the olive is vulnerable to contamination from equipment, the soil and staff. You must develop procedures to minimise contamination of harvested olives.

Harvest records must be kept to enable product traceability. Harvest records should include harvest date, area harvested (reference the grove plan), batch codes or identification marked on bins or packaging containers, amount harvested, and any comments.

What do I need to do?

- Develop Harvesting Procedures that minimise the contamination of olives with leaves, branches, sticks, soil, stones, glass, tools, metals, oils and greases etc.
- Develop Harvested Olive Handling Procedures that prevent physical damage or crushing of harvested olives.
- Develop Personal Hygiene Practices for harvesting staff that minimise the contamination of olives by staff. Include instructions for hand-washing and notifiable diseases.
- Develop a Harvest Record. Complete this record for each harvest day or batch. (See below for an example Harvest and Transport Record. See the Olive Care Reference Manual for a blank record that you may use as a template.)
- Store completed Harvest Records in a safe place.

Example for Contract Harvester

Date Harvested		**No. of Bins harvested**
Time harvest started		
Time harvest completed		**Bin Codes:**
Property (Grove) Harvested		
Block or Patch Harvested		
Harvest Crew (List staff on duty)		

Pre-harvest Inspection	
Harvest Equipment	
All equipment visibly clean?	4for OK
Harvest Mats	4for OK
Mechanical harvesters	4for OK
All harvest machinery free from leaks	4for OK
Harvest (Procedure) Inspection	
Olives physically undamaged by staff	4for OK
Olives not permitted to touch the ground	4for OK
Harvested olives free from contamination?	4for OK
Chemical (Oil, grease, petrol hydraulic fluid)	4for OK
Physical (Sticks, stones, leaves, debris, dirt, etc.)	4for OK
Packing	
Packing (Bin) Inspection	
Bins visually clean	4for OK
Bins free from physical contaminants (Sticks, stones, leaves, debris, dirt, etc.)	4for OK
Bins free from sharp edges and protrusions	4for OK
Packed olive layer <50 cm?	4for OK
Transport	
Transport clean and free from contaminants	4for OK
Transport or bins covered	4for OK
Harvested Olives delivered too:	
Date and Time delivered:	
Temperature of olives on delivery	

Example Harvest and Transport Record

Date	Block ID	Variety	Amount Harvested	Bin ID (Batch no.)	Transport Date	Destination	Comments
3/5/01	M1 – M5	Manz	300 kg	0305-M-SDG	4/5/01	Southern Downs Crushers	Harvest Crew: MM, GR Transport Operator: MM
4/5/01	F1 – F5	Fran	237 kg	0405-F-SDG	4/5/01	Southern Downs Crushers	Harvest Crew: MM, GR Transport Operator: MM

Packing Olives

Further biological, chemical and physical contamination of harvested olives may occur at harvest during packing. All bins or packing containers should be clean and free from contaminants as well as free from sharp or protruding edges that may damage the olives.

A maximum packing depth of 50 cm is recommended by research conducted by the University of Milan. NOTE: Your processor may have a different packing depth requirement.

What do I need to do?

- Develop bin or packing container Inspection procedures that ensure all packing containers are cleaned and free from contaminants before use. This procedure should also include an inspection that ensures there are no sharp edges or protrusions in the container that may damage olives during storage and transport.
- Develop Filling Procedures that ensure bins or packaging containers are filled in a way that prevents crushing or physical damage to the olives. The procedure should also assure containers are not filled to a depth greater than 50 cm **(or a depth recommended by your processor).** You may need to include marks on each bin or packaging container to indicate the correct packing depth.
- Mark each bin, box or container of harvested olives with the name and address of your grove, the date of harvest and the olive variety. You may use a batch code to identify each bin, box or container.

Storing Olives

Further biological, chemical and physical contamination of harvested, packed olives may occur during storage. All storage areas or cold rooms should be clean and free from contaminants.

Research conducted by the University of Milan recommends:

- that storage temperatures should not exceed 25 °C, and
- The time between harvest and processing should not exceed 7 days.

Please check with your Processor for the current requirements that he/she may have.

What do I need to do?

- Develop a storage area pest control program that prevents pests from contaminating olives during storage.
- Develop storage procedures that ensure all storage areas are cleaned and free from contaminants before use. This procedure should also include an inspection of cool room equipment that ensures refrigerants, oils or greases or condensation is prevented from contaminating the olives during storage.
- Develop a Storage Record. Complete this record for each stored batch of olives. (See below for an example Storage Record) Store completed Storage Records in a safe place

Storage Record Example

Date / Time Entering Storage	Batch Number or Identification	Olive Core Temperature (°C) (measured at end of day)	Date / Time Dispatched	Initials
6/4/00	*A1G8-0604-GR*	*21*	*8/4/00 0900*	*GR*
7/4/00	*H9N13-0704-GR*	*22*	*8/4/00 0900*	*MM*

Transporting Olives

Contamination can occur during transport from other substances such as chemicals, fuels and oils on the transport. The environment may also contaminate harvested olives during transport. Dust, leaves, sticks, birds and insects as well as diesel exhaust may enter the bins.

Delays in transporting harvested olives may reduce the quality of olives through increased temperatures.

Transport records must be kept to enable product traceability. Transport records should include batch codes or identification marked on bins or packaging containers, amount of olives transported, date loaded onto transport, name of Transport Company or provider, destination of harvested olives (name of processor) and any comments.

What do I need to do?

- Develop a Transport Procedure that minimises contamination of harvested olives. Ensure bins or packaging containers are only placed on transport that is clean and free from chemicals and other contaminants. Also ensure harvested olives are protected from contamination and high temperatures during transport.
- If a Transport Company is employed to transport harvested olives ensure they have an accredited Food Safety Plan or an accredited Quality Assurance system. Alternatively demand an assurance from the transport provider that harvested olives will:
    - Be transported on clean hygienic trucks
    - Only be transported with other food substances
    - Be covered during transport, and
    - Will not exceed 25°C**(or the recommended temperature provided by your processor)** at the centre of each container during transport.
- Develop procedures to ensure olives are processed within 7 days **(or the recommended period provided by your processor)** of harvesting. Include measures to control the temperature of harvested olives if required.
- Develop a Transport Record. Complete this record for each olive shipment. (See below for an example Harvest and Transport Record)
- Store completed Transport Records in a safe place.

Example Harvest and Transport Record

Date	Block ID	Variety	Amount Harvested	Bin ID (Batch no.)	Transport Date	Destination	Comments
3/5/01	M1 – M5	Manz	300 kg	0305-M-SDG	4/5/01	Southern Downs Crushers	Harvest Crew: MM, GR Transport Operator: MM
4/5/01	F1 – F5	Fran	237 kg	0405-F-SDG	4/5/01	Southern Downs Crushers	Harvest Crew: MM, GR Transport Operator: MM