Australian Government
Australian Quarantine and Inspection Service

AQIS Imported Food Surveys

Report 1 - Imported Horticultural Products

Prepared by the AQIS Imported Foods Programme

Executive Summary

The purpose of this survey was to provide a “snapshot” of the status of imported horticultural products regarding any associated pesticide residues or microbiological contamination.

The survey shows that imported horticultural products are safe. Comparing this result with data from state government surveys of domestic produce indicates that imported produce has microbiological and chemical levels comparable to Australian produce.

The survey results were analysed by Food Standards Australia New Zealand (FSANZ), which advised that the results confirm that horticultural products remain a low food safety risk.

Background

This survey was conducted in addition to the normal testing regime of five percent of imported consignments. It was designed to provide a "snapshot" of the status of imported horticultural products regarding any associated pesticide residues or microbiological contamination.

Maintaining the safety of the Australian food supply and protecting Australian consumers is of the utmost importance to the Australian Government. All food available for sale in Australia is required to comply with the Australia New Zealand Food Standards Code (the FSC) – this applies equally to imported foods as well as foods produced in Australia.

FSANZ is the Australian Government body responsible for the FSC. FSANZ undertakes scientific risk assessments on food, food additives and food contaminants to evaluate any risk to human health and develop appropriate risk management strategies. This includes development or amendment of standards in the FSC. FSANZ also makes recommendations to AQIS as to appropriate monitoring and testing of imported foods, including horticultural products. Currently, horticultural products are deemed a low food safety risk by FSANZ and testing is therefore conducted by AQIS at the rate of five percent of imported consignments.

Specifically, this survey was developed to address:

- concerns that imported horticultural products may be contaminated with chemical residues or pathogenic bacteria; and
- recommendation five of the *National Competition Policy Review of the Imported Food Control Act 1992* (the Tanner Review). The Tanner Review recommended that imported food should be tested for the purpose of information gathering and policy development by Food Standards Australia New Zealand (FSANZ) and AQIS.

The survey was undertaken in response to a request from the Minister for Agriculture, Forestry and Fisheries, the Honourable Peter McGauran.

Methods

Samples were collected aseptically by AQIS field staff, using the attached protocol (see Attachment 2). Samples which were identified by AQIS as a potential quarantine risk were stored at -18^{o}C for a period of not less than one week prior to sampling.

A total of 97 samples were collected. A summary of sample collections is attached (see Attachment 3). Samples were colleted from four points of entry into Australia (Sydney, Perth, Melbourne and Brisbane). Consignments consisted primarily of fresh horticultural products, with a small number of dried or frozen packaged products.

The National Measurement Institute carried out all testing.

E. coli testing was carried out using Coli-ID assay. Coli-ID was used as it allows a more rapid result turnaround than standard methods of detection. Results were reported in colony forming units per gram of sample (cfu/g). Counts of less than 10 cfu/g were considered negative.

Salmonella testing was carried out using Australian standard methods (AS 1766.0-1995). Results were reported as detected/not detected in 25g of sample.

Pesticide assays were performed using a mix of Liquid Chromatography/Mass Spectrometry (LC/MS) and Gas Chromatography/Mass Spectrometry (GC/MS). Attachment 1 includes a list of pesticide residues included in the pesticide assays.

Results

Microbiological Analysis

Salmonella was not detected in any of the 97 samples tested. Of the 97 samples tested for *E. coli*, 14 returned a positive result. Of these positive results, 10 were isolated from horticultural products from a single producer from Fiji, and the remaining four detections were from three different producers from Thailand and one producer from China. The single result from China was 10 cfu/g (that is, at the level of detection), and therefore this result is inconclusive. The horticultural products to which the positive results related included various exotic leaf vegetables (drumstick leaves, cassava leaves, taro leaves, betel leaves and amaranthus leaves), taro, baby corn, asparagus and enoki mushrooms (see Table 1).

Chemical Analysis

50 samples were tested for 139 chemical residues, for a total of 6950 tests. Of these 6950 tests, two tests returned positive results for chemical residues, only one breaching the FSC. A sample of semi-dried tomatoes tested positive to procymidone at 0.06 mg/kg which is below the maximum residue level of 2.0 mg/kg permitted in the FSC. The second positive result was a sample of garlic which tested positive for fenvalerate which is not permitted for use on garlic in the FSC, but is permitted for use in other foods, including horticultural products. FSANZ advised that the detected level of 0.14 mg/kg is unlikely to be any risk to public health but does reflect a breach of the FSC (see Table 1).

Horticultural product	Number of samples	Microbiological results	Chemical residue results
Amaranthus Leaf	2	Nil *Salmonella*; *E. coli* detected in 2 samples	No pesticide residues
Asparagus	10	Nil *Salmonella*; *E. coli* detected in 2 samples	No pesticide residues
Baby corn	10	Nil *Salmonella*; *E. coli* detected in 1 samples	No pesticide residues
Capsicum	5	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Cassava Leaf	2	Nil *Salmonella*; *E. coli* detected in 2 samples	No pesticide residues
Dried mushrooms	1	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Drumstick leaf	2	Nil *Salmonella*; *E. coli* detected in 2 samples	No pesticide residues
Frozen carrot	2	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Frozen cauliflower	1	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Frozen processed carrot	4	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Frozen spinach	4	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Garlic*	9	Nil *Salmonella*; Nil *E. coli*	Fenvalerate residue 0.14 mg/kg
Mushrooms**	9	Nil *Salmonella*; *E. coli* detected in 1 sample	No pesticide residues
Onion	7	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Onion flower	1	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Paan Leaf	2	Nil *Salmonella*; *E. coli* detected in 1 sample	No pesticide residues
Pumpkin	1	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Rosella Leaf	2	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Sadao leaf	1	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Semi-dried tomato*	1	Nil *Salmonella*; Nil *E. coli*	Procymidone residue 0.06 mg/kg
Shallots	1	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Snow pea	6	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Sugar snap pea	4	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Taro	2	Nil *Salmonella*; *E. coli* detected in 2 samples	No pesticide residues
Taro leaf	2	Nil *Salmonella*; *E. coli* detected in 1 sample	No pesticide residues
Tomato	4	Nil *Salmonella*; Nil *E. coli*	No pesticide residues
Yam	2	Nil *Salmonella*; Nil *E. coli*	No pesticide residues

Table 1: Microbiological and chemical residue results of the imported horticultural products survey

*As these chemicals are below Australian MRLs or, as advised by FSANZ, do not present a risk to public health, the countries have not been identified.

** The level was 10cfu/g, which was the level of detection. Therefore this result is inconclusive.

Discussion

Microbiological analysis

Salmonella is an anaerobic rod-shaped bacterium of interest to public health. A number of *Salmonella* species are pathogenic to humans. The detection of *Salmonella* in food requires notification of state or territory health authorities. For the purposes of the survey, *Salmonella* has been used as an indicator of the presence of animal faeces coming into contact with horticultural products, usually via fertiliser usage.

Salmonella was not detected in any of the samples.

E. coli is an anaerobic rod-shaped bacterium of interest to public health. Most strains of *E. coli* are harmless to humans, but a small number of strains are considered pathogenic. *E. coli* is found ubiquitously in the environment, in soil and in intestinal

tracts of humans and animals. *E. coli* has been associated with faecal contamination of food, which can occur through poor handling, contamination with treated sewerage used for irrigation, irrigation with contaminated water, or inadequate storage conditions.

E. coli was detected in 14 samples, mainly in exotic leaf crops. These leaf crops are usually washed and/or cooked prior to consumption. *E. coli* was also found in some vegetables - taro, baby corn, asparagus and mushrooms. Again, these vegetables are generally washed and/or cooked prior to consumption. Health authorities in Australia recommend washing and cooking vegetables as a risk mitigation step for the presence of microorganisms, including *E. coli*.

FSANZ advise that the levels of *E. coli* found in the horticultural products were of little concern to human health.

There are currently no regulatory levels for *E. coli* in horticultural products in the FSC. There is no documented evidence in Australia of foodborne illness in relation to the presence of *E. coli* in horticultural products.

Chemical analysis

Fenvalerate is a synthetic variant of pyrethrum, a natural insecticide. It is widely used in horticulture industries worldwide to control butterflies and moths, as well as aphids, leafhoppers and thrips. It is also used as in Australia as an insecticide.

Procymidone is a fungicide used in Australia to control grey mould, sclerotinia rot and brown rot on a wide variety of crops.

The FSC sets a Maximum Residue Limit (MRL) for procymidone at 2.0 mg/kg in tomatoes. The detection of 0.06 mg/kg in semi-dried tomatoes is therefore within allowable levels as stipulated by the FSC. There is no MRL listed for fenvalerate in garlic, although there are MRLs for fenvalerate for other horticultural products. FSANZ advise that the detected level of 0.14 mg/kg is highly unlikely to represent any risk to public health, but does represent a breach of the FSC.

Acknowledgements

AQIS acknowledges the assistance of Food Standards Australia New Zealand (FSANZ) in conducting this survey, through the provision of independent, expert advice.

AQIS also acknowledges the support and assistance of the Food Surveillance Network in conducting this survey. The Food Surveillance Network includes government representatives from each state and territory in Australia, the Commonwealth, and New Zealand.

Attachment 1 - List of Pesticide Residues

Organochlorines	**Organophosphates**	**Fungicides**	**Herbicides**
Aldrin	Acephate	Benalaxyl	Atrazine
alpha BHC	Azinphos ethyl	Bitertanol	Bromacil
beta BHC	Azinphos methyl	Bupirimate	Diuron
delta BHC	Bromophos ethyl	Captan	Hexazinone
gamma BHC (Lindane)	Carbophenothion	Chlorothalonil	Linuron
Total BHC	cis Chlorfenvinphos	Cyprodinil	Methabenzthiazuron
cis Chlordane	trans Chlorfenvinphos	Dichlofluanid	Metolachlor
trans Chlordane	Total Chlorfenvinphos	Dicloran	Metribuzin
Total Chlordane	Chlorpyrifos	Difenoconazole	Molinate
DDD pp	Chlorpyrifos - methyl	Dimethomorph	o-Phenylphenol
DDE pp	Coumaphos	Diphenylamine	Oxyfluorfen
DDT pp	Demeton-S-methyl	Fenarimol	Pendimethalin
DDT op	Diazinon	Flusilazole	Prometryn
Total DDT Analogs	Dichlorvos	Hexaconazole	Propachlor
Dicofol	Dimethoate	Imazalil	Simazine
Dieldrin	Dioxathion	Iprodione	Trifluralin
alpha Endosulfan	Ethion	Metalaxyl	
beta Endosulfan	Ethoprofos	Myclobutanil	**Synthetic Pyrethroids**
Endosulfan sulphate	Fenamiphos	Oxadixyl	Bifenthrin
Total Endosulfan	Fenchlorphos	Penconazole	Bioresmethrin
Endrin	Fenitrothion	Prochloraz	Cyfluthrin
Heptachlor	Fenthion	Procymidone	beta Cyfluthrin
Heptachlor Epoxide	Fipronil	Propiconazole	Cyhalothrin
Total Heptachlor	Formothion	Pyrimethanil	lambda Cyhalothrin
Hexachlorobenzene	Malathion	Tebuconazole	Cypermethrin
Methoxychlor	Methacrifos	Triadimefon	alpha Cypermethrin
Nonachlor	Methamidophos	Triadimenol	Deltamethrin
Oxychlordane	Methidathion	Vinclozolin	Esfenvalerate
	Mevinphos		Fenvalerate
Carbamates	Monocrotophos		Flumethrin
Carbaryl	Omethoate		Permethrin
Methomyl	Parathion		Phenothrin
Pirimicarb	Parathion methyl		
	Phorate		**Acaricides**
	Phosalone		Buprofezin
	Phosmet		Disulfoton
	Pirimiphos methyl		Propargite
	Profenofos		Tebufenpyrad
	Prothiophos		Tetradifon
	Temephos		
	Triazophos		**Growth Regulators**
	Trichlorfon		Paclobutrazol
	Vamidothion		
			Synergists
			Piperonyl Butoxide

Attachment 2 – Sampling Protocol

For fresh vegetables, the sampling will occur when the quarantine inspection is undertaken. All processed vegetable sampling will occur when the Imported Food inspection is undertaken.

Notes for Quarantine inspection sampling

**Please indicate on the sample form when the sample was taken – pre-treatment or post-treatment.

**Please ensure that aseptic sampling is conducted.

**Please ensure that OH&S considerations are taken into account for determining the most appropriate time to take a sample.

Please conduct normal inspection activities. At the end of the inspection activities, please take the sample. **Note that the time taken to collect the sample should not be billed to the client.

Notes for Imported Food inspection

Please conduct normal inspection activities, including sampling. At the end of the inspection activities, please take an additional sample. **Note that the time taken to collect the sample should not be billed to the client. The laboratory costs for the normal inspection activities will be met by the client. The laboratory costs for the additional sample for this survey will be paid by AQIS.

General notes for Quarantine and Imported Food staff

- Sample quantity: 5 x 100g subsamples constitutes one sample.
- Sample portion: only edible portion of vegetables are suitable for sampling and testing.
- Sample preparation: samples are to be tested "as is" – that is, vegetables will not be washed or rinsed or otherwise treated prior to testing.
- Mixed consignments – where more than one vegetable commodity is in the same shipment, it is at the staff's discretion which samples are taken. The aim is to gather a wide range of vegetables from a wide range of sources. If you have the time to take more than one sample from a mixed consignment, this would be encouraged.

Drawing an aseptic sample

1) Ensure that conditions are suitable for aseptic sampling
2) Wash your hands or use wipes
3) Sterilise the equipment by using sterilising wipes or spraying with ethanol then ignite with a flame, taking into account OH&S considerations
4) Collect sample and place into the appropriate container.
5) Seal sample container
6) Clean equipment.
7) Continue until all sub-samples have been sampled.
8) Place all sub-samples into one bag, and attach a completed 'Sample Identification Form' to the bag (see Attachment 4)
    a) Remember – it is important that you include the entry number and product description on the form, so that if you take more than one sample from the consignment, we can track that. This means that a separate form for each sample in multiple consignments is required.
9) Clean equipment
10) Deliver sample to Laboratory sample depot for lab pick up
11) If necessary, notify laboratory to arrange for collection of sample.

Total Samples by Commodity

Horticultural product	Number of samples
Amaranthus Leaf	2
Asparagus	10
Baby corn	10
Capsicum	5
Cassava Leaf	2
Dried mushrooms	1
Drumstick leaf	2
Frozen carrot	2
Frozen cauliflower	1
Frozen processed carrot	4
Frozen spinach	4
Garlic	9
Mushrooms	9
Onion	7
Onion flower	1
Paan Leaf	2
Pumpkin	1
Rosella Leaf	2
Sadao leaf	1
Semi-dried tomato	1
Shallots	1
Snow pea	6
Sugar snap pea	4
Taro	2
Taro leaf	2
Tomato	4
Yam	2
Total	***97***