Northern Territory Government

Northern Territory Horticultural Produce Monitoring Program 2010

Northern Territory Primary Industries

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Executive Summary

The Northern Territory has a growing horticultural sector with most of the produce sent to interstate markets. There is an increasing interest from consumers in the level of pesticide use on horticultural produce and a desire for minimal if any residues on produce. However, this needs to be balanced with consumers other preference for high quality produce with minimal defects and a good storage/shelf life. There are also quarantine requirements for interstate market access that dictate the need for some pesticide treatments pre- or post-harvest. Northern Territory producers therefore have to balance these two requirements. In 2005, Chemical Services staff began conducting annual pesticide residue surveys for horticultural produce involving a mixture of random and targeted (according to crop significance/volume or the relatively greater potential for residues) samples of produce. In previous annual surveys, while there have been some detections of unacceptable residues where the Maximum Residue Level (MRL) has been exceeded the frequency of this has been similar or below that found in some other jurisdictions. In addition, Chemical Services staff use this information to target users and produce which may have a higher likelihood of MRL violations. Information collection on MRL violations is used to guide R&D to address areas where new or improved controls are required and to work with industry to gain new or extended permits or product registrations for existing or new products.

The Northern Territory horticultural produce monitoring program is conducted on a calendar basis. It involves the collection of samples by two approaches firstly with Chemical Services staff sampling directly from consignments at consolidation points or from grower properties after they have been packed. The second approach used by FreshTest® involves persons based in major interstate markets randomly collecting produce on sale in wholesale markets. Chemical Services has the locally collected produce tested and purchases test results for Territory grown produce from FreshTest®.

Chemical Services collected 24 samples of fruit and produce in the Northern Territory during the period July 2010 to March 2011. Chemical Services also obtained the results of another 146 samples from the FreshTest® sampling program taken from city markets during 2010. A wide range (27) of fruit (15) and vegetable (12) crops were sampled, including beans, citrus, cucumbers, mangoes, melons and a variety of leafy and fruiting vegetables. One hundred and seventeen chemicals were screened for during analyses with an estimated total of 19 422 analyses conducted. Six insecticide and 12 fungicide active ingredients were detected during chemical analysis with chlorpyrifos, dimethoate, fenthion and prochloraz the most commonly detected active ingredients. The majority of these chemicals are used post-harvest to enable interstate market access or to protect crops from storage rots and ensure they have acceptable storage/shelf life for purchasers. Overall, 99.22% of the analyses had residues below the level of quantification. Some unacceptable residues were detected and Chemical Services has taken action to rectify this situation. The level of residues detected continued to be similar or below that found by similar studies interstate.

Introduction

A wide range of pesticides have been registered with the Australian Pesticides and Veterinary Medicines Authority (APVMA) for use in the production of many horticultural crops. Each registered pesticide product has an approved label which specifies how to use the product to achieve effective pest or disease control whilst minimising any potential adverse effects including excessive residues on harvested produce. Chemical Services conducts an annual pesticide survey on a range of Northern Territory grown produce to determine the incidence of residues and to check that these are within the legal Maximum Residue Limit (MRL).

Objectives

The objectives of the Northern Territory annual survey of pesticide residues of horticultural produce are:

1. Determine the pesticide residue status of Northern Territory horticultural produce.

2. Conduct appropriate remedial action where required, including grower education and compliance.

Methodology

This report contains a number of acronyms or terms which are defined in Appendix 1.

The methods used in the survey are described in the 'Biosecurity and Product Integrity Division Pesticide Residue Sampling Produce Manual' (Alcock 2006) that forms part of Chemical Services Manual. Similar surveys are conducted in some other jurisdictions with:

- New South Wales (NSW) – NSW Agriculture and Sydney Markets Limited (SML) funded the Pesticide Residue Survey from 1989 until 2005 (NSWA 1996, 2000, 2001, 2003, 2004, 2005, Plowman 1995, Plowman *et al*. 1995). This survey included produce arriving at the Sydney Market from interstate (Plowman *et al.* 1995).
- South Australia (SA) – conducted annual surveys of produce in weekend markets in early 2000's (e.g. Walker 2004). This survey only involved SA produce.
- Victoria – DPI Victoria and its predecessors has conducted surveys since 1987 (e.g. Heath & Rumbold 2008, VDPI 2009, 2010). Currently, this program is called the Victorian Produce Monitoring Program (VPMP) and only involves Victorian produce. At present, it appears to be the only other pesticide residue testing program being conducted annually and reported by another jurisdiction.

At a national level the federal Department of Agricultural, Fisheries and Forestry (DAFF) conducts the National Residue Survey (NRS) but is only conducted on a limited range of major plant crops (DAFF 2010).

The Northern Territory pesticide residue survey is conducted on a calendar year basis rather than a financial year and involves two sets of testing.

Set (1)

Random testing of samples collected at points of consignment within the Northern Territory

Chemical Services staff collect samples of fruit and produce consigned for interstate markets at consolidation points and packing sheds. Sampling generally occurs within 12–24 hours of harvest. The size of samples is dependent on the type of produce being sampled (Table 1). The sample is collected into a plastic bag, double bagged, labelled and placed in an ice box. Sampling at consolidation points typically occurs in the early-late night. Bagged samples are then placed in polystyrene boxes with gel ice pads and sent overnight to a NATA accredited laboratory where testing is done under contract. The laboratory uses a multiple residue test and screens for a wide range (117) of insecticides, miticides and fungicides (Appendix 2b).

Table 1: Size of samples taken for residue testing according to crop type[1]

Commodity	Examples	Minimum quantity required
Small or light products, unit weight up to about 25 g	Berries, peas, parsley	1 kg
Medium-sized products, unit weight usually between 25 to 250 g	Apples, oranges, carrots, potatoes	1 kg (at least 10 units)
Large-sized products, unit weight over 250 g	Cabbage, melons, large cucumbers	2 kg (at least 5 units)

Note: [1] modified by abbreviation after Table 3.6.3, Appendix 3 (Alcock 2006)

All growers whose produce is sampled receive a letter of notification to inform them that this has occurred. A copy of the laboratory results is then provided to each grower with their results at the completion of the survey. Any growers with detections that are above 0.5 of the MRL are visited and investigated to ascertain the cause(s) of the elevated results. Advice is then provided on how to improve their pesticide use to avoid this reoccurring. When the residues are deemed excessive with no justification for this occurring, the grower is issued a penalty infringement notice.

Set (2)

Random testing of Northern Territory produce in major interstate fresh markets

This testing is part of a national program operated by FreshTest®. This firm conducts large scale surveys from produce in large produce markets (Adelaide, Brisbane, Melbourne, Perth, Sydney). One hundred and seventeen pesticides are screened for and Chemical Services purchases FreshTest®'s Northern Territory set of sample results.

FreshTest® is operated by the Australian Chamber of Fruit & Vegetable Industries Ltd and was developed by the wholesaling market sector to verify the food safety and quality assurance systems of growers and wholesalers. The sampling is undertaken by a facilitator who samples the produce independently from the wholesaler or the grower.

Samples are taken in accordance with CODEX Guidelines for sampling and are then sent to the contracted laboratory for analysis of the same suite of pesticide actives and metabolites as for the samples collected by Chemical Services (Appendix 2a).

http://www.freshstate.com.au/index.php?option=com_content&task=view&id=41&Itemid=66

Unlike the samples collected within the Northern Territory (Set 1), it is not possible to trace the FreshTest® results to the grower of the property of origin. This is due to the confidential arrangements between FreshTest®, the wholesaler and the grower. FreshTest® undertakes its own remedial corrective action as required.

Results and Discussion

Data from the two sources is collected differently. In spite of this difference, the two data sets have been combined where we feel it is appropriate to get the widest picture of residues in Northern Territory horticultural produce. The sampling in all cases does not represent a statistically random sample based on volumes.

(a) Source of produce

Most of the produce sampled within the Northern Territory was from producers in the Darwin rural area (Darwin River, Humpty Doo, Lambell's Lagoon, Marrakai, Palmerston (nearby)), with several samples from Katherine properties and most samples collected at transport depots. Samples were collected between 27 July 2010 and 15 March 2011. Normally all of the samples are collected within a calendar year, but in 2010 citrus was sampled in March 2011 as this is the harvest period for the crop. The timing of sampling is dependent on when crops are sown (i.e. Asian vegetables) or mature. For example, Asian vegetables were sampled between 27 July and 1 September 2010, with mangoes sampled in October and citrus up to 15 March 2011.

'FreshTest® samples' (146) of Northern Territory produce were mostly collected from the Sydney market but also from other major markets.

(b) Type of produce sampled

A wide range (27) of fruit (15) and vegetable (12) crops were sampled (Appendix 3). This is much wider than the range tested in some other jurisdictions e.g. 11 in Victoria in 2007/08 (Heath & Rumbold 2008).

(c) Number of analyses conducted

Overall, 170 samples were tested, of which 24 were collected by Chemical Services staff and the remainder organised by FreshTest®. An estimated total of 19 422 analyses were then conducted on these samples for various pesticides (Appendix 2). Both the number of samples (Appendix 4) and analyses were similar to those conducted per annum over the previous three years. These statistics compare very favourably with those in other jurisdictions. For example, in Victoria, which has a substantially larger plant industry, in 2007/08 457 samples were collected and 32 314 analyses conducted (Heath & Rumbold 2008). This indicates that the Northern Territory residue survey is one of, if not the most comprehensive in the country and can provide a high degree of confidence in the overview of crop residues that is being obtained.

(d) Types of residues detected

Six insecticide and 12 fungicide active ingredients were detected in either the samples collected by Chemical Services staff or FreshTest® (Table 2). The active ingredients most commonly detected were chlorpyrifos, dimethoate, fenthion and prochloraz (Appendices 5–6). This mainly reflects the pattern of use of these pesticides with all of them except for chlorpyrifos used as post-harvest treatments against fruit flies (for interstate market access) or to prevent storage rots and unacceptable post-harvest losses (e.g. Pikethley & Conde 2007).

Table 2: Range of pesticides (active ingredients) with residues detected from Northern Territory horticultural produce sampled for pesticide residue testing during 2010 by Chemical Services and FreshTest®

Type of produce	Fungicides	Insecticides
Fruit (including rock and water melons)	azoxystrobin, fludioxonil, imazalil, prochloraz	bifenthrin, carbaryl, chlorpyrifos, dimethoate, endosulfan, fenthion, malathion, permethrin
Vegetable (including bitter melon)	azoxystrobin, dithiocarbamate, fenarimol	carbaryl, chlorpyrifos, dimethoate, endosulfan, imidacloprid, methomyl, omethoate, permethrin, spinosad

(e) Level of residues detected

A very high proportion (99.22%) of the analyses detected either no residues or residues that were below the Maximum Residue Limit (MRL) as found in previous years (i.e. 99.52–99.99%). This is a very good result and compares very favourably with the available results from other jurisdictions. For example, in 2007/08 in Victoria 0.1% of the produce tested was found to have unacceptable residues (Heath & Rumbold 2008). It should also be noted that the Northern Territory result has been achieved even though some crops with the potential for greater residues were targeted and with a smaller number of samples.

Residues of two pesticides (i.e. chlorpyrifos, permethrin) were found at levels above the MRL and four on crops for which there was no MRL set (i.e. azoxystrobin, bifenthrin, fenarimol, permethrin). These residues were detected on one of seven crops (i.e. beans (snake), cucumber (Lebanese), mango (green and KP), okra, pitaya and Sin Qua) (Appendices 5, 6). A higher incidence of residues above MRL has also been observed in other states (e.g. NSWA 1996, 2000, 2001, 2003, 2004, 2005, where the % samples with residue detections greater than the MRL ranged from 0.9–3.3% for fruit crops compared with 1.9–6.1% per annum for vegetables).

Some of these pesticides found above MRL in 2010 have been previously detected above MRL or on crops for which no MRL has been set. The range of pesticides detected with unacceptable residues, varies slightly between years (Appendix 6). However, the level of chlorpyrifos which is the only pesticide which has been found on a number of occasions, has declined with up to 2.6 mg/kg found between 2002–05 compared with up to 0.89 mg/kg since 2006 on various vegetable crops.

(f) Compliance actions taken in response to survey results

There were 17 instances where pesticide residues exceeded the MRL (Appendices 5, 6). These were detected from 15 samples, with one sample having excess residues of two pesticides.

Residue violation can occur for a number of reasons and it is useful to categorise them as:

1. Residues above the MRL for a pesticide crop combination that is a registered use.
2. Residue above the MRL for a pesticide crop combination that is a registered use but the use of the product as per the label will still result in residues above the MRL. A specific current example is the use of chlorpyrifos on vegetables. This particular issue is being addressed by a review of chlorpyrifos use by APVMA and should not be an ongoing issue. For more details refer to the following website http://www.apvma.gov.au/products/review/current/chlorpyrifos.php
3. Crops where the use of the pesticide is not registered for use on that crop or commodity group. i.e. an off label use. This includes a number of very minor crops that may not be covered by labels or permits.

The identification of these residues results in a combination of regulatory actions aimed at preventing a repetition of the residue violations. These range from extension advice, written warning for corrective action through to infringement notice and at a last resort prosecution for non-compliant offenders.

Growers who have been detected with residue violations are also targeted in the following programs to audit compliance.

As the sample results are received well after the produce has gone through the distribution chain the actions do not generally include product recalls. Producers are notified of their analysis results and a combination of extension and regulatory actions are applied.

Recommendations

The following recommendations are made:

1. Future testing. That annual pesticide residue testing is continued at the same level but with changes in the range of crops and location of sampling made as required to reflect any changes that may occur in the industry development and risk shown by previous surveys or new intelligence.

2. Compliance activity. That this is maintained and industry is reminded that legislation will be enforced. That extension to industry remains a fundamental part of the regulatory program with Chemical Services staff having some involvement in relevant industry-funded programs and the existing partially complete Chemical Services database of available pesticides across a range of crops is completed and updated annually and used as part of the extension process.

3. Dissemination of results. That an annual report on the pesticide residue results continues to be published and that this report should be made available publicly by placing on the Departmental website. That key results from the report continue to be discussed with pesticide resellers based in the Northern Territory.

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Appendices

Appendix 1: Terms used in report

Term (acronym)	Definition
APVMA	Australian Pesticides and Veterinary Medicines Authority
LOD	Limit of Detection Minimum concentration of a residue present in a sample that can be confidently detected and positively identified by a specific laboratory method.
LOR	Limit of Reporting Minimum concentration (mg/kg) of a residue used for reporting purposes. Results of analyses lower than the LOR are not included in this report. Typically the LOR set by NRS is 10–20% of the respective maximum residue limit (MRL), extraneous residue limit (ERL) or maximum level (ML). (DAFF 2010).
LOQ	Limit of Quantification Lowest level of residue which can be quantified by a test used for residue analysis.
MRL	Maximum Residue Limit Maximum level of a chemical that is legally permitted to be present in food, and is generally expressed in milligrams of the chemical per kilograms of the food (mg/kg). This limit represents the level of residue that should not be exceeded if good agricultural practice is followed.
NRS	National Residue Survey Established by Federal Government in the early 1960s in response to concerns about pesticide residues in exported meat. Now conducts tests for a range of animal, grain, horticulture and fish products for residues of pesticides and veterinary medicines, as well as for other contaminants. NRS uses random or specifically designed sampling protocols. Australian primary industries are able to participate in NRS by providing funds through levies or through contracted direct funding. Results from the NRS are published annually (e.g. DAFF 2010).
Residue	Within the context of agriculture, this refers to the amount of a chemical treatment, or its breakdown products, which can remain in or on produce. This can include elements (such as heavy metals or pesticides, which may be present through agricultural or industrial activities or natural circumstance.
(WHP)	Withholding Period Minimum permissible time between the last application of an agricultural chemical to a crop and the harvesting of the agricultural or horticultural produce to which the chemical was applied.

Appendix 2: Summary of agricultural chemical actives and metabolites and levels of detection/reporting

(a) FreshTest® - actives tested and limit of reporting (LOR)

Compound	LOQ (mg/kg)	Compound	LOQ (mg/kg)	Compound	LOQ (mg/kg)
Organochlorines		**Fungicides**		**Synthetic Pyrethoids**	
Aldrin	0.05	Benalaxyl	0.05	Bifenthrin	0.01
BHC - alpha	0.05	Biteranol	0.05	Bioresmethrin	0.05
BHC - beta	0.05	Captan	0.05	Cyfluthrin	0.05
BHC - delta	0.05	Chlorothalonil	0.05	Cyfluthrin-b	0.02
BHC - Total	0.05	Cypraconazole	0.05	Cyhalothrin	0.02
DDD - p.p.	0.05	Cyprodinil	0.05	Cyhalothrin-l	0.02
DDE - p.p.	0.05	Dicloran	0.05	Cypermethrin	0.05
DDT - p.p.	0.05	Difenoconazole	0.05	Cypermethrin-a	0.02
DDT - Total	0.05	Dimethomorph	0.05	Deltamethrin	0.02
Dicofol	0.05	Diphenylamine	0.05	Esfenvalerate	0.05
Dieldrin	0.05	Fenarimol	0.05	Fenvalerate	0.05
Endosulfan - a	0.05	Fludioxonil	0.05	Fluvalinate	0.05
Endosulfan - b	0.05	Flusilazole	0.05	tau-Fluvalinate	0.05
Endosulfan - Sulphate	0.05	Hexaconazole	0.05	Permethrin	0.05
Endosulfan - Total	0.05	Imazalil	0.05	Phenothrin	0.05
HCB	0.05	Iprodione	0.05	Pyrethrins	0.05
Lindane	0.05	Kresoxim methyl	0.05		
Trichlorfon	0.10	Metalaxyl	0.05	**Others**	
		Myclobutanil	0.05	Azoxystrobin	0.05
Organophosphates		Paclobutrazol	0.05	Benomyl	0.10
Acephate	0.10	Penconazole	0.05	Carbendazim	0.10
Azinphos methyl	0.05	Piperonyl butoxide	0.05	Chlorfenapyr	0.05
Chlorpyrifos	0.01	Prochloraz	0.05	Clofentezine	0.05
Chlorpyrifos methyl	0.05	Procymidone	0.05	Dithianon	0.02
Diazinon	0.05	Propiconazole	0.05	Diuron	0.05
Dichlorvos	0.05	Pyrimenthanil	0.05	Fenhexamid	0.02
Dimethoate	0.05	Quintozene	0.05	Fenoxycarb	0.05
Fenamiphos	0.05	Tebuconazole	0.05	Fenpyroximate	0.05
Fenitrothion	0.05	Toclophos methyl	0.05	Fipronil	0.05
Fenthion	0.05	Triadimefon	0.05	Hexythiazox	0.05
Malathion	0.05	Triadimenol	0.05	Imidacloprid	0.05
Methamidophos	0.05	Vinclozolin	0.05	Methomyl	0.02
Methidathion	0.05			Methomyl oxime	0.02
Mevinphos	0.05	**Dithiocarbamates**		Pymetrozine	0.02
Monocrotophos	0.05	Ferbarn	0.01	Spinosad	0.02
Omethoate	0.10	Mancozeb/Maneb	0.01	Tebufenozide	0.05
Parathion ethyl	0.05	Metiram	0.01	Thiabendazole	0.02
Parathion methyl	0.05	Propineb	0.01	Thiacloprid	0.05
Phorate	0.05	Thiram	0.01	Trifloxystrobin	0.05
Phosmet	0.05	Zineb	0.01		
Pirimiphos methyl	0.05	Ziram	0.01		

Organophosphates		Carbamates		Others	
Profenofos	0.05	Carbaryl	0.05	Indoxacarb	0.05
Prothiofos	0.05	Pirimicarb	0.05	Pyriproxifen	0.05
Tebufos	0.05				
		Phenols		**Herbicides**	
Acaricides		O- Phenylphenol	0.05	Chlorthal dimethyl	0.05
Buprofezin	0.05			Linuron	0.05
Propargite	0.05			Metribuzin	0.05
Tebufenpyrad	0.05			Oxyfluorfen	0.05
Tetradifon	0.05			Pendimethalin	0.05

(b) Contract laboratory – actives tested and limit of quantification (LOQ)

Compound	LOQ (mg/kg)	Compound	LOQ (mg/kg)	Compound	LOQ (mg/kg)
Acephate	0.05	Etoxazole	0.01	p,p-DDE	0.01
Aldrin	0.01	Fenamiphos	0.01	p,p-DDT	0.01
alpha-BHC	0.01	Fenarimol	0.01	Paclobutrazol	0.01
alpha-Endosulfan	0.01	Fenhexamid	0.01	Parathion ethyl	0.01
Azinphos-methyl	0.01	Fenitrothion	0.01	Parathion methyl	0.01
Azoxystrobin	0.01	Fenoxycarb	0.01	Penconazole	0.01
Benalaxyl	0.02	Fenpyroximate	0.01	Pendimethalin	0.01
Benomyl	0.01	Fenthion	0.02	Permethrin	0.01
beta-BHC	0.02	Ferbam*	0.01	Phenothrin	0.01
beta-Endosulfan	0.02	Esfenvalerate	0.02	Phorate	0.02
Bifenazate	0.01	Fipronil	0.01	Phosmet	0.01
Bifenthrin	0.01	Fludioxonil	0.01	Piperonyl-butoxide	0.01
Bioresmethrin	0.01	Flusilazole	0.1	Pirimicarb	0.02
Bitertanol	0.01	Fluvalinate	0.01	Pirimiphos methyl	0.01
Boscalid	0.01	HCB	0.01	Prochloraz	0.02
Bupirimate	0.02	Heptachlor	0.01	Procymidone	0.01
Buprofezin	0.01	Heptachlor epoxide	0.01	Profenofos	0.01
Captan	0.05	Hexaconazole	0.01	Propargite	0.01
Carbaryl	0.01	Hexythiazox	0.01	Propiconazole	0.01
Carbendazim	0.01	Imazilil	0.02	Propineb*	0.1
Chlorantranilipole	0.01	Imidachloprid	0.01	Prothiofos	0.01
Chlorfenapyr	0.05	Indoxacarb	0.01	Pymetrozine	0.01
Chlorothalonil	0.05	Iprodione	0.01	Pyraclostrobin	0.01
Chlorpyrifos	0.01	Kresoxim methyl	0.01	Pyrimethanil	0.01
Chlorpyrifos methyl	0.01	lambda-Cyhalothrin	0.01	Pyriproxifen	0.01
Chlorthal dimethyl	0.01	Lindane	0.01	Quintozene	0.01
Clofentezine	0.01	Linuron	0.01	Spinetoram	0.01
Cyfluthrin (incl. β)	0.02	Malathion	0.01	Spinosad	0.01
Cyhalothrin	0.01	Mancozeb*	0.01	Spirotetramat	0.01
Cypermethrin (incl. α)	0.02	Maneb*	0.01	Tebuconazole	0.01
Cypraconazole	0.01	Metalaxyl	0.01	Tebufenozide	0.01
Cyprodinil	0.02	Methamidophos	0.05	Tebufenpyrad	0.01

delta-BHC	0.02	Methidathion	0.01	Terbufos	0.01
Deltamethrin	0.02	Methomyl	0.1	Tetradifon	0.01
Diazinon	0.01	Methomyl oxime	0.01	Thiabendazole	0.01
Dichlorvos	0.02	Metiram*	0.05	Thiacloprid	0.01
Dicloran	0.01	Metribuzin	0.01	Thiram*	0.1
Dicofol	0.05	Mevinphos	0.01	Tolclofos methyl	0.01
Dieldrin	0.01	Mirex	0.01	Triadimefon	0.01
Difenconazole	0.01	Monocrotophos	0.02	Triadimenol	0.01
Dimethoate	0.02	Myclobutanil	0.01	Trichlorfon	0.01
Dimethomorph	0.01	Omethoate	0.05	Trifloxystrobin	0.01
Diphenylamine	0.01	Nabam*	0.1	Vamidothion	0.01
Diuron	0.01	o-Phenylphenol	0.02	Vinclozolin	0.01
Endosulfan Sulphate	0.02	Oxyfluorfen	0.02	Zineb	0.1
Endrin	0.01	p,p-DDD	0.01	Ziram	0.1

*Dithiocarbamates reported as CS_2

Appendix 3: Range of Northern Territory horticultural produce sampled for pesticide residue testing during 2010 by Chemical Services and FreshTest®

Crop type	Chemical Services	FreshTest®
Fruit	citrus - grapefruit citrus – Tahitian lime mango - KP mango - green	banana carambola citrus - lemon citrus – Tahitian lime citrus - tangerine fig litchi mango - Honey Gold mango - KP mango - R2E2 mango – unnamed melon - honeydew melon - rock melon - water passionfruit pitaya (dragonfruit) rambutan
Vegetables	beans - snake cucumber - Lebanese kang kung lettuce luffa - angled (also known as Sin Qua) melon - bitter okra	beans – snake chilli cucumber cucumber – Lebanese eggplant melon – bitter okra potato pumpkin taro zucchini

Appendix 4: Number of samples taken by Chemicals Services or FreshTest® during residue surveys for Northern Territory produce, 2005–2010

Number of samples collected by	Year of survey					
	2005	2006	2007	2008	2009	2010
Chemical Services	31	25	24	25	18	24
FreshTest®	80	92	75	82	158	146
Total	111	117	99	107	176	170

Appendix 5: Summary of pesticide residue results from 2010 survey of Northern Territory produce

a) Samples collected by Chemical Services staff

Type of produce sampled	Number of samples	Number of samples ALL <LOQ	Number of residues detected with regard to MRL:				Chemicals detected with regard to their MRL:			
			1–50% MRL	50–100% MRL	>100% MRL	No MRL	<50% MRL	50–100% MRL	>MRL	No MRL
beans - snake	3	1	5		1	2	carbaryl, dimethoate, dithiocarbamate, methomyl, omethoate,		chlorpyrifos	fenarimol, permethrin
citrus - grapefruit	1		5				chlorpyrifos, dimethoate, dithiocarbamate, fenthion, imazalil			
citrus – Tahitian lime	2	1	1				malathion			
cucumber-Lebanese	3		1		2		carbaryl		chlorpyrifos (2)	
kang kung	1		2				dithiocarbamate, methomyl			
lettuce	1		1				spinosad			
mango - green	2		2		2	1	azoxystrobin, carbaryl		chlorpyrifos, dimethoate (2)	permethrin
mango - KP	3		5				dimethoate, fenthion, fludioxonil, prochloraz (2)			
melon - bitter	4		3		3		dimethoate, imidacloprid, permethrin		chlorpyrifos (3)	
okra	3	2	1		1	1	dithiocarbamate		chlorpyrifos	azoxystrobin
Sin Qua	1		1		1		endosulfan		chlorpyrifos	
Totals	24	4	27	0	10	4	27	0	10	4

Note: There were 11 samples with multiple residues

Summary of analyses – samples collected by Chemical Services 2010

	Number or % of analyses with regard to:					
	<LOQ MRL	<50% MRL	50–100% MRL	>100% MRL	No MRL	Total
Number of residue analyses	2767	27	0	10	4	2808
% of total residue analyses	98.57%	0.96%	0	0.36%	0.14%	

b) 'FreshTest® samples'

Type of produce sampled	Number of samples	Number of samples ALL <LOQ	Number of residues detected with regard to MRL:				Chemicals detected with regard to their MRL:			
			1–50% MRL	50–100% MRL	>100% MRL	No MRL	<50% MRL	50–100% MRL	>MRL	No MRL
banana	3	2	1							
beans - snake	2	2								
carambola	2	2								
chilli	2	1	1		1		chlorpyrifos		permethrin	
citrus - lemon	1		1				chlorpyrifos			
citrus – Tahitian lime	3	3								
citrus - tangerine	1			1				chlorpyrifos		
cucumber	2	2								
cucumber-Lebanese	4	4								
eggplant	2	2								
fig	1	1								
litchi	1	1								
mango – unnamed (most likely KP)	50	35	21		1	,	chlorpyrifos, fenthion (9), fludioxonil, prochloraz (10)		chlorpyrifos	
mango - Honey Gold	1		3				endosulfan, fenthion, prochloraz			
mango - KP	44	10	70	2	3		carbaryl (2), chlorpyrifos (2), dimethoate (8), endosulfan (1), fenthion (25), omethoate (6), prochloraz (26)	chlorpyrifos (2)	chlorpyrifos (3)	
mango - R2E2	1	1								
melon - long	1	1								
melon – rock and honeydew	3	2	1				bifenthrin			

melon - watermelon	4	4								
melon – seedless watermelon	3	3								
okra	1	1								
passionfruit	1	1								
pitaya	3	2	1		1		omethoate		permethrin	
potato	1	1								
pumpkin	3	2		1				endosulfan		
rambutan	2	2								
taro	2	1	1				chlorpyrifos			
zucchini	2	2								
Totals	**146**	**88**	**100**	**4**	**6**	**0**	**100**	**4**	**6**	**0**

Note: (1) There were 38 samples with multiple residues (2) There were 146 samples with 117 pesticides tested per sample = total of 17,082 pesticide analyses..

Summary of analyses – 'FreshTest® 2010 samples'

	Number or % of analyses with regard to:					
	<LOQ MRL	**<50% MRL**	**50–100% MRL**	**>100% MRL**	**No MRL**	**Total**
Number of residue analyses	16,972	100	4	6	0	17,082
% of total residue analyses	99.36%	0.59%	0.02%	0.04%	0	

c) Summarised by crop

Type of produce sampled	Number of samples	Number of samples ALL <LOQ	Number of residues detected with regard to MRL:				Chemicals detected with regard to their MRL:			
			1–50% MRL	50–100% MRL	>100% MRL	No MRL	<50% MRL	50–100% MRL	>MRL	No MRL
banana	3	2	1				chlorpyrifos			
beans - snake	5	3	5		1	2	carbaryl, dimethoate, dithiocarbamate, methomyl, omethoate		chlorpyrifos	fenarimol, permethrin
carambola	2	2								
chilli	2	1	1		1		chlorpyrifos		permethrin	
citrus - grapefruit	1		5				chlorpyrifos, dimethoate, dithiocarbamate, fenthion, imazalil			
citrus - lemon	1		1				chlorpyrifos			
citrus – Tahitian lime	5	4	1				malathion			
citrus - tangerine	1			1				chlorpyrifos		
cucumber	2	2								
cucumber-Lebanese	7	4	1		2		carbaryl		chlorpyrifos (2)	
eggplant	2	2								
fig	1	1								
lettuce	1		1				spinosad			
litchi	1	1								
kang kung	1		2				dithiocarbamate, methomyl			
mango – unnamed (most likely KP)	50	35	21		1		chlorpyrifos, fenthion (9), fludioxonil, prochloraz (10)		chlorpyrifos	
mango - green	2		2		3	1	azoxystrobin, carbaryl		chlorpyrifos, dimethoate (2)	permethrin
mango - Honey Gold	1		3				endosulfan, fenthion, prochloraz			

mango - KP	48	10	75	2	3		carbaryl (2), chlorpyrifos (2), dimethoate (9), endosulfan (1), fenthion (26), fludioxonil, omethoate (6), prochloraz (26)	chlorpyrifos (2)	chlorpyrifos (3)	
mango - R2E2										
melon - bitter	4		3		3		dimethoate, imidacloprid, permethrin		chlorpyrifos (3)	
melon – rock and honeydew	3	2	1				bifenthrin			
melon - watermelon	4	4								
melon – seedless watermelon	3	3								
okra	4	3	1		1	1	dithiocarbamate		chlorpyrifos	axoxystrobin
passionfruit	1	1								
pitaya	3	2	1		1		omethoate		permethrin	
potato	1	1								
pumpkin	3	2		1				endosulfan		
rambutan										
Sin Qua	1		1		1		endosulfan		chlorpyrifos	
taro	2	1	1				chlorpyrifos			
zucchini	2	2								
Totals	169	90	127	4	17	4	127	4	17	4

Note: (1) There were 11 samples with multiple residues. (2) There were 169 samples with 117 pesticide analyses per sample = Total of 19422 analyses.

Summary of amalgamated results – analyses from samples collected by Chemical Services and FreshTest® 2010

	Number or % of analyses with regard to:					
	<LOQ MRL	**<50% MRL**	**50–100% MRL**	**>100% MRL**	**No MRL**	**Total**
Number of residue analyses	19 270	127	4	17	4	19 422
% of total residue analyses	99.22%	0.65%	0.02%	0.09%	0.02%	

d) Summarised by pesticide (Number of samples)

Chemical	Residues in relation to MRL			
	<50%	50–100%	>MRL	No set MRL
azoxystrobin	mango – green (1)			
bifenthrin	melon (1)			
carbaryl	bean –snake (1), Cucumber – Lebanese (1)			
chlorpyrifos	banana (1), chilli (1), citrus - grapefruit (1), citrus - lemon (1), mango – green (1), mango – KP (2), taro (1)	mango – KP (2), tangerine (1)	cucumber – Lebanese (2), mango – unnamed (1), mango - green (1), mango – KP (3), melon – bitter (3), okra (1), Sin Qua (1)	
dimethoate	mango – KP (9)		mango – green (2)	
dithiocarbamate	beans – snake (1), citrus – grapefruit (1), kang kung (1), okra (1)			
endosulfan	mango – KP (1), Sin Qua (1)	pumpkin (1)		
fenthion	citrus – grapefruit (1), mango – HG (1), mango – KP (35)			
fenarimol				beans – snake (1)
fludioxonil	mango (1), mango – KP (1)			
imazalil	citrus - grapefruit (1)			
imidacloprid	melon – bitter (1)			
malathion	citrus - Tahitian lime (1)			
methomyl	kang kung (1)			
omethoate	beans – snake (1), mango – KP (6), pitaya (1)			
permethrin	melon – bitter (1)		chilli (1), pitaya (1)	beans – snake (1), mango – green (1)
prochloraz	mango (10), mango – HG (1), mango – KP (28),			
spinosad	lettuce (1)			

Appendix 6: Combined (Chemicals Services + FreshTest®) results from 2005–2010 residue survey for Northern Territory produce

a) Crops with pesticide residues above Maximum Residue Limit (MRL)

Pesticide	2005	2006	2007	2008	2009	2010
bifenthrin		melon-bitter				
chlorpyrifos	beans-snake, cucumber, Sin Qua, okra	cucumber, melon-bitter	melon-hairy	beans-snake, cucumber - Lebanese (2), luffa-smooth, melon-bitter, okra	beans-snake	beans-snake, cucumber - Lebanese, mango - green, mango - unnamed, mango - KP, okra, Sin Qua
cypermethrin			beans-snake			
dithiocarbamates		beans-snake, mango-not specified	okra	kang kung		
imidacloprid				melon-bitter		
permethrin			melon-bitter			pitaya

b) Crops with pesticide residue and no set Maximum Residue Limit (MRL)

Pesticide	2005	2006	2007	2008	2009	2010
azoxystrobin						okra
bifenthrin	beans-snake					
carbaryl					basil	
chlorpyrifos	basil		basil			
α-cypermethrin				melon-bitter		
cypermethrin	basil	beans-snake, cucumber, mango-unnamed				
dithiocarbamates			basil, kang kung		luffa-smooth	
endosulfan					basil	
fenarimol				okra		beans - snake
indoxacarb	Sin Qua		okra			
methamidophos						
omethoate					basil	
permethrin			beans-snake			beans - snake, mango - green
procloraz				okra		
propoconozole	Sin Qua					
thiabendazole					curry leaf	