Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

Pesticides and Metals in Beverages - April 1, 2015 to March 31, 2016

Food chemistry - Targeted surveys - Final report

Summary

Targeted surveys provide information on potential food hazards and enhance the Canadian Food Inspection Agency's (CFIA's) routine monitoring programs. These surveys provide evidence regarding the safety of the food supply, identify potential emerging hazards, and contribute new information and data to food categories where it may be limited or non-existent. They are often used by the Agency to focus surveillance on potential areas of higher risk. Surveys can also help to identify trends and provide information about how industry complies with Canadian regulations.

The availability of a wide variety of beverages, such as bottled water, tea, coffee, juice, wine and beer is continuously increasing to meet consumers' demands[1,2]. These beverages are products of agricultural commodities and may contain pesticide residues introduced from the environment or if the crops were treated with pesticides in the field, during transport and/or during storage to prevent damage from insects, moulds or other pests. These beverages may also contain levels of metals from environmental sources. Though metals such as arsenic, cadmium, lead and mercury are not permitted to be added to foods, and manufacturers are responsible for measures aimed at reducing accidental introduction of these elements in foods (for example, from lead solder in steel equipment), their presence is expected in foods, at very low levels, primarily as a result of their natural presence in the environment.

A total of 1355 samples of beverages were collected from retail locations in six cities across Canada and tested for pesticides and metals. Residues of 174 different pesticides were detected, in 854 (63%) of the samples. The overall compliance rate for pesticides in beverages was 92%. There were 357 non-compliant results occurring in 114 tea samples. Health Canada (HC) determined the levels of pesticides in beverages observed in the current survey are not expected to pose a concern to human health, therefore there were no recalls resulting from this survey. CFIA conducted appropriate follow up activities which included further testing of similar products in subsequent years and working with the Tea and Herbal Association of Canada to improve compliance.

Only the results for the metals of highest concern to human health (arsenic, cadmium, mercury, lead) are included in this report. Mercury and cadmium had the lowest and the highest prevalence, respectively. Of all product types sampled, tea was the commodity with the highest detected content of these metals. It should be noted that the levels were measured in dried tea leaves and not in brewed tea. In all the ready-to-serve samples, the levels of lead and arsenic met HC's proposed maximum levels in fruit juice, fruit nectar, beverages when ready-to-serve and water. There are no regulations in Canada for metal levels in the other products tested. HC determined that none of the samples analyzed for metals in this survey posed a concern to human health.

What are targeted surveys

Targeted surveys are used by the CFIA to focus its surveillance activities on areas of highest health risk. The information gained from these surveys provides support for the allocation and prioritization of the Agency's activities to areas of greater concern. Originally started as a project under the Food Safety Action Plan (FSAP), targeted surveys have been embedded in our regular surveillance activities since 2013. Targeted surveys are a valuable tool for generating information on certain hazards in foods, identifying and characterizing new and emerging hazards, informing trend analysis, prompting and refining health risk assessments, highlighting potential contamination issues, as well as assessing and promoting compliance with Canadian regulations.

Food safety is a shared responsibility. We work with federal, provincial, territorial and municipal governments and provide regulatory oversight of the food industry to promote safe handling of foods throughout the food production chain. The food industry and retail sectors in Canada are responsible for the food they produce and sell, while individual consumers are responsible for the safe handling of the food they have in their possession.

Why did we conduct this survey

Chemical hazards in foods can come from a variety of sources. Pesticides may be present as contaminants in the environment or they may be deliberately used by farmers to protect food and crops from pests. Different pest pressures and climatic conditions in food export countries may result in the potential use of pesticides that are not approved for use in Canada, or result in pesticide residues in products that do not meet established Canadian maximum residue limits (MRLs) to be legally sold in Canada[3].

Metals are naturally-occurring elements that may be present in very low amounts in rock, water, soil, or air. Therefore, finding these substances in food products is not unexpected as trace levels generally reflect normal accumulation from the environment. They may be present in finished foods due to their presence in the ingredients used to manufacture those foods, and/or may be unintentionally incorporated along the food production chain. Only the results of the metals of highest concern (arsenic, cadmium, lead, and mercury) are presented in this report.

Inappropriate use of pesticides may pose a health risk to consumers, with the risk dependant on the type of pesticide, the concentration of the pesticide, how the human body interacts with it, and the length of exposure to the pesticide by the consumer. Metals of highest concern to human health include arsenic, cadmium, lead, and mercury and these have been shown to have effects on human health following long term exposure. The human health effects depend on the metal, its concentration in the food, and other possible exposure effects/sources.

The main objectives of this targeted survey were to generate additional baseline surveillance data on the level of pesticide residues and metal levels in beverages not routinely monitored

under other CFIA programs, available on the Canadian retail market, and to compare, the prevalence of pesticides in foods in this survey with that of previous targeted surveys.

What did we sample

A variety of domestic and imported beverages including coffee, juice, tea, water, other shelf-stable beverages and alcoholic beverages (wine and beer) were sampled between August 1, 2015 and March 21, 2016. Samples of products were collected from local/regional retail locations located in 6 major cities across Canada. These cities encompassed four Canadian geographical areas: Atlantic (Halifax), Quebec (Montreal), Ontario (Toronto, Ottawa) and the West (Vancouver, and Calgary). The number of samples collected from these cities was in proportion to the relative population of the respective areas. The shelf life, storage conditions, and the cost of the food on the open market were not considered in this survey.

Table 1. Distribution of samples based on product type and origin

Product type	Number of domestic samples	Number of imported samples	Number of samples of unspecified[a] origin	Total number of samples
Beer	13	64	20	97
Beverage	58	117	50	225
Coffee	29	58	19	106
Juice	122	78	92	292
Tea	26	286	50	362
Water	72	67	34	173
Wine	18	82	0	100
Grand total	**338**	**752**	**265**	**1355**

[a] Unspecified refers to those samples for which the country of origin could not be assigned from the product label or available sample information

How were samples analyzed and assessed

Samples were analyzed by an ISO 17025 accredited food testing laboratory under contract with the Government of Canada. See Appendix A for a list of the pesticides analyzed. The results are based on the food products as sold and not necessarily as they would be consumed.

Pesticide MRLs are established by Pest Management Regulatory Agency (PMRA) of HC and appear in their MRL database[3]. Pesticide MRLs apply to the specified raw agricultural commodity as well as to any processed food product that contains the commodity unless otherwise specified. According to section B.15.002 of the *Food and Drug Regulations* (FDR), in the absence of a specific MRL, residues of a pesticide or other agricultural chemical must not exceed the general MRL of 0.1 ppm.

Contaminants and other adulterating substances in foods have regulatory maximum levels. In 2014 HC proposed regulatory tolerances for arsenic and lead in a variety of ready-to-serve beverages, and proposed further changes in 2017[4,5]. Compliance is assessed against the established tolerances available when the survey was carried out. In the absence of a specific maximum level, the levels of arsenic, cadmium, mercury and lead may be assessed by HC on a case-by-case basis using the most current scientific data available.

What were the survey results

Pesticides

A total of 1355 samples of domestic and imported beverages were tested for over 400 pesticides in this targeted survey. Pesticide residues were not detected in 501 (37%) samples. In the remaining 854 samples, residues of 174 different pesticides were detected. A summary of the pesticide results by each product type can be seen in Table 2.

The percentage of samples with pesticide residues detected ranged from 5% in bottled water to 94% in wine. Bifenthrin, imidacloprid and acetamiprid were the most frequently detected pesticides. All product types had a compliance rate of 100% except for tea which had a 69% compliance rate. It should be noted that dried tea samples were analyzed as sold and not brewed, therefore should not be compared to ready-to-serve beverages.

All of the non-compliant pesticide residues in tea were associated with exceeding the general MRL of 0.1 ppm. Compliance was assessed against the established MRLs (10) available when the survey was carried out. Canadian MRLs had not been established for other pesticides in tea at the time. The average amount of residue detected in the non-compliant samples was 0.33 ppm (mg/kg).

Many of the non-compliant tea samples contained more than one non-compliant pesticide residue. There were 357 non-compliant results associated with the 114 non-compliant tea

samples. Most (68%) of the non-compliant samples had one to three non-compliant pesticide residues. The remaining non-compliant samples contained three to a maximum of ten non-compliant residues. Acetamiprid and imidacloprid were the pesticides with the greatest number of non-compliant results.

Specific MRLs for some (6/42) of the pesticides detected in these commodities were recently established by the PMRA. Applying the new MRLs would reduce the number of non-compliant samples to 109 (30%) and non-compliant pesticide residue results to 251.

Table 2. Results of pesticide testing in beverages

Product type	Number of samples	Number (percentage) of samples with detected pesticide residue(s)	Number (percentage) of samples with no detected pesticide residue(s)	Number of non-compliant residue result(s)/number (percentage) of non-compliant samples
Beer	97	73 (75%)	24 (25%)	0
Beverage	225	69 (31%)	156 (69%)	0
Coffee	106	100 (94%)	6 (6%)	0
Juice	292	227 (80%)	57 (20%)	0
Tea	362	276 (76%)	86 (24%)	357/114 (31%)
Water	173	8 (5%)	165 (95%)	0
Wine	100	94 (94%)	6 (6%)	0
Grand total	**1355**	**854 (63%)**	**501 (37%)**	**357/114 (8%)**

Metals

All 1355 samples were also analysed for arsenic, cadmium, lead and mercury. Most (71%) of the survey samples contained one or more metals, while 32% of the samples contained traces of all four toxic metals.

Table 3. Detected levels of metals in beverages

Product type	Number of samples	% pos for arsenic	Average level (range) of arsenic (ppm)	% pos for cadmium	Average level (range) of cadmium (ppm)	% pos for lead	Average level (range) of lead (ppm)	% pos for mercury	Average level (range) of mercury (ppm)
Beer	97	45	0.008 (<LOD-0.018)	2	0.0012 (<LOD-0.0113)	11	0.0017 (<LOD-0.0025)	0	<LOD
Beverage	225	17	0.010 (<LOD-0.034)	12	0.0026 (<LOD-0.0123)	14	0.0054 (<LOD-0.0599)	7	0.0002 (<LOD-0.0011)
Coffee	106	91	0.012 (<LOD-0.040)	98	0.0050 (<LOD-0.0113)	100	0.0166 (<LOD-0.3149)	96	0.0003 (<LOD-0.0009)
Juice	292	34	0.009 (<LOD-0.064)	25	0.0030 (<LOD-0.0162)	58	0.0053 (<LOD-0.1422)	9	0.00015 (<LOD-0.0003)
Tea	362	97	0.112 (<LOD-1.71)	100	0.0614 (0.0007-2.578)	100	0.9527 (0.001-10.29)	93	0.0074 (<LOD-0.093)
Water	173	24	0.008 (<LOD-0.014)	2	0.0007 (<LOD-0.0009)	6	0.0026 (<LOD-0.0062)	7	0.00016 (<LOD-0.0004)
Wine	100	30	0.008 (<LOD-0.014)	10	0.0009 (<LOD-0.0013)	98	0.0115 (0.001-0.074)	0	<LOD

<LOD = Below the limit of detection (0.0001 - 0.0004 ppm, depending on the laboratory)
Note: Average values were calculated using only results for samples with quantifiable metal levels

Table 3 illustrates the level of these metals found in the products tested. Mercury and cadmium had the lowest and the highest prevalence, respectively. None of the beer and wine samples contained measurable amounts of mercury. Tea was associated with the highest average level of metals observed, followed by coffee. Oolong and white tea had the highest average content of these metals. Average levels of the metals found in different types of ready-to-serve beverages were alike. The detection rate was highest for lead in wine (98%).

In all the ready-to-serve beverage samples, the levels of lead and arsenic met HC's proposed maximum level. There are no regulations in Canada for metal levels in the other products tested. HC determined that none of the products posed a health risk to consumers.

What do the survey results mean

In comparison to previous survey years, the detection rates for pesticides in various types of non-alcoholic beverages were consistent, with the exception of coffee (Table 4). In this 2015 to 2016 survey, 89% of coffee samples contained a quantifiable amount of bifenthrin. In 2012 the European Commission established new maximum residue levels for bifenthrin for certain products including coffee[6]. An increase in the detection rate due to its wider use since that time is not unexpected.

Table 4. Pesticide testing results in non-alcoholic beverages from various survey years

Commodity	Survey year	Number of samples	Number (percentage) of samples with detected pesticide residue(s)	Number of non-compliant residue result(s)/number (percentage) of non-compliant samples
Coffee	2015-2016	140	113 (81%)	0
	2010-2011[7]	297	2 (1%)	0
Juice	2015-2016	292	227 (80%)	0
	2012-2013[8]	965	661 (68%)	0
	2011-2012[9]	255	173 (68%)	0
	2010-2011	510	291 (57%)	2/2 (0.5%)
Juice concentrates	2008-2009[10]	186	40 (22%)	0
Tea	2015-2016	362	276 (76%)	357/114 (31%)
	2011-2012	259	202 (79%)	152/83 (32%)
	2010-2011	267	172 (64%)	138/66 (25%)
	2009-2010[11]	100	69 (69%)	84/41(41%)

The compliance rate for pesticides in tea samples (69%) was comparable to previous survey years (59 to75%). As observed in previous surveys, oolong tea contained the highest number of non-compliant residue levels (165 in 45/67 samples). HC determined the levels of pesticides in tea observed in the current survey are not expected to pose a concern to human health, therefore there were no recalls resulting from this survey. The CFIA conducted appropriate follow up activities to improve compliance.

The detection rates and the levels of metals reported in this targeted survey were comparable to those previously found in these product types, namely tea and juices[11,9]. In these beverages, mercury and lead had the lowest and the highest observed levels, respectively.

References

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2. Beverage consumption of Canadian adults. (2015). Canada. Statistics Canada.
3. Maximum Residue Limits for Pesticides. (2012). Canada. Health Canada. Consumer Product Safety.
4. Proposed Changes to the Tolerances for Arsenic and Lead in Fruit Juice, Fruit Nectar, Beverages when Ready-to-Serve, and Water in Sealed Containers. (2014). Canada. Health Canada.
5. Proposal to Update the Maximum Levels for Arsenic in Apple Juice and Water in Sealed Containers in the List of Contaminants and Other Adulterating Substances in Foods. (2017). Canada. Health Canada.
6. Commission Regulation (EU) No 441/2012 of 24 May 2012 amending Annexes II and III to Regulation (EC) No 396/2005 of the European Parliament and of the Council as regards maximum residue levels for bifenazate, bifenthrin, boscalid, cadusafos, chlorantraniliprole, chlorothalonil, clothianidin, cyproconazole, deltamethrin, dicamba, difenoconazole, dinocap, etoxazole, fenpyroximate, flubendiamide, fludioxonil, glyphosate, metalaxyl-M, meptyldinocap, novaluron, thiamethoxam, and triazophos in or on certain products. Off. J. Eur. Union. (2012) L135/4.
7. 2010-2011 Pesticides in Coffee, Fruit Juice and Tea. (2014). Canada. Canadian Food Inspection Agency.
8. National Chemical Residue Monitoring Program: 2012-2013 Report. (2014). Canada. Canadian Food Inspection Agency.
9. 2011-2012 Pesticides and metals in tea and juices. [unpublished results]. Canadian Food Inspection Agency.
10. 2008-2009 Pesticides Residues and Metals in Fruit Juice Concentrates. (2014). Canada. Canadian Food Inspection Agency.
11. 2009-2010 Pesticide Residues and Metals in Dried Tea. (2014). Canada. Canadian Food Inspection Agency.

Appendix A

List of analytes (483) included in the PESTICIDE-GCLC multi-residue pesticide program used by the accredited laboratory in this survey

3-hydroxyCarbofuran	Demeton-S	Formetanate	Picoxystrobin
Acephate	Demeton-S-methyl	Fosthiazate	Piperonyl butoxide
Acetamiprid	Demeton-s-methyl sulfone	Fuberidazole	Piperophos
Acetochlor	Demeton-s-methyl sulfoxide	Furalaxyl	Pirimicarb
Acibenzolar-s-methyl	Des-ethyl Atrazine	Furathiocarb	Pirimiphos-ethyl
Aclonifen	Desmedipham	Griseofulvin	Pirimiphos-methyl
Alachlor	Desmetryn	Halofenozide	Pretilachlor
Alanycarb	Di-allate	Haloxyfop	Primisulfuron-methyl
Aldicarb	Dialofos	Heptachlor	Prochloraz
Aldicarb Sulfone	Diazinon	Heptachlor epoxide endo	Procymidone
Aldicarb sulfoxide	Diazinon o analogue	Heptenophos	Prodiamine
Aldrin	Dichlobenil	Hexachlorobenzene	Profenofos
Allidochlor	Dichlofenthion	Hexaconazole	Profluralin
Ametryn	Dichlofluanid	Hexaflumuron	Promecarb
Aminocarb	Dichloran	Hexazinone	Prometon
Anilofos	Dichlormid	Hexythiazox	Prometryne
Aramite	Dichlorvos	Hydramethylnon	Pronamide
Aspon	Diclobutrazole	Imazalil	Propachlor
Atrazine	Diclocymet	Imazamethabenz-methyl	Propamocarb
Azaconazole	Diclofop-methyl	Imidacloprid	Propanil
Azinphos-ethyl	Dicofol	Indoxacarb	Propargite
Azinphos-methyl	Dicrotophos	Iodofenphos	Propazine
Azoxystrobin	Dieldrin	Ipconazole	Propetamphos
Benalaxyl	Diethatyl-ethyl	Iprobenfos	Propham
Bendiocarb	Diethofencarb	Iprodione	Propiconazole
Benfluralin	Difenoconazole	Iprovalicarb	Propoxur
Benfuracarb	Diflubenzuron	Isazophos	Prothioconazole
Benodanil	Dimethachlor	Isocarbamide	Prothiophos
Benomyl	Dimethametryn	Isofenphos	Pymetrozine
Benoxacor	Dimethenamid	Isoprocarb	Pyracarbolid
Benzoximate	Dimethoate	Isopropalin	Pyraclostrobin
Benzoylprop-ethyl	Dimethomorph	Isoprothiolane	Pyraflufen-ethyl
BHC Alpha	Dimoxystrobin	Isoproturon	Pyrazophos
BHC beta	Diniconazole	Isoxathion	Pyridaben
Bifenazate	Dinitramine	Kresoxim-methyl	Pyridalyl
Bifenox	Dinotefuran	Leptophos	Pyridaphenthion
Bifenthrin	Dioxacarb	Lindane (gamma-BHC)	Pyridate
Biphenyl	Dioxathion	Linuron	Pyrifenox
Bitertanol	Diphenamid	Lufenuron	Pyrimethanil
Boscalid	Diphenylamine	Malaoxon	Pyriproxyfen

Bromacil	Dipropetryn	Malathion	Pyroxsulam
Bromophos	Disulfoton	Mandipropamid	Quinalphos
Bromophos-ethyl	Disulfoton sulfone	Mecarbam	Quinomethionate
Bromopropylate	Diuron	Mefenacet	Quinoxyfen
Bromuconazole	Dodemorph	Mepanipyrim	Quintozene
Bupirimate	Edifenphos	Mephosfolan	Quizalofop
Buprofezin	Emamectin B1a	Mepronil	Quizalofop-ethyl
Butachlor	Emamectin B1b	Metaflumizone	Schradan
Butafenacil	Endosulfan alpha	Metalaxyl	Secbumeton
Butocarboxim	Endosulfan beta	Metazachlor	Siduron
Butocarboxim sulfoxide	Endosulfan sulfate	Metconazole	Simazine
Butoxycarboxim	Endrin	Methabenzthiazuron	Simetryn
Butralin	EPN	Methamidophos	Spinetoram
Butylate	Epoxiconazole	Methidathion	Spinosyn A
Cadusafos	EPTC	Methiocarb	Spinosyn D
Captafol	Esfenvalerate	Methiocarb sulfone	Spirodiclofen
Captan	Etaconazole	Methiocarb Sulfoxide	Spiromesifen
Carbaryl	Ethalfluralin	Methomyl	Spirotetramat
Carbendazim	Ethiofencarb	Methoprotryne	Spiroxamine
Carbetamide	Ethiofencarb sulfone	Methoxychlor	Sulfallate
Carbofenthion	Ethiofencarb sulfoxide	Methoxyfenozide	Sulfentrazone
Carbofuran	Ethion	Methyl - trithion	Sulfotep
Carbosulfan	Ethiprole	Metobromuron	Sulprophos
Carboxin	Ethirimol	Metolachlor	TCMTB
Carfentrazone-ethyl	Ethofumesate	Metolcarb	Tebuconazole
Chlorantraniliprole	Ethoprop	Metoxuron	Tebufenozide
Chlorbenside	Ethylan	Metribuzin	Tebufenpyrad
Chlorbromuron	Etofenprox	Mevinphos-cis	Tebupirimfos
Chlorbufam	Etoxazole	Mexacarbate	Tebuthiuron
Chlordane cis	Etridiazole	Mirex	Tecnazene
Chlordane trans	Etrimfos	Molinate	Teflubenzuron
Chlordimeform	Famoxadone	Monocrotophos	Temephos
Chlorfenson	Fenamidone	Monolinuron	Tepraloxydim
Chlorfenvinphos (e+z)	Fenamiphos	Myclobutanil	Terbacil
Chlorfluazuron	Fenamiphos sulfone	Naled	Terbufos
Chlorflurenol-methyl	Fenamiphos sulfoxide	Napropamide	Terbumeton
Chloridazon	Fenarimol	Naptalam	Terbutryne
Chlorimuron-ethyl	Fenazaquin	Neburon	Terbutylazine
Chlormephos	Fenbuconazole	Nitenpyram	Tetrachlorvinphos
Chlorobenzilate	Fenchlorphos (Ronnel)	Nitralin	Tetraconazole
Chloroneb	Fenfuram	Nitrapyrin	Tetradifon
Chloropropylate	Fenhexamid	Nitrofen	Tetraiodoethylene
Chlorothalonil	Fenitrothion	Nitrothal-isopropyl	Tetramethrin
Chloroxuron	Fenobucarb	Norflurazon	Tetrasul
Chlorpropham	Fenoxanil	Novaluron	Thiabendazole
Chlorpyrifos	Fenoxycarb	Nuarimol	Thiacloprid

Chlorpyrifos-methyl	Fenpropathrin	o,p'-DDD (o,p'-TDE)	Thiamethoxam
Chlorthiamid	Fenpropidin	o,p'-DDE	Thiazopyr
Chlorthion	Fenpropimorph	o,p'-DDT	Thidiazuron
Chlorthiophos	Fenpyroximate	Octhilinone	Thiobencarb
Chlortoluron	Fenson	Ofurace	Thiodicarb
Chlozolinate	Fensulfothion	Omethoate	Thiofanox
Clethodim	Fenthion	Ortho-phenylphenol	Thiofanoxsulfone
Clodinafop-propargyl	Fentrazamide	Oxadiazon	Thiofanoxsulfoxide
Clofentezine	Fenuron	Oxadixyl	Thiophanate-methyl
Clomazone	Fenvalerate	Oxamyl	Tolclofos-methyl
Cloquintocet-mexyl	Fipronil	Oxamyl-oxime	Tolfenpyrad
Clothianidin	Flamprop-isopropyl	Oxycarboxin	Tolyfluanid
Coumaphos	Flamprop-methyl	Oxychlordane	Tralkoxydim
Crotoxyphos	Flonicamid	Oxyfluorfen	Triadimefon
Crufomate	Fluazifop-butyl	p,p'-DDD (p,p'-TDE)	Triadimenol
Cyanazine	Flubendiamide	p,p'-DDE	Tri-allate
Cyanofenphos	Flucarbazone-sodium	p,p'-DDT	Triazophos
Cyanophos	Fluchloralin	Paclobutrazol	Tribufos
Cyazofamid	Flucythrinate	Paraoxon	Trichlorfon
Cycloate	Fludioxonil	Parathion	Tricyclazole
Cycloxydim	Flufenacet	Parathion-methyl	Trietazine
Cycluron	Flufenoxuron	Pebulate	Trifloxystrobin
Cyfluthrin (I,II,III,IV)	Flumetralin	Penconazole	Trifloxysulfuron
Cyhalothrin-lambda	Fluometuron	Pencycuron	Triflumizole
Cymoxanil	Fluorochloridone	Pendimethalin	Triflumuron
Cypermethrin	Fluorodifen	Penoxsulam	Trifluralin
Cyprazine	Fluoxastrobin	Permethrin (Total)	Triforine
Cyproconazole	Fluquinconazole	Phenmedipham	Trimethacarb
Cyprodinil	Flusilazole	Phenthoate	Triticonazole
Cyromazine	Flutolanil	Phorate	Vamidothion
Dacthal (chlorthal-dimethyl)	Flutriafol	Phorate sulfone	Vernolate
delta-HCH (delta-lindane)	Fluvalinate	Phosalone	Vinclozolin
Deltamethrin	Folpet	Phosmet	Zinophos
delta-trans-allethrin	Fonofos	Phosphamidon	Zoxamide
Demeton-O	Forchlorfenuron	Picolinafen	