Pesticide Residues Testing & Food Safety

Richard Fung

Pesticide Residues in Food Regulation, Cap 132CM

- The new regulation has been enforced on August 2014
- Applies to all “FOOD” (Animal & Plant origin)
- Classified based on Codex Alimentarius Commission (CODEX), also in considering of other regulations from China, US, Thailand.
- A total of 360 Pesticides will be controlled
- “Food” are classified into different food group/subgroup

e.g. Choi sum

- Food Group: Leafy Vegetable;
- Food subgroup: Brassica Leafy Vegetable

ie Choi Sum has to fulfil the Pesticides requirement of both group & subgroup

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Schedule I—Pesticide-food pairs

- Consists of 360 “pesticides” – approx. 560 individual compounds

  eg: Aldicarb: sum of 3 compounds

  Phorate : sum of 6 compounds

  - Maximum Residue Limits (MRLs) : 354

  - Extraneous Maximum Residue Limits (EMRLs) : 6

Schedule II—Exempted Pesticides

- Natural pesticides or Residues identical to or indistinguishable to natural food components : 78

  Eg: Boric Acid, Mineral Oil…

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What if my commodity is not on the list:

- If pesticide is found:

  - Risk Assessment will be arranged to assess the “danger” of the detected level of pesticides (will be conducted by the FEHD)

  - Conducted by considering factors such as safety reference values (daily intake, acute reference dose)

Pesticide Residues found since August 2014

According to FEHD, 46 volition have been reported,

(estimate no. of samples tested: 2000)

- Chinese Lettuce (唐生菜)
- Baby Shanghai Greens (小棠菜)
- Choi Sum (菜心)
- Radish (蘿蔔)
- White Cabbage (白菜)
- Chinese Wolfberry (枸杞菜)
- String Pod (豆角)
- Others : Orange, Pear, Chaote (佛手瓜)

Pesticide Residues Found

- Carbofuran 克百威
- Chlorpyrifos 毒死蜱（ 3-10x MRL）
- Cypermethrin 氯氰菊酯
- Cyhalothrin 氯氟氰菊酯
- Dimethoate 樂果
- Methamidophos 甲胺磷（ half life: 5 days)
- Methomyl 滅多威

Testing Need & Demand (Govt Lab Tender)

- In Hong Kong

- 3-4 Pesticide Residue testing tenders available in year 2015
- Each tender require the testing of >50 pesticides.
- Focusing on Fruit & Vegetables (More sample type will be tested in future)
- Focus on the “most important & frequently used” & local- accredited 150 pesticides (Number of compounds gradually increasing in future)
- Accreditation & Price are the major factors

Example :

1. Bamboo Shoot:

   20 Pesticides have been regulated; GL tender: only 8 have been required;

2: Chinese Broccoli:

   81 Pesticides have been regulated; GL tender: only 26 have been required.

Need & Demand (Private Sectors)

- Multiple & complicate Matrix (Dumpling, Sticky Rice, Soup pack)
- “What is the best rate that I can spent on the maximum number of pesticide compounds on every type of my products that will meet government requirement?”
- What is the Regulation limit?

- Compound food (e.g. compositing fruit juices),
- Food in other processed forms (e.g. rice flour),
- Food in dried, dehydrated form

Need & Demand (Other Countries)

- Australia:

  - Very specific pesticide list on Poultry Products

- Europe, UK:

  - Vegetable & Fruit

  - Specific Food type (Baby Food)

1. ***Screening is a very popular Testing Approach used***
2. also require very specific testing compound list

   (There are Suites for OC Pesticides, N-containing Insecticides)

Testing Requirement

- Sample Preparation

  - QuEChERS (Multi-pesticide residue extractions)

    Different extraction condition, Different extractants…;

  - Individual Target Pesticides Preparation Approach

- Instrumentation

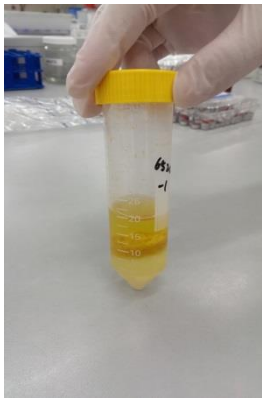
- LC-MS/MS (Sensitivity of instrument play a very important role)
- GC-MS/MS
- GC-MS
- Other specific technique (GC-ECD, GC-FPD…)

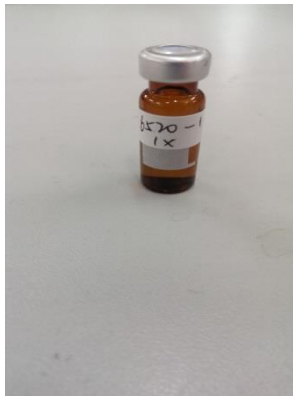
Sample Preparation

1. One (1) kg (Codex) or the entire receiving sample will be tested.
2. Subsample an appropriate portion to be extracted with the QuEChERS,

   Vortexed, Centrifuged.
3. Organic Layer is withdrawn
4. Making up to specific volume
5. Analysed by different Instrumentations







Testing Approach

1. **Screening**

   - Trying to use the minimal sample preparation procedures, and the minimal testing approach to find if pesticides compounds are detectable.

   (Below certain Reporting Level➔ Not detected)

Advantage:

Relatively Cheaper Approach

Can pick up a lot of information (esp when pesticides are present in the samples)

Problem:

False Negative Results: “You might miss some but you might not know”.

Results not consistent from batch to batch (Preparation method not applicable to every type of sample)

Very depending on the Integrity, Experience & Ability of the service providers.

A lot of argument in Europe… Becoming more & more unpopular in future

Testing Approach

- Practical Approach: Screening + Specific & Target-oriented

No.	Item	Pesticide	Description of food	MRL/EMRL (mg/kg)
1	8.8	Acephate	"Assorted tropical and sub-tropical fruits - edible peel"	0.5
2	23.11	Azinphos methyl	"Assorted tropical and sub-tropical fruits - edible peel"	1
3	39.15	Bromide ion	"Assorted tropical and sub-tropical fruits - edible peel"	20
4	42.14	Buprofezin	Guava	0.3
5	54.16	Carfentrazone ethyl	Guava	0.1
6	55.13	Chlorantraniliprole	Guava	4
7	92.1	Dichlorvos	"Assorted tropical and sub-tropical fruits - edible peel"	0.2
8	117.1	Esfenvalerate	"Assorted tropical and sub-tropical fruits - edible peel"	0.2
9	133.1	Fenitrothion	"Assorted tropical and sub-tropical fruits - edible peel"	0.5
10	136.7	Fenpropathrin	"Assorted tropical and sub-tropical fruits - edible peel"	5
11	139.1	Fenthion	"Assorted tropical and sub-tropical fruits - edible peel", except olives	0.05
12	140.1	Fenvalerate	"Assorted tropical and sub-tropical fruits - edible peel"	0.2
13	176.2	Glyphosate	"Assorted tropical and sub-tropical fruits - edible peel"	0.1
14	188.2	Imidacloprid	Guava	1
15	203.2	Malathion	Guava	8
16	222.1	Methoxyfenoxide	Guava	0.4
17	241.4	Oryzalin	Guava	0.05
18	246.7	Oxyfluorfen	Guava	0.05
19	249.1	Paraquat	Guava	0.05
20	250.6	Parathion	"Assorted tropical and sub-tropical fruits - edible peel"	0.01
21	255.1	Permethrin	"Assorted tropical and sub-tropical fruits - edible peel"	2
22	262.6	Phoxim	"Assorted tropical and sub-tropical fruits - edible peel"	0.05
23	264.1	Piperonyl butoxide	Guava	8
24	288.8	Pyrethrins	Guava	1
25	293.2	Pyriproxyfen	Guava	0.1
26	307.2	Spinosad	Guava	0.3
27	340.7	Trichlorfon	"Assorted tropical and sub-tropical fruits - edible peel"	0.1
28	1.1	Aldrin and Dieldrin	"Assorted tropical and sub-tropical fruits - edible peel"	0.05
29	2.7	Chlordane	"Assorted tropical and sub-tropical fruits - edible peel"	0.02
30	3.7	DDT	"Assorted tropical and sub-tropical fruits - edible peel"	0.05
31	4.6	Endrin	"Assorted tropical and sub-tropical fruits - edible peel"	0.01
32	5.8	Heptachlor	"Assorted tropical and sub-tropical fruits - edible peel", except fig	0.01
33	6.7	Hexachlorocyclohexane (HCH)	"Assorted tropical and sub-tropical fruits - edible peel"	0.05

Opportunity for Testing Laboratories?

- Expensive Instrumentation
- Expensive Pesticide Standard
- Intensive Method Development

  (Different sample types require different preparation & testing approach)
- Very High maintenance cost
- Availability of Qualified Specialists: limiting
- Knowledge about Agricultural Science is limited Locally
- *HOKLAS Accreditation Requirement is more stringent than many other countries*

Consideration of Service Providers

How to look for a reliable laboratory to conduct the testing?

What testing program do you needed?

Is the money you are paying achieving your goals?

- What can we learn from the GL tender?

Focus on Target/ Specific type of Pesticides, Not all 360?

- Reputable Laboratory
- Consistency in Quality of service
- Experience in Specific Sample Type

Summary

- Pesticide Testing is a big Challenge to Laboratories around the globe.
- A Noble Task, How can laboratories be able to provide competent testing service to fulfil the market need for the coming 5 years is a big challenge.
- Experience Chemists in this area will be most wanted!

Thank You

Email: Richard.Fung@alsglobal.com