Joint Research Centre

The European Commission's in-house science service

www.jrc.ec.europa.eu

Serving society
Stimulating innovation
Supporting legislation

FATE COMES
JRC Sampling and Analysis Campaign for Compost and digestate

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Contributions by

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Introduction

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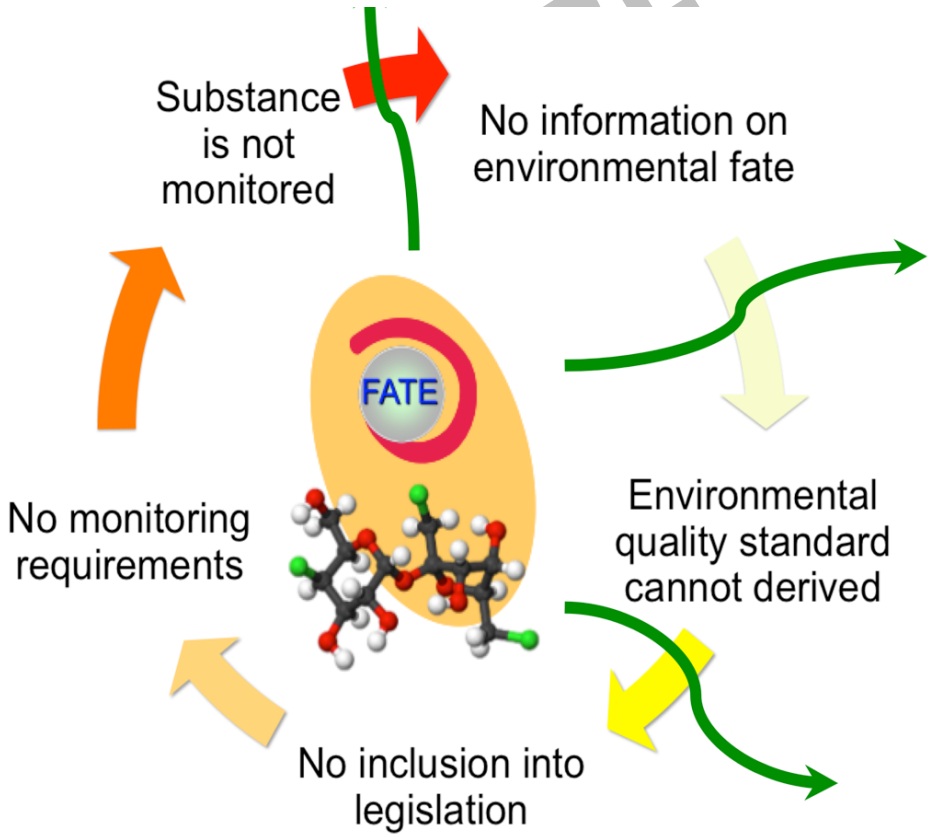
Objective:

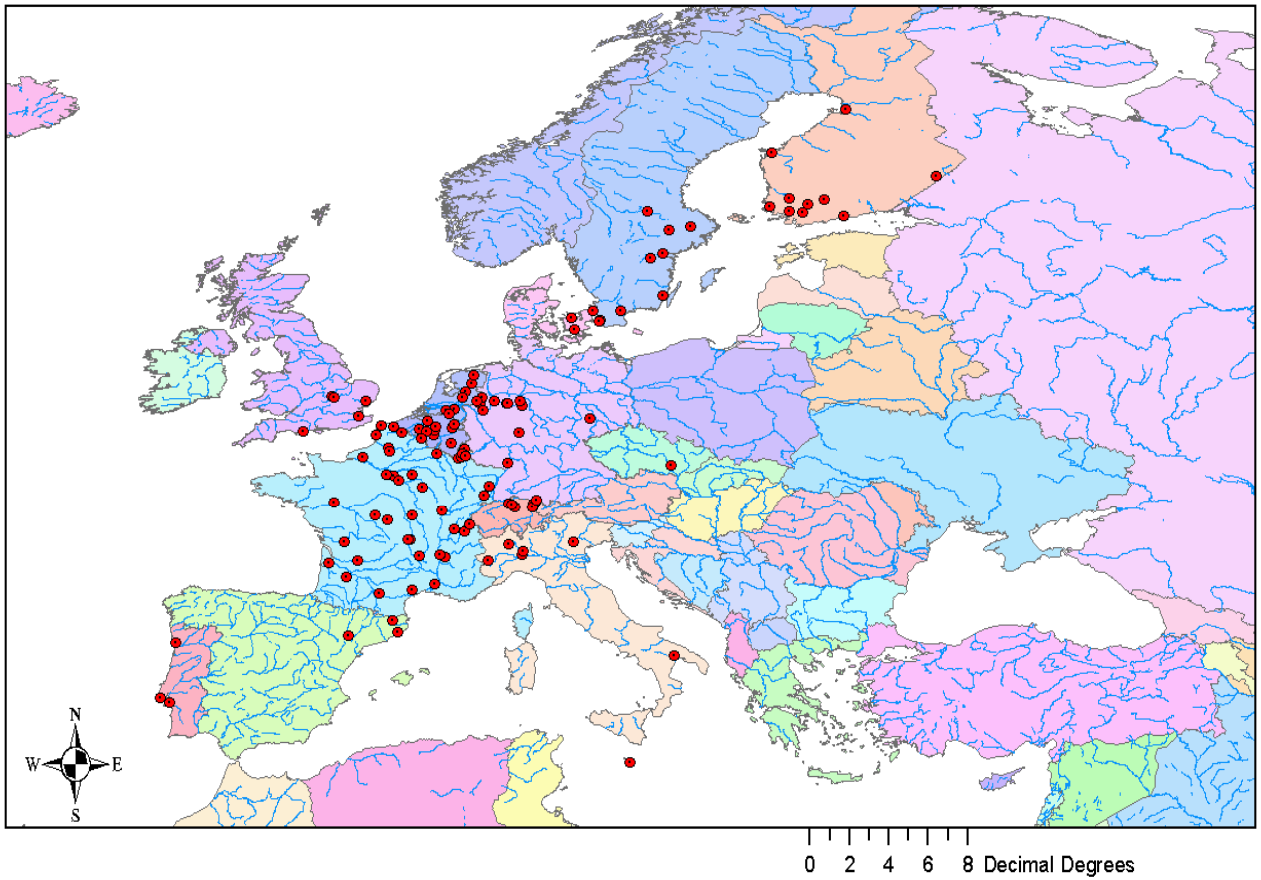
To produce independent data on the occurrence of contaminants in environmental media on a manageable sample set (up to 300) by sharing and synchronising available resources.



Pan-European Screening

FATE COMES

- Centralised collection of 120+19 compost and biowaste samples
- 15 countries
- 22 minor and trace elements
- 92 organics
- Parallel *Ad hoc* sampling

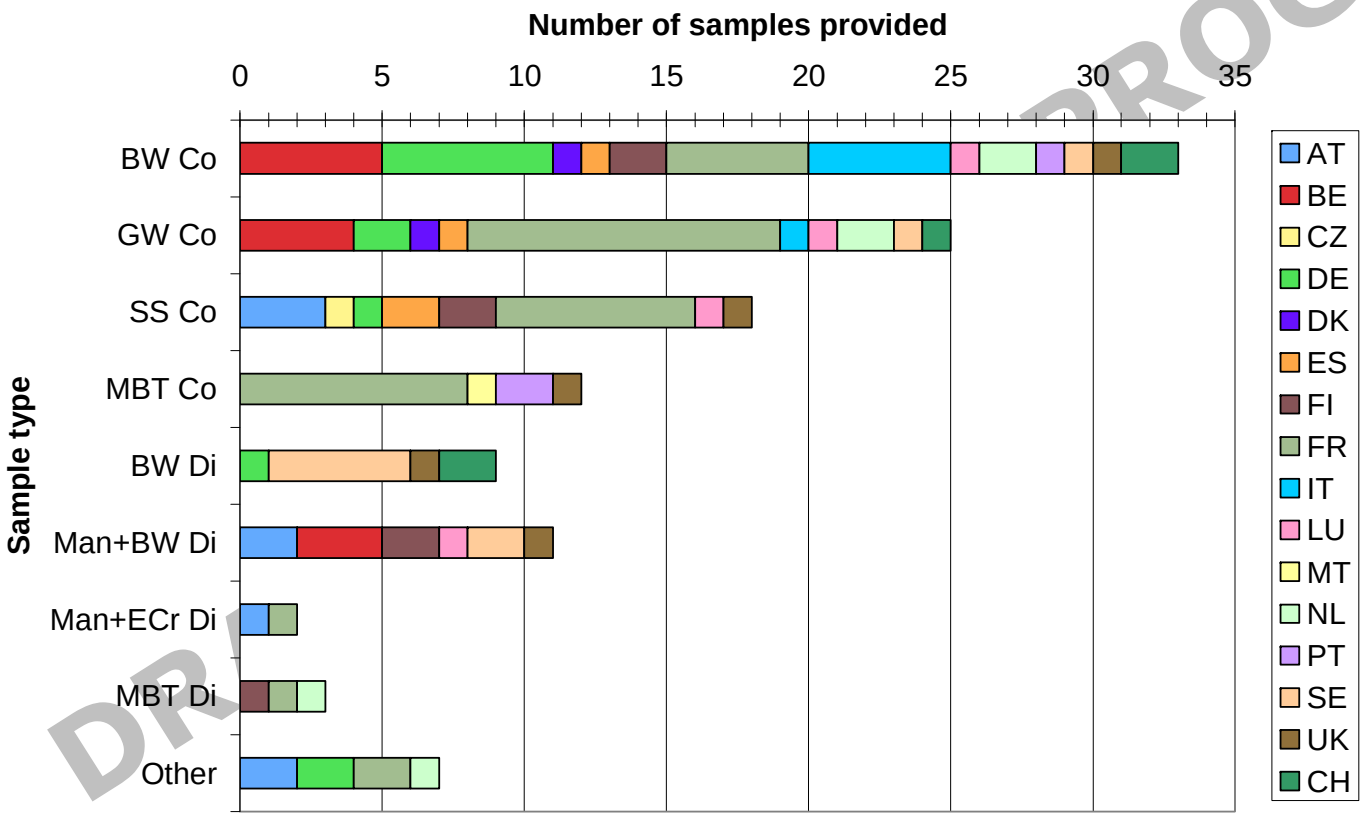

N
W
E
S
0 2 4 6 8 Decimal Degrees
Legend
sampling points
Main Rivers

Sampling campaign Compost/digestate

- JRC sampled 19 samples in unannounced sampling campaign (June 2011): results in line with samples sent by plants
- Other samples sent by plants in JRC containers
- 120 samples were eligible for measurement, geo-referenced and distributed over the following categories:
  - Compost produced from separately collected organic waste from households and similar commercial institutions, including garden and park waste
  - Compost produced from garden and park waste only (green compost)
  - Sewage sludge compost produced from good quality sewage sludge and other separately collected organic waste (e.g. garden and park waste, straw, etc.)
  - Municipal Solid Waste compost generated by Mechanical Biological Treatment (MBT) aimed at producing compost (derived from non-hazardous household waste and similar commercial waste where no separate collection of household waste is in place)
  - Digestates from source separated biowastes from households and similar commercial institutions (liquid and solid fraction)
  - Digestates from manure and source separated biowastes from households and similar commercial institutions (liquid and solid fraction)
  - Digestates from manure and energy crops (liquid and solid fraction)
  - Digestate derived from Mechanical Biological Treatment of Municipal Solid Waste, aimed at producing digestate for use in agriculture (derived from non-hazardous household waste and similar commercial waste)
  - Other, minor categories. These include bark compost or municipal solid waste compost like output generated by Mechanical Biological Treatment aimed at stabilizing a rest fraction sent to landfill.

Sampling campaign Compost/digestate

Geographical sample distribution:



- Co=compost
- Di=digestate
- BW=source separated biowaste & green waste
- GW= source separated green waste
- SS=sewage sludge
- MBT=mechanical biological treatment
- Man=manure
- ECr=energy crops

Materials and Methods

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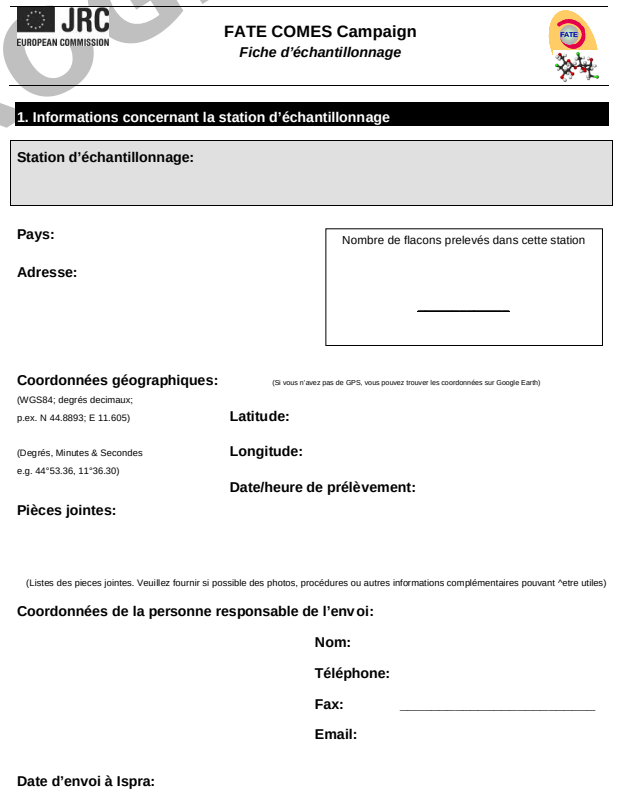
Sampling Bill

- Country Address
- Input material
- Geographic coordinates (WGS84)
- Sampling date/time
- Attachments (possible photos, SOPs,…)
- Contact person for all dispatch issues
- Sampling operation/Sampling method
- Field observations and weather
- Other observations
- Field analyses
- Relevant information about the plant
- …



JRC EUROPEAN COMMISSION

FATE COMES Campaign

Fiche d'échantillonnage

1. Informations concernant la station d'échantillonnage

Station d'échantillonnage:

Pays:

Adresse:

Nombre de flacons prelevés dans cette station

_____

Coordonnées géographiques: (Si vous n'avez pas de GPS, vous pouvez trouver les coordonnées sur Google Earth)

(WGS84; degrés decimaux;
p.ex. N 44.8893; E 11.605)

Latitude:

(Degrés, Minutes & Secondes
e.g. 44°53.36, 11°36.30)

Longitude:

Date/heure de prélèvement:

Pièces jointes:

(Listes des pieces jointes. Veuillez fournir si possible des photos, procédures ou autres informations complémentaires pouvant ^etre utiles)

Coordonnées de la personne responsable de l'envoi:

Nom:

Téléphone:

Fax: _____

Email:

Date d'envoi à Ispra:

Analytical methods

Minor and trace elements	*prEN 16170, prEN 16174*	Horizontal standards
Mercury	*prEN 16175-1 (modified)*	
PAH (EPA 12)	*prEN 16181*	
Impurities (20 samples)	*FprCEN/TS 16202 bleach*	
Dioxins (19 samples)	*FprCEN/TS 16190*	
AhR-active compounds (DL)	*Validated in-house*	
PFC	*Validated in-house*	
PCMs	*Validated in-house, accredit.*	
Non-target screening	*Validated in-house, EU Commission Decision 2002/657/EC*	

Results

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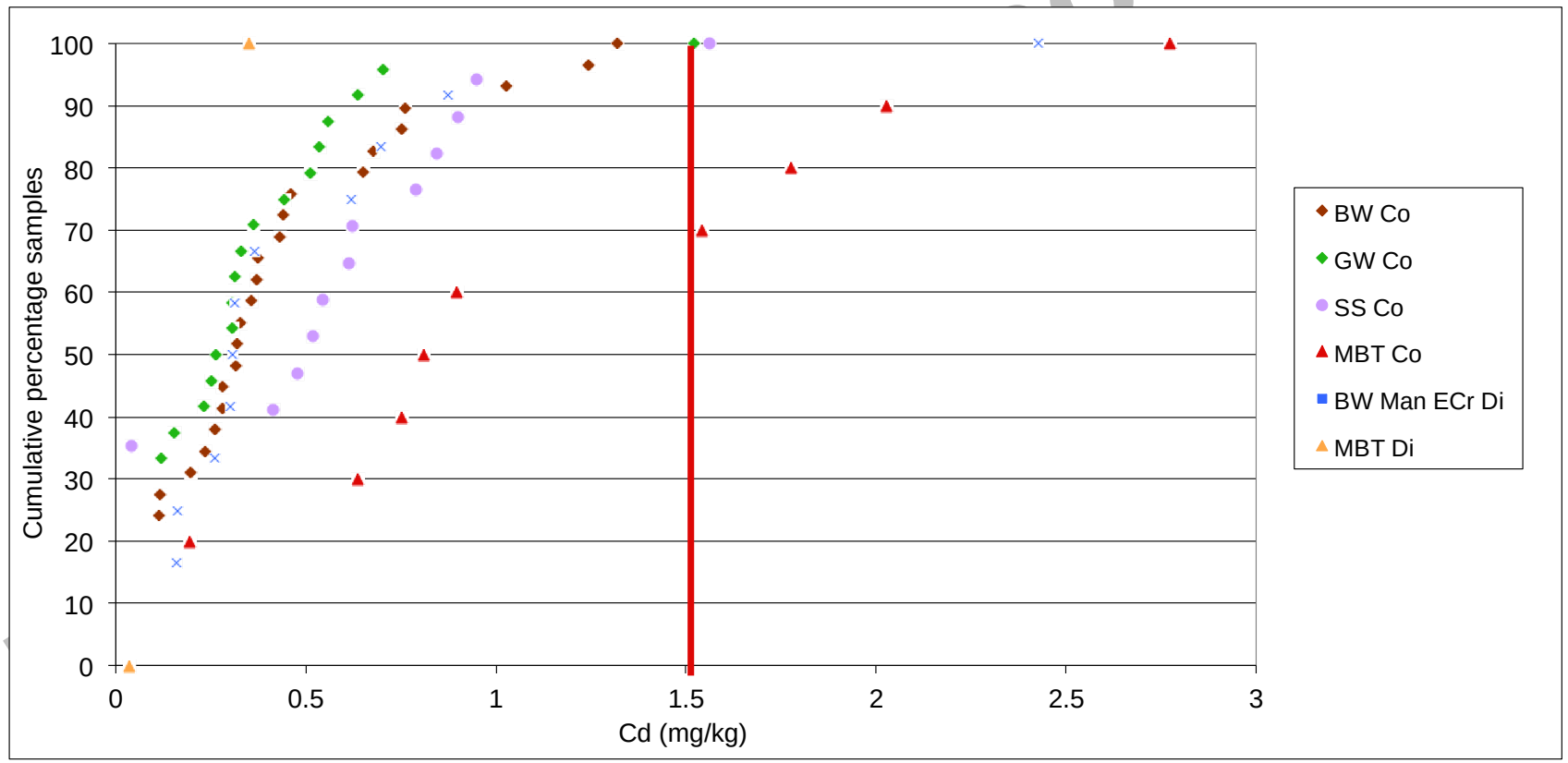
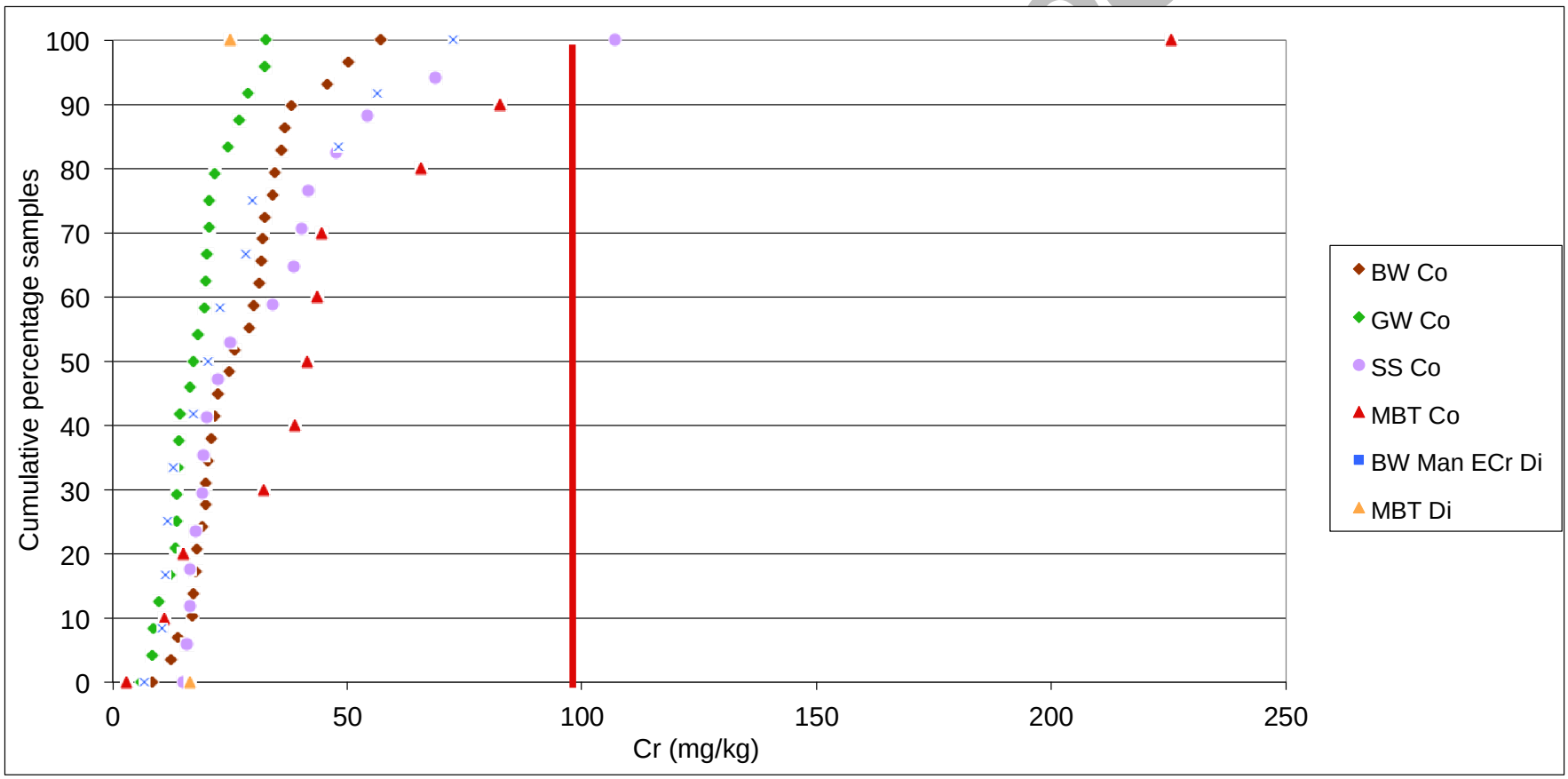
Cd

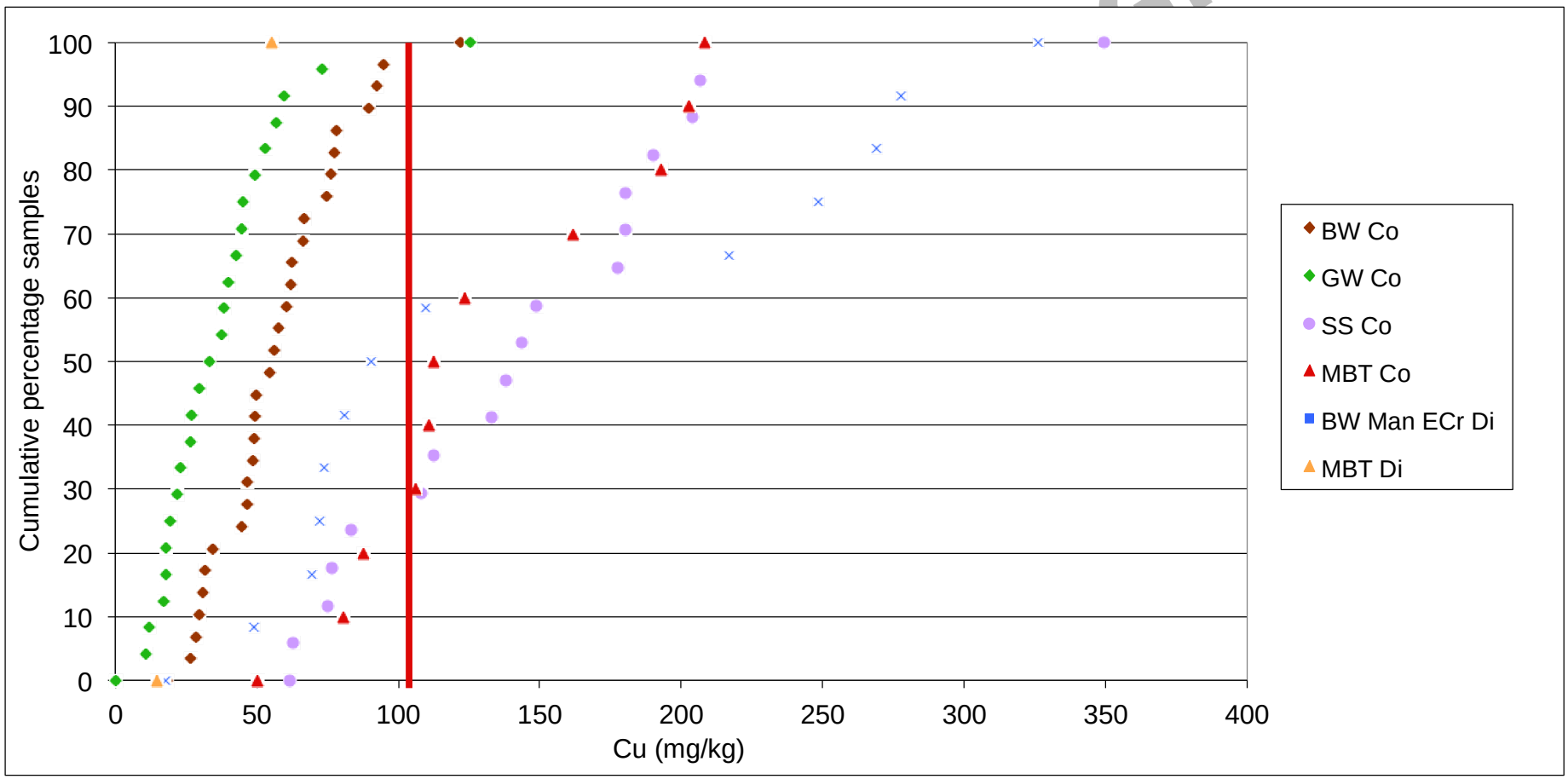
- Cumulative percentage: sample size= 100%
- All samples represented for every category
- Every dot represents an actual sample



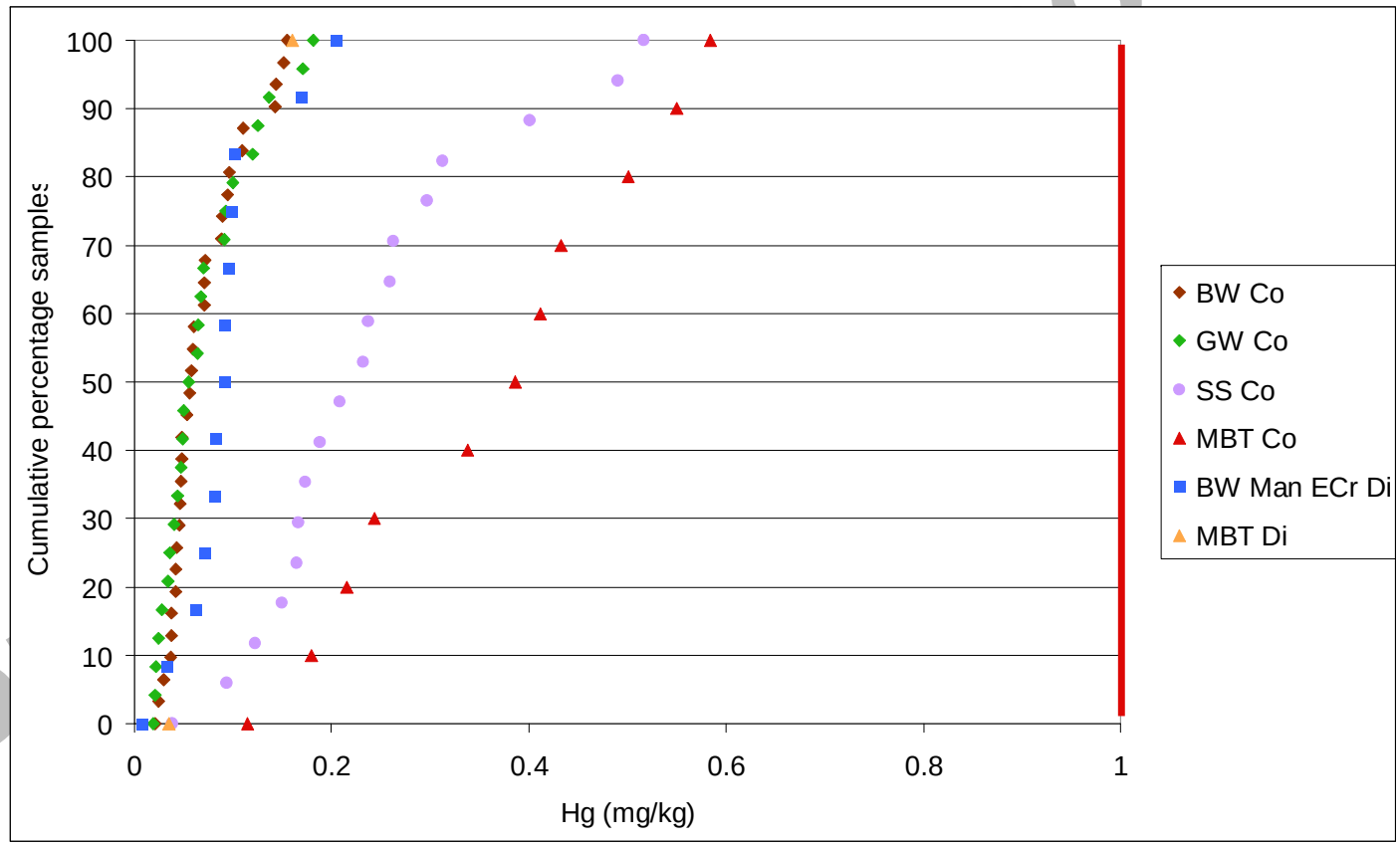
Cr


Cumulative percentage samples
100
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
Cr (mg/kg)
BW Co
GW Co
SS Co
MBT Co
BW Man ECr Di
MBT Di

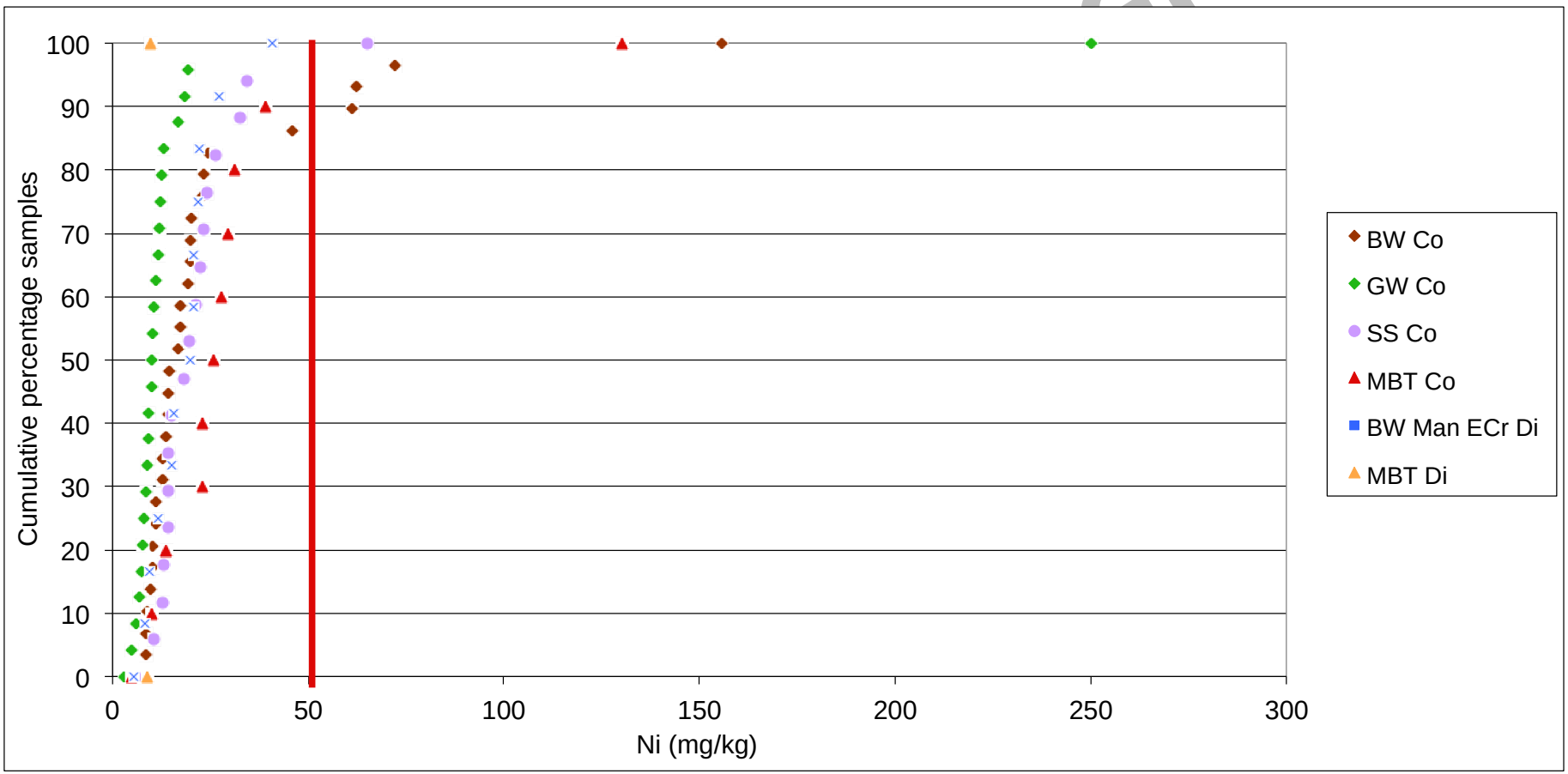
Cu


Cumulative percentage samples
100
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
350
400
Cu (mg/kg)
BW Co
GW Co
SS Co
MBT Co
BW Man ECr Di
MBT Di

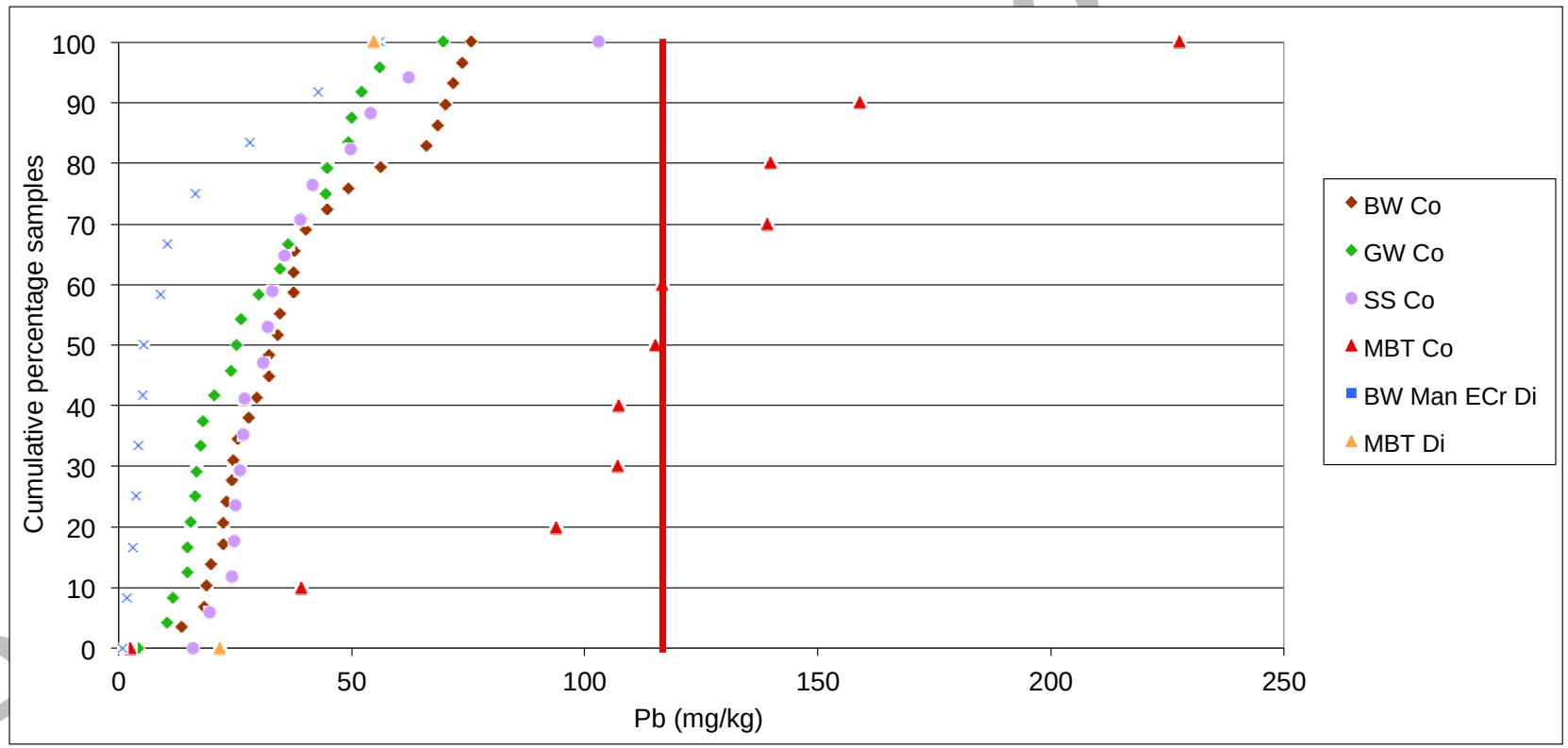
Hg


Cumulative percentage samples
100
90
80
70
60
50
40
30
20
10
0
0
0.2
0.4
0.6
0.8
1
Hg (mg/kg)
BW Co
GW Co
SS Co
MBT Co
BW Man ECr Di
MBT Di

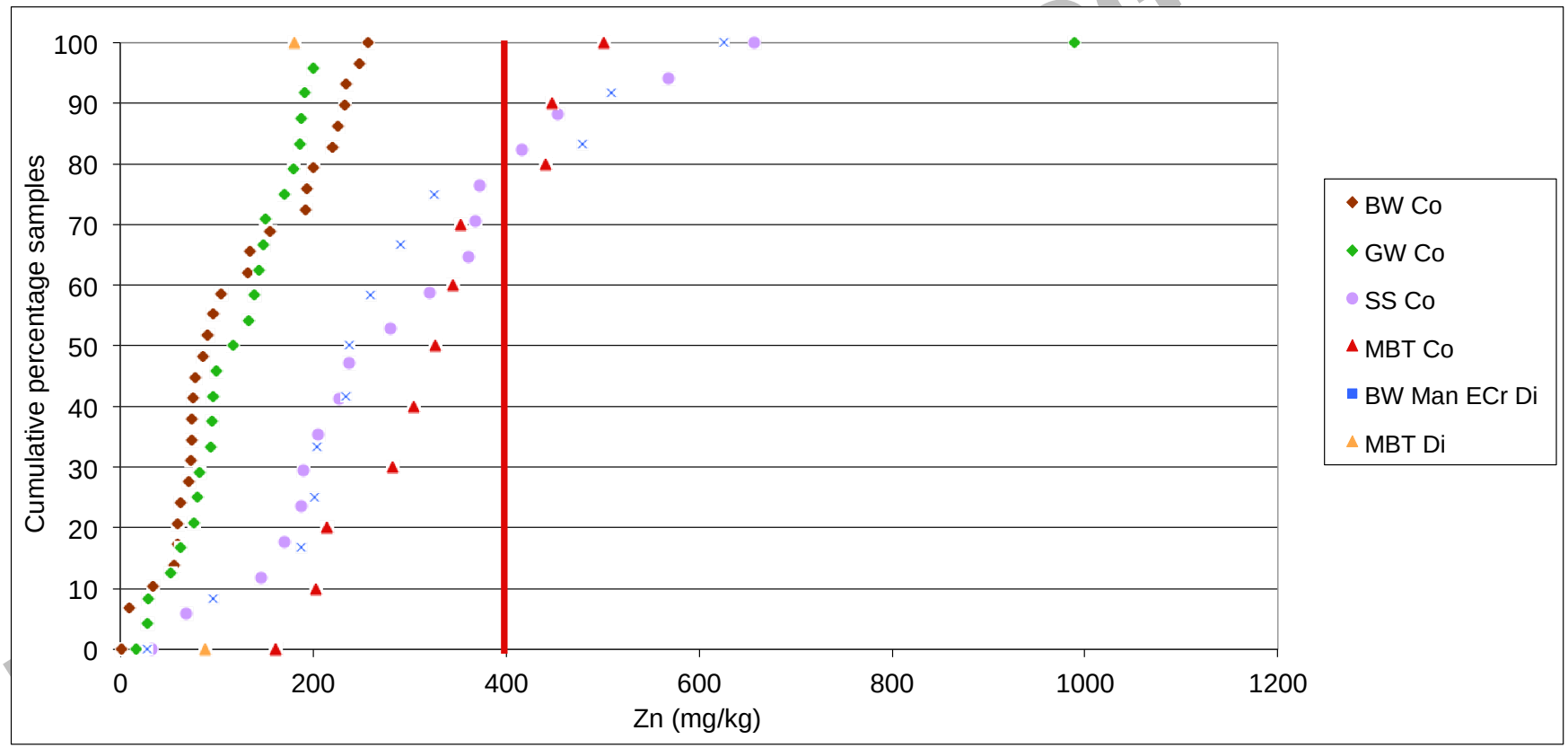
Ni


Cumulative percentage samples
100
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
Ni (mg/kg)
BW Co
GW Co
SS Co
MBT Co
BW Man ECr Di
MBT Di

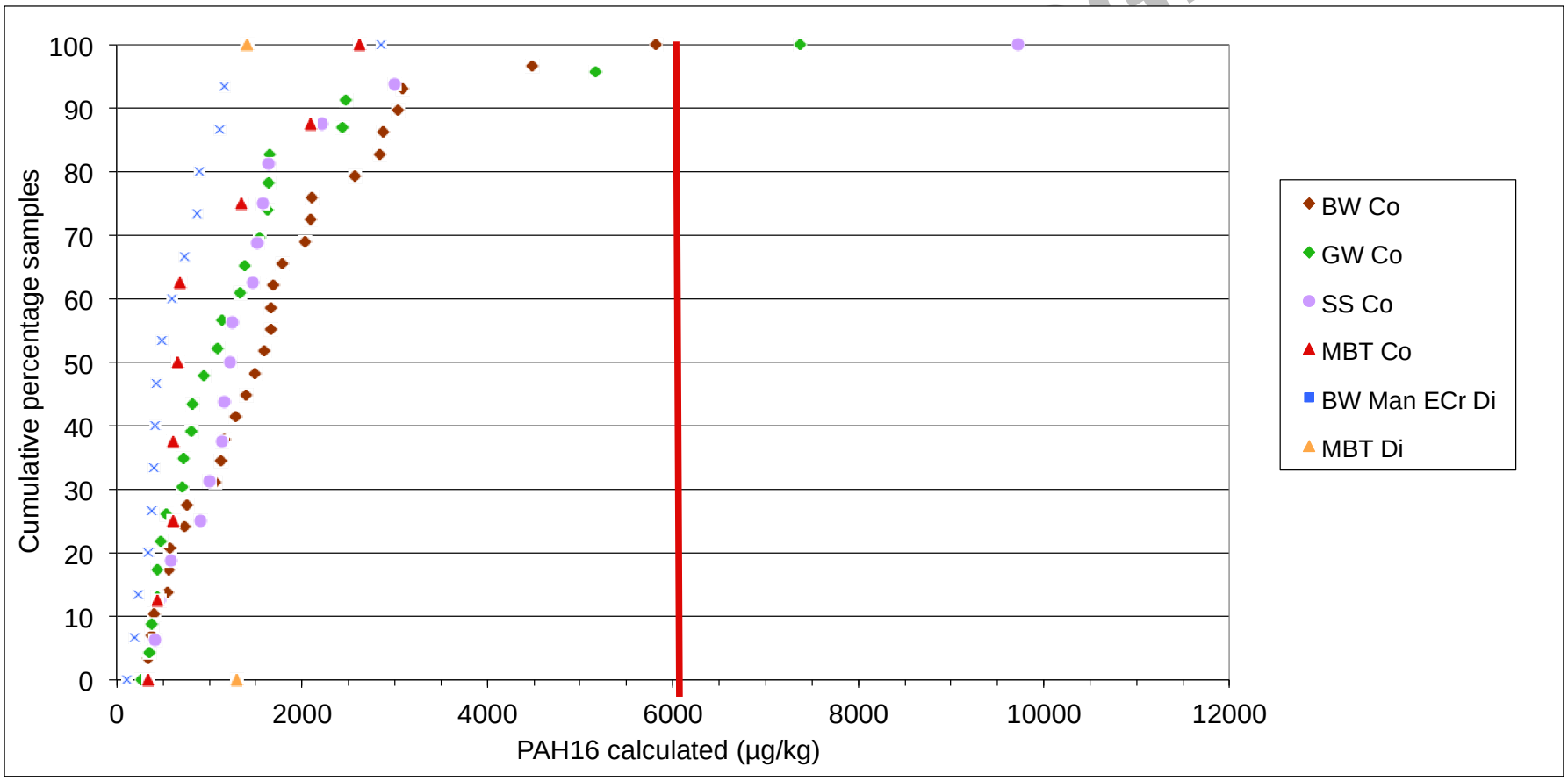
Pb


Cumulative percentage samples
100
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
Pb (mg/kg)
BW Co
GW Co
SS Co
MBT Co
BW Man ECr Di
MBT Di

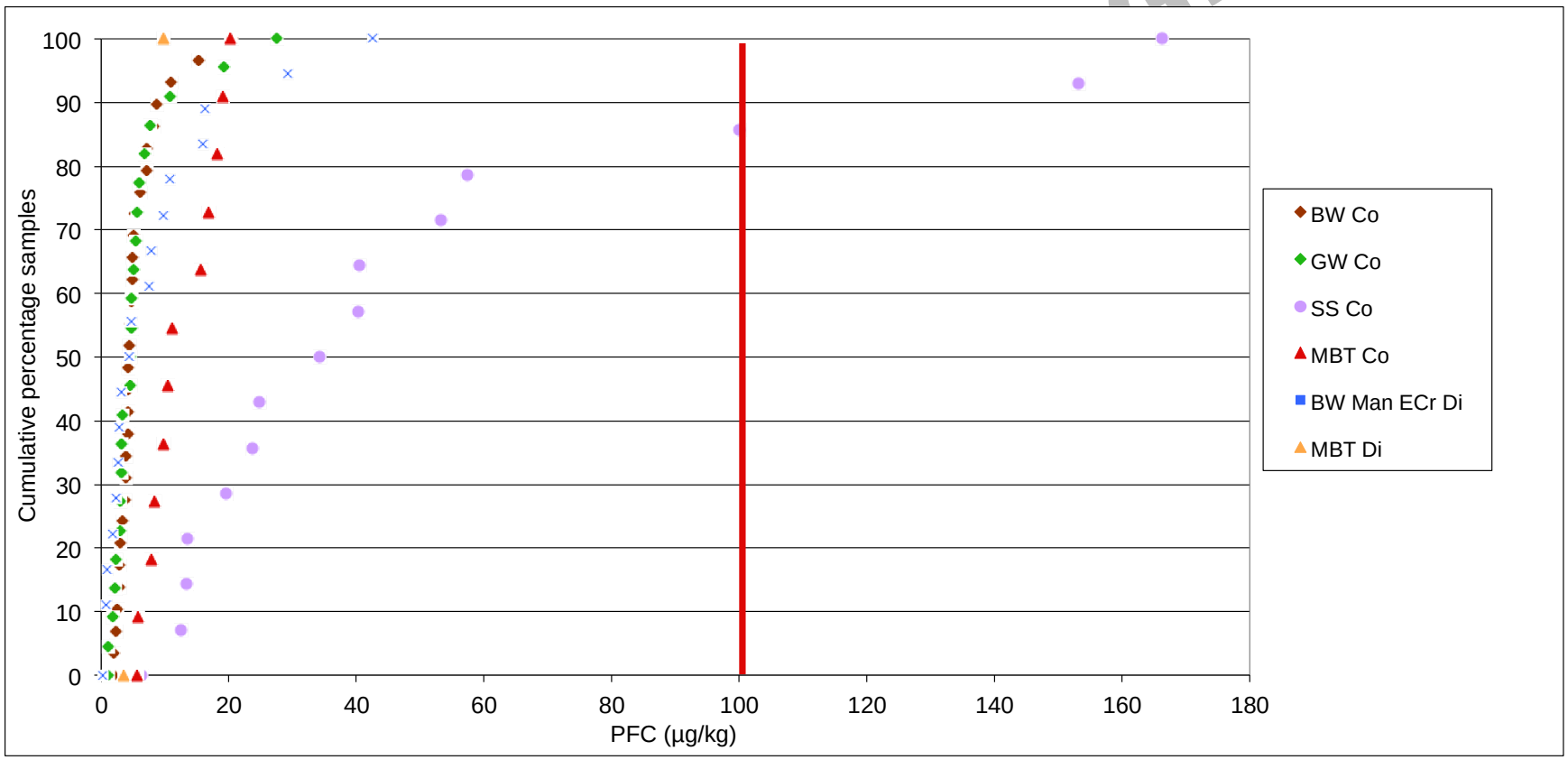
Zn

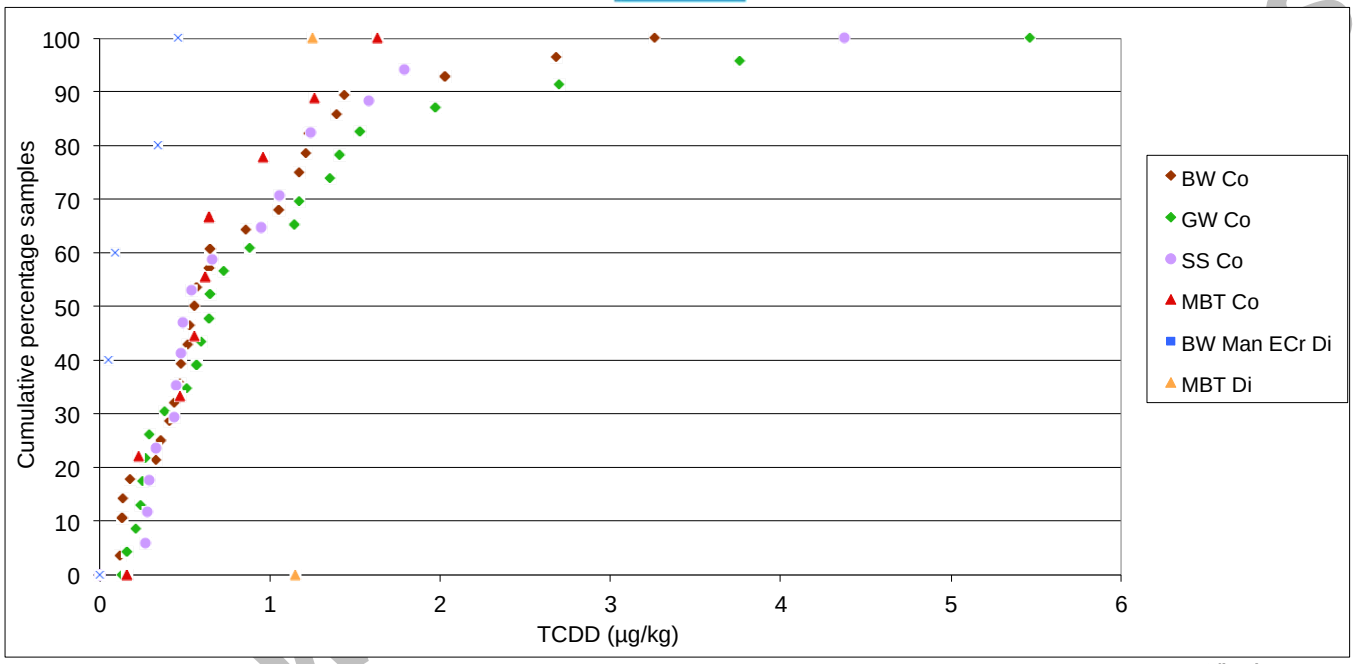

Cumulative percentage samples
100
90
80
70
60
50
40
30
20
10
0
0
200
400
600
800
1000
1200
Zn (mg/kg)
BW Co
GW Co
SS Co
MBT Co
BW Man ECr Di
MBT Di

PAH_{16}


Cumulative percentage samples
100
90
80
70
60
50
40
30
20
10
0
0
2000
4000
6000
8000
10000
12000
PAH16 calculated (µg/kg)
BW Co
GW Co
SS Co
MBT Co
BW Man ECr Di
MBT Di

PFC


Cumulative percentage samples
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
160
180
PFC (µg/kg)
BW Co
GW Co
SS Co
MBT Co
BW Man ECr Di
MBT Di



Dioxin (effects)

6 March 2013

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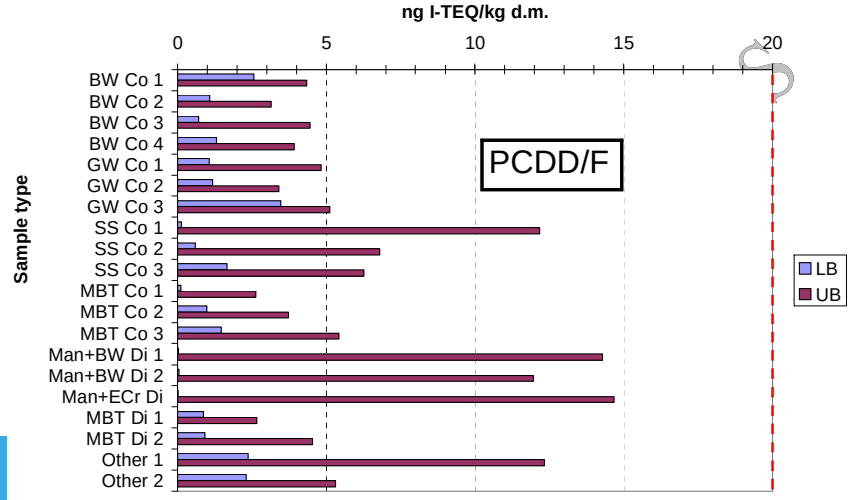
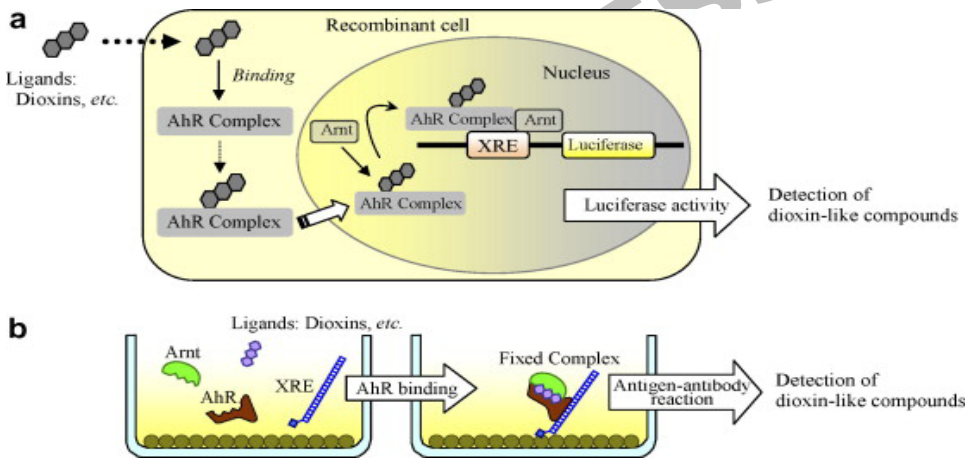


- Reporter gene bioassays are bioanalytical tools
- Overall effect of a mixture (in our case compost extract).
- Calibration needed
- Final values provided (TEQbio) are expressed in concentration units (ng/g).
- Therefore, limits (or EQS etc.) can easily be suggested for this parameter.
- However, some more work - metaanalysis of existing data are needed to define "limit" at this moment.



Outline of mechanistic models of AhR-mediated in vitro bioassay. (a) CALUX assay, (b) Ah-immunoassay.

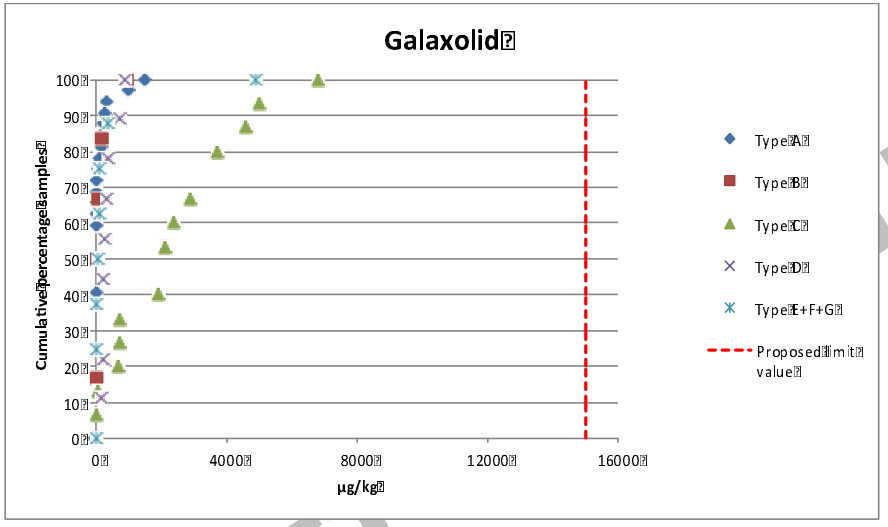
SOURCE
Yoshiaki Amakura , Tomoaki Tsutsumi , Kumiko Sasaki , Masafumi Nakamura , Takashi Yoshida , Tamio Maitani

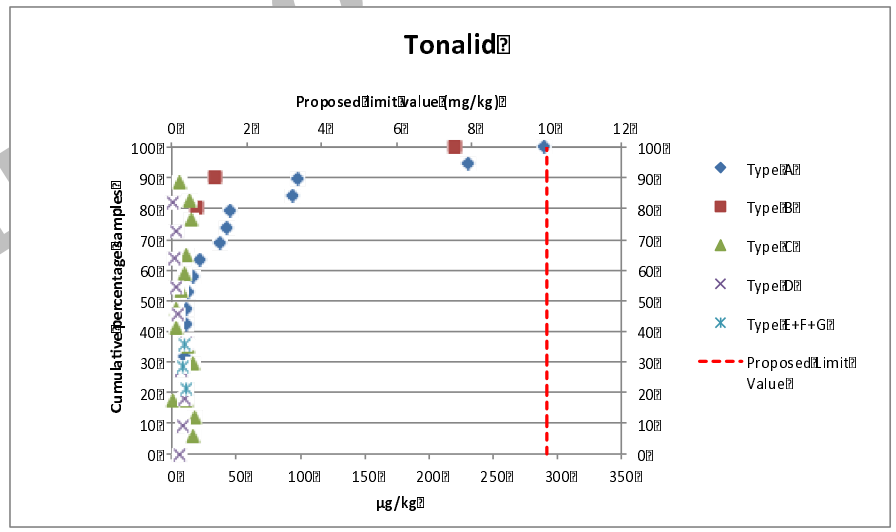
Influence of food polyphenols on aryl hydrocarbon receptor-signaling pathway estimated by in vitro bioassay

Phytochemistry Volume 69, Issue 18 2008 3117 - 3130

http://dx.doi.org/10.1016/j.phytochem.2007.07.022

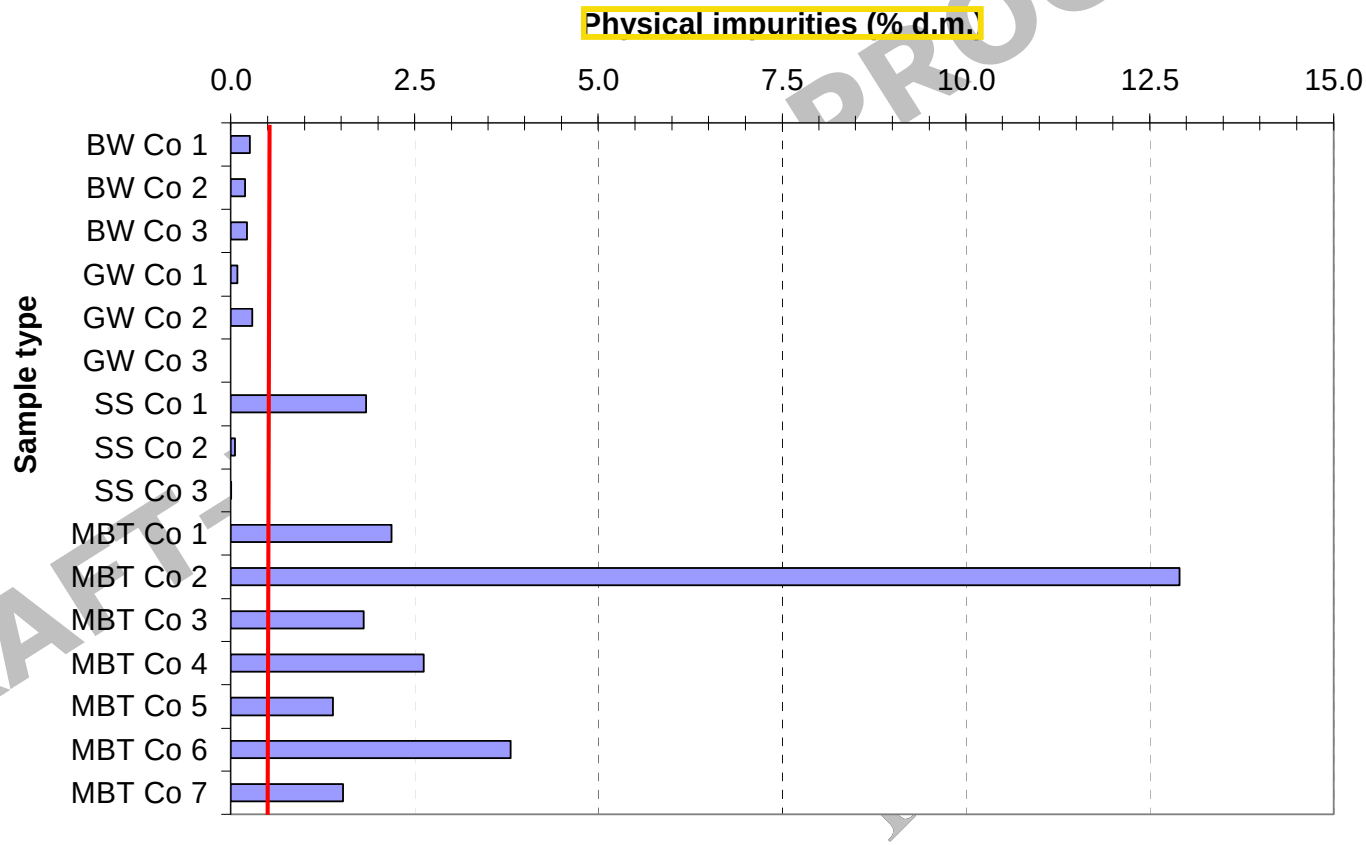
PCM





Proposed limit by BMU 2006 for sludge not endorsed

Physical impurities



Summary

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Summary

	BW Co	GW Co	SS Co	MBT Co	Dig
Cd	+	0	0	-	0
Cr	+	++	0	0	+
Cu	0	0	--	--	-
Hg	++	++	+	+	++
Ni	-	0	0	0	+
Pb	+	+	+	-	++
Zn	+	0	-	-	-
PAH_{16}	+	0	0	++	++
PFC	++	++	-	++	++

- ++: max below 50% of proposed limit value
- +: max below limit value
- 0: max exceeds limit value
- -: 90 percentile exceeds limit value
- --: median value exceeds limit value

Summary

- Proposed criteria largely met
- MBT and Impurities
- Bio-assay for dioxin-like substances reliable alternative ?
  - Criteria
  - Standardisation
  - Need for pre-normative consolidation