Assessment of organochlorine pesticides in food from Kinshasa and Johannesburg

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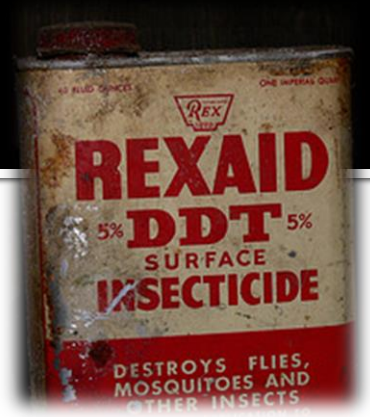
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UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

UNIVERSITY OF KINSHASA
Faculty of Pharmacy

ENVIRONMENTAL ANALYTICAL chemistry
School of Chemistry
University of the Witwatersrand

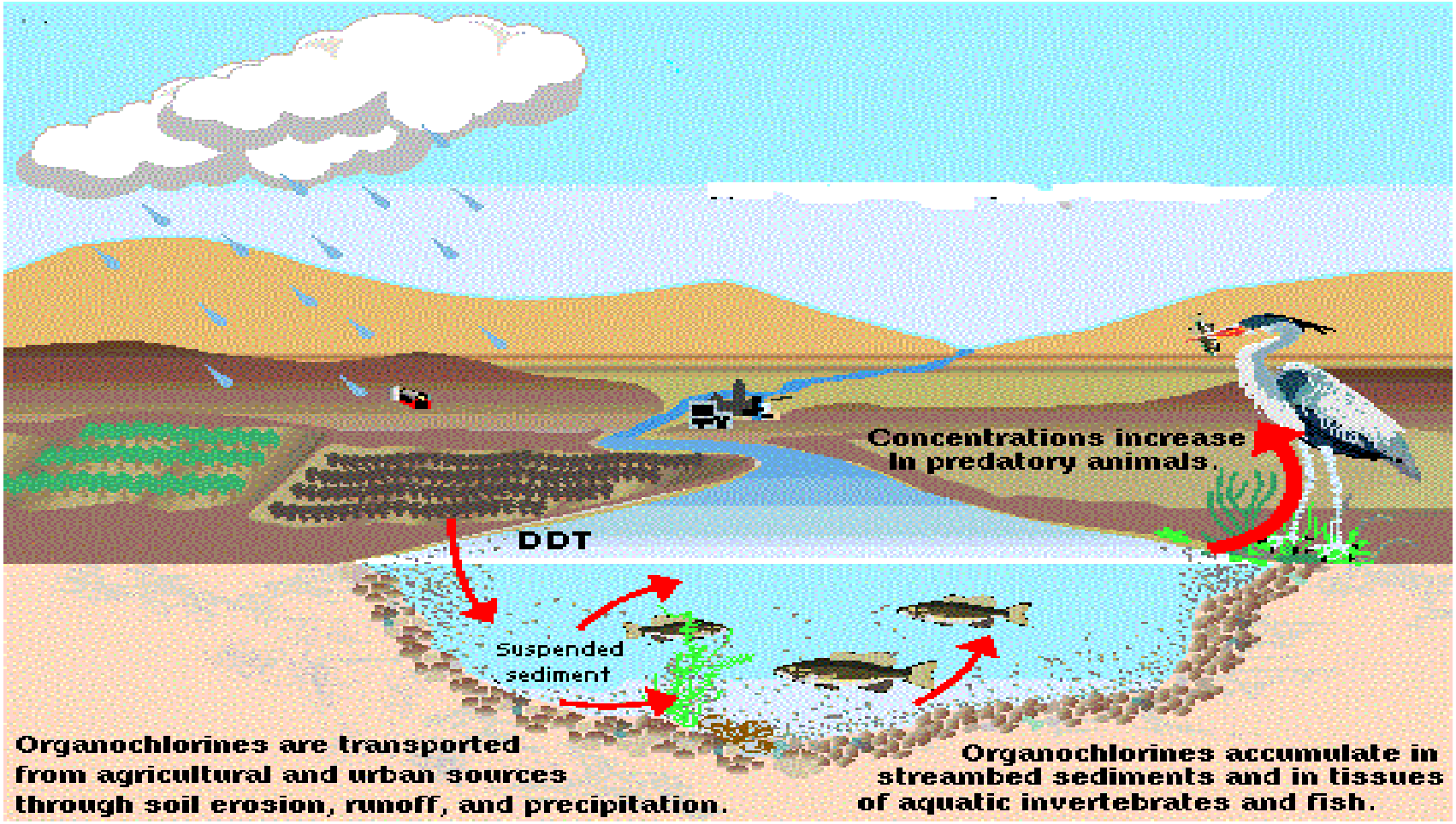
About Organochlorine pesticides



Organochlorines….

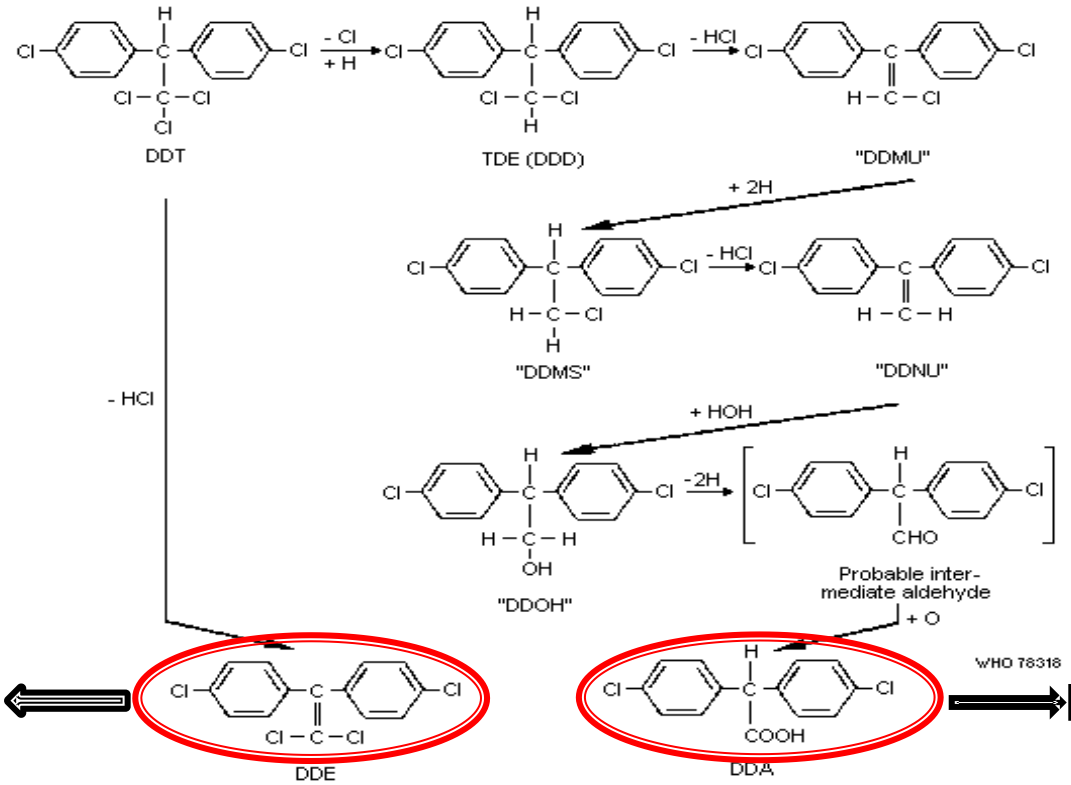
- Are groups of chlorinated compounds that persist in the environment
- For pest control in agriculture
- Malaria control
- Banned or heavily restricted in many countries because of adverse effects on living organisms and the environment

Organochlorine pesticides in food chain



Biotransformation of DDT in Human body

Dechlorination detoxification pathway



Dehydrochlorination toxic pathway

Adipose tissues

Excreted in urine

Harmful effects of organochlorine residues

- Endocrine disruption
(reduced of fertility, spontaneous abortion)
- Neurobehavioral disorders
- Chronic health effects
- Carcinogenic



Objectives of the studdy

- To assess the level of organochlorines in food sold in Kinshasa and Johannesburg open markets
- Use the obtained data to compare the level of organochlorine in both countries through the food sold in the market

Sampling area

60 food samples from Kinshasa markets
The food samples constituting by meat,fish, beans and cabbage



60 food samples from Johannesburg markets
The food samples constituting by meat, fish, beans and cabbage

Sample preparation and clean up (QuERChERS)

Weigh 10 g of Frozen Sample

↓

Add 10 mL Acetonitrile

↓ Shake vigorously for 1 min

Add 4 g $MgSO_4$ / 1 g NaCl

↓ Shake & Centrifuge

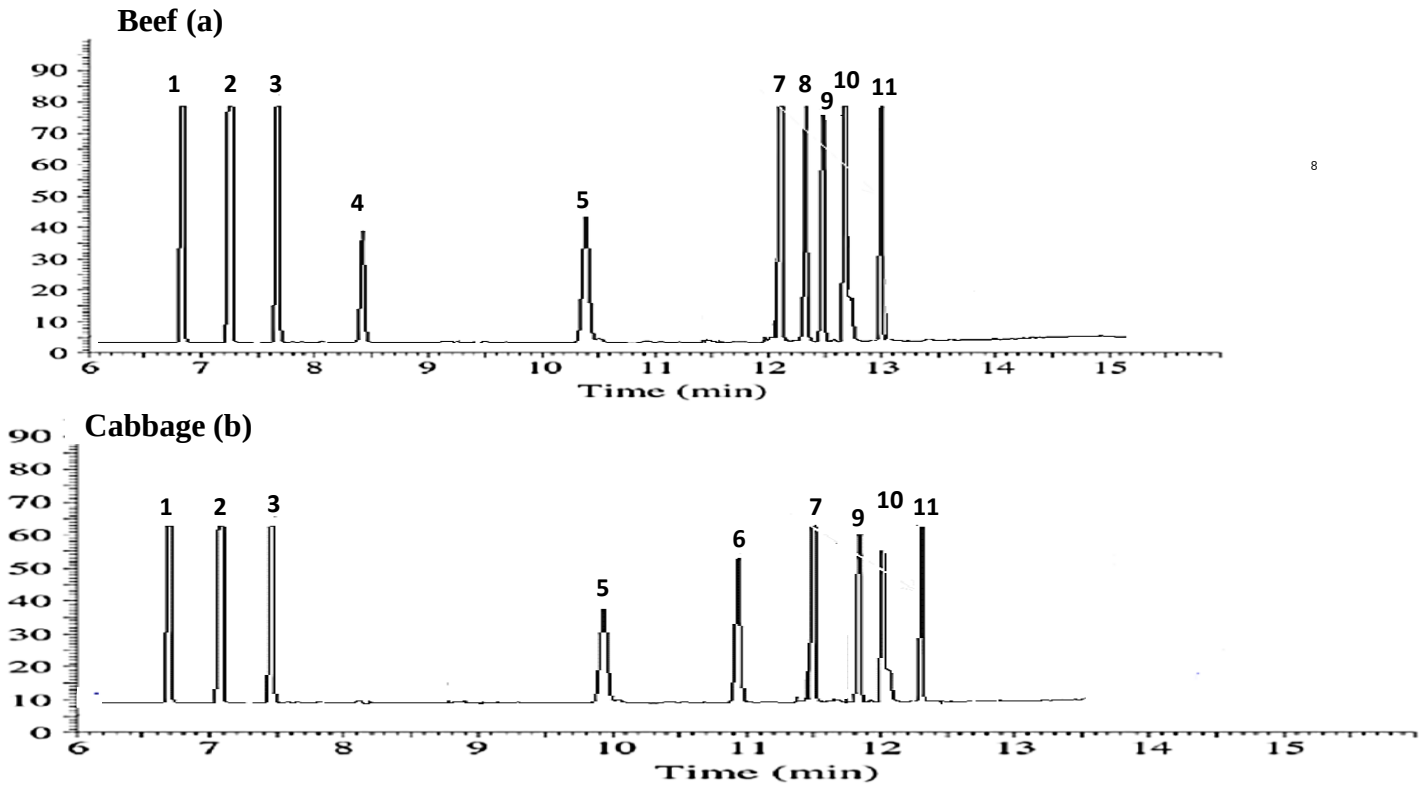
Mix an Aliquot with $MgSO_4$ & PSA

↓ Shake & Centrifuge

Determination by GC-ECD/GS-MS



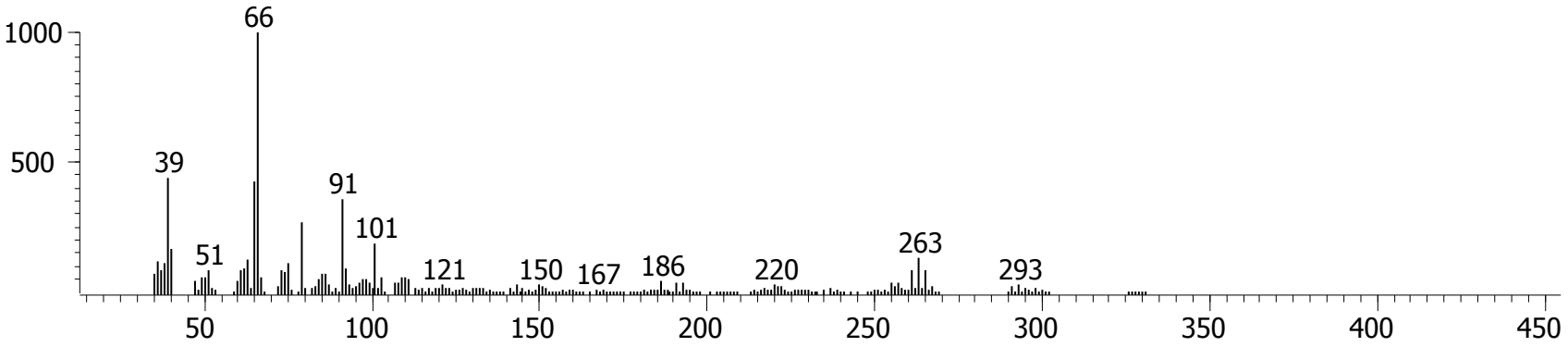
Qualitative analysis : GC- ECD



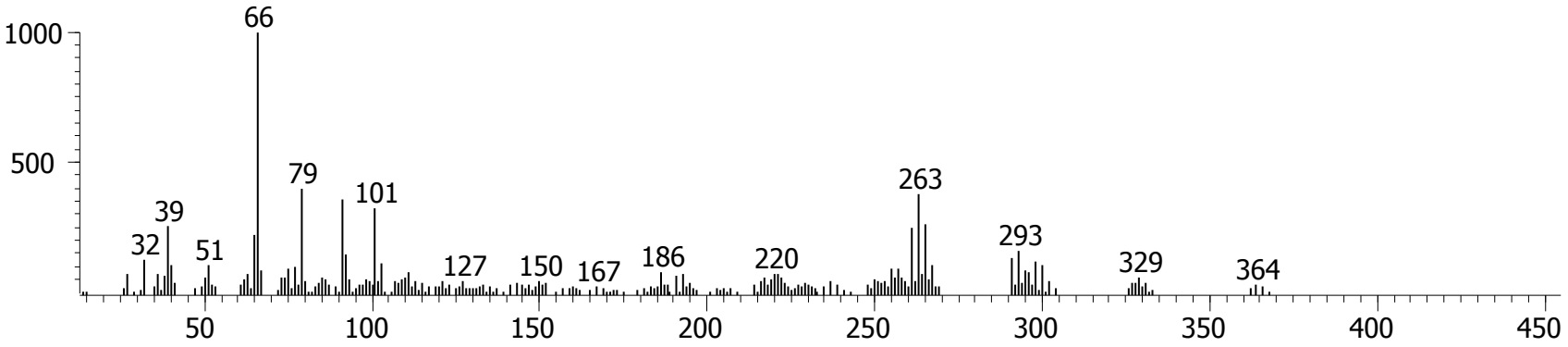
(1) α – BHC, (2) γ – BHC, (3) β -BHC, (4) Heptachlor, (5) Aldrin, (6) Heptachlor epoxide, (7) 4,4’ – DDE, (8) Dieldrin, (9) Endrin, (10) 4,4’ – DDD, (11) 4,4’- DDT.

Qualitative analysis : GC- MS

Aldrin in beef



Aldrin in cabbage



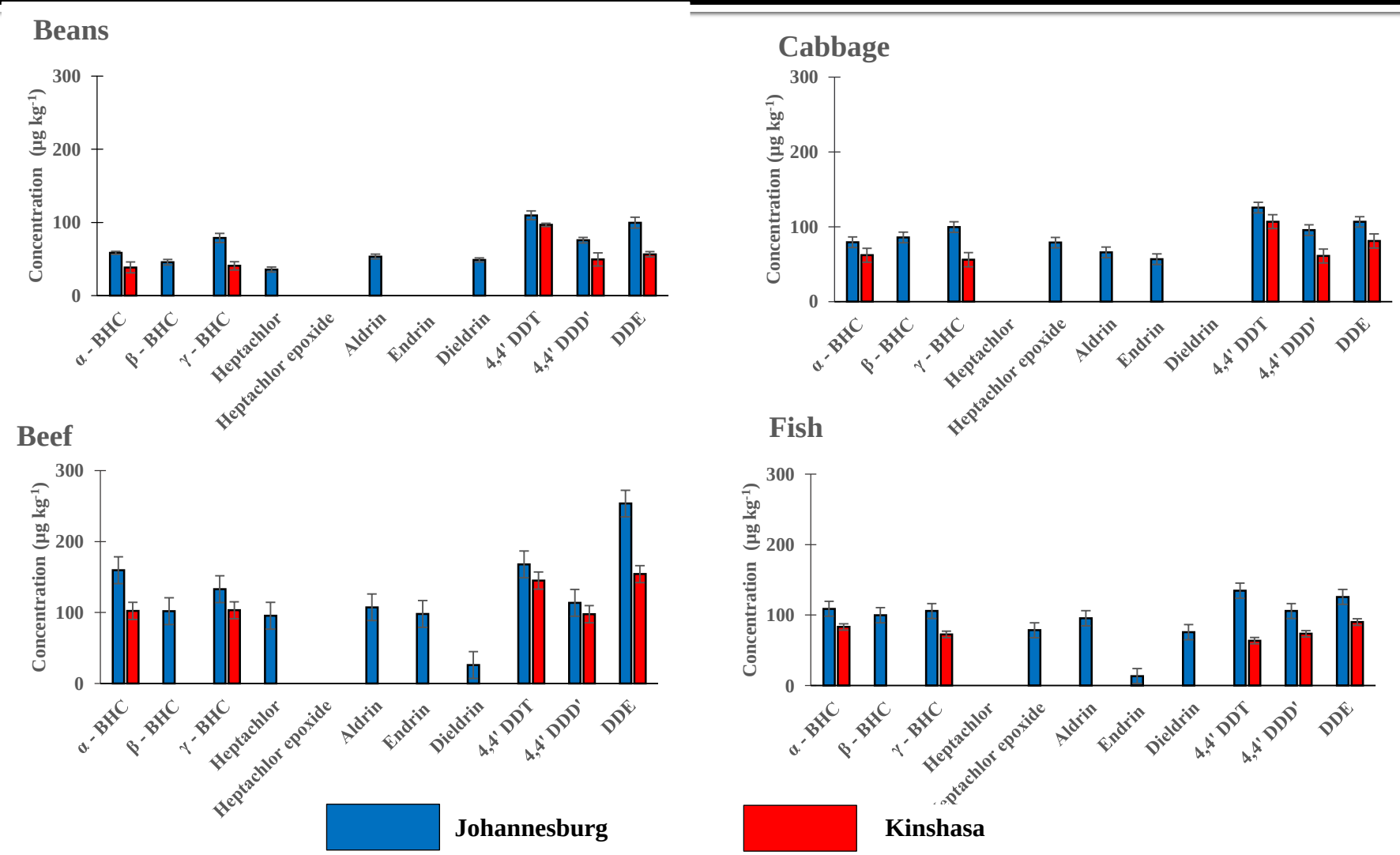
Quality assurance of the method applied

Analyte	LOD (µg kg^{-1})	LOQ(µg kg^{-1})	R^2	RSD(%)
α – BHC	1.49	15.01	0.999	3.50
γ – BHC	1.90	18.90	0.999	4.90
β – BHC	2.89	29.00	0.999	2.44
Heptachlor	1.37	14.01	0.999	1.55
δ-BHC	3.89	38.90	0.999	3.13
Aldrin	1.90	20.01	0.999	3.27
Heptachlor epoxide	2.90	28.87	0.999	4.78
Endosulfan	4.34	43.40	0.999	4.39
4,4' DDE	2.81	28.10	0.999	2.82
Endrin	3.45	34.60	0.999	4.91
Dieldrin	2.91	29.10	0.999	3.43
4,4' - DDD'	2.05	20.50	0.999	3.89
Endosulfan II	12.89	128.90	0.999	3.76
4,4' DDT	8.02	80.20	0.999	2.95
Endrin aldehyde	7.82	78.20	0.999	2.27
Endosulan sulfate	8.67	86.70	0.999	1.98
Methoxylchlor	9.01	90.10	0.999	3.16

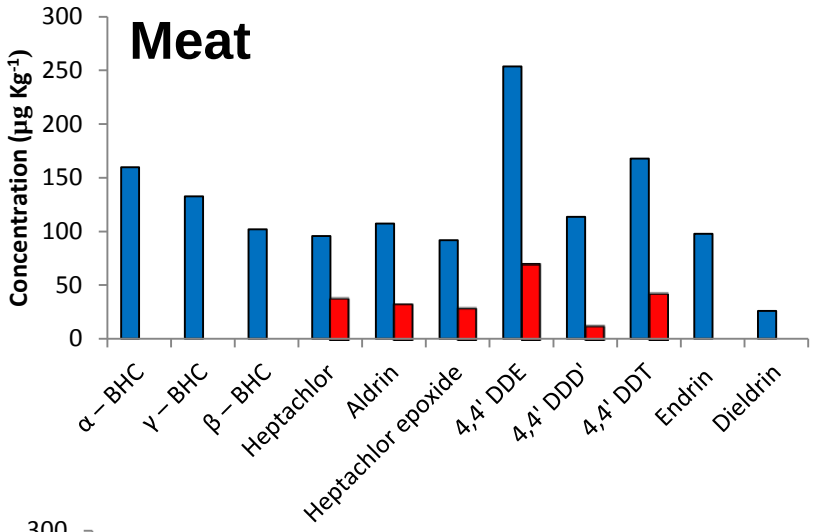
Quality assurance of the method

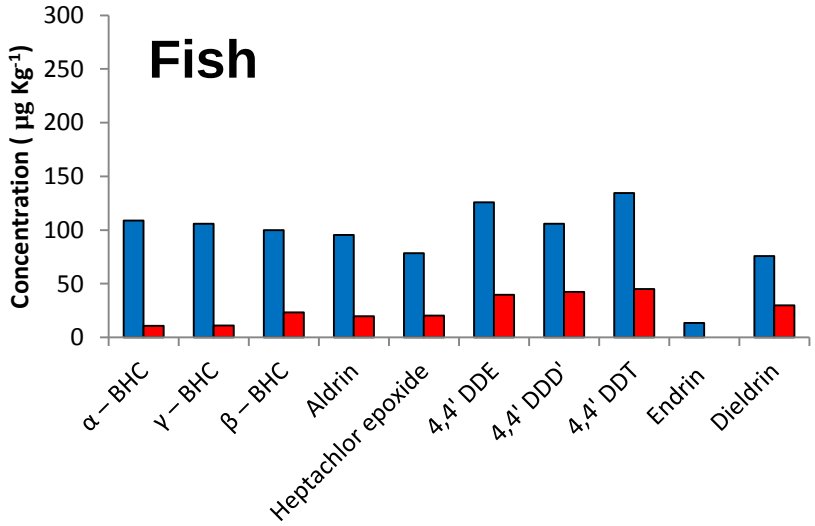
	Recovery (%) of organochlorin pesticides (spiked level of 10 µg kg^{-1})			
	Beans	Cabbage	Fish	Meat
α – BHC	81.2±0.17	84.4±0.17	84.6±0.25	81.3±0.25
γ – BHC	81.8±0.25	80.8±0.13	80.8±0.10	82.7±0.21
β – BHC	81.9±0.15	81.6±0.28	81.8±0.23	81.6±0.15
Heptachlor	84.5±0.25	87.8±0.17	87.6±0.081	80.4±0.11
δ-BHC	81.3±0.25	82.1±0.56	81.5±0.08	80.3±0.27
Aldrin	82.7±0.21	80.9±0.63	80.7±0.18	84.5±0.15
Heptachlor epoxide	81.6±0.15	88.7±0.21	90.6±0.18	80.7±0.21
Endosulfan	80.4±0.11	80.7±0.26	80.4±0.09	83.7±0.15
4,4' DDE	83.5±0.11	84.8±0.17	84.8±0.8	81.8±0.15
Endrin	80.2±0.10	81.2±0.19	81.1±0.06	80.8±0.18
Dieldrin	84.4±0.25	88.8±0.16	88.8±0.06	83.7±0.15
4,4' - DDD'	80.6±0.12	82.2±0.18	82.4±0.09	81.8±0.23
Endosulfan II	83.6±0.18	84.2±0.13	84.2±0.53	87.6±0.081
4,4' DDT	81.4±0.11	80.2±0.13	80.0±0.09	81.5±0.08
Endrin aldehyde	80.7±0.31	81.9±0.22	81.6±0.09	80.7±0.18
Endosulan sulfate	83.7±0.29	85.8±0.17	85.6±0.21	84.8±0.8
Methoxylchlor	81.7±0.30	87.6±0.34	87.3±0.12	81.1±0.06

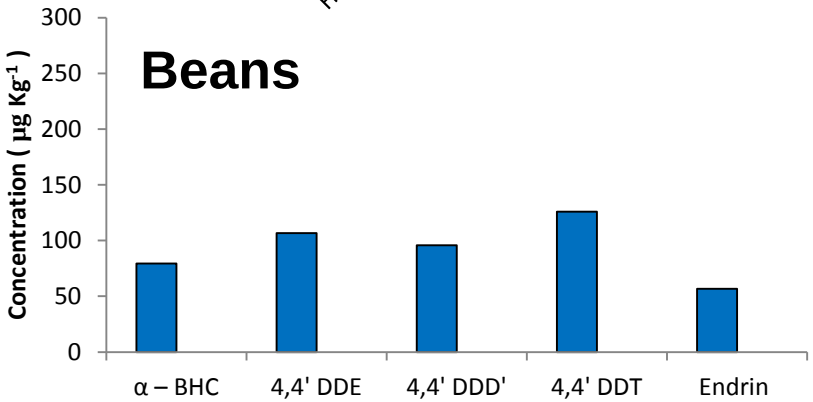
Levels of organochlorine pesticides in raw food from Kinshasa and Johannesburg open markets.

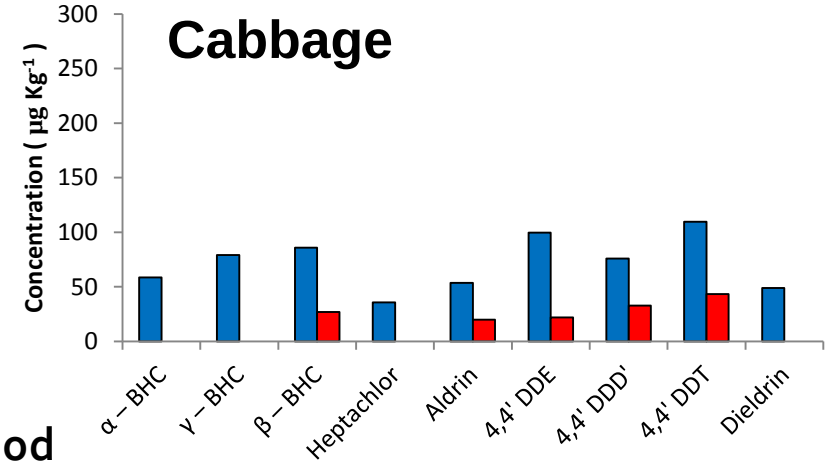


Impact of cooking on pesticide residues in food samples









Raw food

Cooked food

Conclusion

On comparing our results with FAO/WHO (2012) guidelines, all the samples were found to be contaminated and exceeded the limit for BHC group (10 µg kg^{-1}). Besides this, the concentration of DDT, DDD, DDE, aldrin, endrin and dieldrin in the food samples were within FAO/WHO (2012) maximum residue limits in food. Cooking Process decreases significantly the amount of pesticides in food.

THANK YOU

