#ToxicBusiness

Science iCafé: **Pesticides in the Kenyan Market**

This icafé will highlight concerns around pesticides in Kenya drawing on evidence and expertise submitted to the Pest Control Products Board. Join us to find out what action can be taken to protect human and environmental health.

Date:
Wednesday 17th November, 2021

Time:
3 - 4:30pm (EAT)

Speakers:
Expert Task Force on Pesticides

biba

KOAN

RODI Kenya
Resources Oriented Development Initiatives

ROUTE TO FOOD

Scientific Report on Pesticides in the Kenyan Market

Submission from:

Biodiversity and Biosafety Association of Kenya (BIBA-K)
Kenya Organic Agriculture Network (KOAN)
Resources Oriented Development Initiatives (RODI)
Route to Food Initiative (RTFI)

Prepared by an expert task force
September 2021

Acknowledgements

The petitioners wish to acknowledge the following experts of the task force who researched and prepared this dossier:

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Methodology - Toxicity Scores

Each active ingredient was categorized according to its toxicity as follows:

For each active ingredient, we looked up the following different toxicity data in the Pesticide Properties Database (FOOTPRINT, 2006), which provides toxicity information on all active ingredients worldwide (Table 1).

Table 1. Categories of toxicity according to PPDB

Wildlife toxicity (Bees, fish) [mg/L]		Chronic human health	
Very toxic	<0.1	Yes	Carcinogenicity
Toxic	0.1 - 1.0	Possible	Mutagenicity
Moderately toxic	1.0 - 10	No	Reproduction Toxicity
Low toxic	10 - 100	No data	Neurotoxicity
Not toxic	>100		Endocrine disruption

Table 2. Categories for mobility according to PPDB

<2.8	High mobility
2.8-1.8	Medium
<1.8	Low
No KOC or DT50 value	No data

Accordingly we assigned scores to each given toxicity value following the below criteria (applied and published by Dabrowski *et al.*, 2009).

Table 3. Scoring system used to rank pesticides for environmental and human health effects

Toxic effect	Classification	Value
Environment		
Bees, fish, etc	<0.1	4
	0.1 - 1.0	3
	1.0 - 10	2
	10 - 100	1
	>100	0
	No data	2
Mobility (solubility, persistence)	<2.8	4
	2.8 - 1.8	2
	<1.8	1
	No data	1.5
Human Health		
Endocrine Disrupting Acitity	Yes	8
	Possible	6
	No data	3
	No	0
Carcinogenicity	Yes	8
	Possible	6
	No data	3
	No	0
Mutagenicity	Yes	6
	Possible	4
	No data	2
	No	0
Reproduction	Yes	4
	Possible	2
	No data	1
	No	0
Neurotoxicity	Yes	4
	Possible	2
	No data	1
	No	0

Toxicity score of active ingredients

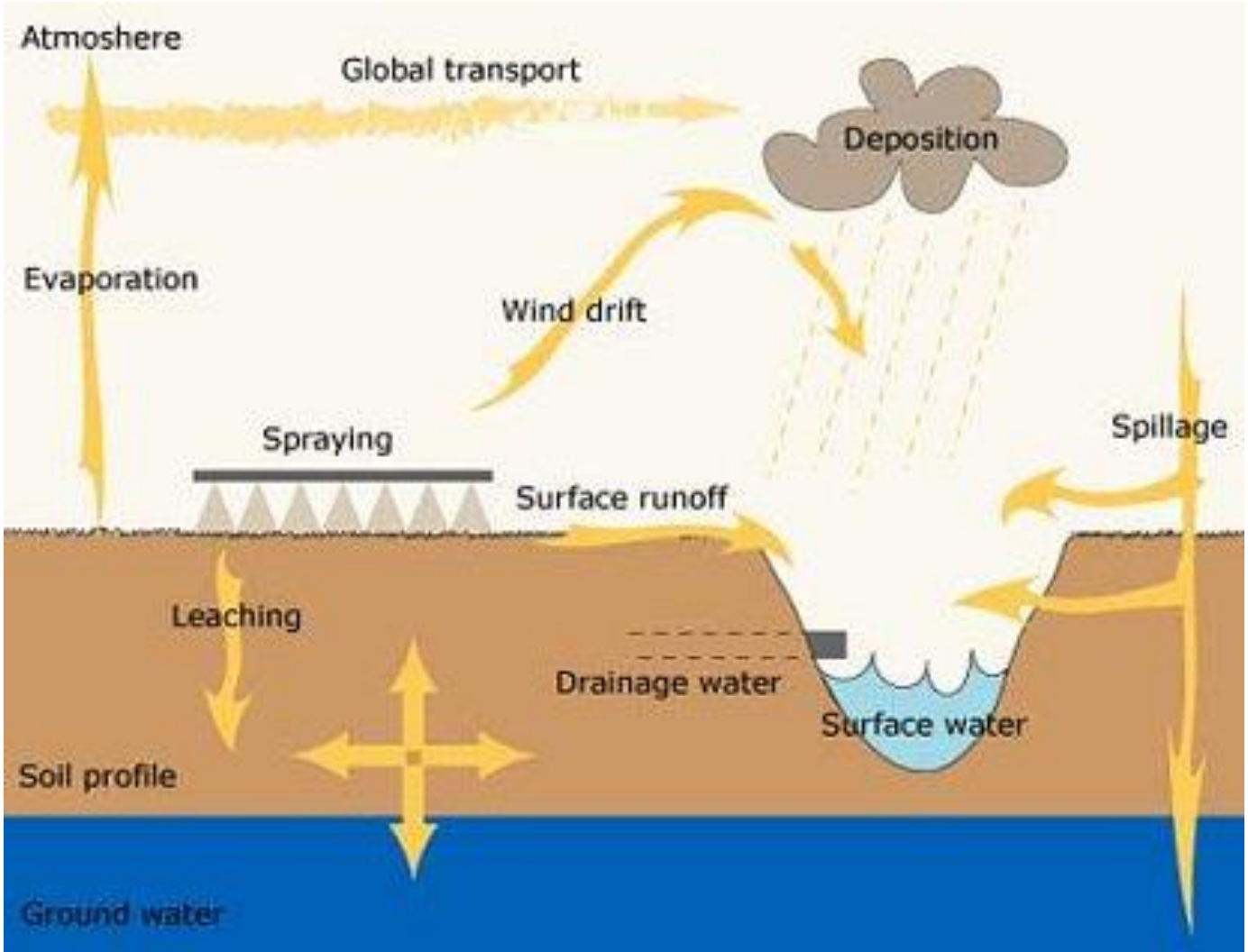
To determine a total toxicity score for each active ingredient, all scores were summed for the environment (fish, daphnia, bee, algae, mobility) and for human health (carcinogenicity, mutagenicity, reproduction, EDC, neurotoxicity). The toxicity scores can be used as a method for prioritising which pesticides should be withdrawn first. The higher the score, the greater the toxicity potential.

Active ingredient	Environmental score	Human Health Score	Total Score	Proposed Action in Kenya
Permethrin	17	24	41	Withdraw immediately
Bifenthrin	16	24	40	Withdraw immediately
Malathion	14	22	36	Withdraw immediately
Dichlorvos	12	23	35	Withdraw immediately
Carbaryl	14	20	34	Withdraw immediately
Carbendazim	11	22	33	Withdraw immediately
Chlorothalonil	13	20	33	Withdraw immediately
Chlorpyrifos	19	14	33	Withdraw immediately
Mancozeb	13	20	33	Withdraw immediately
Carbofuran	14,5	18	32,5	Ban
Thiacloprid	8	24	32	Phased withdrawal
Gamma-cyhalothrin	15	16	31	Phased withdrawal
Deltamethrin	15	14	29	Phased withdrawal
Omethoate	11	16	27	Withdraw immediately
Flufenoxuron	11	16	27	May be retained
Flubendiamide	16	10	26	May be retained
Oxyfluorfen	10	16	26	Phased withdrawal
Abamectin	15,5	10	25,5	Phased withdrawal
Imidacloprid	12	13	25	Withdraw immediately
Tebuconazole	10	15	25	Withdraw immediately
Acephate	4	19	23	Withdraw immediately
Clodinafop	10	13	23	May be retained
Fenitrothion	12	10	22	Phased withdrawal
Thiophanate-methyl	5	17	22	Phased withdrawal
Pymetrozine	3	17	20	Withdraw immediately
2,4 D-Amine	3	17	20	Withdraw immediately
Dimethoate	8	12	20	Withdraw immediately
Oxydementon Methyl	8	10	18	Phased withdrawal
Glufosinate-Ammonium	2	10	12	Withdraw immediately

environmental concerns

Dr. Victor Shikuku
Department of Physical Sciences
Kaimosi Friends University College

pesticides and the environment: the pesticides cycle



pesticides and the environment: what do we know?

1. The impact of all registered pesticide ingredients has only been studies for certain species.

2. Not all have been studied in terms of their environmental fate and if so not under local conditions

3. of the fraction studied, the data is insufficient to draw legitimate conclusions

Chlorpyrifos

Chlorpyrifos (CPS) is an organophosphate insecticide and is registered in **25 products.** It is not allowed to be applied on vegetables. It is only registered for control of various insect pests on barley, maize, wheat and pineapples. Despite this, it was the most used pesticides by farmers in Kirinyaga and Murang'a on kale, maize, tomatoes, melon, avocado, sweet potatoes, cabbage, rice and coffee (KOAN, 2020).

General aspects	
Registered products containing Chlorpyrifos	Agropyrifos 48 EC Anaconda 55 EC Antfex 48 EC Betafos 263 EC, Bulldock star EC 262.5 Cobra 75WG Colt 480 EC Cyren 480 EC Dursban 4 EC Epyrifos Gladiator 4TC Glean 75 DF Jawabu 48 EC Mursban 480 Pyriban 480 EC Pyrinex 48 EC Pyrinex quick 256 ZC Ranger 48% EC Reldan 40 EC Robust 48 EC Royalnex CS 25 Spectator Gold 500 EC Sulban 48 EC Tricel 48EC Twigapyrifos 480EC
Manufacturing companies	Adama Makhteshim Ltd, Israel. AIMCO pesticides Ltd, India Asiatic Agricultural Industries, Singapore. Bayer Crop Science Germany Cheminova Agro AS, Denmark. Dow Agro Sciences Export S.A./ Middle East / East Africa. Dow Agrosciences, France Dow Agrosciences, UK. Du pont De Nemours and Co. Inc, USA / Du Pont De Nemours International S.A Geneva, Switzerland. Excel Crop Care Limited, Mumbai, India Gharda Chemicals Ltd, India Jiangsu Huangma Agrochemical Co. Ltd., China Makhteshim Chemical Works / Crompton Ltd. Makhteshim Chemical Works, Ltd, Israel Ningbo Sunjoy Agroscience Co, China. Sabero Organics, India. Sulphur Mills India. Tagros chemical Pvt ltd, India Zhejiang Xinnong Chemicals Co. Ltd, China
HHP	Yes
Withdrawn in Europe	Yes

Crops treated	Barley, Maize, Wheat, Pineapples
Pest	Caterpillars, Termites, Ants, Aphids, Thrips, Whitefly, Bollworms, Antestia bugs, Armyworms, Mosquitoes larvae, Leaf miner, Mealy bugs
Alternatives*	Ozoneem, Achook, Nemroc (Azadirachtin), AMINEM XY16 Liquid Emulsion (Carvacrol 2% w/v), NEMguard® (Polysulphide Formulation) Diflubenzuron, Spirotetramat, Acrinathrin, Spinetoram, Spinosad, Flubendiamide, Sulphur Oxymatrine, pyrethroids
Human Health**	
Carcinogenicity	
Mutagenicity	
Endocrine Disrupter	
Reproductive Toxicity	
Neurotoxicity	
Environmental Health**	
Bee Toxicity	
Fish Toxicity	
Earthworm Toxicity	
Bird Toxicity	

** Safer inputs database: Kenya Organic Agriculture Network, 2021*
*** Pesticide Properties Database: University of Hertfordshire, 2021*
Note: green circle = low; orange circle = medium; red circle = high

Springer Link

Published: 24 January 2015

Chlorpyrifos Degradation in Soils with Different Treatment Regimes Within Nzoia River Drainage Basin, Kenya

Gershom Kyalo Mutua, Anastasiah Njoki Ngigi & Zachary Moranga Getenga

Bulletin of Environmental Contamination and Toxicology **94**, 387–392 (2015) | Cite this article

Journal of Scientific Research & Reports

24(5): 1-11, 2019; Article no.JSRR.48243
ISSN: 2320-0227

Pesticide Residue Levels in Soil, Water, Kales and Tomatoes in Ewaso Narok Wetland, Laikipia, County, Kenya

Peter Ngolo[1,2*], Mildred Nawiri[1], Alex Machocho[1] and Helida Oyieke[2]

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ELSEVIER

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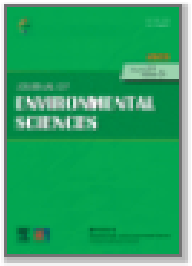
Volume 21, Issue 3, 2009, Pages 380-386



Degradation of chlorpyrifos in laboratory soil and its impact on soil microbial functional diversity

Hua FANG [a] ✉, Yunlong YU [a] ✉, Xiaoqiang CHU [a], Xiuguo WANG [a], Xiaoe YANG [b], Jingquan YU [c]

Show more

Pesticide Biochemistry and Physiology
Volume 122, July 2015, Pages 50-58

Impact of chlorpyrifos on health biomarkers of broiler chicks

Muhammad Zishan Ahmad [a], Ahrar Khan [a], M. Tariq Javed [a], Iftikhar Hussain [b]

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https://doi.org/10.1016/j.pestbp.2014.12.024

Highlights

Chlorpyrifos in broiler chicks resulted in

- Significantly ($P \leq 0.05$) decreased body weight.

International Journal of Pharmacy and Biological Sciences
ISSN: 2321-3272 (Print), ISSN: 2230-7605 (Online)
IJPBS | Volume 7 | Issue 3 | JUL-SEPT| 2017 | 168-184 Original Research Article – Biological Sciences| Open Access| UGC Approved | MCI Approved Journal

POTENTIAL EFFICACY OF *TRIBULUS TERRTRI* AGINST TOXIC IMPACT OF CHLORPYRIFOS ON ENZYMOLOGICAL ALTERATION IN THE FRESH WATER FISH *ORIOCHROMMIS MOSSAMBICUS*

Usha R, Pugazhendy K[2]*Tamizhazhagan V[2], Sakthidasan V[2], Jayanthi C[3]

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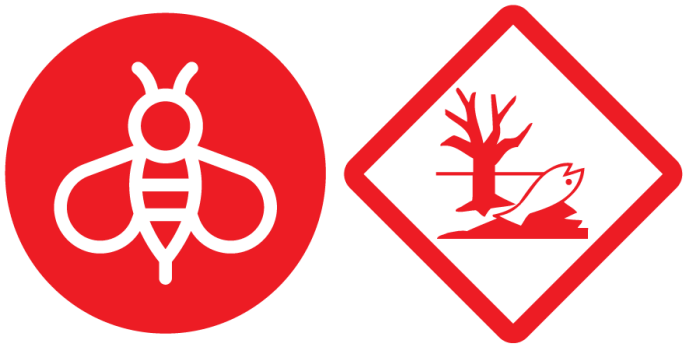
ABSTRACT

Environmental pollution occurs when the environmental degradation crosses limit so that. It becomes lethal to living organisms. Pollution of water bodies forces them to acclimatize to various factors thus imposing a considerable amount of stress on their lives. Phosphatase is known to be sensitive to metal exposures and can be used to predict metal toxicity. The acid phosphatase (ACP) and alkaline phosphatase (ALP) enzyme activity brought a decrease in acid and alkaline phosphatase (ACP and ALP) in Liver and Kidney when a freshwater fish Oriochrommis mossambicus exposed to Chlorpyrifos concentration as compared to the control group. Tribulu



chlorpyrifos: recommended action

Proposed action in Kenya

Active ingredient that must be **withdrawn immediately**.
Proposed withdrawal in Kenya should be based on:

- Residue in marketed French beans and kales raising food safety concerns
- Non-compliance with recommended measures for risk mitigation by farmers
- Endocrine disrupting activity and neurotoxicity towards farm workers
- High risk to children resulting to learning difficulties
- High bee and aquatic toxicity

Chlorpyrifos meets the criteria for classification as toxic for reproduction category 1B (regarding developmental toxicity).

Imidacloprid

Imidacloprid is a neonicotinoid insecticide. It is registered in **42 products** to control a variety of insect pests on various crops. Farmers use it regularly on a wide range of crops, including coffee, cabbage, kale, maize, tomatoes, French beans, chillies, sweet potatoes, coriander, melon, spinach and beans (KOAN, 2020). Over the past decade, the EU has been tightening regulations on neonicotinoid insecticides in response to an increasingly strong body of research suggesting they are lethal for pollinators such as bees. In 2018, the EU banned the use of three neonicotinoids - imidacloprid, thiamethoxam and clothianidin. There are an increasing number of studies that show exposure to neonicotinoids poses potential risk to mammals and even humans.

General aspects	
Registered products containing Imidacloprid	Agrispark 300 SC Allez 200SC Amigo GT 275 FS Bamako WDG Bellamid 600 FS Buffalo 100 OD Click 200 SL Concord 20 SL Confidor 200 SL Confidor 70 WG Dimiprid 200SL EABCL vital 350 SC Elgold 70 WDG Emerald 200 SL Emerald Gold 700WP Fortune Galil 300SC Gaucho FS 350 Grizly 175/30 SC Imaxi 200SC Imidacel 200 SL Imidaflo 52 FS Imidagold Imigo 600 FS Insemida 200 SL Kohinor 200 SL Loyalty 700WDG Metro 200SC Monceren GT 390 FS Murcloprid Nuprid 200 SC Ovados 300 SC Protreat Raxil Super 375 Seed plus 30WS Seed power 250 FS Seed Pro 30 WS Septer 200SL Shield 600 FS Tata mida Thunder OD 145 Warrant 200 SL
Manufacturing companies	Adama Makhteshim Ltd, Israel Anhui Fengle Agrochemical Co Ltd, China Bayer AG Germany, Leverkusen, Germany Bayer AG Germany, Taminco, Belgium Bayer Crop Science, Germany / Cheminova AS, Denmark. Jiangsu Yangnong Chemical Group Co., Ltd, China. Beijing Yoloo Bio-Technology Co., Ltd. China East African Business Company
Manufacturing companies	Excel Crop Care, India Hailir Pesticides and Chemical Group Co. Ltd Hubei Sanonda International / Handelsgesellscafe Detlef Von Appen mbH (DVA). Meghmani Organics Ltd., India. Nanjing Aijing Chemical Co., Ltd, China Ningbo Sunjoy Agroscience Co, China Nufarm S.A.S., France Rallis Ltd., India. Rotam Agrochemical Co. Ltd, Hong Kong. Rotam Ltd., Hong Kong.. Shandong United Pesticide Industry Co. Ltd., China Sichuan Jiadeli Technical Development Co Ltd, China Sineria China Chemical Ltd China Topsen Goldchance Fluence, China/ Sineria Industries Ltd, Cyprus UPL Limited India
HHP	Yes
Withdrawn in Europe	Yes
Crops treated	French beans, Maize, Citrus, Snow peas, Cabbages,
Pest	Aphids, Whiteflies, Thrips, Bean flies, Beetles, Leaf miners
Alternatives*	Fortune, Magneto, Nimbecidine, Ozoneem, Neemark, Achook (Azadirachtin), Pesthrin, Pyagro, Pyeneem Oxymatrine products: Peril, Levo Diflubenzuron, Spirotetramat, Acrinathrin, Spinetoram, Spinosad, Flubendiamide, Sulphur Oxymatrine, pyrethroids
Human Health**	
Carcinogenicity	
Mutagenicity	
Endocrine Disrupter	
Reproductive Toxicity	
Neurotoxicity	
Environmental Health**	
Bee Toxicity	
Fish Toxicity	
Earthworm Toxicity	
Bird Toxicity	

** Safer inputs database: Kenya Organic Agriculture Network, 2021*
*** Pesticide Properties Database: University of Hertfordshire, 2021*
Note: green circle = low; orange circle = medium; red circle = high

imidacloprid: recommended action

Proposed action in Kenya

Active ingredient that must be **withdrawn immediately**. Proposed withdrawal in Kenya should be based on:

- Effect on reproduction, possibly neurotoxic
- High bee toxicity
- High aquatic toxicity
- High bird toxicity
- High persistence in soil

Carbendazim

Carbendazim is a systemic fungicide and is registered in **17 products** for controlling fungal diseases mainly in French beans and tomatoes but also in snow peas, squash, broccoli, onions and capsicum, in staple crops like rice, barley, wheat and in fruits like mangoes, citrus, pawpaw. No registration was found for use on kale or spinach despite residues of carbendazim being found on kales, as reported in the Kenya Plant Health Inspectorate Service (KEPHIS) 2018 annual report (KEPHIS, 2018). Farmers are using it on zucchini, melon, rice, maize, cabbage, kale and tomatoes (KOAN, 2020).

General aspects	
Registered products containing Carbendazim	Goddard 35 SE Seed Pro 30 WS Saaf WP Sherrif 75 WP Megaprode Lock 52.5 WP Rimeta Gold 300 SC Discovery 400 SC Bendazim 500 SC Botran 500 SC Chariot 500 SC Rodazim SC Ransom 600WP Pearl 80 DF Exempo-Curve 250 SC Soprano SC 250 Seed Plus 30WS Companion 75 WP
Manufacturing companies	Adama Makhteshim Ltd, Israel. Anhui Guangxin Agrochemical Co. Ltd., China/ Ningbo Sunjoy Agroscience Co. Ltd, China Indofil Industries Limited, India Jiangsu Kuaida Agrochemical Ltd, China Ningbo Yihwei Chemical Co. Ltd., China Rotam Agrochemicals, Hong Kong. Shaanxi Hengrun Chemical Industry Co. Ltd, China Shanghai Forever Chemicals Co. Ltd., China Sulphur Mills Ltd., India. Topsen Goldchance Fluence, China/ Sineria Industries Ltd, Cyprus UPL Ltd, India Yantai Keda Chemical Co. Ltd China
HHP	Yes
Withdrawn in Europe	Yes
Crops treated	French beans, Snow beans, Mangoes, Citrus, Pawpaw, Tomatoes, Rice, Capsicum
Pest	Powdery mildew, Botrytis, Heterosporium, Rhizoctonia, Anthracnose sclerotinia, Grey mold, Fruit rot, Root rot, Angular leaf spot, Rice Blast, Early and late blight, Yellow and stem rust, Phytophthora blight
Alternatives*	Bupirimate, Sulphur, Captan, Thiophanate-Methyl, Trifloxystrobin, Azoxystrobin, Prothioconazole, Benalyaxl-M, Dimethomorph

Human Health**	
Carcinogenicity	
Mutagenicity	
Endocrine Disrupter	
Reproductive Toxicity	
Neurotoxicity	
Environmental Health**	
Bee Toxicity	
Fish Toxicity	
Earthworm Toxicity	
Bird Toxicity	

** Safer inputs database: Kenya Organic Agriculture Network, 2021*
*** Pesticide Properties Database: University of Hertfordshire, 2021*
Note: green circle = low; orange circle = medium; red circle = high

carbendazim: recommended action

Proposed action in Kenya

Active ingredient that must be **withdrawn immediately**.
Proposed withdrawal in Kenya should be based on:

- Persistent in water, soil and plants and the degradation results in the formation of 2-amino-benzimidazole, a highly toxic component
- Occupational risk for farm workers
- Misuse by farmers
- Consumer risk and food safety concerns
- Endocrine disrupting activity and reproductive toxicity
- High toxicity towards bees, aquatic organisms and earthworms

food safety concerns

Dr. Catherine Nkirote Kunyanga
Department of Food Science, Nutrition and Technology
University of Nairobi

the context:
food safety concerns

- main challenge - food safety is a more critical issue than food insecurity

- triggered by increasing food borne illnesses, NCDs and other health risk to consumers

- *"Access to … safe food is a right of each individual*" (WHO/FAO).
- research shows that safety measures are not applied by most farmers, due to lack of awareness, limited extension services, high costs, poor regulation etc.

the context:
food safety concerns

- government responsibility to implement regulations and assure food safety, especially in the context of the climate crisis and towards the right to safe food

- new hazards are discovered yearly, linked to chemical contaminants or toxins from food

- call to action - cue in agri-business interests and corporate, sustainability of food systems and agro-biodiversity and promotion of safe and healthy diets

Acephate

The active ingredient acephate is an organophosphate insecticide typically used as a foliar (relating to leaves) spray. Its breakdown product (metabolite) is methamidophos, which is not approved in Europe. Methamidophos is highly toxic to mammals and is an enzyme inhibitor and neurotoxin. It is highly toxic to birds and honeybees, and moderately toxic to most aquatic species and earthworms. In Kenya it is sold in **8 products** and is registered for controlling chewing and sucking insects in tobacco. It is only allowed for use on maize to control armyworm, but not on other vegetables. Nevertheless, acephate is being on beans, tomatoes, and kale (KOAN, 2020).

General aspects	
Registered products containing acephate	Lotus 75% SP Soluble Powder Missile 75% SP Water Soluble Powder Orthene Pellet Ortran 97% Sinophate 75% SP Ace 750 Asataf SP Starthene Plus 97% DF
Manufacturing companies	Agrolex Private Ltd. / Nulandis Pty Ltd., South Africa Rallis Ltd., India. Swal Corporation Ltd., India Devidayal Ltd, Nariman point, Mumbai, India Zhejiang Jiahua Chemical Co. Ltd., China Shanghai E-Tong Chemical Co. Ltd., China Ningbo Huili Imp. & Exp. Co. Ltd., China Arvesta Corporation, US
Highly Hazardous Pesticide (HHP)	Yes
Withdrawn in Europe	Yes
Crops treated	Maize
Pest	Armyworm
Alternatives*	Neem (Azadirachtin): Fortune, Magneto, Nimbecidine, Ozoneem, Neemark, Achook Pyrethroids Spinosad, Flubendiamide, Diflubenzuron, Chlorantraniliprole
Human Health**	
Carcinogenicity	
Mutagenicity	
Endocrine Disrupter	
Reproductive Toxicity	
Neurotoxicity	
Environmental Health**	
Bee Toxicity	
Fish Toxicity	
Earthworm Toxicity	
Bird Toxicity	

** Safer inputs database: Kenya Organic Agriculture Network, 2021*
*** Pesticide Properties Database: University of Hertfordshire, 2021*
Note: green circle = low; orange circle = medium; red circle = high

food safety concerns: acephate

- organophosphate insecticide used as a foliar spray
- breakdown product (metabolite) is methamidophos, which is not approved in Europe
- methamidophos is highly toxic to mammals and is an enzyme inhibitor and neurotoxin
- due to high human toxicity of methamidophos, no safe level is possible
- longer PHI to assure consumer safety - crops treated with acephate are unsafe for consumption except under stringent pre-harvest intervals (PHI)
- in Kenya it is sold in 8 products and is registered for controlling chewing and sucking insects in tobacco.

food safety concerns: acephate

- only allowed for use on maize to control armyworm
- high residues of acephate & methamidophos were found on kale, tomatoes, French beans, khat, teas & dried products compromising the food safety of Kenyan consumers (Kirinyaga, Muranga, Mwea, Meru etc).
- human health effects of concern - linked with hyperglycaemia, lipid metabolism dysfunction, DNA damage, and cancer which are rapidly growing epidemics
- leads to increased morbidity and mortality rates and soaring healthcare costs

food safety concerns: acephate

- exposure routes - absorbed into the body by ingestion and by inhalation of its aerosol
- inhalation symptoms - pupillary constriction, muscle cramp, excessive salivation, sweating, nausea, dizziness, laboured breathing and convulsions
- ingestion symptoms - abdominal cramps, vomiting, diarrhoea

food safety concerns: acephate

Neurotoxicity and endocrine disrupting activity

Acephate causes cholinesterase inhibition in humans (overstimulation of the nervous system which can cause nausea, dizziness, confusion, blurred vision, difficulty in breathing, muscle weakness and at very high exposures

food safety concerns: acephate

Carcinogenicity

Possible human carcinogen and classification is based on increased incidence of hepatocellular carcinomas and adenomas in female mice. Limited human carcinogenicity data.

food safety concerns: acephate

Reproductive toxicity

Limited evidence exists on harm to the developing foetus but reduces sperm motility, capacitation & functional integrity of sperm cell membrane, and DNA damage/viability

food safety concerns: acephate

Recommendations

- For risk assessment the residues of methamidophos and acephate have to be considered, taking into account the toxicological potencies
- We propose a RA residue definition based on methamidophos, including acephate (taking into account the toxicological equivalence)
- Withdrawn immediately

Carbendazim

Carbendazim is a systemic fungicide and is registered in **17 products** for controlling fungal diseases mainly in French beans and tomatoes but also in snow peas, squash, broccoli, onions and capsicum, in staple crops like rice, barley, wheat and in fruits like mangoes, citrus, pawpaw. No registration was found for use on kale or spinach despite residues of carbendazim being found on kales, as reported in the Kenya Plant Health Inspectorate Service (KEPHIS) 2018 annual report (KEPHIS, 2018). Farmers are using it on zucchini, melon, rice, maize, cabbage, kale and tomatoes (KOAN, 2020).

General aspects	
Registered products containing Carbendazim	Goddard 35 SE Seed Pro 30 WS Saaf WP Sherrif 75 WP Megaprode Lock 52.5 WP Rimeta Gold 300 SC Discovery 400 SC Bendazim 500 SC Botran 500 SC Chariot 500 SC Rodazim SC Ransom 600WP Pearl 80 DF Exempo-Curve 250 SC Soprano SC 250 Seed Plus 30WS Companion 75 WP
Manufacturing companies	Adama Makhteshim Ltd, Israel. Anhui Guangxin Agrochemical Co. Ltd., China/ Ningbo Sunjoy Agroscience Co. Ltd, China Indofil Industries Limited, India Jiangsu Kuaida Agrochemical Ltd, China Ningbo Yihwei Chemical Co. Ltd., China Rotam Agrochemicals, Hong Kong. Shaanxi Hengrun Chemical Industry Co. Ltd, China Shanghai Forever Chemicals Co. Ltd., China Sulphur Mills Ltd., India. Topsen Goldchance Fluence, China/ Sineria Industries Ltd, Cyprus UPL Ltd, India Yantai Keda Chemical Co. Ltd China
HHP	Yes
Withdrawn in Europe	Yes
Crops treated	French beans, Snow beans, Mangoes, Citrus, Pawpaw, Tomatoes, Rice, Capsicum
Pest	Powdery mildew, Botrytis, Heterosporium, Rhizoctonia, Anthracnose sclerotinia, Grey mold, Fruit rot, Root rot, Angular leaf spot, Rice Blast, Early and late blight, Yellow and stem rust, Phytophthora blight
Alternatives*	Bupirimate, Sulphur, Captan, Thiophanate-Methyl, Trifloxystrobin, Azoxystrobin, Prothioconazole, Benalyaxl-M, Dimethomorph

Human Health**	
Carcinogenicity	
Mutagenicity	
Endocrine Disrupter	
Reproductive Toxicity	
Neurotoxicity	
Environmental Health**	
Bee Toxicity	
Fish Toxicity	
Earthworm Toxicity	
Bird Toxicity	

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*** Pesticide Properties Database: University of Hertfordshire, 2021*
Note: green circle = low; orange circle = medium; red circle = high

food safety concerns: carbendazim

- carbendazim is a systemic fungicide and registered in 17 products for controlling fungal diseases mainly in French beans and tomatoes but also in snow peas, squash, broccoli, onions and capsicum, in staple crops like rice, barley, wheat & in fruits like mangoes, citrus, pawpaw
- no registration was found for use on kale or spinach despite residues of carbendazim being found on kales (KEPHIS 2018 annual report)
- farmers are using it on zucchini, melon, rice, maize, cabbage, kale and tomatoes

food safety concerns: carbendazim

- carbendazim levels above the MRLs set by the EU was reported in French beans from Meru, Kenya
- other studies showed levels above the MRLs set by EU and Codex in tomatoes from Kirinyaga County.
- carbendazim levels in tomatoes from Nairobi markets were reported to be below the EU MRLs

food safety concerns: carbendazim

- carbendazim has a long half-life (up to 6 months) and thus occupational re-entry exposure can occur for a significant length of time following application

- risk assessments show that re-entry exposure in grapes, stone fruits, custard apples, apples, pears, turf and roses was unacceptable

food safety concerns: carbendazim

carbendazim shows a wide range of chronic effects - causes embryo toxicity, apoptosis, teratogenicity, infertility, hepatocellular dysfunction, endocrine-disrupting effects, disruption of haematological functions, mitotic spindle abnormalities, mutagenic & aneugenic effects, hepatocellular dysfunction, hepatocellular dysfunction and endocrine-disrupting effects

carbendazim: recommended action

Active ingredient that must be withdrawn immediately

based on persistence in water, soil and plants and the degradation results in the formation of 2-amino-benzimidazole, a highly toxic component, occupational risk for farm workers, misuse by farmers, consumer risk and food safety concerns

case studies

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recommendations for Kenya

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pesticides and the environment: what don't we know?

In the risk assessment there is a **very high uncertainty** in terms of environmental exposure and hazard:

- Many active ingredients are old and new tests are available
  - (e.g. impact on bacteria and fungi is not considered but crucial for good soil quality
- Local species (endangered species) and local conditions are not considered
- Field studies are not done- environmental monitoring is not happening
- Mitigation measures are not implemented

pesticides and human health: what don't we know?

In the risk assessment there is a **very high uncertainty** in terms of human exposure and hazard:

- Many active ingredients are old and new tests are available
- Local consumption patterns and health situations of farmers, consumers and bystanders are not considered (including women and children)
- Field studies are not done- epidemiological monitoring is not happening – e.g. high cancer rates in Meru
- Mitigation measures (PPE) are not always implemented

withdrawal of active ingredients

Long-term plan to phase out certain active ingredients (HHPs)

Chlorpyrifos, permethrin:
heavily used by farmers + high human health toxicity – occupational health risk

Carbendazim, profenofos, acephate:
high residues regularly found in tomatoes and kale – consumer health risk

withdrawal of active ingredients

Chlorpyrifos, imidacloprid, carbendazim:
heavily used by farmers + high environmental toxicity with little mitigation measures –
environmental health risk

withdrawal of active ingredients

Complete ban of restricted active ingredients

Carbofuran:
not registered but misused by farmers

Dimethoate and acephate (methamidophos):
currently restricted but misused by farmers

redesign registration procedure
reduce uncertainty in the risk assessment

required mitigation measures are not implemented
risk assessment should consider that mitigation measures are not implemented – higher risk

redesign registration procedure

reduce uncertainty in the risk assessment

Local situations are not considered

Risk assessment should include local species (e.g. stingless bees), local conditions (sandy soil) and local consumption patterns

Contamination is not assessed

Monitoring need to be implemented

Registration status need to react to contaminations in the environment and food

further recommendations

transparent registration processes

involvement of independent experts

develop a strategy to phase out HHPs – including agroecological strategies

q&a
discussion