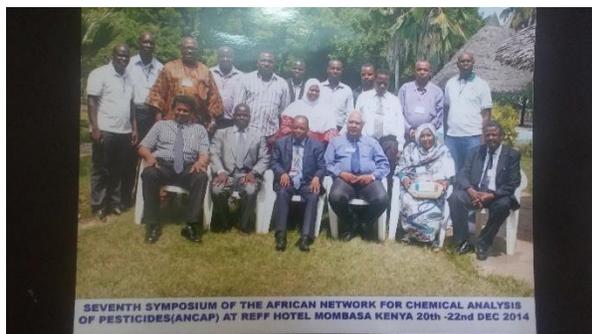


**Seventh Symposium of the African Network for Chemical Analysis of
Pesticides (ANCAP)**

Reef Hotel-Mombasa Kenya

20th – 22nd December 2014



Celebrating 12 years of ANCAP

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SUMMARY

The symposium was conducted from 20th to 22nd December 2014 at The Reef Hotel in Mombasa-Kenya with the theme of “Environmental pollution food safety and public health as related to pesticides”. It included 19 participants from seven African countries including Tanzania, Kenya, Uganda, Ethiopia, Sudan, Rwanda and Nigeria.

There were two sessions in each day of the symposium that included presentations and discussions.

Many papers were presented by scientist during the symposium on different aspects of pesticide research conducted in the respective countries. The presentations reflected the theme of the symposium and they included the aspects of monitoring, assessment, transportation and status of pesticide residues. A discussion followed after each presentation to discuss the presented work and its reflection on the environment and society.

On the last day of the symposium a discussion on how to improve ANCAP symposia and conferences was done by participants followed by ANCAP coordinating board meeting. The participants were awarded certificate of participation in the Seventh ANCAP symposium.

LIST OF PARTICIPANTS

| No | Name | Country |
|----|----------------------------------|----------|
| 1 | Prof. Negussie Megersa Gemechu | Ethiopia |
| 2 | Mr. Alula Yohannes Nigussie. | Ethiopia |
| 3 | Mr. Tura Gemechu Deme. | Ethiopia |
| 4 | Prof. Geoffrey Njuguna Kamau. | Kenya |
| 5 | Dr. Vincent Odongo Madadi. | Kenya |
| 6 | Mr. Enock Mosei Osoro. | Kenya |
| 7 | Prof. Rufus ShaAto. | Nigeria |
| 8 | Dr. Theoneste Muhizi. | Rwanda |
| 9 | Prof. Nabil Hamid Hassan Bashir. | Sudan |
| 10 | Ms. Ihlam Hassan Ahmed. | Sudan |
| 11 | Mr. Ahmed Hamza Mohamed. | Sudan |
| 12 | Dr. Aviti John Mmochi. | Tanzania |
| 13 | Dr. Clerence Anthon Mgina. | Tanzania |
| 14 | Dr. Fikira Kimbokota. | Tanzania |
| 15 | Dr. John Wasswa. | Uganda |
| 16 | Mr. Kenneth Arinaitwe. | Uganda |
| 17 | Mr. Eliezer Brown Mwakalapa. | Tanzania |
| 18 | Mr. James Kamau Mbugua. | Kenya |
| 19 | Mr. Gabriel Andati Waswa. | Kenya |

ABSTRACTS

THEME 1: LOCAL FOOD AND HUMAN HEALTH

QUANTITATIVE DETERMINATION OF THE ACCUMULATION LEVEL OF SELECTED ESSENTIAL AND TOXIC HEAVY METALS IN THE SELECTED PLANT SPICES AND THEIR CORRESPONDING SOILS CULTIVATED IN JIMA ZONE, SOUTH WEST ETHIOPIA

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ABSTRACT

The level of accumulation of selected essential and non-essential metals, namely; Ca, Cu, Zn, Ni, Cd, Pb, and Cr have been investigated in the seeds, fruits, and rhizomes, which is the edible part of some spice plants used for food flavouring in Ethiopia and their respective soil samples. These include seed of *Aframomum corrorima* (korarima), fruit of *Piper nigrum* (black pepper), rhizomes of *Zingiber officinale* (ginger), and rhizomes of *Curcuma longa* (turmeric) and their respective soil samples. All dried plant and soil samples were digested by wet digestion using appropriate concentrated acids such as HNO₃, HClO₄, HCl, and H₂O₂. The contents of the metals in the digests were analysed using flame atomic absorption spectrometer. From analyzed essential elements: Ca (429.01 – 5369.67 mg kg⁻¹) was the predominant metal followed by Zn (31.88 – 67.70 mg kg⁻¹), and Cu (7.62 – 10.67 mg kg⁻¹) in all the spice plant. Whereas the non-essential or toxic metals like Cr, Cd, Ni and Pb were not detected in all spice plants. Acidity, organic matter content and electrical conductivity of soil samples were found in the range of 5.86 – 6.57, 13.93 - 20.59 % and 0.28 - 0.49 mS/m respectively. In the soil samples, Ca (1195.67 – 4147.17 mg kg⁻¹) was the most abundant metal followed by Zn (112.90 – 120.25 mg kg⁻¹), Cr (21.92 – 45.76 mg kg⁻¹), Ni (21.40 – 56.93 mg kg⁻¹) and Cu (13.03 – 28.67 mg kg⁻¹). While Pb and Cd were not detected in all soil samples. Translocation factor of these metals in plant sample to their respective soil sample were calculated. The levels of all metals determined in the spice plants and the respective soil samples are below the standard set by WHO/FAO and in good agreement with those reported in the literature and the standards set for the soil by various legislative authorities.

Keywords: Korarima, Ginger, Turmeric, Black pepper, Heavy Metal, Wet digestion, FAAS

EFFECTS OF SOME FUNGICIDES ON CONTROL OF POWDERY MILDEW IN SNAKE MELON (*Cucumis melo* var. *flexuosus* Naud.)

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ABSTRACT

Field experiments were conducted at the Gezira Research Farm (GRF) of the Agricultural Research and Technology Corporation (ARTC), Wad Medani, Gezira State (Central Sudan) in winter season 2003/2004. Two formulations of triadimefon fungicide [1-(4-chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4-triazol-1-yl)-2-butanone], viz. Trical 250 EC and Bayleton 50% WP, were evaluated for their efficacy to control Powdery mildew (*Sphaerotheca fuliginea*) in snake-melon (*Cucumis melo* var. *flexuosus* Naud.)

Trical 250 EC and Bayleton 50% WP significantly reduced the mean disease incidence of powdery mildew by 69% or more, compared to the untreated control. The formulations reduced the mean disease severity by 94 and 86%, respectively, compared to the untreated control. Both formulations, reduced mean shedding of infected snake-melon leaves by 71% (Trical) and 58% (Bayleton). Trical 250 EC out-yielded Bayleton 50% WP and resulted in 129 and 116% increase in yield, respectively.

Bayleton 50% WP when sprayed prophylactically (three sprays, *i.e.* once every two weeks), significantly reduced the mean disease incidence of powdery mildew by 84.2%, disease severity by 80%, leaf shedding by 99.8%, and increased the yield by 682.5% (> 6x), compared to the untreated control.

Prophylactic spaying exhibited improvements over the curative treatment on mean disease incidence, disease severity and leaf shedding, and effected better yield in all picks.

THEME 2: ENVIRONMENTAL POLLUTION AND FOOD SAFETY

CHEMICAL POLLUTANTS, MICROBES, WORMS AND THEIR BIOTOXINS IN FINFISH POND MARICULTURE SYSTEMS.

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ABSTRACT

Capture fisheries has stagnated since 2000s due to overfishing and illegal, unreported and unregulated fishing. Conversely, aquaculture has continue to grow at 8.8% per year as a source of food, protein and income in the world. Coastal aquaculture is on the edge of development in Africa and the WIO region. This mode of aquaculture which started in the late 1980s in Tanzania, depends in the surrounding environmental quality including marine waters, land and seeds for rearing. Due to their high range of salinity tolerance, tilapia and milkfish are the major groups of finfish for mariculture insome parts of the world including Tanzania. The near shore marine environment, a potential area for mariculture operation is under a growing risk of environmental pollution from land and offshore based industrial development, urban development and agricultural activities. These developments are a source of physical, chemical and biological pollutants in the oceans. The pollutants that affect the oceans and its associated organisms include sediments, pesticides, heavy metals, worms and microbes. These marine pollutants enter marine waters in several different ways including river and rain runoff. Heavy metals and pesticides find their way into marine organisms especially fish through food chain and bio accumulate in the fatty tissues. Consumption of the polluted fish pose a serious health hazards to human being and eventually to food insecurity to many society. Microbes and worms have been connected to poor immunity and health in cultured finfish and their consumers. Studies have been made to identify and quantify chemical and biological pollutants in marine environment and fishes. However, no study has been done to identify and quantify sediments, organic matter, chemical and biological pollutants in a confined marine aquaculture system in the WIO region. Furthermore little is known on the cause, diagnosis and prevention of diseases in marine cultured finfish. This study is aimed at assessing the chemical pollutants, microbes, worms and biotoxins in marine cultured finfish and their surrounding environment. The study will be conducted along the coasts of Tanzania. Samples of fish, soil/sediments and water for analysis and assessment of pesticides, heavy metals, nutrients, microbes, worms and biotoxins will be collected from pond and surrounding oceanic waters during dry and wet seasons. Nutrients analysis will be conducted by adopting Parsons et al., (1984) and measured using Lambda Polynom 1201 UV/VIS spectrophotometer using blanks and prepared standards for fresh and sea water. Standard methods for chemical analysis of pesticides and heavy metals will be used to identify and quantify pesticides and heavy metals in soil/sediments, water and fish tissues. Microbes and worms will be assessed using specific culture methods/photographic microscopes and magnifiers respectively. The expected output of the this study include, establishment of the variation in chemical and biological pollutants, suspended sediments and

organic matter content, nutrient concentrations and levels of infection by bacteria and worms in cultured marine species and surrounding environment.

MONITORING PESTICIDE RESIDUES IN THE ENVIRONMENT: AN IMPERATIVE FOR FOOD SAFETY AND PUBLIC HEALTH SUSTAINABILITY IN DEVELOPING COUNTRIES (WITH A PROPOSED MODEL)

BY

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ABSTRACT

This presentation gives an overview of the fate of pesticides in the environment after their application. These fate pathways are responsible for their wide distribution in environmental media, including agricultural produce and even processed food, which directly bother on issues of food safety and human health. It is proposed that regular systematic monitoring should be key to minimizing the threat pesticide use poses to the wellbeing of populations in developing countries, especially in Africa. A model system for achieving this proposed – it involves technical, policy and legislative/regulatory participation.

THEME 3: WATER QUALITY AND HUMAN HEALTH

SINGLE DROP MICROEXTRACTION BASED ENRICHMENT OF ATRAZINE AND ITS MAJOR METABOLITES IN ENVIRONMENTAL WATERS FOLLOWED BY LIQUID CHROMATOGRAPHIC DETERMINATION

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ABSTRACT

In this work, a method of single drop microextraction combined with high performance liquid chromatography was developed and validated to measure atrazine and two of its major metabolites (deethylatrazine and deisopropyl atrazine) in water samples. The main factors influencing the extraction including types of extraction solvent, volume of extraction solvent, sample agitation rate, sample solution PH, extraction temperature, extraction time, and salting out effect were investigated and optimized. Under optimized conditions, the proposed method was applied for the analysis of environmental water samples and good spiked recoveries higher than 89.6 % were obtained at five fortification levels with the relative standard deviation of less than 5%. The linear range was 1.5–150 ppb and the detection limits were well below 0.1 ppb for all triazines analyzed. The results confirm that the proposed procedure provides better precision, linear range and limit of detection and is very effective for analyzing the target compounds in various matrices. Therefore, the method developed is found to be sensitive, inexpensive, and environmentally friendly sample pretreatment technique.

Keywords: Atrazine, DI-SDME, HPLC

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ASSESSMENT OF ORGANOCHLORINE PESTICIDE RESIDUES IN RUSINGA ISLAND IN LAKE VICTORIA REGION

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ABSTRACT

While most of the organochlorine pesticides have been banned through the Stockholm Convention on POPs, appreciable amounts are still detected in the environment due to their persistence, illegal use and leakage from obsolete stocks. This study was carried out to investigate the organochlorine pesticide residue level in Rusinga island of Lake Victoria, Kenya. Water samples from five sites along shores of the Island were extracted and analysed for some selected organochlorine pesticides using gas chromatography equipped with electron capture detector.

The pesticides targeted were DDT, lindane, aldrin, dieldrin, heptachlor, heptachlor epoxide, DDE, DDD, endrin, endrin, aldehyde, endosulfan sulfate, methoxychlor and endosulfan. Prior to their ban or restriction in use, they had found wide applications in public health and agriculture for control of disease vectors and crop pests respectively. Field samples were collected seasonally between the months of September 2012 to May 2013 from 5 sites along the shores of Rusinga Island of the Kenyan Lake Victoria covering both wet and dry seasons. Analysis of pesticide was achieved on Virian Gas Chromatograph equipped with an electron capture detector. From the analysis the average percentage recoveries of Organochlorine Pesticides (OCPs) were $70.00 \pm 10.77\%$ to 114.83 ± 18.39 . The instrument detection limit ranged between $0.007091 \mu\text{g}$ to $0.139417 \mu\text{g}$. The concentrations of OCPs in water ranged from BDL to $61.923 \pm 30.2 \text{ ng/L}$. pp'-DDD gave the highest concentration level of $61.923 \pm 30.2 \text{ ng/L}$ during the month of September as compared to the other OCPs in water samples. Endosulfan sulfate pesticide was not detected from any of the water samples from the five sites. The month of May recorded the highest occurrence of OCPs as compared to other sampling periods. The sampling sites, Litare had the highest sum of OCPs level of 105.46 ng/L , while Ligongo had the least sum of OCPs value of 29.34 ng/L .

From the inventory of pesticides used in Rusinga Island it was found that the most commonly used pesticides in the area are organophosphates, organosulfur, carbamates and pyrethroids. The main consideration for use of a particular pesticide by farmers from the survey was whether the pesticide enables the farmer to get higher yields, costs of each pesticide used and the types of pests encountered in the region. From the survey study it was revealed that 46% of the respondents got highest yield, this was followed by cost effectiveness of the pesticide by 30% of the farmers as the most important factor. The survey showed that 6% of the farmers used a given pesticide because it was suggested by non-government organisations (NGO), however 4% used a given

pesticide because it was suggested by the agrochemical dealers and the sales agents of the agrochemical industries. Also 14% of the respondents said they were suggested by other farmers. The main information source for the farmers on chemical use are through the agricultural sector government workers from division and location levels, non-governmental organizations (NGOS), Agro-chemical industries, agro-chemical dealers and radio. This study provides baseline data on the levels of OCP residues in the water from Lake Victoria. This will inform policy makers on the quality of water of Lake Victoria Basin as well as supplement the country's studies as an obligation for all parties to the Stockholm convention on POPs.

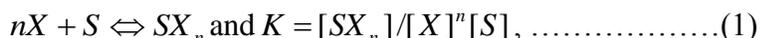
**ADSORPTION OF N-(3,4-DICHLOROPHENYL)-N,N-DIMETHYL UREA BY LAKE
NAIVASHA SOILS AND SEDIMENTS: ADSORPTION CHARACTERISTICS AND
RELATED THERMODYNAMIC DATA**

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ABSTRACT

The adsorption/desorption properties of soils in aqueous solution from Lake Naivasha by N-(3,4-dichlorophenyl)-N,N-dimethyl urea (Diuron) was studied in terms of the first order model of a binary solution expressed as:



X is the chemical species of interest (pesticide), S is the substrate (soil particles), K is the adsorption/desorption equilibrium constant and SX_n is the particle-pesticide complex. According to this model, the apparent adsorption/desorption equilibrium constant K' is given by equation 2:

$$\ln[x]_{ads} = \ln(nk') + n(\ln[x]_e + [sx_n]_w) \dots\dots\dots(2)$$

where $[X]_{ads}$ is concentration of X in adsorbed state in suspension. $[X]_e$ is the concentration of X in solution at equilibrium. $[SX_n]_w$ is the pesticide adsorption site complex in the suspension at equilibrium. The average values of K' (the apparent adsorption/desorption equilibrium constant), n and $\Delta G'$ (the apparent adsorption/desorption free energy) for Lake Naivasha soils obtained for Diuron were 18.33, 0.57 and -7.08 KJ/mol respectively.

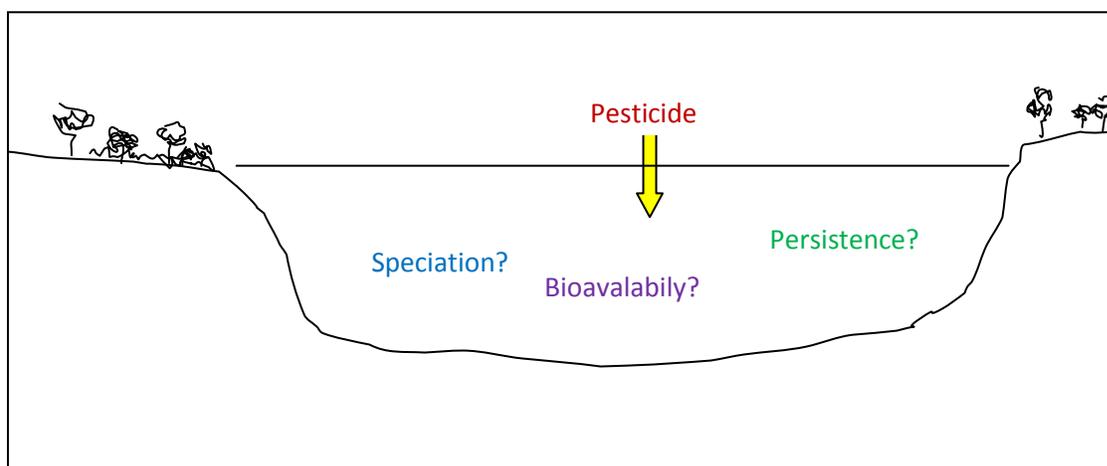
Key words: Adsorption, adsorption equilibrium constant, adsorption free energy.

SPECIATION, PERSISTENCE AND BIOAVAILABILITY OF ORGANIC PESTICIDES IN THE AQUATIC ENVIRONMENT: PROGRESS TOWARDS CHARACTERIZATION IN TERMS OF A STEADY STATE KINETIC MODEL THAT TAKES INTO ACCOUNT MICROBIAL DEGRADATION AND ADSORPTION OF THE PESTICIDE BY COLLOIDAL AND SEDIMENT PARTICLES. A REVIEW.

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ABSTRACT



The impact of a pesticide in the aquatic environment largely depends on its persistence and its bioavailability to living organisms. It is well known that when a pesticide is introduced into the aquatic environment, a portion remains in solution, while other portions are adsorbed by particulate matter in the aquatic eco-system. Different particulates exist in the aquatic environment, thus leading to different adsorption speciation forms. These different speciation forms will differ in their persistence and their bio-availabilities to living organisms. The current convention of describing the persistence of pesticides in the environment in terms of their half-lives does not give any clue as to the speciation and bioavailability of the pesticide. This paper reviews recent work based on microcosm experiments designed to take into account chemical, photochemical and microbial degradation, and adsorption of the pesticide by colloidal and sediment particles. The method is based on steady state modelling techniques, and has the advantage that it enables the identification and quantification of the various speciation forms of the pesticide in the aquatic environment. In addition, the technique enables the evaluation of the thermodynamic properties of the adsorbed speciation forms, thus facilitating possible definitions

of persistence and bioavailability based on the relevant thermodynamic parameters, and that take into account the speciation state of the pesticide and its susceptibility to microbial degradation.

THEME 4: ENVIRONMENTAL ASSESSMENT

ALTERNATIVE TOOLS FOR INSECT PEST MANAGEMENT: A CASE ON CHEMICAL COMPOSITION AND RESPONSES OF MALE AND FEMALE *BACTROCERA INVADENS* TO THEIR VOLATILE EMISSIONS

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ABSTRACT

Responses of male and female *Bactrocera invadens* fruit flies to their respective volatiles and to those of each other were evaluated in a dual choice olfactometer. Volatiles from male flies were significantly ($P < 0.05$, Chi Square) more attractive to both sexes compared to those from females. GC-MS analyses of volatiles of volatile emissions from the two sexes of flies were found to comprise of various groups of compounds with esters and spiroacetals as the dominant constituents. The esters were emitted in higher proportion by females (59.89%) than that by males (35.73%), with the four spiroacetals (2-ethyl-8-methyl-1,7-dioxaspiro[5.5]undecane, (E,E)-2,8-dimethyl-1,7-dioxaspiro[5.5]undecane, 2,8-diethyl-1,7-dioxaspiro[5.5]undecane and 2-(*n*-propyl)-8-methyl-1,7-dioxaspiro[5.5]undecane) identified in this study included one that had previously been reported to be a constituent of the male sex pheromone of other tephritid species. The major component in the volatile emission was identified as ethyl dodecanoate, which constituted 35.9% and 18.0% in the volatiles from female and male flies, respectively. The second major peak was for 2,8-dimethyl-1,7-dioxaspiro[5.5]undecane (10.67%) from females and *N*-(3-methylbutyl)acetamide (14.75%) from males. Most of the compounds identified were present in the volatile emissions from both male and female flies. The attraction of both male and female flies to the volatiles produced by males suggests that the male volatiles may play a dual role in aggregation for the formation of leks at dusk and for mate location.

Key Words *Bactrocera invadens*; sex pheromone; spiroacetals; esters; olfactometer

FATE OF PESTICIDE RESIDUES IN ORGANIC CONTAINER GARDEN: FOOD SECURITY PHENOMENON

J. Kamau, D. Mbui, G.N. Kamau

ABSTRACT

Food insecurity in the world has led to improvement of farming methods to modern and more sustainable methods which require less rainfall, land and agricultural inputs. These methods translate to high yields, and shorter time to crop maturity. Organic container gardening methods is practical in areas where land is scarce, for example in slums and therefore has been adopted by some slum dwellers. Most farmers, who practice this type of farming, grow vegetables, maize, beans and nappier grass in sacks, plastic bags, flower phases and plastic containers. Questionnaire administered to farmers revealed that 70% have prior knowledge of organic farming. Most of them said they did not wash their produce before use or selling. 78% of the interviewed people do not know where the produce they eat/use come from. Some farmers admitted to applying pesticides in their farms. This work focuses on the fate of pesticide residues mainly; pentachlorophenol, lambda cyhalothrin, chlorothalonil and chlorpyrifos in organic container farming in soil and crop surfaces. Adsorption of pesticide residues, photo-degradation of residues by light and levels in various crops have been discussed

The adsorption phenomenon of chlorpyrifos by loam soil particles where the crops were grown in an aqueous solution was studied using a Freundlich isotherm model which assumes the adsorption/ desorption relations: $nX + S \leftrightarrow SX_n$, $K = [SX_n]/[X]^n[S]$ and $\ln[x]_{ads} = \ln(nK') + n\ln[x]_e + [sx_n]_w$, where X is the chemical species of interest; S is the substrate; K is the adsorption/desorption equilibrium constant; SX_n is the particle-pesticide complex. The apparent adsorption equilibrium constant; $[X]_{ads}$ is concentration of X in adsorbed state in water suspension. $[X]_e$ is the concentration of X in solution at equilibrium and $[SX_n]_w$ is the pesticide adsorption site complex in the suspension at equilibrium. The amount of chlorpyrifos adsorbed was determined against variation of mass of sediment, concentration of chlorpyrifos and contact time using UV-Visible spectrophotometer at 254nm. 89-99.1% of chlorpyrifos molecules were adsorbed regardless contact time with the process equilibrating after 30 minutes. The data obtained in this study best fitted the quasi Langmuir adsorption isotherm with regression values of up to 0.992. The calculated values of the apparent K , n and $\Delta G'$ were found to be 118.665, 0.244 and -11.7946kj/mol. The negative value for $\Delta G'$ confirmed the fact that adsorption reaction occurs spontaneously. Moreover, adsorption of chlorpyrifos onto suspended/dissolved sediment particles decreased with increase in mass of the substrate and variation of concentration.

Photo degradation of pentachlorophenol, lambda cyhalothrin, chlorothalonil and chlorpyrifos by sunlight, 40w, 60w, 75w and 100w light bulbs on the surface of spinach and

tomatoes was also studied. The results obtained indicated that up to 84% pentachlorophenol, 71% chlorpyrifos, 72% lambda cyhalothrin and 85% chlorothalonil degraded on the surface of spinach on exposure to 100w bulb for 60 minutes. Photo-degradation of these residues was found to be dependent on temperature, time of exposure, light intensity and surface of exposure.

Analysis of pentachlorophenol, lambda cyhalothrin, chlorothalonil and chlorpyrifos on tomatoes, potatoes and spinach from organic container garden was also studied. Extraction was done using AOAC 2007.01 method without cleanup step. The samples were analyzed using reversed phase high pressure liquid chromatography. The results indicated presence of significant levels of chlorothalonil, pentachlorophenol and chlorpyrifos in spinach and high levels of PCP in both tomatoes and potatoes. Pentachlorophenol (PCP) levels exceeded CODEX limits by 26.47, 89.13 and 44.44 % in spinach, tomatoes and potatoes, respectively, while chlorothalonil and chlorpyrifos in spinach exceeded MRL levels by 20.00 and 28.57 % , respectively.

Key words: Pesticide Residue, Organic Container Gardening Vegetables, Quechers, Adsorption, Photo-Degradation.

EFFECT OF ORGANIC SOLVENT AND MINERAL ACID TREATMENT ON ADSORPTION OF VOLATILE POLAR ORGANIC COMPOUNDS BY WATER HYACINTH (*EICHHORNIA CRASSIPES*) ROOT BIOMASS: THERMODYNAMIC PARAMETERS.

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ABSTRACT

The adsorbent properties of the ground dried water hyacinth (*Eichhornia crassipes*) root biomass towards four polar organic substances (acetone, ethylacetate, diethylether and dichloromethane) with different polarities and acid-base properties were studied between 40°C and 70°C column temperature using inverse gas chromatography. The free energy of adsorption (ΔG_a), enthalpy of adsorption (ΔH_a) and entropy of adsorption (ΔS_a) values of -51.234 to -74.658 kJ.mol⁻¹, -48.123 to -69.949 kJ.K⁻¹.mol⁻¹ and +0.0097 to +0.0146 kJ.mol⁻¹ respectively, were obtained for the polar probes. Mineral acid and organic solvent treatment leads to weaker adsorption bond strength with ΔG_a and ΔH_a values of -23.744 to -41.161 kJ.mol⁻¹ and -22.511 to -38.66 kJ.K⁻¹.mol⁻¹ respectively after mineral acid treatment, and -15.171 to -62.614 kJ.mol⁻¹ and -14.432 to -58.63 kJ.K⁻¹.mol⁻¹ respectively after organic solvent treatment. Factors affecting the adsorbent-adsorbate interaction are discussed.

LEGACY AND CURRENTLY USED PESTICIDES IN THE ATMOSPHERIC ENVIRONMENT OF LAKE VICTORIA, EAST AFRICA

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ABSTRACT

The Lake Victoria watershed is home to a high level of agricultural activity with a history of pesticide use. There is very limited data on historical pesticide use and on environmental levels to serve as a baseline for assessing current and future contaminant trends in the lake's environment. In order to contribute to this data gap, high volume air samples from two sites, Kakira (KAK) which is an agricultural site and Entebbe (EBB) which is sub urban site close to the Northern shore of Lake Victoria, were collected over two sampling campaigns and analysed for organochlorine pesticide residues. The first campaign consisted of samples collected over various periods between 1999 and 2004 inclusive (KAK 1999-2000, KAK 2003-2004, EBB 2003 and EBB 2004 sample sets). The second campaign consisted of air samples collected from 2008 to 2010 inclusive (EBB 2008, EBB 2009 and EBB 2010 sample sets). These samples were also analysed for currently used pesticides (CUPs) including chlorpyrifos, chlorothalonil, metribuzin, trifluralin, malathion and dacthal. During the second campaign, monthly precipitation samples were also collected and analysed for the same pesticide residues. Chlorpyrifos was the most abundant CUP in air samples with average concentrations of 93.5, 26.1 and 3.54 ng m⁻³ for the EBB 2008, 2009, 2010 sample sets, respectively. The average concentrations of total endosulfan (Σ Endo), total DDT related compounds (Σ DDTs) and hexachlorocyclohexanes (Σ HCHs) ranged from 12.3 – 282, 22.8 – 130 and 3.72 – 81.8 pg m⁻³, respectively, for all the sample sets. The results show increasing atmospheric prevalence of residues of persistent organic pollutants (POPs) characterized by fresh emissions of endosulfan, DDT and lindane. Other pesticides detected in the air samples include hexachlorobenzene (HCB), pentachlorobenzene (PeCB) and dieldrin. Transformation products pentachloroanisole, 3,4,5-trichloroveratrole and 3,4,5,6 –tetrachloroveratrole were also detected. The five most prevalent compounds in the precipitation samples were in the order chlorpyrifos > chlorothalonil > Σ Endo > Σ DDTs > Σ HCHs with average fluxes of 1123, 396, 130, 41.7 and 41.3 ng m⁻² sample⁻¹, respectively. PeCB was higher than HCB in precipitation samples while the reverse was true for air samples. Backward air trajectory analysis showed high potential of

transboundary and local emission source influence on the atmospheric profiles of the analytes. The results underscore the need for increased regional vigilance in agrochemical management along with regular environmental monitoring for trends in residue levels.

DISPOSABLE RESIDUES FROM LOCAL DRINKS FERMENTATION AND LOCALLY AVAILABLE MATERIALS FOR QUANTITATIVE REMOVAL OF TOXIC HEAVY METALS FROM POLLUTED INDUSTRIAL/AGRICULTURAL ENVIRONMENTS

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ABSTRACT

With the fast development of industrialization and the need for diverse food productions in order to satisfy the larger number of ever growing human population along with continuously increasing urbanization, there is enormous chemical pollutant loads in the physical environments. The occurrences of the pollutants originated from industrial discharges, agrochemical residues and urban households certainly reach the human environments ultimately posing health risks to human beings and the inhabitants of the whole ecosystems. In this regards, the effluents from leather, leather and liquor industries, in particular, are the major sources of toxic heavy metals, in quantities much greater than that could be assimilated by the natural and environmental processes. Therefore, there is increasing interests by the various legislative authorities to understand the extent to which these pollutants are present in the environmental compartments. To this end and to support the efforts that are underway by the police makers, our research group has been engaged with the search for development of analytical methods that utilizes cheap, locally available and disposable materials, to quantitatively remove the pollutants of concerns from various samples that are continuously used by the dwellers in their day to day lives. In this presentation, thus, the spectrum of the efforts made in our group to find practical solution to the existing problems will be addressed.

The leather factory is one of the major sources of chromium, to occur in environmental samples and in order to quantitatively remove them from the waste discharges, the locally available mineral, i.e., vermiculite and the disposed residues resulted after harvesting the Teff grain (the source of the staple food, *injera*, in Ethiopia) have been utilized. The experimental finding of our research works indicated that quite large proportion of Chromium could be adsorbed on these materials and demonstrated to owe their usability as the best alternatives sorbents for future applications. Besides, in the continued efforts to find priceless and disposed materials, the residues of the fermentation processes after production of *Tella* (Ethiopian local beer) and *Tej* (Ethiopian honey wine) were used. Several sample pretreatments, acid and base treatments, have been conducted and the candidate residues were evaluated for application in the removal processes of the toxic heavy metals from various industrial wastes. Appreciable removal efficiencies were noted for a number of essential and non-essential metals released to the environmental resources. All the variable affecting the efficiencies of the extraction processes have been studied and optimum conditions have been established for future practical uses.

Furthermore, the relevant isotherms and kinetic conditions have been evaluated and initial procedures for routine uses have been established.

HISTORICAL DEPOSITION OF PERSISTENT ORGANIC POLLUTANTS IN THREE EQUATORIAL LAKES FROM EAST AFRICA: INSIGHTS INTO ATMOSPHERIC DEPOSITION FROM SEDIMENTATION PROFILES.

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ABSTRACT

There is a general lack of historical deposition of persistent organic pollutants (POPs) in the African lakes. In this study, we investigated the historical deposition trends and sources of POPs in sediment cores from Lakes Victoria (SC1), Bujuku (Buju2) and Mahoma (Maho2). The latter two lakes are equatorial mountain lakes situated high up in the Rwenzori mountain range along the border of Uganda and Democratic Republic of Congo. SC1 was taken from a pristine depositional part of the lake. The deposition profiles in Buju2 and Maho2 were a reference for historical atmospheric deposition in remote environments. For the post-1940 sediment deposits in SC1, the average focusing factor-adjusted fluxes (FFFs) of Σ DDTs, polychlorinated biphenyls (Σ PCBs), hexachlorocyclohexanes (Σ HCHs) and chlordanes (Σ CHLs) were 385, 226, 207 and 124 ng m⁻² yr⁻¹. Higher fluxes of Σ DDTs, Σ PCBs, and Σ CHLs were observed in Buju2 and Maho2. The average FFF of HCB in Buju2 was the highest while the values for Maho2 and SC1 were similar. The endosulfan FFFs in SC1 were lower than in the alpine lake cores. In general, Buju2 was a better reference for historical atmospheric deposition of POPs than Maho2 due to potential distortion of the latter's profile by Lake Mahoma's forested catchment. The deposition profiles of p,p'-DDE, Σ CHLs and HCB in SC1 were consistent with atmospheric deposition while the profiles of PCBs and HCHs were indicative of particle-bound loadings from other sources, in addition to atmospheric deposition. Profiles of endosulfans, DDTs, and chlordanes, among others, in SC1, were consistent with influence of other factors such as anoxia, and dilution. Further studies of spatial resolution of historical deposition, especially in near-shore deposition areas of the lake are recommended.

THEME V: CAPACITY BUILDING AND POLICY

PESTISIDES MANAGEMENT IN SUDAN

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ABSTRACT

Pesticides for all purposes including public health are currently regulated in the Sudan by the same act, namely, the Pesticides and Pest Control Products Act 1994, which replaced the Pesticides Act of 1974. The act regulates all activities related to pesticides registration, importation, storage, transportation, use, formulation and any other related activities in the country. Accordingly seven relevant by-laws were issued and updated regularly.

The National pesticides Council (NPC) is established under paragraph 4(1) of the Law of pesticides and pest control products Act 1994, is responsible for the management of pesticides in Sudan in accordance with the terms of reference and the authorities described in this Act.

The NPC is a multidisciplinary interministerial council, which has representatives from all stakeholders within the country including; Ministries of Agriculture, Health, Animal wealth, Justice, Research Institutions, Customs, Universities, Economical security, Sudanese Agrochemicals Association, Higher Council for Environment & Natural Resources (HCENR), Sudanese Metrological & Standardization organization (SSMO), in addition to two experts appointed by the minister of Agriculture. The registrar of the council is the Director General, Plant Protection Directorate (PPD). The registrar is responsible for all administrative and executive functions of the council.

The act regulates all activities related to pesticides in the country through the National Pesticides Council (NPC). About 350 active ingredients and >1000 trade names of insecticides, herbicides, fungicides, nematicides, rodenticides, avicides, public health and veterinary pesticides are already registered in the Sudan

10TH ANNIVERSARY OF THE AFRICAN NETWORK FOR CHEMICAL ANALYSIS OF PESTICIDES

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ABSTRACT

The African Network for Chemical Analysis of Pesticides (ANCAP, www.ancap.org) is a legally registered non-governmental, non-political, non-sectarian and non-profit making scientific body devoted to the study, promotion and development of the science of all aspects of chemical analysis of pesticides, including residue analyses, degradation and environmental fate - with the overall objective of not only safeguarding public health and the environment, but also ensuring the safety of African agricultural and aquatic products thus making them competitive on the world market, thereby significantly contributing to the continent's poverty eradication endeavours. In its 10 years of existence, ANCAP, which, in collaboration with SETAC Africa organised a highly successful global conference on the "Use of Pesticides in Developing Countries" in Arusha in October 2006; again joined SETAC Africa in SETAC's 4th Conference in Africa (and 2nd ANCAP-SETAC conference November 2009) in Kampala on Environmental Pollution in Africa) and SETAC ANCAP in Zambia 2013 had a great impact in the region by effecting, among others, the following: Conducting 8 "Summer Schools" on Pesticide Chemodynamics and Residue Analysis; holding six Regional (Scientific) Symposia, Exchange of several MSc and PhD students amongst universities in the region; enhanced the publication profiles of researchers in pesticide residue analysis and environmental chemistry in the sub-region. The presentation highlights the most important outputs and together with country coordinators compile the list of graduates and publication for the 10th anniversary publication due next year.

Keywords: pesticides, residue analysis, summer schools, regional symposia