Training Report

UN Environment Capacity Building for POPs Analysis

for the Mauritius Sugarcane Industry Research Institute (MSIRI), Mauritius Cane Industry Authority (MCIA), Reduit, Mauritius

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Summary

The training of theory and practice of POPs analysis was attended by employees of the Mauritius Sugarcane Industry Research Institute (MSIRI), but in addition also from two other institutes at Mauritius. Theoretical aspects of the analysis of POPs served as an introduction to the activities that took place in the practical training that followed. Environmental samples, including a PUF, sediment, human milk, molasses and a dust sample from the lab itself. These samples were Soxhlet-extracted, cleaned-up, fractionated, and POPs were identified and quantified using GC-MS during the training.

Introduction

This UN training was the first one in the MSIRI laboratory but the second one at Mauritius. The first one was given, also by the Vrije Universiteit, in another laboratory at Mauritius, the Government Analyst Division (GAD) of the Ministry of Health and Quality, National Laboratories Complex, several years ago. Staff of that laboratory was also present in this training as well as staff from the National Environmental Laboratory (NEL). Annex 1 shows the participants list of the recent training. The training was intended to assist the laboratories in the POPs analysis work necessary for the mirror analyses, interlaboratory study, and tasks in the Global Monitoring Network of the UN Stockholm Convention on Persistent Organic Pollutants.

The Training

The on-site training took place between 14 and 22 September 2017 in Reduit. The first two days were used for theoretical training, consisting of lectures given by Prof.Dr. Jacob de Boer. Ms. Rianne van Dijk BSc prepared the laboratory for the hands on training starting immediately after the theoretical training.

The following topics were covered: the relevance of POPs monitoring and the context of the UN Environment Global Monitoring Program, sampling and sample storage, extraction and clean up, GC analysis, safety issues and QA/QC. An additional lecture was devoted to the reasons of human errors, which are important to understand why QA/QC is so important in the laboratory. This lecture in particular genereted much interest and discussion. New Pops such as chlorinated paraffins were also addressed and the results of thje recent UNEP Interlab study were also shown and discussed. The analytical scheme was explained to the trainees to prepare them for the hands-on training that followed. Details regarding the solvent extraction, clean up and fractionation steps and following that analysis by GC were explained for the matrices of interest. Attention was also given to the mirror study and details of this study and selection of samples were discussed. The course participants were actively participating, asking questions and sharing their own knowledge, experiences and opinions with the group.

The following five days consisted of hands-on training in the laboratory in which the participants were trained in extraction and clean-up of test materials with a focus on air, sediment, molasses and human milk. This part of the training was given by VU Technician Ms. Rianne van Dijk BSc.

The hands-on training consisted of showing all steps necessary for the analysis of POPs in environmental samples. This was done by taking four types of matrices: PUFs (air sample), human milk, molasses and sediment and a dust sample for background checks from the laboratory and extract and clean these by the methods described in the training manual (see annex 2). In short, the samples were Soxhlet extracted and subsequently cleaned with Alumina (8% water) and fractionated with Silica (1.5% water). After that the final extracts were measured on a GC-MS. Due to safety regulations on the MSIRI laboratory does not allow to run a 16 hour during Soxhlet overnight, so this was carried out on the day. Water leakage during Soxhlet caused a short circuit and terminated two extraction, which were started again the next day. The fume hoods on the lab did not perform properly, causing uncomfortable smell and headache with many participants.

Emphasis was put on working clean and precise. The molasses and milk samples were liquid-liquid extracted. Risk for cross-contamination of the rotary evaporator were explained. Copper powder was prepared for the Sulphur removal from sediment.

GC-electron impact MS settings were explained and calibration curves were demonstrated. One group session was organized in how to do the final calculations in Chem Station.
Advice was given on the accelerated solvent extraction (ASE) in the GAD laboratory.

Conclusions and recommendations

At the end of the training certificates of course completion were given to all participants. The trainers received positive feedback on the training.
The following recommendations can be given.

1. Replacement or adjustment of the fume hood(s).
2. Chemical waste bins should be stored inside the fume hoods. The waste bins should also be sealed.

3. Replacement of rotary vapor with Kuderna Danish to prevent blank issues or thoroughly check rotary evaporator between sample series.
4. Replacement of the heating mantle (Soxhlet) bya water bath. This will prevent short circuit risks.
5. Use of a pipette tip box. This will be beneficial for the ease of use and prevents negative effects of dust.
6. Check the exact volume of the pipette/syringe before every use for internal standards. Keep track of the (changes in) volume with the help of an Excel worksheet. The volume always must meet the requirements (predefined acceptable deviation).
7. For personal safety, it is important to wear no slippers or sandals at the lab.
8. Purchase of appropriate (small volume (10-20 mL) and sealable) vials for preparing standard solutions.
9. Be aware that dust will contaminate samples, so a clean workplace is of high importance.
10. Consider to establish a separate room for POP analysis/low contaminated samples. The main laboratory is not suitable for this because of the open windows and ceiling fans. The separate room should not be exposed to open windows/fans and needs to be air-conditioned. A proper fume hood should be installed.
11. Always rinse all glassware before use with the type of solvent that will be used. Also cover the glassware (that can't be sealed) with aluminium foil before/after use.
12. Purchase of powder-free nitrile gloves instead of latex gloves. Nitrile gloves are stronger and provide a better safety. Change the gloves regularly during the day, especially if one spills solvents on the gloves.
13. If possible, consider to connect a PC to the balance. A PC will reduce the risk of mistakes when recording the weight.
14. Consider to place solvents inside a fire-resistant cabinet.
15. Consider to place a towel dispenser close to the sink.

Although the list of recommendations is relatively long, the laboratory made a positive impression on the trainers. The staff is motivated and the director and vice-director were highly motivated and convinced of the importance of the monitoring for the Global Monitoring Program (GMP). An active sampler was also present and the lab is prepared to make that available for work for the GMP. In summary, this laboratory has potential to play an important role in further UN Environment and GMP activities.

Annex 1. Participants in the laboratory training

PARTICIPANT	INSTITUTION
Nirmal Prakash BABEEA	GAD
Ranooka CHUCKOWREE	MSIRI
Mr. Devindranath DINDYAL	NEL
Sareeta CHOYTOO	NEL
Tesha MARDAMOOTOO	MSIRI
Sivapragassen PAKEEROO	GAD
Sheba Jahan Ara ROJUBALLY-CADINOUCHE	NEL
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Annex 2. Training Manual

The manual is attached as a separate file.