CRA-W INFO

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CRA-W BOOSTS ITS COOPERATIVE LINKS WITH INTERNATIONAL ORGANISATIONS

International organisations have made ever-increasing use of CRA-W's services in recent years for quality control of plant protection products used in agriculture and biocides used in public health.

Quality control involves determining the chemical, physical and technical properties of formulations in order to check their compliance with the specifications laid down, in particular, by the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO). This important step provides assurance that the products have the required physical-chemical properties for optimum application and, provided the conditions of use are adhered to, that they are sufficiently biologically effective against diseases, pests and weeds and do not pose a significant risk to human health or the environment.

In the last two years CRA-W has stepped up its cooperative links with international organisations such as the WHO, FAO, the Global Fund to Fight AIDS, Tuberculosis and Malaria, the United Nations Development Programme (UNDP) and the Collaborative International Pesticides Analytical Council (CIPAC). This mainly involves work in the following areas:

- Contributing to the development of guidelines and reference documents in the field of pesticide physical chemistry.
- Assistance with the drafting, finalisation and publication of physical-chemical specifications published by the WHO and the FAO and used as a basis for pesticide quality control and registration.
- Developing and validating new chemical and physical-chemical analysis methods for assessing pesticide quality.
- Pesticide quality control in the context of international public procurement contracts. This work involves determining the physical-chemical properties of plant protection products and either helping clients to evaluate the results, helping laboratories to interpret analytical methods or helping manufacturers to improve pesticide quality.
- Arranging training courses and conferences on pesticide specifications and analytical methods.

CRA-W is more determined than ever to continue this work with the unwavering aim of improving pesticide quality and reducing the risks to public health and the environment.

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CRA-W TAKES A CLOSE LOOK AT THE ORGANIC POULTRY SECTOR

Since 2007 CRA-W has been involved in a technical and economic monitoring of organic chicken farms in collaboration with Wallonia's poultry and rabbit sector association (FACW). The aim is to optimise performance and promote development of the value chain "Coq des Prés".

Back in 2001, a company called For Farmers Hendrix (formerly Hendrix) established a broiler production and distribution chain complying with the Organic Farming specifications. To support its development of this sector, some farmers have approached FACW and CRA-W to ask them to conduct a technical and economic study of their activities. The Animal Breeding, Quality Production and Welfare Unit accordingly has developed an Excel spreadsheet for encoding technical and economic data for each batch of chickens (feed consumption, mortality, weight over time, cost of feed, selling prices, etc.) and calculating performance ratings (consumption index, production cost, etc.) in order to create a database for all the batches monitored over the years. The data are regularly analysed and shared during meetings with individual or groups of farmers from the chain. These have led to participatory discussions and opened up constructive debate. Analysis and comparisons of the technical and economic prevailing situations have resulted in some significant progress, achieved by improving farm performance and profitability. Benchmarks have been collected with a view to developments.

The organic sector has originally targeted the Dutch market. The Walloon cooperative, "Coq des prés", was set up in 2010 in response to the local demand. The price policy followed by these associations on the two markets consists of adapting poultry selling prices to counter fluctuating feed costs.

The monitoring scheme currently in operation encompasses 37 producers in Wallonia.

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HYBRID OILSEED RAPE VARIETIES BECOME REALITY

Since the renewal of interest in oilseed rape growing in Wallonia that began in the early nineteen eighties, breeding has been characterised by a series of significant innovations in productivity and seed quality. CRA-W has conducted a number of annual variety trials in Wallonia in cooperation with the SPW Department of Agriculture, Natural Resources and the Environment (DGARNE).

Breeding has resulted on the one hand in 'single zero' varieties with no erucic acid, which is suspected of causing cardiovascular disorders, and on the other hand in 'double zero' varieties, with no erucic acid and with a low glucosinolate content, that have an antinutritional effect on non-ruminants in particular. At European level, the conversion from 0 rape to 00 rape was very rapid, being complete in Belgium by 1990.

Then came hybrid varieties with higher yields because of the heterosis effect. Producing 'restored' hybrid varieties requires, firstly, a male-sterile line and, secondly, a line producing pollen containing genetic material that will restore the fertility of the resulting hybrid. In Belgium, the first 'restored' hybrid varieties marketed in 1997 were obtained via the MSL system developed by the German company, NPZ-Lembke. The hybrids resulting from the Ogu-INRA system developed in France appeared a little later, in 2000.

Farmers started enjoying the benefits of hybridism in 1994, thanks to variety associations comprising 80% male-sterile hybrids and 20% pollinating lines. Synergy was the first such model, called a 'hybrid-line composite' or HLC, and was relatively widely grown in Belgium. The pollinator percentage was then increased from 20 to 30% to promote fruiting after fertilisation. Synergy was followed by various variety associations, some of them having the same sterile male but different pollinating lines. Nearly all the oilseed rape sown in Belgium today is likely to be hybrid varieties.

A further aim of breeding hybrid varieties was to limit autumn stem elongation, resulting in better winter resistance in mild autumns that favour strong growth before winter sets in. Hybrids also have greater resistance to shattering, allowing all the siliques to reach maturity without the risk of premature seed loss from the first mature siliques.

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CRA-W CHEMOMETRICIANS SCORE POINTS

A challenge is presented each time to the participants at the IDRC (International Diffuse Reflectance Conference), a biennial event held in Chambersburg, Pennsylvania, USA. This is a worldwide competition with a prize for the individual or team that develops the best model and obtains the lowest prediction error for a particular dataset.

This traditional challenge is always an opportunity for learning and interacting with experienced chemometricians presenting their approach to a common multivariate analysis problem. This year, for the first time, petrochemical datasets were analysed. These were provided by Halliburton. As this is a very competitive field, steps had been taken to reduce the potential for rival companies to use the data. Specifically, the wavelength scales were unspecified, as was the nature of the parameters to be predicted. The variables corresponded to the near and mid infrared. There were two datasets to be processed, with a single parameter available per set. The first set comprised liquid samples from oil wells and the second consisted of gaseous mixtures. The spectra were acquired in transmission mode at different temperatures and pressures representing actual conditions.

The challenge was to present the best results for the validation set, for which no reference values were provided. The approach was a rather perilous one, given that the spectral space of the validation set was not covered at all by the calibration set.

The CRA-W's NIR (Near Infrared) team thanks to its CHEMOMETRICS expertise and combining several multivariate techniques (PCA, MLR, Local-PLS, Interval -PLS and Mahalanobis distances) produced successfully the best solutions. CRA-W thus carried off the trophy for the third time out of the last five challenges, demonstrating its internationally acknowledged competence in developing spectroscopic calibration models.

More details of the different approaches will be published in NIRnews (Vol. 26 n° 2 – www.impublications.com). The data are available on the conference website (http://www.idrc-chambersburg.org/).

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PHYTOREMEDIATION IN PARTNERSHIP

Two research teams, one from CRA-W and the other from the University of Liège, have joined forces to develop plant engineering for phytoremediation (IVEREM) and provide sustainable solutions to soil pollution.

Following on from their joint work as part of an Interreg IV-A 'Greater Region' project targeting the use of woody riverbank ecotypes to maintain or improve the quality of surface water, CRA-W and Gembloux Agro-Bio Tech (ULG) decided to continue working together in the form of a scientific and technical partnership specifically focusing on phytoremediation activities.

The partners will therefore engage in studies of environmentally critical situations where in situ remediation techniques can provide sustainable solutions. The work will be specifically concerned with designing and managing the reinstatement of contaminated sites and plant breeding and propagation, preferably woody plants which not only produce biomass but also are biologically active with respect to soil pollutants. A mixed team will bring together the multidisciplinary expertise needed for the issues to be tackled. In the early years they hope to respond favourably to public or private expectations with regard to phytoremediation in the wider sense, starting with the restoration of land marginalised by industrial activity. The areas of expertise will obviously diversify thereafter, according to the scientific and technical progress resulting from joint activities.

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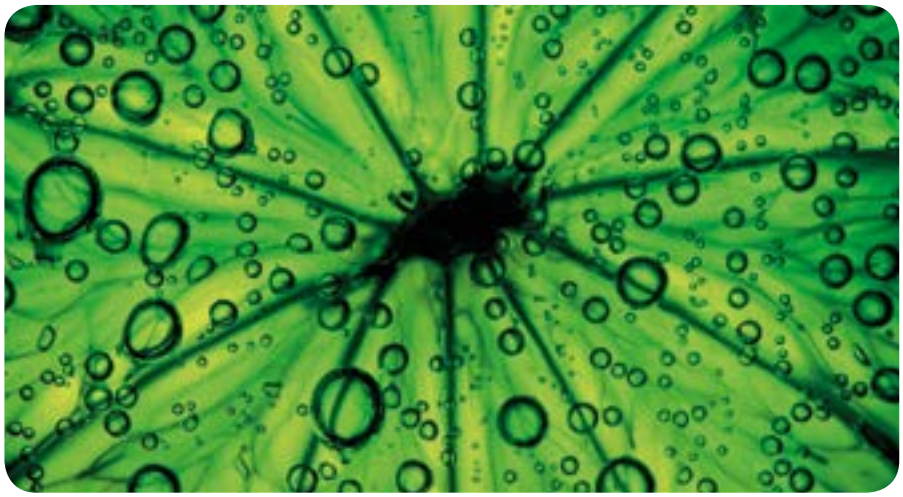
CHEMICAL COMPOSITION OF PLANT BIOMASS AND ENERGY USE

In a rapidly changing world, and faced with the challenges of green growth and climate change, the wide availability and sustainability of plant biomass give it significant potential as a source of energy and bioproducts.



CRA-W has further developed its work on the chemical composition of fibrous plant species and their suitability for energy uses. This study has been carried out in the context of two projects: BIOETHA2 (Moerman Act) and ENERBIOM (INTERREG IVa 'Greater Region' cross-border project) and a thesis by B. Godin. The research has looked at the production of high-fibre (cellulose and hemicellulose) fibrous plant biomass such as miscanthus, switchgrass, fibre sorghum, fibre maize, pasture, cereal straw and hemp. Selecting suitable plant species for plant-to-energy applications requires a sound knowledge of their chemical composition and convertibility to biomethane or bioethanol by fermentation or their suitability for use as a solid fuel.

We have developed an analytical method for fibre determination which is suited to the plant biomass-to-energy field. The method has been implemented with the aid of a charged aerosol detector (CAD) funded under the Moerman Act. We have shown that this method enables cellulose, hemicellulose and hemicellulose composition to be determined with a high degree of accuracy. By analysing a great many types of biomass we found out that the diversity of their chemical composition can be structured into biomass groups that not only have similar properties and fibre content but also have common phylogenetic origins. To reduce the analytical costs we selected three routinely analysed parameters (cellulose, hemicellulose and mineral content) as sufficient to predict the suitability of the biomass for the different biomass-to-energy conversions. It finally appears that gross per hectare energy productivity depends first and foremost on the crops' dry matter productivity, far more than on their changing chemical composition during growth or the growing conditions (sites, years, varieties, levels of nitrogen fertilisation).
The lessons we have learned from this research can also be used in connection with converting plant biomass into bioproducts by biorefining. This type of research is carried on by CRA-W in the context of the BioThermoRaf postdoctoral project funded under the Moerman Act.

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DIARY

23 - 27 February 2015
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13 - 17 April 2015
IDF/ISO ANALYTICAL WEEK AND OPTIMIR SYMPOSIUM
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www.namur2015.be/en/index.php
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