

## EVALUATION AND CHARACTERIZATION OF DIFFERENT TOMATO VARIETIES IN ORGANIC MARKET GARDENING

IN ORGANIC FARMING (OF), THE TOMATO IS ONE OF THE MAJOR CROPS CULTIVATED UNDER TUNNELS. THERE ARE HUNDREDS OF VARIETIES OF TOMATOES AROUND THE WORLD, NOT ALL OF WHICH ARE COMPATIBLE WITH OUR CLIMATE OR SUITED TO OUR DIET. SINCE 2010, THE BIODIMESTICA (\*) PROJECT HAS AIMED TO STUDY AND CHARACTERIZE, AMONG OTHERS, SEVERAL VARIETIES OF BELGIAN OR FOREIGN TOMATOES THAT ARE ADAPTED TO OUR GROWING CONDITIONS.

Since the research programme began, over 750 varieties of tomatoes have been studied with a view to bringing to light those with good resistance to disease, consistent, early production and favourable organoleptic properties.

During a first phase, the varieties were studied in greenhouses. We have 100 m<sup>2</sup> of tunnel greenhouses. The following characteristics were studied: entry into production, yield and taste quality, with specific criteria such as: firmness, juiciness, bitterness, sweetness, acidity, thickness of skin, fragrance, and a more subjective rating that constitutes an overall assessment, all graded on a scale of 1 (low) to 9 (high).

The most promising varieties selected in this way then underwent an outdoor trial, to study their resistance to disease without treatment. The CRA-W has developed a tomato umbrella system, which works very well. This system is easy to set up and often gives better results than a greenhouse-grown crop.

After several years of research, we can report the first findings. Six types of tomatoes can be distinguished according to weight: currant (5 to 9 g), cherry (10 to 19 g), cocktail (20 to 29 g), small classic (30 to 59 g), medium classic (60 to 149 g) and large classic ( $\geq 150$  g). Data sheets have been created for each variety, to characterize them according to resistance to disease, early ripening, yield, use, and organoleptic

qualities. The data sheets are available free of charge on the CRA-W website.

The varieties selected in the trial are already on the market in a variety of shapes, colours and uses, depending on their characteristics. In parallel with this trial, an extensive effort of evaluation and characterization of collectible varieties was launched, with a view to identifying our varieties of the future. For the most promising varieties, we are carrying out studies on resistance to disease.

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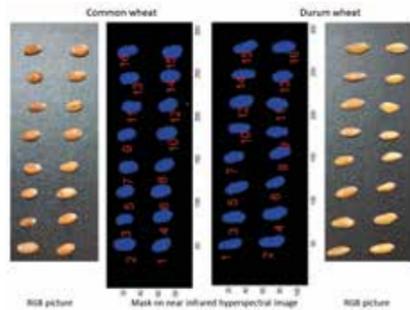
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## ANALYTICAL TOOLS FOR THE MONITORING OF FOOD FRAUD

THE GOAL OF THE EUROPEAN FOODINTEGRITY PROJECT IS TO PROVIDE EUROPE WITH AN INVENTORY OF TOOLS AND RESOURCES TO DETECT FRAUD AND GUARANTEE THE INTEGRITY OF THE FOOD CHAIN.



As part of a 5-year project (2014-2018), the partners have worked together to develop tools that can be integrated into industrial production and supply chains to ensure the integrity of food products. The CRA-W has made a significant contribution to this by exploring the role of near-infrared spectroscopy, particularly near-infrared hyperspectral imaging, in the detection of soft wheat grains in durum wheat. The aim is

to enable companies to detect a mixture of soft wheat and durum wheat on reception of the cereals. This is of interest because the legislation in some southern European countries requires the use of durum wheat for the manufacture of pasta, with a maximum tolerance of 3% soft wheat. For this study, 77 samples of durum wheat and 180 samples of soft wheat, collected in 2014, 2015 and 2016 in Italy and Belgium respectively, were analysed using near-infrared hyperspectral imaging, seed by seed (see illustration). Four approaches were investigated to distinguish soft wheat from durum wheat. These were based on morphological criteria, near-infrared spectral profile, protein content (<12% or > 12%), and the vitreous/non-vitreous grain ratio. The results show that the method based on a combination of morphological criteria and spectral profiles can easily detect fraud or adulteration at the required threshold. Moreover, models based on protein content and vitreousness can be

used to reject batches that do not meet the minimum thresholds.

The tools developed within the framework of this project should help to bring the worlds of research and industry closer together. On another note, the research provides the agri-food sector with analytical methods useful in the authentication of products. CRA-W's expertise in database management and data fusion, combined with its knowledge of agricultural product authentication, makes CRA-W a preferred partner in the development of on-site analytical solutions for product control.

Further information can be found on <https://secure.fera.defra.gov.uk/foodintegrity/index.cfm>

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## THE CRA-W PARTICIPATES IN THE DEVELOPMENT OF MACHINERY IN WALLONIA...

THE CRA-W HAS ALWAYS WORKED CLOSELY WITH THE VARIOUS PLAYERS IN THE AGRICULTURAL MACHINERY SECTOR. EVEN TODAY, THE CRA-W PROVIDES EXPERTISE IN THE SELECTION OF INNOVATIVE PRODUCTS. IT IS ALSO THE MAIN PARTNER IN THE ORGANISATION OF MAJOR EVENTS AND DEMONSTRATIONS OF EQUIPMENT.

**Agribex**, the international agricultural fair in Brussels, organises a competition at each round. There are prizes for the most outstanding innovations in the animal, vegetable and garden & green space sectors. The jury for the vegetable sector includes representatives from the CRA-W. Their job is to consider the relevance of the various technical dossiers and assess the novelties put forward. In 2017, the jury selected five winners, who received gold and silver awards.

**Potato Europe** is an international open-air fair devoted entirely to potatoes. The CRA-W, a Fedagrim partner, organises demonstrations from the uprooting of potatoes to their unloading and sorting. Its role is to create planting schemes, prepare harvesting areas for the different machines and, above all, to assist in the smooth running of the various demonstrations during the two days.

Every year, the CRA-W chairs the selection committee of the **Mechanic Show** at the Libramont Agricultural, Forestry and Agribusiness Fair, which is the biggest outdoor fair in Europe. In this event, it actively participates in the selection of the latest developments to be presented, and in the running and presentation of the demonstrations. It also plays a leading role in the organisation of the **Journée de l'Herbe**, (Grass Day), which takes place every four years. The field work consists, first, in the preparation of the different plots required for the demonstrations (crop monitoring, delimitation of parcels according to the type of machine) and ensuring the smooth running of the day (safety, adherence to timing, presentation of machines,...). The second part is concerned with compiling the catalogue, which contains all the technical characteristics of the machines presented during the day (108 in this year's event).



Finally, we would like to add that each year, in collaboration with various partners (pilot centres, Provinces, associations, etc.), the CRA-W organises **demonstration days for specific agricultural equipment**, depending on requests and our trials: beetroot and chicory technical days, the Organic interprofessional day, and the spraying of organic matter with Protect'EAU.

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## APPLE POMACE, AN ALLY IN IMPROVING THE PERFORMANCE AND DIGESTIVE HEALTH OF NEWLY WEANED PIGLETS?

POST-WEANING IS A CRITICAL PERIOD BECAUSE OF THE CONSEQUENCES IT CAN HAVE ON YOUNG ANIMALS (ANOREXIA, DIARRHOEA AND LOSS OF PERFORMANCE). WHAT IF APPLE POMACE COULD HELP OVERCOME THIS HURDLE MORE COMFORTABLY? REPORT ON A TRIAL CARRIED OUT IN COLLABORATION WITH GEMBLoux AGRO-BIO TECH AND THE FACULTY OF VETERINARY MEDICINE OF THE UNIVERSITY OF LIÈGE.



In March 2018, a group of 42 piglets from the CRA-W farm was enrolled on a 5-week trial at the Centre of Experimentation in Animal Productions (CEPA) of Gembloux Agro-Bio Tech. The aim of the study was to establish whether the addition of apple pomace to the diet of newly weaned piglets had a positive effect on the performance and digestive health of the animals. To do this, two concentrations of apple pomace (2 and 4%) were compared with a control. The performance results were conclusive. Those treated with the 4% apple pomace had an improved consumption index of 1.5 versus 1.7 for those on the control diet. For the 2% apple pomace, the results were more uncertain. The piglets do not seem to derive any benefit from this apple pomace treatment at the start of their post-weaning period. However, they show appreciable compensatory growth in the second part of the post-weaning period, but insufficient, since there is no effect on their consumption index. The beneficial effect of apple pomace on animal performance is nevertheless offset by a higher incidence of diarrhoea. This is exacerbated as the level of apple pomace incorporated into the diet is increased. Other digestive health parameters are currently being analysed to draw more in-depth conclusions on this aspect of the research, particularly in relation to the constitution of the intestinal membrane itself and the microbiota living in the tract.

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## CAN OAK TANNIN IMPROVE THE EFFICIENCY OF FODDER PROTEINS?

PROTEIN-RICH FODDER IS NOT EASY TO STORE, AND OFTEN CAUSES SIGNIFICANT NITROGEN LOSSES. COULD OAK TANNIN ADDED WHILE ENSILING THE FODDER BE AN ANSWER TO PROTEIN DEGRADATION?

Fodder proteins are highly degradable by micro-organisms, both in the silo and in the rumen of the cow. In the silo, proteins mainly decompose into ammonia. If present in excess, this cannot be used by the animal consuming the fodder. Nitrogen formed from degraded proteins in the rumen is partially excreted as urea, which constitutes another loss of efficiency for the animal.

Through experiments in laboratory-scale silos, the Autefel project has shown that oak tannin reduces the ammonia produced during silage fermentation, which means a reduction in protein degradation (from 10 to 15%). Tannins are natural molecules found in plants that have the property of complexing with proteins, thus protecting them from degradation. *In vitro* studies have shown that tannin can also reduce protein degradability in the rumen (5 to 10%). According to these laboratory experiments, oak tannin seems to be an efficient way of protecting proteins, whether in the silo or the rumen.

To confirm these results, an *in vivo* trial on 6 dairy cows was conducted this winter. The cows were fed a grass-based silage ration with or without oak tannin, depending on the treatment. Neither the milk production nor the nitrogen efficiency of the cows was affected by the presence of tannin in the silage. On the other hand, we observed variations in the excretions: the cows consuming tannins eliminated less nitrogen via the urine but more nitrogen via the faeces. Although these results do not affect production, they nevertheless have an environmental significance, since urinary nitrogen, being very volatile, is more damaging to the environment than faecal nitrogen.

A further trial, expected to be carried out on cull cows at the Libramont site, will make it possible to compare the addition of tannin before silage with that added directly to rations, and monitor the greenhouse gas emissions associated with livestock manure.

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Oak tannin, a co-product of the timber industry, is added when baling fodder.



## PESTICIDES IN THE ATMOSPHERE OF WALLONIA: A LITTLE OF EVERYTHING, EVERYWHERE, IN SMALL QUANTITIES!

THE EXPOPESTEN PROJECT AIMS TO ASSESS THE AVERAGE EXPOSURE OF THE WALLOON POPULATION TO PESTICIDES IN THE ATMOSPHERE.



The first part of the study focussed on measuring the concentrations of 46 different pesticides in the air around 12 sampling stations over the course of one year. The stations were selected to provide a representative sample of the urban and agricultural fabric and a uniform distribution within the Walloon territory.

This study revealed mainly herbicides and fungicides, and the concentrations measured were of the order of one nanogram per m<sup>3</sup>.

The four farming communities (Gembloux, Louvain-La-Neuve, Dour and Oupeye), and the city of Charleroi, show the highest average total concentrations measured over the year. The fruit-growing community of Oupeye has the highest values for the number of active substances and the total average concentrations. The reference station at Mount Rigi (Waimes),

in the heart of the Hautes-Fagnes nature park, has the lowest values for these criteria.

Pesticides were detected throughout the year, but a marked seasonality was observed. Their occurrence is near zero in winter, very high in spring, and more moderate in summer and autumn. Similar temporal variations have been observed in the heart of the Hautes-Fagnes nature park, but at lower concentrations and for a lower number of pesticides. This is probably due to background concentrations relating to atmospheric transport.

The results highlight a ubiquitous presence of pesticides in the air of Wallonia. The frequencies at which pesticides are detected are largely linked to agricultural spraying activities, the concentrations being related to the physicochemical properties of pesticides and their uses.

the overall exposure (via food, water and air) of the general population to pesticides, particularly by studying specific internal exposure markers. The CRA-W is currently participating in a new study, PROPULPP, which aims to assess, among other things, the threat to those living close to fields. These people are much more directly exposed to the drift and volatility of pesticides during spraying.



The second part of the study focussed on the impact of living area on the exposure of populations of children to pesticides. A search on biomarkers (pesticides and/or metabolites) in the urine of children was conducted. The results show that of the 31 active substances looked for in the children's urine, only 6 were found, while specific and non-specific metabolites were detected frequently – some of these were present in 100% of the children. Due to the plurality of sources of exposure, the results show no conclusive link between the atmospheric concentrations measured and the urinary concentrations.

The EXPOPESTEN results represent preliminary data on pesticide exposure in Wallonia. They point to a need for greater understanding of

EXPOPESTEN, which was launched in 2014, has brought together four Walloon partners: ISSEP, initiator and coordinator of the project, the CRA-W, the Toxicology Department of the University Hospital of Liège, and the Phyto Regional Committee (CRP). The CRA-W has mainly been involved in the analytical part and has also contributed its expertise in agronomics and risk assessment.

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