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CRA-W INFO

Wallonie recherche CRA-W

VARIETAL SELECTION IN POTATOES: A SOLUTION FOR COPING WITH CLIMATE CHANGE

SINCE 2005, CRA-W HAS RELAUNCHED ITS VARIETAL SELECTION PROGRAMME WITH THE AIM OF CREATING NEW BELGIAN VARIETIES THAT MEET THE PRESENT AND FUTURE NEEDS OF PRODUCERS AND ENVIRONMENTAL EXPECTATIONS.

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With the evolution of the market, climate change and the changing requirements of the industry, the demand for more robust varieties is growing. One of the main components is a strong resistance to late blight, which is by far the main potato disease against which many fungicide treatments have to be applied. In addition, climate change will undoubtedly impose a need for varieties that are more tolerant to water stress and periods of high temperature rises. CRA-W's mission is now to be able to offer the Belgian market new varieties that meet these requirements, while maintaining good quality and high yields.

To achieve these objectives, the selection programme focuses on two areas:

• **Resistance to late blight:**
Our strategy is based on the "pyramidal" combination of resistance genes against several strains of *Phytophthora infestans*, as well as on the combination of different polygenic resistance mechanisms. To achieve this, the identification of resistance genes present in the panel of genitors used in our selection programme is an essential step. In addition, work will be carried out to identify genitors with polygenic resistance components. This will enable us to cross parents with different resistance genes, in the hope of combining them into a single hybrid.
Monitoring the evolution of late blight strains and the bypassing of resistance genes will also provide information that will enable us to be more precise in our choice of genitors and subsequently hybrids. This last point is covered by the CRA-W late blight laboratory every year.
Initial objectives have been achieved thanks to the creation of three varieties with a certain level of resistance to late blight: 'Louisa' in 2017, 'Floribel' in 2022 and 'Sarpira' in 2023. The creation of new varieties that are more resistant to late blight replaces the traditional varieties that are highly susceptible, such as 'Bintje', 'Fontane', 'Challenger', etc.

• **Resistance to water stress:**
By studying the physiological characteristics of plants under water stress using different phenotyping tools, we can define effective and precise selection methods for this type of stress. These tools help to accelerate the plant improvement process.
An experiment carried out in the CRA-W greenhouses aimed to determine the responses of a series of potato cultivars to drought stress. This experiment showed genetic differences in stress response, particularly in agronomic traits (such as tuber weight and number) and physiological parameters. Reduced stomatal conductance is one of the first responses to water stress that can be measured with a "porometer". In fact, reduced stomatal conductance is a direct response of stomatal closure when facing this type of stress. This phenomenon enables the plant to maintain leaf turgidity. The experiment showed that varieties that close their stomata faster have a higher water stress tolerance index.

Further d'information:
www.cra.wallonie.be/fr/le-programme-de-creation-varietale-de-pommes-de-terre
www.cra.wallonie.be/fr/laboratoire-mildiou-pomme-de-terre

CO-CULTIVATION TO CONTROL WEEDS IN ORGANIC FIELD CROPS

In a context of organic farming and no-ploughing field crops, the co-cultivation of a permanent legume cover in association with a cash crop appears to offer interesting possibilities.

In organic conservation agriculture (OCA), weed management and nitrogen availability are the two main obstacles to the implementation of no-tillage, no-pesticide models, which are still utopian on a large scale and designed to restore soil health. In view of this, the idea of avoiding leaving the soil bare during rotation by planting vegetation covers seems to have been the ideal solution for some years now. As part of the broad concept of green manures, legumes are attracting particular attention in the farming world. Among their many advantages, their ability to fix atmospheric nitrogen thanks to the nodules in their roots is undoubtedly the best-known and most sought-after in low-input cropping systems. At present, these cover crops are mainly used for inter-cropping, and are completely destroyed before the next crop is planted.

Relay-cropping or *inter-cropping* techniques, grouped together under the general term of *co-cultivation*, involve sowing two crops separated by every other row in the plot. The cover crop is maintained throughout the rotation, providing maximum inter-row coverage to limit weed proliferation, releasing nitrogen over the course of the cycle, and improving soil structure while limiting erosion.

The BioCoCrop project thus aims to develop a phytotechnical solution based on a permanent cover of leguminous strips between which two cash crops will be successively planted: corn in spring and wheat in winter. The main challenges are choosing the right legume and ensuring it is controlled so that it doesn't compete with the current crop, while keeping weeds under control. Thanks to advances in precision guidance (RTK GPS) and optimised spatial organisation in relation to the widths of working tools, it now appears to be possible to mechanically regulate the growth of permanent cover using a localised mowing tool (still at the prototype stage). In addition to an overall study of the feasibility of such a technical itinerary, three legume modalities will be compared: (1) alfalfa, (2) white microclover, (3) mixture of alfalfa, lotus and red clover.

Ultimately, the aim is to evaluate co-cultivation as a lever for the resilience of low-input organic systems. On paper, this interesting agricultural model could ensure yield security in the medium and long term, thanks to the expected provision of additional nitrogen to the crop and the prospect of crop diversification (protein and cereals).

Further information: www.cra.wallonie.be/fr/biococrop

Financing: Walloon Recovery Plan

Wallonie Relance

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PHYTOSANITARY RISK ASSOCIATED WITH THE INTERNATIONAL CONIFER SEED TRADE

This risk was assessed as part of the ALERTSEED project, through the development of a molecular analysis method for the detection of all fungi present in a batch of seeds, as well as through surveys of the various stakeholders in the tree seed sector.

An analysis method based on high-throughput sequencing was validated and applied to forty seed lots of Belgian or foreign origin, belonging to some thirty conifer species. The analyses carried out led to the identification of almost 500 fungal species, including pathogenic species never reported in Belgium, or even in Europe. Due to its very high cost, this method cannot yet be used for routine analysis. Furthermore, although the method can detect various pathogenic fungi in seed batches, the risk of transmission of the pathogen from the seed to the seedling (through the development of symptoms) still needs to be assessed.

Surveys were carried out with the competent authorities, nursery owners and foresters in both the north and south of the country. They highlighted the fact that certain seed lots, particularly of ornamental conifers, come from other continents (North America and Asia) and are therefore associated with a greater risk of introducing new diseases into our territory. They also showed that the rather complex regulations governing the conifer seed trade, which provide certain guarantees for the purchaser (identity of the woody species, genetic purity, origin), were often poorly understood by nursery owners. These surveys also revealed a lack of information on the origin of seeds in the catalogues of certain suppliers, which can lead to purchases of seeds from third countries without the buyer's knowledge. Another common practice in Belgium is the use of cultivation contracts, whereby customers, spread throughout Europe, supply a batch of seeds and receive seedlings from these seeds in return. This practice increases the quantity of seeds introduced into Belgium and the associated risk of introducing new diseases.

Further information:
www.cra.wallonie.be/fr/alertseed-maladies-emergentes

Financing: Project funded by the Federal Public Service *Public Health, Security of the Food Chain and Environment,* contract no. RF 31/6344, ALERTSEED

Chamaecyparis lawsoniana seeds from Denmark

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AIR AND SOIL: A PESTICIDE MONITORING NETWORK

The SuRiPest project aims to set up a network to monitor the pesticide-related risks in air and soil.

The European Union requires action plans to be set up to reduce the risks and impacts of pesticide use on human health and the environment. Despite the numerous studies carried out for the authorisation of pesticides and the good practices followed by users, the dispersion of pesticides in the environment is still little understood. For the time being in Belgium, pesticide monitoring networks exist for surface water, groundwater and mains water supply, as well as for food, but there is no network for air and soil.

The aim of this project is to set up two pesticide monitoring networks: in the air and in the soil. These networks will not only improve the prevention of pesticide contamination, but also complement the risk assessments carried out thanks to data obtained from the existing networks. They will also make it possible to assess the effectiveness of the measures to reduce the use of pesticides taken under the Walloon Pesticide Reduction Plan (PWRP III).

This 5-year project comprises several stages:

The first stage will review the substances authorised and used in Wallonia, in order to prioritise them and determine, *a priori*, those to be monitored. At the same time, an inventory of existing monitoring networks in Europe will be carried out to compare the different methodologies and the results obtained.

In the second stage, air and soil specimens will be taken throughout Wallonia. These specimens will provide an overall view of pesticide contamination of air and soil over a one-year period. The results of these analysis will be compared with the list of priority molecules to be monitored drawn up in the first stage.

The third stage will involve the development, optimisation and validation of analytical methods specific to the molecules selected in the first two stages.

All the results obtained during the first three stages will enable us to organise an operational and relevant pesticide monitoring programme in the air and soil components of the environment. This is when the two networks will be designed: specimen sites, sampling frequency, molecules monitored, etc.

Finally, the last stage will enable us to test and evaluate the correct operation of the networks: specimen schedule, sample analysis, analysis of results, report writing, sharing of results. If any problems are encountered, adjustments will be made.

Further information:
www.cra.wallonie.be/en/suripest

Financing: Programme wallon de Réduction des Pesticides III (PWRP III)

Cooperation partnership:
ISSeP (www.issep.be)

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SPOT-SPRAYING FOR WEED CONTROL

Using precision agriculture, InnovEau aims to combat the risk of groundwater contamination by plant protection products (PPPs).

The InnovEau project, launched in 2019, brings together CRA-W and three partners from the agricultural and drinking water sectors (Apligeer, SWDE and CILE). It aims to reduce the use of plant protection products, particularly in the Hesbaye chalk area, one of Belgium's main sources of drinking water.

Spot-spraying involves applying herbicide exclusively to the weeds. The trials were carried out using 3 sprayers fitted with on-board sensors to detect and map weeds in the plots. These precision sprayers use artificial intelligence to differentiate between weeds and crops. Each nozzle is operated independently and only surfaces colonised by weeds are sprayed, saving product and reducing environmental damage.

During trials, weed-counting zones are defined and the GPS coordinates of each weed are recorded so that the solutions tested can be validated by calculating theoretical spraying, i.e. the ideal situation where 100% of weeds are sprayed without excess product. Ratings are also carried out to quantify the efficiency of the spraying.

In 2022, the final year of the project, tests were carried out on 5 crops: beet, corn, beans, stubble and meadows for the detection of Rumex. For theoretical gains of 17% to 95% less sprayed area compared to blanket spraying, real savings of between 3% and 67% of sprayed area were achieved for on-board sensors, with between 13% and 62% of weeds detected depending on the crop, compared to 98% efficiency for blanket spraying.

For the other precision sprayers tested, gains in terms of PPP quantity ranged from 74% to 97%, with results ranging from 46% to 92% of weeds destroyed.

Further trials should be carried out with precision sprayers to confirm the results obtained and to test new crops. Although current technologies still need to be improved to increase their accuracy, the results are encouraging for deployment in Wallonia's future agricultural world, and could ultimately lead to significant reductions in the use of phytosanitary products, resulting in better protection of water resources.

Precision sprayer

Further information:
www.cra.wallonie.be/fr/innoveau

Financing:
Public Water Management Company (SPGE)

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PRODUCING MEAT USING ORGANIC FARMING IN WALLONIA

Is dynamic rotational grazing suitable for finishing Bleu-Mixte bulls?

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ince 2013, CRA-W has been testing organic fattening itineraries for male cattle at its Libramont site. These concern the production of **bull**, steers and, more recently, **rosé** veal calves.

In 2022, following the new organic legislation requiring animals to be turned out as soon as conditions permit, we decided to work with dynamic rotational grazing, a practice usually used by dairy farmers in Wallonia.

After a first grazing season in 2021, accompanied by their dams, and interesting performances during the winter (average weight gain of 1.2 kg per day), two batches of 4 animals were turned out for a second grazing season on 3 May 2022. At the time, they were 13 months old and weighed an average of 530 kg. Two contrasting supplements based on organic concentrates were tested at pasture: one estimated at 20% and the other at 40% of feed intake, i.e. half of the maximum permitted, and the maximum permitted by legislation. Rotational grazing was carried out until 29 September on 10 plots, with a residence time of two to three days per plot. By this date, the animals had reached an average weight of 637 kg and 682 kg, with average daily gains of 700 g and 1 kg per day for the 20% and 40% supplements respectively. The animals, which were then returned to the stables because they were considered too thin, were fattened for a further three months. They were slaughtered at an average age of 21 months, with live weights of 690 kg (20% case) and 750 kg (40% case).

Compared with historical trials, the animals were slaughtered young after ingesting a lower quantity

of concentrates per animal, especially those supplemented at a maximum of 20% of feed intake. However, the possibility of finishing Bleu-Mixte bulls on this type of grazing has not been demonstrated.

Since 2023, the **SPOt** project has also been mobilising this practice with dairy-meat crossbred animals, to assess whether fattening this type of animal is possible while making the most of the advantages associated with grazing.

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SATELLITES, THE TOOL OF TOMORROW FOR CROP MONITORING...

In this context, the SPAGHYTI project aims to make the most of hyperspectral satellite images to monitor nitrogen status and (a)biotic stress at the level of winter wheat fields in Wallonia.

The relevance of multispectral satellite imagery for such applications has already been demonstrated by CRA-W projects (e.g. the **BELCAM** and **SAGRIWASENT** projects). The hyperspectral satellite images used in the SPAGHYTI project are unique in that they can offer a greater number of narrow spectral bands. This special feature, coupled with a higher acquisition frequency, should enable finer characterisation of the phenomena under consideration, at marginal cost.

In order to calibrate and validate the algorithms, intensive field campaigns are organised. The first of these took place during the 2022-2023 season (March to July). Various observations and measurements were carried out regularly, including field qualification of diseases, measurement of spectral data using a portable spectrometer (ASD FieldSpec 4) and characterisation of the canopy using hemispheric images. It continued with the collection of samples and the measurement of dry matter and nitrogen, in the whole plant but also specifically in the ears at the end of the season, carried out in the laboratory by infrared spectrometry (FOSS NIR XDS). A second field campaign is scheduled for the 2023-2024 season.

spectral characterisation of the canopy

An initial calibration of the algorithms was carried out on the basis of data from varietal trials (fertilisers, post-registration and fungicides) set up by CRA-W or CePiCop (fertiliser trials). Validation of these algorithms is based on data collected from farmers' field, compatible with the spatial resolution of hyperspectral satellite images. Algorithm development involves identifying the most relevant wavelengths or combinations of wavelengths (in the form of indices). The initial results obtained highlight the relevance of hyperspectral imaging for monitoring nitrogen status.

Digital agriculture is booming, and the contribution of satellite imagery is undoubtedly an innovative approach contributing to the evolution of Walloon agriculture towards greater resilience and greater respect for the environment.

Financing:
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Cooperation partnership:
private stakeholders (Constellr – project coordinator, AMOS, DELTATEC) and scientific/technical stakeholders (UCLouvain, CePiCop)

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