The innovation box of Objectif Végétal

The innovation box of Objectif Végétal is a series of 4-page issues on **different topics** ; they enable to discover or better know the research laboratories of the Région Pays de la Loire, France. **This tool aims to encourage collaborations between companies and researchers**. You will find in it current or recent projects, key results, useful contacts and **partnership opportunities**.

Find all the issues in the Innovation section of our website
http://www.objectifvegetal.univ-angers.fr

n°11

Soilless cultivation and/or under shelter

Optimise your climate and your growing melia!

ASTREDHOR / GIE Fleurs et Plantes©

Companies talk about it

Last updated: June 2019

Laurent Largant
General Delegate of **Afaïa**
(Professional Union of the actors of the sector of the supports of culture, mulches, organic amendments, organic fertilizers and organic-minerals and biostimulants).

For several decades, the work on substrates has focused on their physical properties (air retention, water retention, stability). This research continues, for example *via* **Ecol'eau Terreau project**, supported by several members of **Afaïa**. **Tools** are available to producers on new parameters such as the **diffusibility of air and water**.

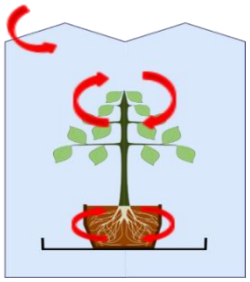
Other requests from horticulturists and consumers opened up new research fields. Among them:

- The demand for soil "usable in organic farming" has led manufacturers to incorporate organic fertilizers whose behaviour needs to be better known. This is the origin of the **Optifaz project** that has been supported by **Afaïa** since the beginning. More generally, the interest is on the **living** side of culture media: we are now talking about "**biotised soils**". This is an important area of research, in order to develop more efficient growing media combining organic fertilizers and biostimulants.

- The reduction of the **environmental impact** of growing media is part of the actions of **Afaïa and its members**, with the commitments for **Circular Agriculture**. The reduction in the use of **non-renewable materials** has been going on for a long time, and continues to be clarified, for example thanks to new LCAs (life cycle analyzes) on raw materials. **We welcome innovative initiatives that put substrates at the heart of the pathways of progress for more sustainable horticulture**.

This issue was produced with the contribution of an editorial board: **JC Michel** and **P. Cannavo** (Agrocampus-Ouest), **N. Maniez** (Aria), **F. Robert** (ASTREDHOR), **V. Truffault** (CTIFL), **E. Defossez** (Végépolys), **L. Lecerf** et **T. Redjala** (RFI Objectif Végétal).

Aboveground and / or under-shelter production systems are growing rapidly, and must meet major challenges, both in terms of **performance** and in terms of **reducing inputs** and **protecting natural resources**.
Nitrogen fertilization, reduction in the use of **peat**, **root development**, management of **irrigation** and the **climatic environment** of plants, **energy** savings … are therefore all research topics of interest to professionals (**market gardeners, producers of ornamental plants, greenhouse and substrate producers**).



Angers is recognized for its academic skills in the field of bio-physical transfers in the plant environment in highly anthropised or artificialized constrained environment. The **EPHor**[1] research unit is working to better understand and understand off-ground and / or under-ground production systems. Researchers are studying the interactions between organic culture media and roots as well as the consequences on the bioavailability of water, air and nutrients during culture. They are also interested in the **transfer of water and energy** in the **substrate-plant-atmosphere continuum** under irrigation restriction conditions. Their work sometimes uses the skills of the Arch-E team of the **IRHS**[2] research unit, that is specialist in plant eco-physiology.

These skills enable researchers to **propose ways to meet the societal demand** for the **performance** of these production systems while reducing the **environmental impact**:

- Improve the **physical properties** of substrates
- Favor **organic fertilization**
- Better control **greenhouse climate** by modeling
- Better manage **water resources**
- Valorise **alternative materials**

Improve your horticultural growing media

❑ Reduce the irrigation of your horticultural growing media

Text'EAU Terreau (2019-2023) – *funds from Région Pays de la Loire and professional consortium*

This project is led by **EPHor**[1] research unit in partnership with several culture media manufacturers, to evaluate the size and shape of the media particules (texture), analyze their arrangement (structure) and predict their physical and hydraulic behaviour.

- **Expected results :**

- The quantitative and qualitative analysis of the size and shape of the particules **will enable to elaborate a close classification** of the culture media texture.
- The study of the relationships texture vs structure, physical properties and rehumectation abilities, **will enable to build a predictive mdel** of the physical behaviour of the culture media according to their their textural caracteristics, and thus to **propose new mixes.**

Ecol'EAU Terreau project (2013-2017) – *funds from Angers Loire Métropole and professional consortium.*

This project was performed by **EPHor**[1] research unit in partnership with **11 culture media manufacturers**, to evaluate the effect of root development and irrigation regime on transfer properties and on bioavailability in water and air in organic substrates.

- **Results:** This project has demonstrated the **aerating properties** of the substrate and its **wettability** as key physical parameters **favoring root development**. *In extenso*, this project contributes to **optimise**
- the **associations of substrates** on the basis of these new criteria,
- the **managment of irrigation**.

OPTIFRAISE project (2015-2018) – *funds from FEDER, Région N^elle Aquitaine, Fraises de France and private companies.*

The project is driven by **Invenio** with a consortium of partners **(Chambre d'agriculture 47**, **ValPrim**, **INRA Bordeaux**, **EPHor**[1] research unit **and private companies).** It aims to **optimise irrigation** management in **soilless strawberries cultivation**.

- **Results:** This project highlights the effectiveness **of irrigation management** using tensiometers and water content probes, allowing significant reduction in water intake (around 20%) compared to the usual practices of producers.

REWET project (2018-2019) – *private funds.*

This project is performed by **EPHor**[1] research unit, in partnership with private companies.

- **Objective:** Optimise the composition of the substrate by analysing the influence of the incorporation of **coconut fibers** and **wetting agents** on the ability to re-wet peat substrates according to irrigation techniques.

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[1] EPHor: Physical Environment of Horticultural Plants research Unit (Agrocampus-Ouest)
[2] IRHS: Institute of Horticulture and *Seeds* (Inra, Agrocampus-Ouest, University of Angers)

❑ Manage your nitrogen fertilisation in soil-less conditions

OPTiFaz project (2017-2020) – *funds from CASDAR*
Driven by **ASTREDHOR[4]**, this project aims to **optimize organic nitrogen fertilization** in horticultural growing media, by developing a predictive tool based on the modeling of organic nitrogen mineralization under ground conditions.

➢ **Objective:** field management **tools** to support the management of organic fertilization and determine nitrogen requirements in the crop cycle.

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❑ Microorganisms, a fertility factor in soil-less cultivation

Louise Paillat

Louise Paillat has been recruited by **Premier Tech** for a Cifre **thesis** (2018-2021), and is co-supervised by **EPHor[1]** and **IRHS[2]** (Arch-E team) research units. She studies the **role of the rhizosphere microorganisms** in a complex "organic fertilizer-substrate" medium on the **nutrients bioavailability** and on **plant growth**.

➢ **Objective:** improve the fertility of substrates by controlling microorganisms of the rhizosphere.

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Optimize the climate around yours plants

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❑ Optimize the energy efficiency of your greenhouses

Hortinergy
Energy analysis for greenhouse project

Hortinergy project (2017-2019) – *ADEME funds (initiative SMEs)*
EPHor[1], **Agrithermic**, **CTIFL[3]** (Balandran et Carquefou) et **ASTREDHOR[4]** (RATHO).

➢ **Results:** A **simulation software** for the **energiy balance** and **GHG emissions** of a greenhouse has been developed by integrating the contribution of plants.

Nominee GreenTech innovation award 2018

❑ Conciliate energy savings and yield optimisation

Conser project (2014-2017) – *funds from Région Pays de la Loire / FranceAgriMer / ARELPAL*
CTIFL[3]Carquefou), **CDDM[5]**, **EPHor[1]**, **HortiMaX France**, **Cheminant**
The aim is to test and validate innovative crop management methods for greenhouse-grown cucumber, that have been determined according to the plant physiology. For this, the project conciliates **energy savings** and **optimization of yield** while reducing the impact of *Didymella Bryoniae* (a pathogenic fungus).

➢ **Results:** Recommendations on how to **optimally control the climate** in production greenhouses, improve the efficiency of cucumber crops (for example: partial relocation of the heating systems and the ventilation fan for the entire canopy).

❑ Control your climatic parameters to manage pathogens

Projet PHYSI'HO (2012- 2017) – *funds from Région Pays de la Loire + private companies.*
This innovative collaborative project involving **EPHor[1]**, **IRHS[2]**, **BHR[6]**, **BIOGER[7]** research unit of INRA-Grignon and the hydrangea producers of Maine et Loire (**Chauvin Hortensia**, **Hortensia France Production**, **Sicamus Productions**) studied the climatic and physiological factors influencing the conservation of hydrangea plants when stored in a cold room.

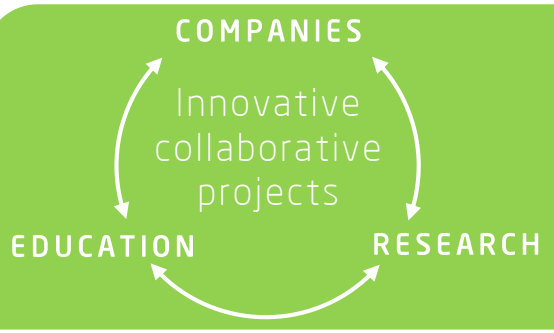
[3]CTIFL: Interprofessional Technical Centre for Fruit and Vegetables
[4]ASTREDHOR : FrenchTechnical Institute of Horticulture
[5]CDDM: Departmental Committee for Vegetable growing Development
[6]BHR: Regional office for horticulture
[7]BIOGER : Biology and risk assessement in agriculture research unit

Collaborate with research

Take advantage of ...
- **scientific expertise**
- **advanced equipment**
- **a network of collaborators**
- **innovative ideas**

Reinforce your R&D team with...
- **Master trainees**
- **PhD students** under Cifre modality
- **« Young » PhD graduates**

➢ Contact us to help you build your projets and support them:



Emeline Defossez, contact to support your R&D projects and put you in touch with various actors on the national and European territory. emeline.defossez@vegepolys.eu

Tanegmart Redjala, proximity interface with the laboratories of the Structure Fédérative de Recherche Quasav. tanegmart.redjala@univ-angers.fr

Examples of possible collaboration topics

- Evaluation of the **agronomic properties** of **alternative culture media to peat**
- Effectiveness of products as substrates **rewetting agents** (natural or synthetic wetting agents)
- **Agronomic interest** of the use of **biodegradable pots** compared to plastic pots
- Characterization of the **microbiological perfomance** of substrates
- Assessment of the **energy performance of greenhouses**
- **Equipent efficiency:** relocated heating, fans, screens... on productions
- Seeking solutions to **improve crop management** (instructions, temperature integration...)
- **Crop modeling** (quantification of transpiration, effect of water restriction)
- Concept of **innovative greenhouse with low environmenal impact**

Training for professionals

- Soil quality: concept and evaluation methods, from **2nd to 4th October** 2019, Rennes
- **Greenhouse** approach: from project development to delivery of buildings
- Cultivation of **plants in pots under glass**

Also remember to recruit **alternating students** (in professionalization contrect or apprenticeship contract).

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Do not miss !

The congress will include a **specific session dedicated to professionals** (producers, technicians, star-ups, applied research), on June 19th.

https://www.greensys2019.org/professionnals-professionnels

Contact : pierre-emmanuel.bournet@agrocampus-ouest.fr

Almost 600 participants registered !

Objectif Végétal, Research, Training & Innovation in Pays de la Loire is a regional program (2014-2019) promoted by the Pays de la Loire Region which involves higher education and research institutions (University of Angers, project leader, Agrocampus Ouest, ESA, Inra, University of Nantes) as well as the Végépolys competitiveness cluster.
Objectif Végétal aims to increase the visibility of upstream research, increase the attractiveness of the training center and its links ith companies and strengthen the economic value of the results of academic research.

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CE PROJET EST CO-FINANCÉ PAR LA RÉGION ET LE FONDS EUROPÉEN DE DÉVELOPPEMENT RÉGIONAL