

## IDP-Pro

### Ideotype plants from Defensin Protein Promiscuity

#### ABSTRACT

Protein promiscuity is a fascinating phenomenon by which a single protein could assume different and unusual functions under different physiological conditions. Among those are defensin which distribute in all kingdoms of life where they form the first line of defence to protect their host from microbial attack. Defensins are small (45-54 amino-acids), basic, cysteine-rich proteins showing extremely conserved structures and disulphide bond patterns. In plants, apart from their antimicrobial role, plant defensins are also involved in the defence against insects, through the reduction of their digestive enzyme activities. Defensins also fulfil other important roles in plant response to abiotic stresses, among which is tolerance to zinc excess. Keeping in mind, the protein promiscuity concept, all these characteristics put defensins at the crossroad of plant response to both biotic and abiotic stresses and let emerge that expression of these peptides is a possible approach to protect crop plant from stresses having different origins.

**Keywords :** 1. Exclu de la photothèque, Developing the plant of the future, Plant, Operation, Abiotic stress, Arabidopsis, Protein/proteomic, Arabidopsis (species)

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**Flagship project :** no

**Project leader :** Françoise Gosti

**Project leader's institution :** INRA-INRAE

**Project leader's RU :** BPMP

**Budget allocated :** 50380 €

**Total budget allocated ( including co-financing ) :** 67940 €

**Funding :** Labex

#### GOAL

The IDP-Pro project aims to develop a new approach to produce plants with better tolerance to biotic and abiotic stresses. For that, we will investigate whether and how the properties of defensins could be shared and how they could combine in planta.

#### ACTION

To do this, we will answer the following questions: Do cowpea defensins possess the properties of transmitting zinc tolerance? What is the bactericidal activity, and what is the anti-protease activity of the different PDF1 of Arabidopsis? How do the different properties of defensins can be combined within the same molecule and what are their actions at the cellular and in planta level?

#### RESULTS

The zinc tolerance activity of cowpea defensins tested in the yeast system showed that they were not all equivalent. Interestingly, chimeric defensins constructed after in silico study retained the ability to confer

tolerance to zinc. In-plant analysis of the action of these proteins is underway. The purification of the defensins to test the bactericidal and anti-protease activities of the various defensins of Arabidopsis and chimeric defensins is under way.

## **PERSPECTIVES**

The completion of the IDP-Pro project will allow the acquisition of knowledge from the gene to the plant in the fields of genetics, genomics and plant improvement. We will be able to provide the scientific community with a multi-functional description of the defensins from both *V. unguiculata* and Arabidopsis and from combined chimeric proteins. With this project, we will implement an innovative approach, which as such, holds promise for beneficial output to improve phenotype of transgenic plants which might be considered as valuable tools to improve plant resilience when facing multiple stresses constraining their growth and yields.