IMAGINES

Project title: Towards the production of pea ideotypes more efficient in soil nitrogen absorption for improving weed control in low input innovative intercrops

Acronym: IMAGINES

Project duration: 36 months - Start date: 1 October 2018 End date: 30 September 2021

Key-words: lntercropping, legume, weed contrai, nitrate absorption, biological nitrogen fixation, transceivers, lateral roots, Nod factors

Coordinator: Fustec Joëlle / USC 1432 LEVA (ESA, INRA)
j.fustec@groupe-esa.com

PhD student: Laure Boeglin

Financial support from « Objectif Végétal »: 25 k€

Summary:

Context
ln a context of increasing protein demand and limitation of nitrogen fertilizers and pesticides use, intercrops including a legume providing one or more services, are seen as a means to move towards productive systems more sustainable and ·resilient to climatic and economic hazards. Recent work has shown that it is possible to use auxiliary legumes for limiting weed development and providing a cash crop such rapeseed with atmospheric nitrogen resulting from biological fixation. The productivity of this kind of intercrops strongly depends on competition and complementarity for the use of light and nitrogen between associated crops and weeds. lndeed, for controlling weeds, it is necessary that the rapeseed and the legume effectively absorb the soil nitrogen at the expense of the weeds. However, legumes are low competitors for soil nitrogen, likely because they also can fix atmospheric nitrogen through root nodules resulting from symbiosis with bacteria

Objectives
The objectives of the project IMAGINES is to better understand interactions between the development of lateral root for a higher absorption of soil nitrogen, soil nitrate concentration and the presence of bacteria allowing for nitrogen fixing nodules. lt will help to design new varieties of legumes to be used as auxiliary crops, well adapted to their expected functions for improving the performance of intercrops.

Methodologies
Pea plants will be grown in greenhouse to study the effect of soil nitrate concentration on lateral root development and root architecture. The effect of the presence of nitrogen-fixing bacteria on root architecture will then be studied as well as the interaction with the minerai nitrogen uptake of the soil. The pea roots will also be phenotyped in the presence of rapeseed and weeds. Finally, the interactions between the elongation of lateral roots, soil nitrate and fixing bacteria will be studied by molecular techniques.