SeqLeg

Interaction between the biogeochemical cycles of C, N and P in the rhizosphere of nodulated legumes (bean model) in reference agro-ecosystems of the Mediterranean basin

ABSTRACT

Legumes contribute to food security and soil fertility by their symbiotic nitrogen fixation that would also contribute to global C sequestration. However they suffer yield instability because of their sensitivity to biotic and abiotic constraints, particularly the low bioavailability of P in most soils of the Mediterranean basin. The objective of SeqLeg was to study the interaction between nitrogen fixation and the P availability by comparing recombinant lines of common bean (Phaseolus vulgaris) that werre contrasting in P use efficiency for the fixation of N2, and to assess the contribution of the rhizobial symbiosis to C balance by including the N2-fixing nodulation in the MOMOS model.
In a network of horticultural fields of the Herault valley, the efficient line in P use for N2 fixation was found to be generally the most productive. However, the difference with the low efficiency line varied, and was even nil in some sites. Moreover this comparison was possible only for sites where nodule biomass was above a threshold below which the nodulation would not contribute sufficiently to the N nutrition of the legume plant. The nodulation was above this threshold in more than half the sites in Herault valley in South of France and Setif in Algeria, but less frequently in soils of new cultivation with irrigation at Nuberia in the Nile delta.
In the agronomic station of Melgueil, the MOMOS model including N with legume nodulation has been assessed for C cycle during 3 years of faba bean (Vicia faba), in pure culture or in association with wheat. It still remain to assess MOMOS for the N cycle and thus to confirm that this model can be utilized to couple of N and C cycles in cereal cropping with legumes.

Keywords : Agroecosystem, Operation, Interaction, Nitrogen, Phosphorus, Soil, Bean / Pea, Mediterrannea

Year : 2009
Project number : 0901-005
Type of funding : AAP
Project type : AAP
Research units in the network :
Start date : 2009-09-01
End date : 2012-12-31
Flagship project : no

Project leader : Jean-Jacques Drevon
Project leader's institution : INRA-INRAE
Project leader's RU : ECO&SOLS

Budget allocated : 42640 €
Total budget allocated (including co-financing) : 42640 €
Funding : RTRA

PERSPECTIVES

To test the MOMOS model for the common bean (Phaseolus vulgaris) in the spatial variability of bean nodulation in the Sétif agro-écosytem where 6 contrasting sites have been identified ; Isolate rhizobia and rhizobacterias from nodulated roots of legumes in identified sites with high nodulation and low differences between contrsating genotypes in order to verify in controled environment whether thees bacteria could contribute to cempensate the low efficiency of the host to use P for nitrogen fixation. The

finalized objective would be the selection of legume – bactéria associations with potential to fix nitrogen with limited P supplies.