Sujet : L'absorption du fer chez *Arabidospis thaliana*

Le candidat prendra simplement connaissance des documents ; aucune présentation n'est attendue en début d'entretien avec l'interrogateur. Les analyses et interprétations seront développées au cours du dialogue.

Source : IRT1, an Arabidopsis Transporter Essential for Iron Uptake from the Soil and for Plant Growth, G. Vert, The Plant Cell (2002).

Document 1 : Le mutant *irt1* et ses défauts

Figure 1. Molecular Characterization of the irt1-1 Knockout Mutant.

(A). Scheme of the T-DNA integration site in irt1-1. The location of the T-DNA insertion within the sequence of the IRT1 gene is shown. Exons are boxed. (B) Detection of IRT1 mRNA. RT-PCR was performed on total RNA extracted from wild-type (WT) and irt1-1 iron-deficient roots. EF1- specific primers were included as a control. (C) Immunoblot analysis of IRT1. Total proteins were extracted from wild-type and irt1-1 plants grown in the presence (+) or absence (-) of iron. The blot was probed with antibodies directed against IRT1. R, roots; S, shoots.

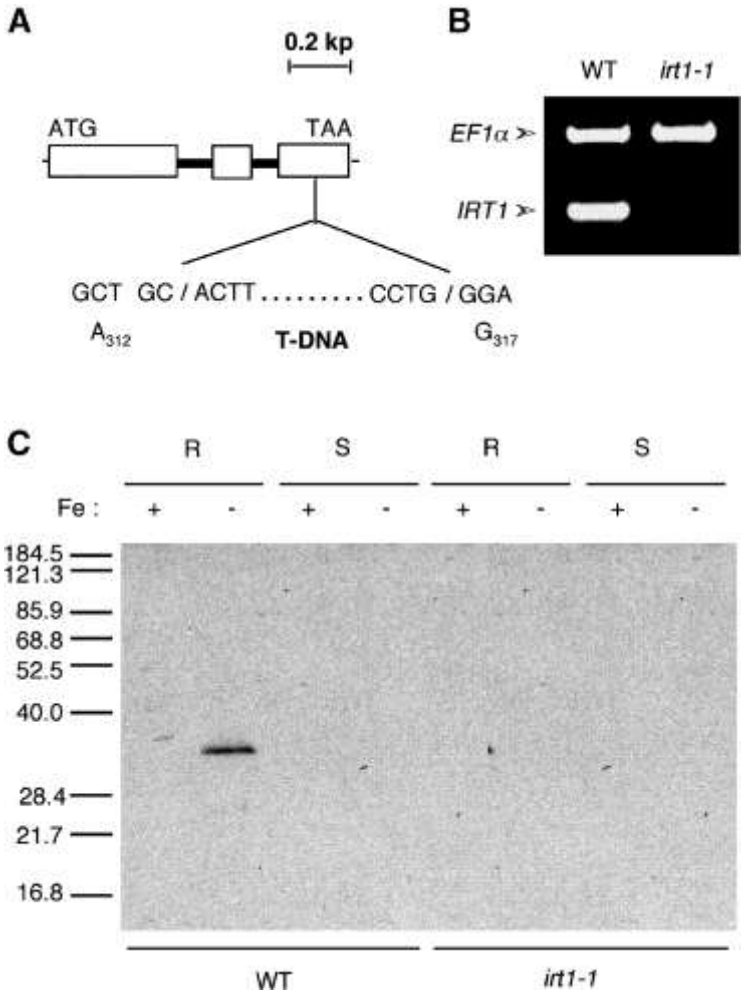


Figure 2. Phenotype of irt1-1.

Phenotype of 15-day-old (top) or 4-week-old (bottom) plants grown in soil. WT, wild-type plant; irt1-1, irt1-1 mutant; irt1-1 / , irt1-1 heterozygous plant; irt1-1:IRT1, transgenic irt1-1 mutant expressing functional IRT1; irt1-1 Fe, irt1-1 watered with 0.5 g/L Sequestrene.

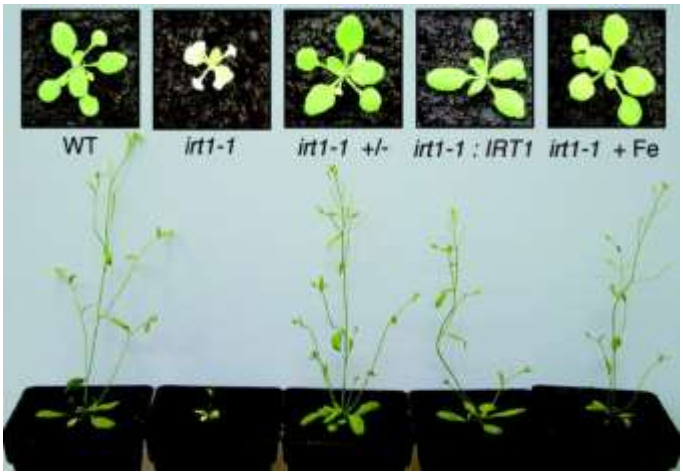
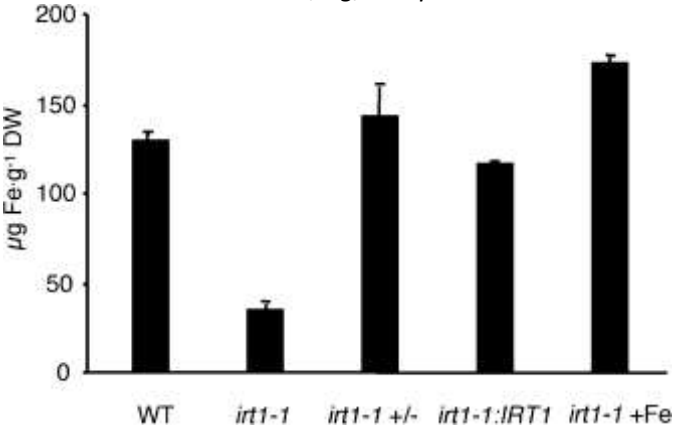


Figure 3. Reduced Leaf Iron Content in irt1-1

Leaf iron content was assessed on 4 weeks-old plants grown in soil. DW : Dry Weight; WT : Wild Type; irt1-1 : homozygous mutant; irt1-1 +/- : hétérozygous mutant; irt1-1:IRT1 : mutant transformed with a functional IRT1; irt1-1+Fe : watered with 0,5 g/L sequestrene.



Document 2 : L'expression du gène IRT1

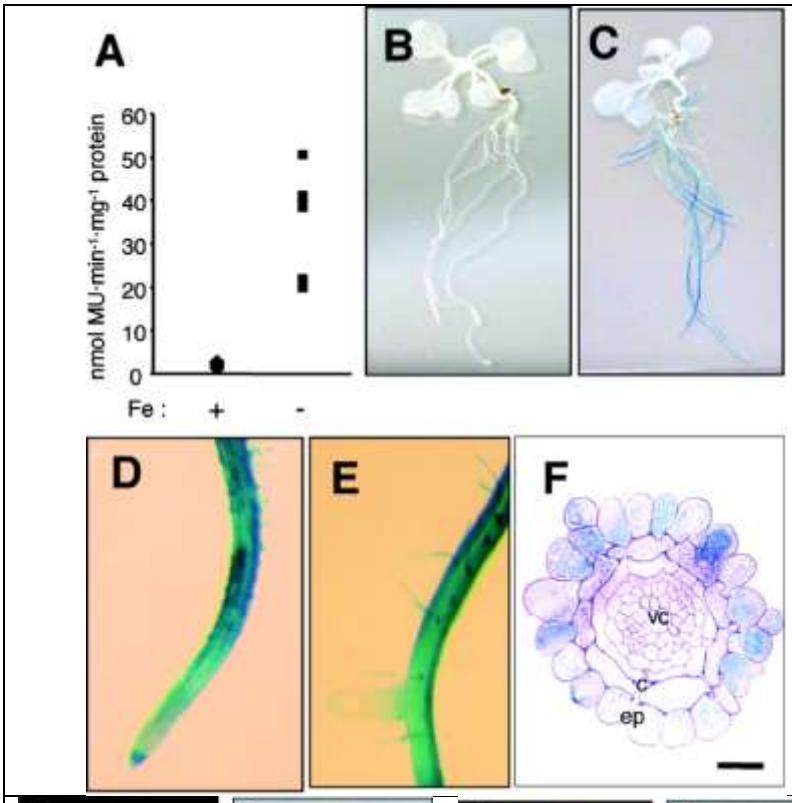


Figure 4. Root Periphery Localization of IRT1 Expression.

(A) Enzymatic GUS assay was performed on six independent transgenic lines expressing an IRT1 promoter–GUS fusion protein and grown in the presence of 50 µM Fe-EDTA (+) or in the absence of added iron (-). No significant GUS activity was detected in wildtype plants (data not shown). MU, methylumbelliferone. (B) to (F) GUS histochemical staining of the transgenic lines. (B) Twelve-day-old plantlets grown as in (A) in the presence of iron. (C) Twelve-day-old plantlets grown as in (A) in the absence of iron. (D) and (E) Enlargement of the iron-deficient roots shown in (C) to highlight the weak GUS staining in the meristematic zone (D) and the strong staining in the root hairs and in the root lateral branching zone (E). (F) Three-micrometer cross-section of an iron-deficient root shown in (C). Cross sections were counterstained with Schiff dye. c, cortex; ep, epidermis; vc, vascular cylinder. Bar 100 µm.

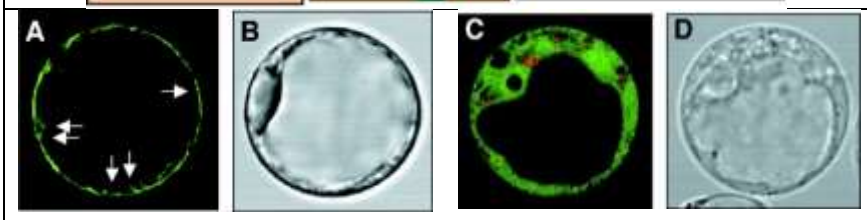


Figure 5. Subcellular Localization of the IRT1 Protein.

Subcellular localization of IRT1-GFP (A) and GFP alone (C) in transfected Arabidopsis protoplasts. Chlorophyll autofluorescence, shown in red (indicated by arrows in [A]), is superimposed on GFP fluorescence in (A) and (C). (B) and (D) show the transmission view of the same fields shown in (A) and (C), respectively.

Document 3 : Fonction de la protéine IRT1

Figure 6. Reduced Cadmium Sensitivity of irt1-1.

(A) Phenotype of wild-type (WT) and irt1-1 plants grown in the presence of cadmium. Plants were grown in the presence or absence of iron (+Fe and -Fe) and in the presence or absence of 20 µM cadmium (+Cd and -Cd) for 8 days. (B) Cadmium content in roots of the iron-deficient plants described in (A) and processed for inductively coupled plasma mass spectrometry analysis. DW, dry weight.

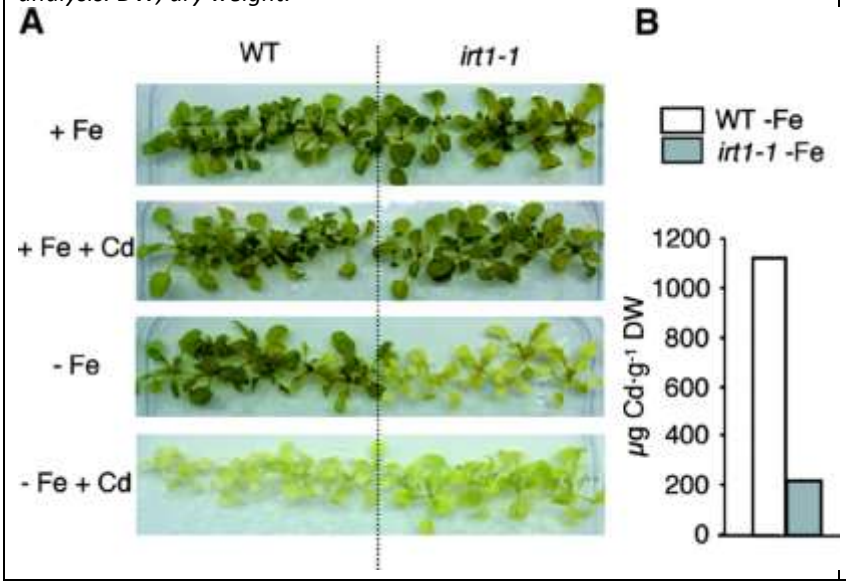


Figure 6. IRT1 Is a Multispecific Metal Ion Transporter in Planta.

(A) Elemental analysis of wild-type (WT) and irt1-1 roots. Plants were grown in the presence (+Fe) or absence (-Fe) of iron for 5 days, and roots were processed for inductively coupled plasma mass spectrometry analysis (see Methods). DW, dry weight. (B) Phenotype of 15-day-old wild-type and irt1-1 plants grown in soil and irrigated either with water (wild type and irt1-1) or with a solution of 600 µM Sequestrene (irt1-1 + Fe), 500 µM ZnCl2 (irt1-1 + Zn), 500 µM MnCl2 (irt1-1 + Mn), or 50 µM CoCl2 (irt1-1 + Co) as indicated.