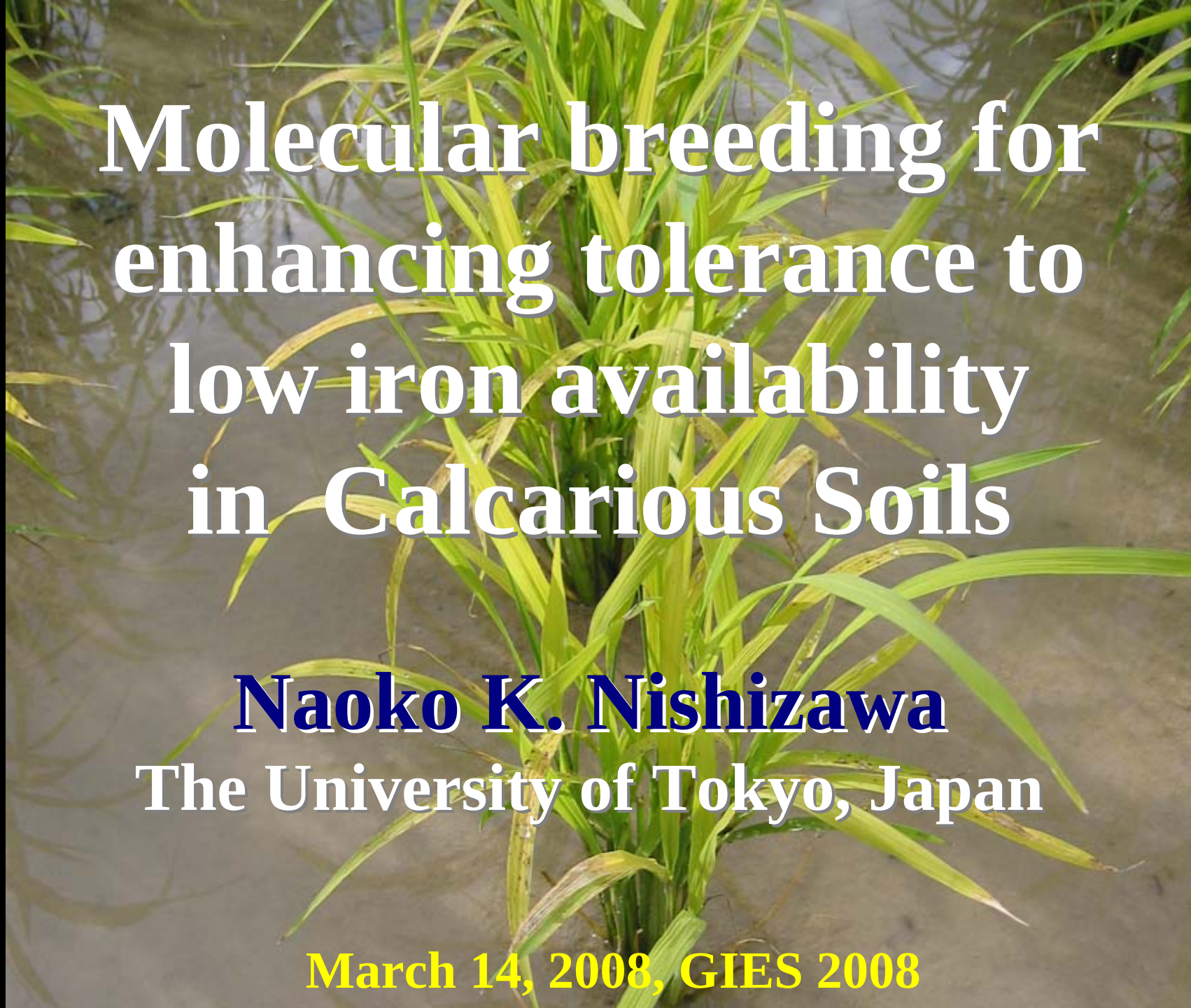


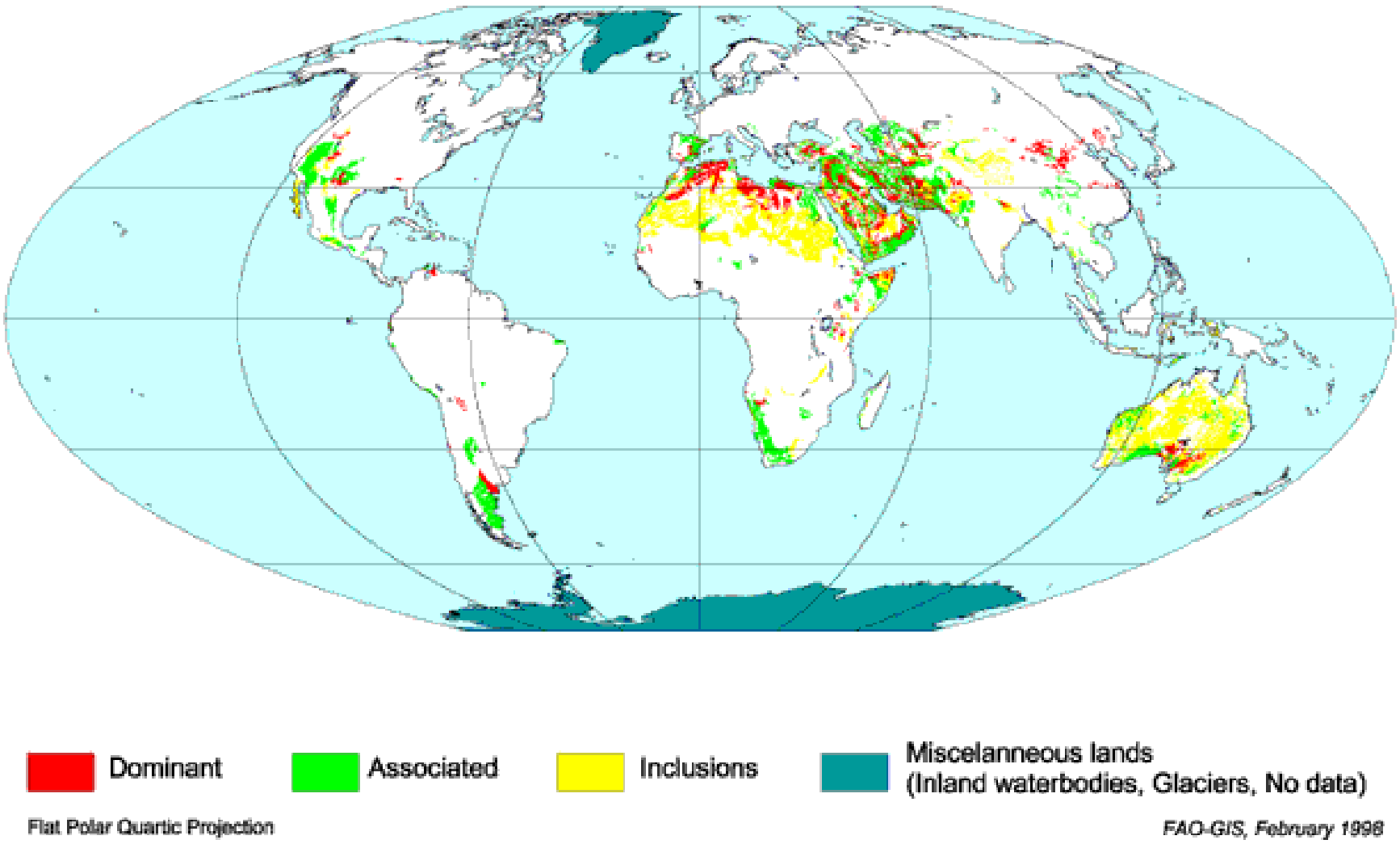
Molecular breeding for enhancing tolerance to low iron availability in Calcarious Soils

Naoko K. Nishizawa
The University of Tokyo, Japan

March 14, 2008, GIES 2008

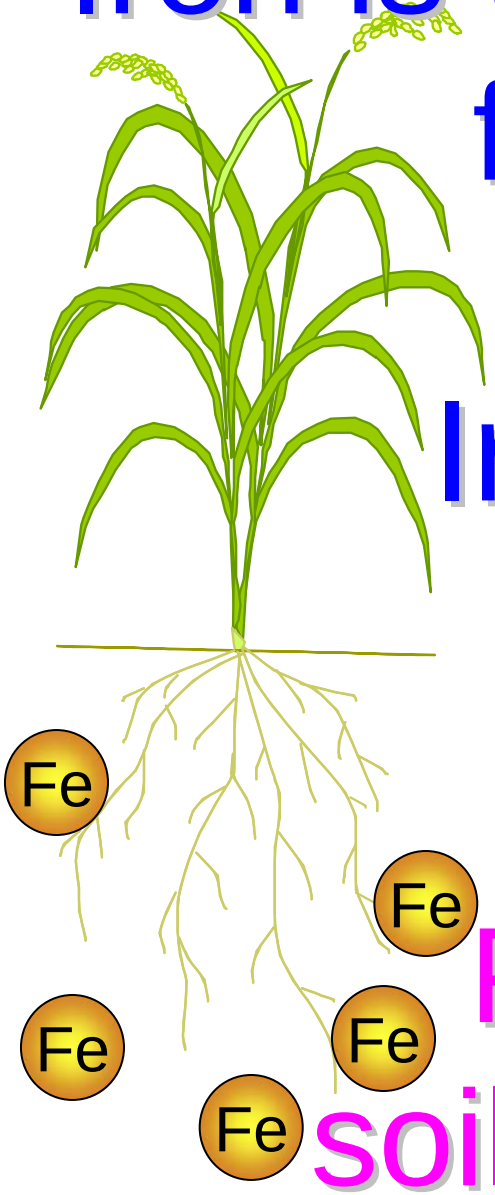
Crop production is critical for our life

Distribution of CALCISOLS
Based on WRB and the FAO/Unesco Soil Map of the World



Distribution of calcareous soils (high soil pH)

Iron is the essential element for plant growth



Iron is not available in alkaline soils

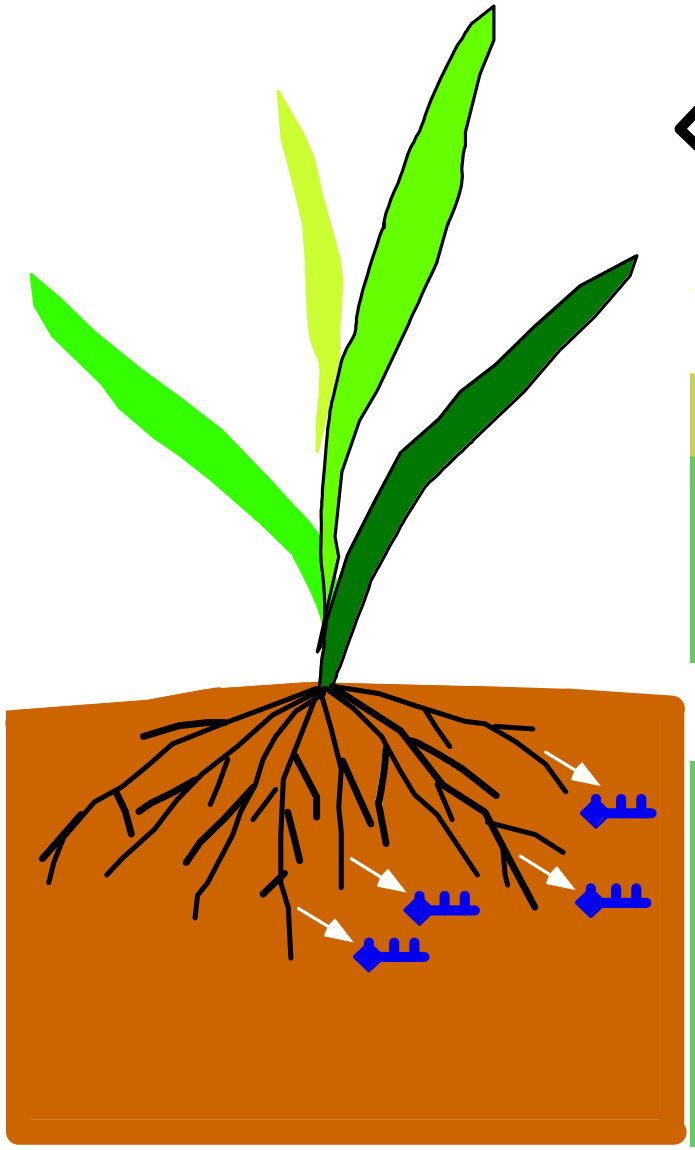
Plants die in alkaline soils due to iron deficiency

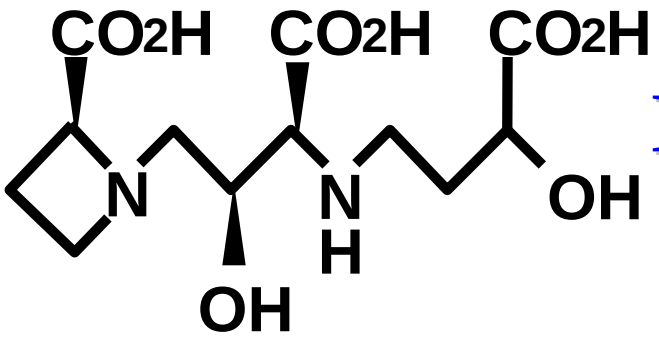
Fe deficiency in peach tree (Israel)

Maize suffered from Fe deficiency (Utha, USA)

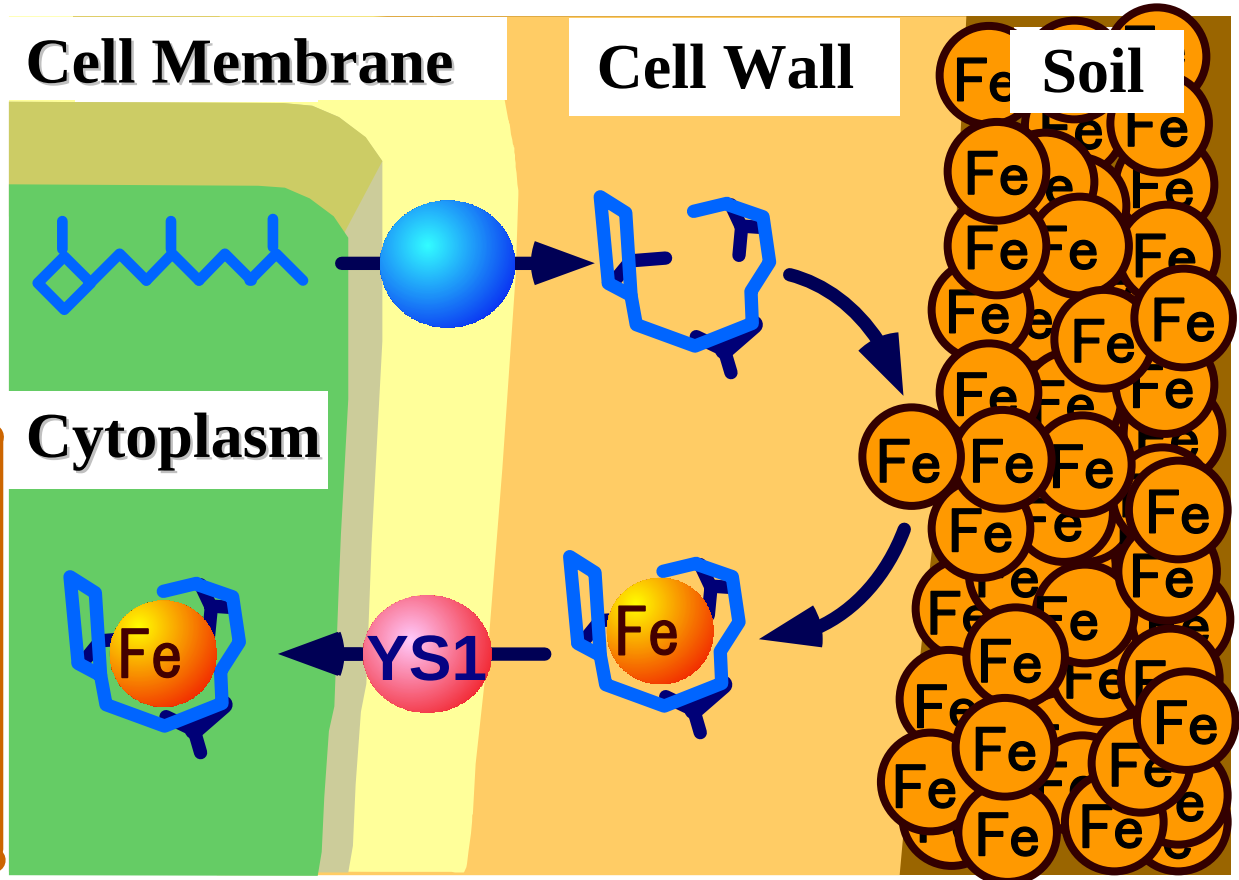
Fe deficient grape (Israel)

Iron Acquisition in Graminaceous plants

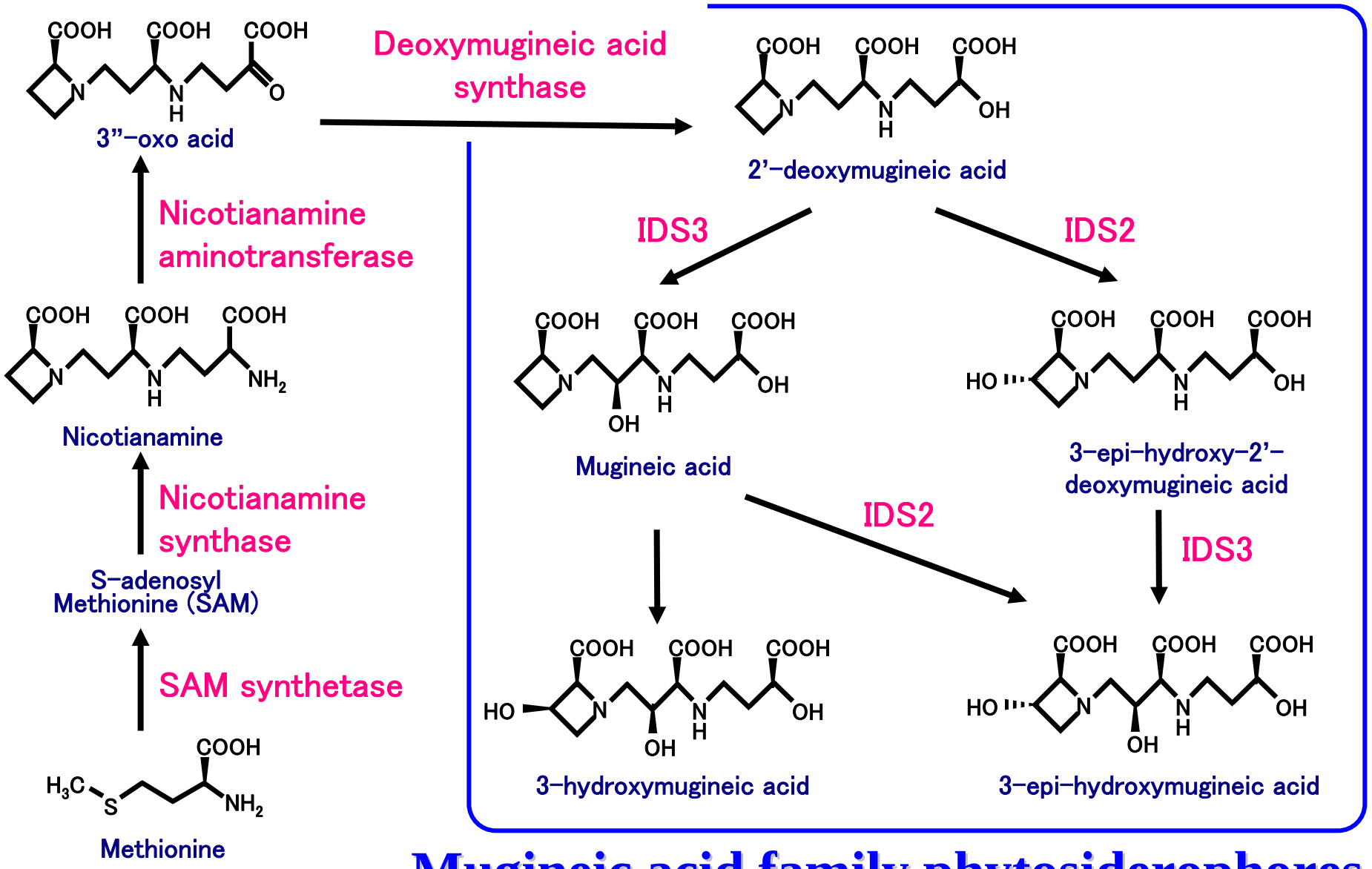




Mugineic Acid



Biosynthetic Pathway of MAs



Mugineic acid family phytosiderophores

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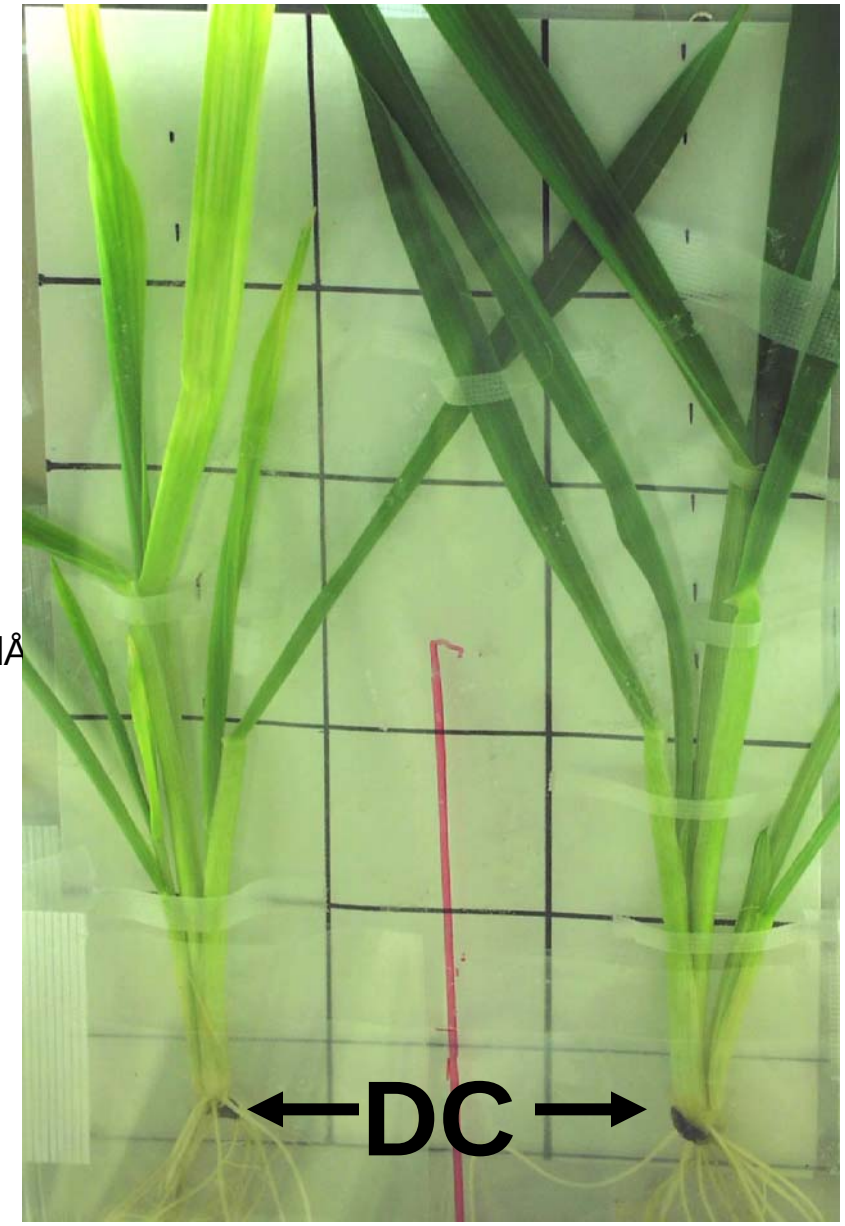


high

low

0 1 2 3 4 5 6 (h)

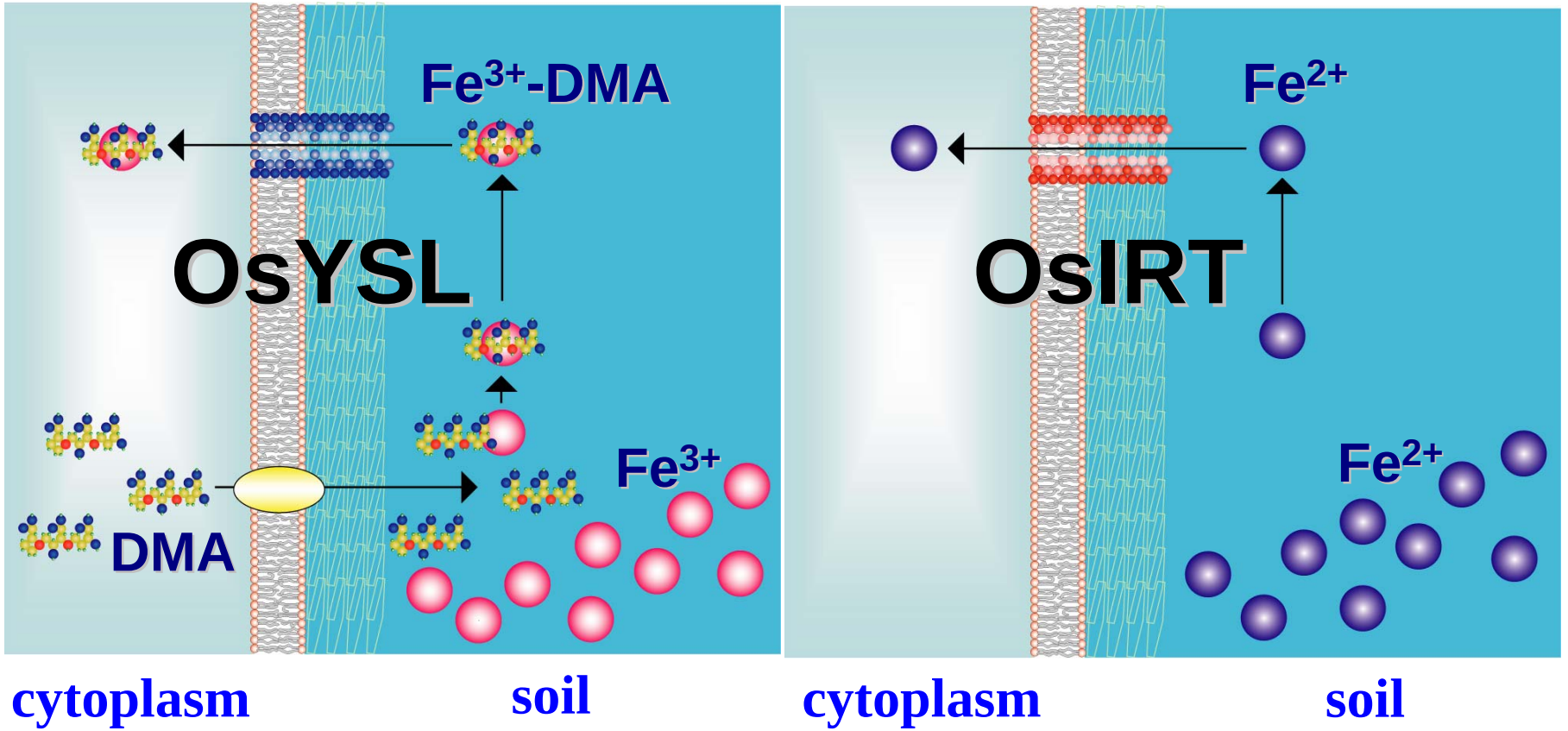
$^{52}Fe^{3+}$-DMA absorption from the barley roots

Rice Suffered From Iron Deficiency

Fe deficiency rice field in India

Rice Plants Uptake Iron as Fe^{3+}-phytosiderophore and Fe^{2+}

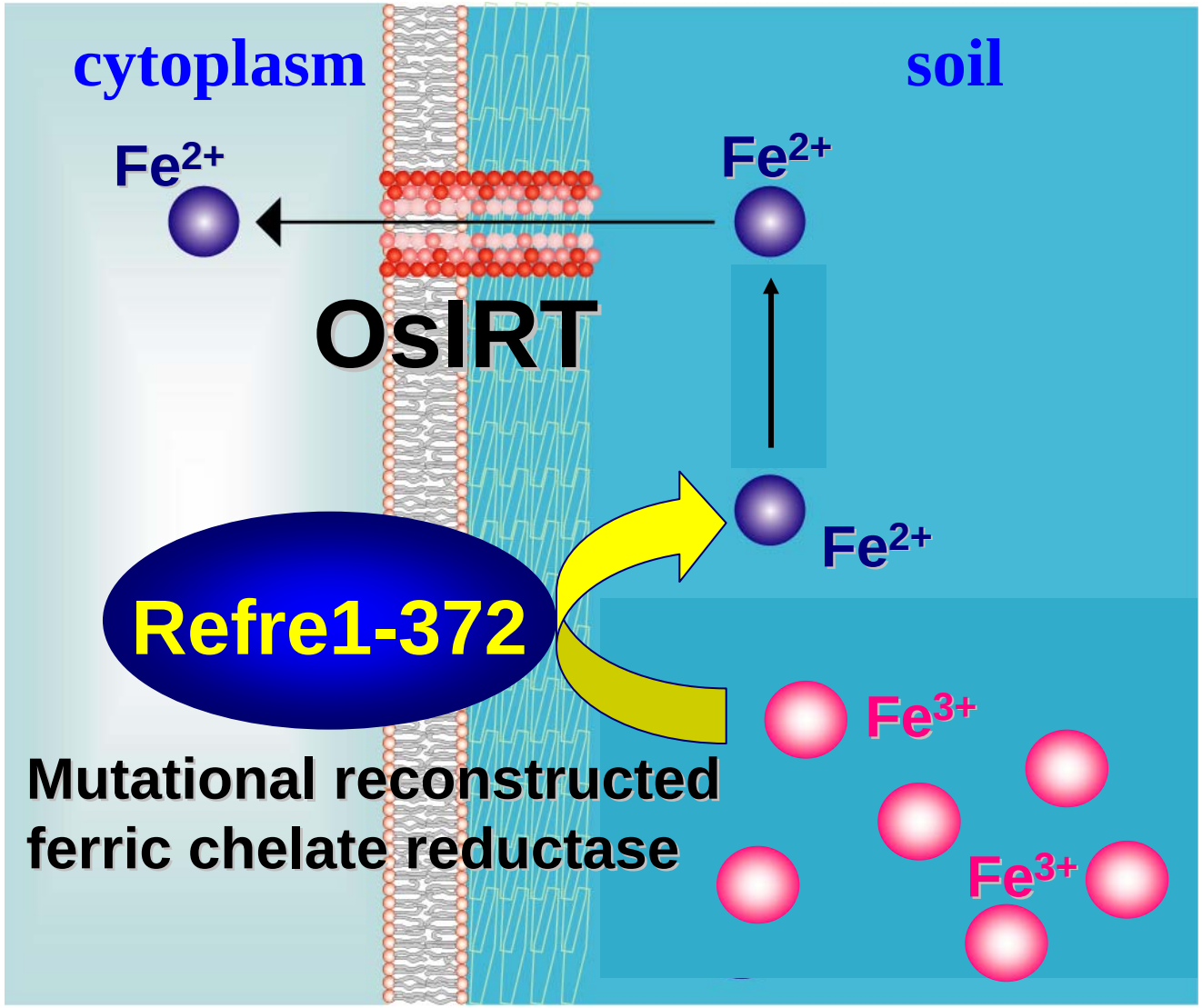
Ishimaru *et al*, *Plant J*, 2006



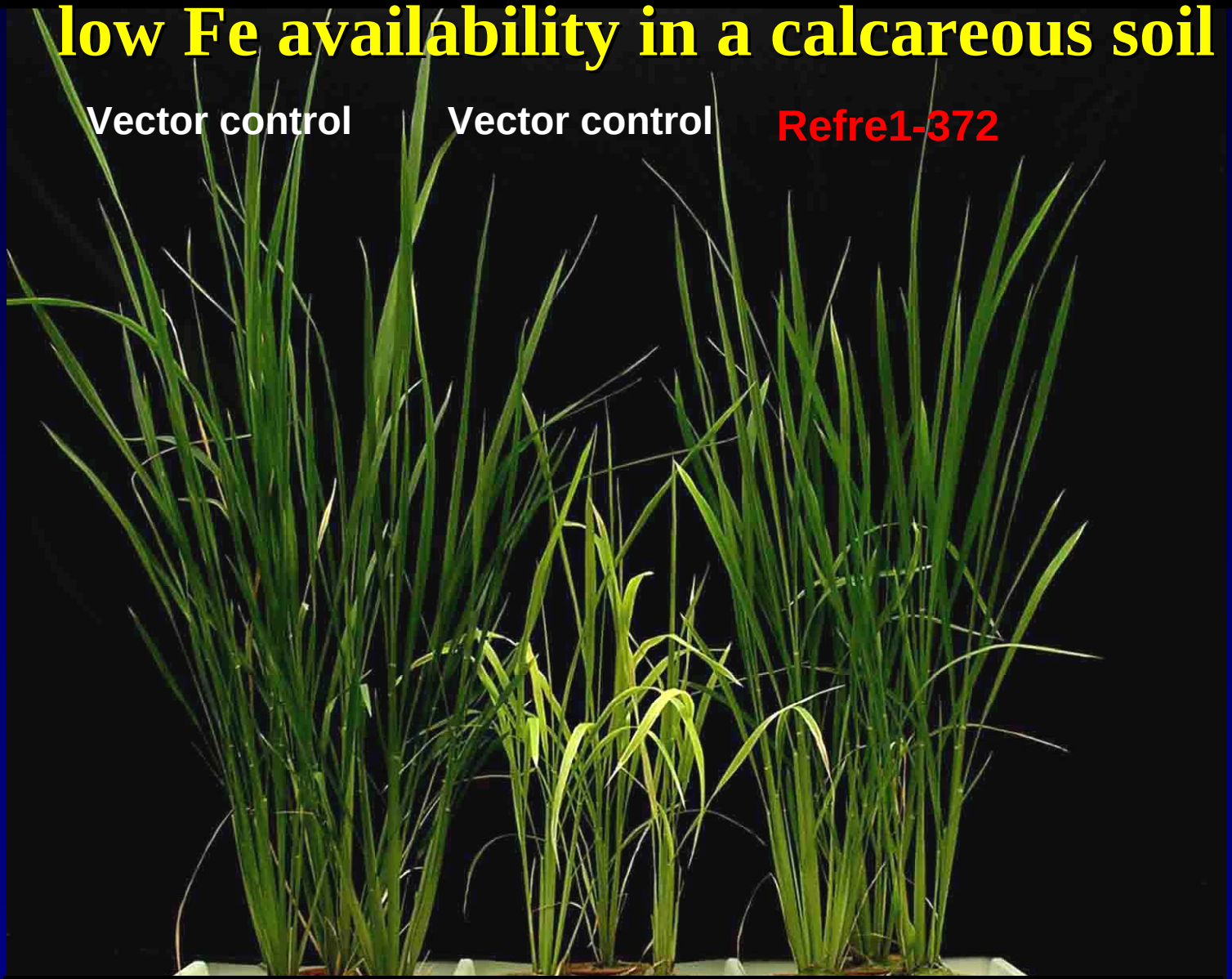
Transgenic rice tolerant to Fe deficiency

Takahashi et al,
Nature Biotech, 2001

Introduction of Fe^{3+} Reduction Activity into Rice

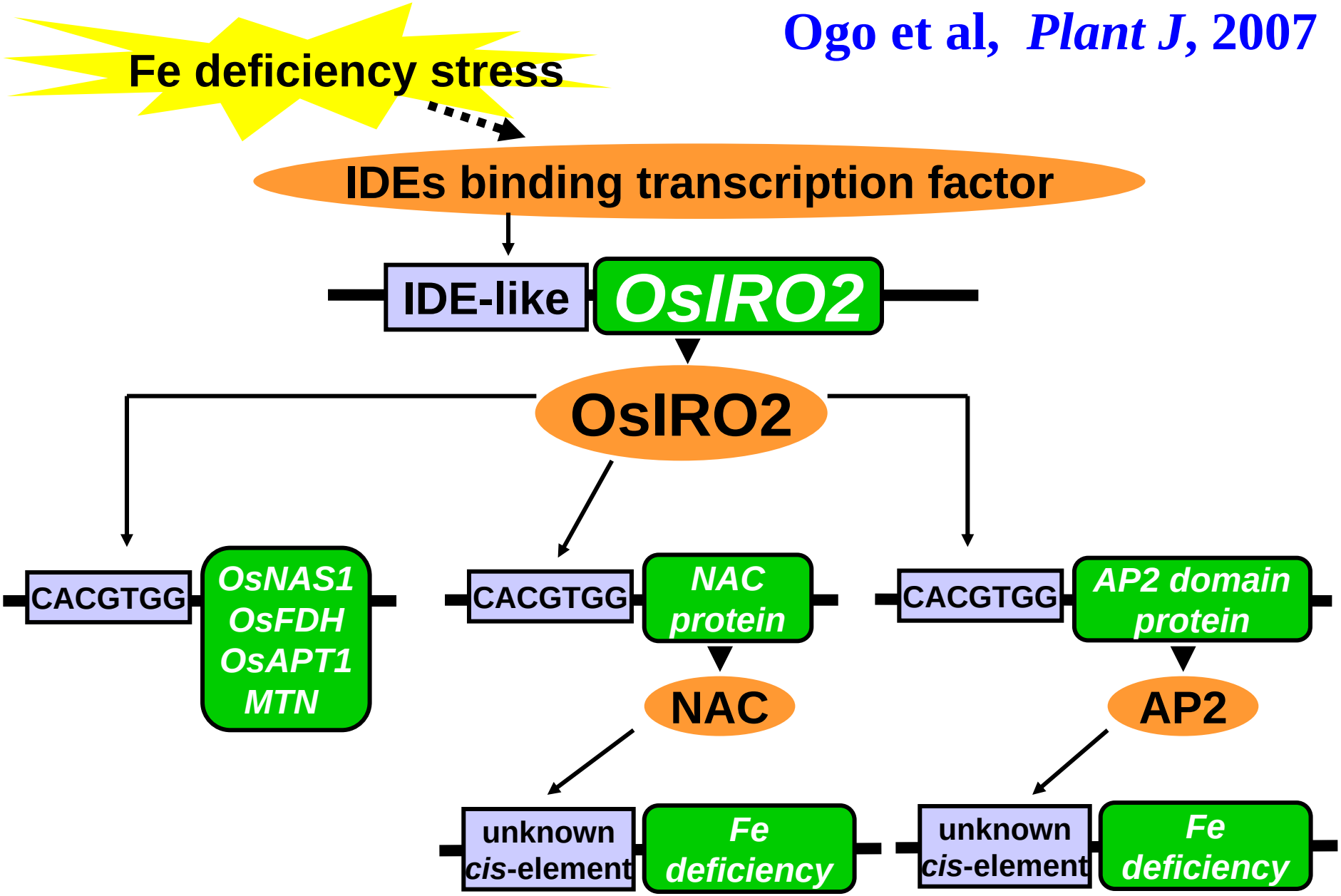


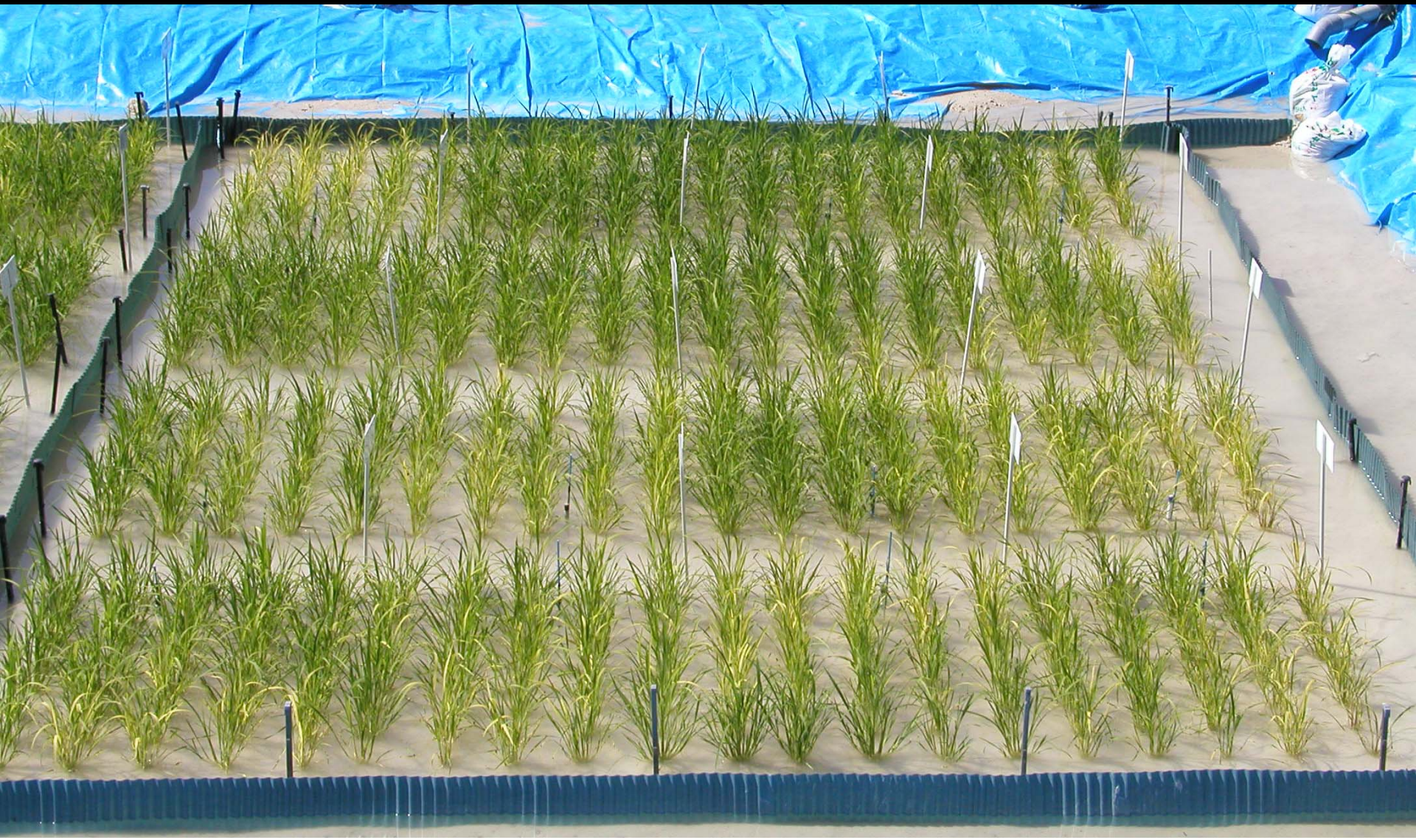
Transgenic rice shows enhanced tolerance to low Fe availability in a calcareous soil



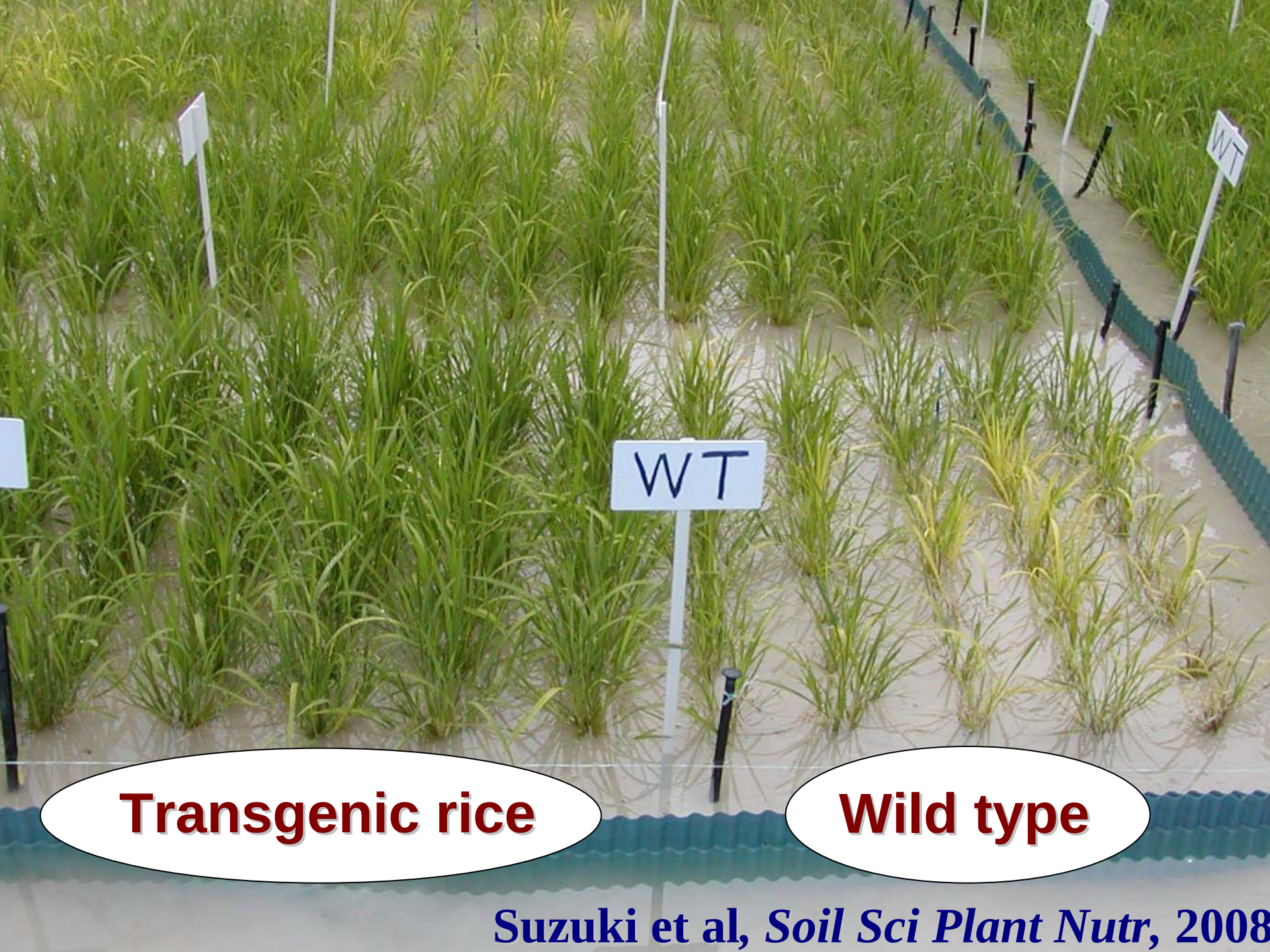
Model of gene regulation, including OsIRO2

Ogo et al, *Plant J*, 2007



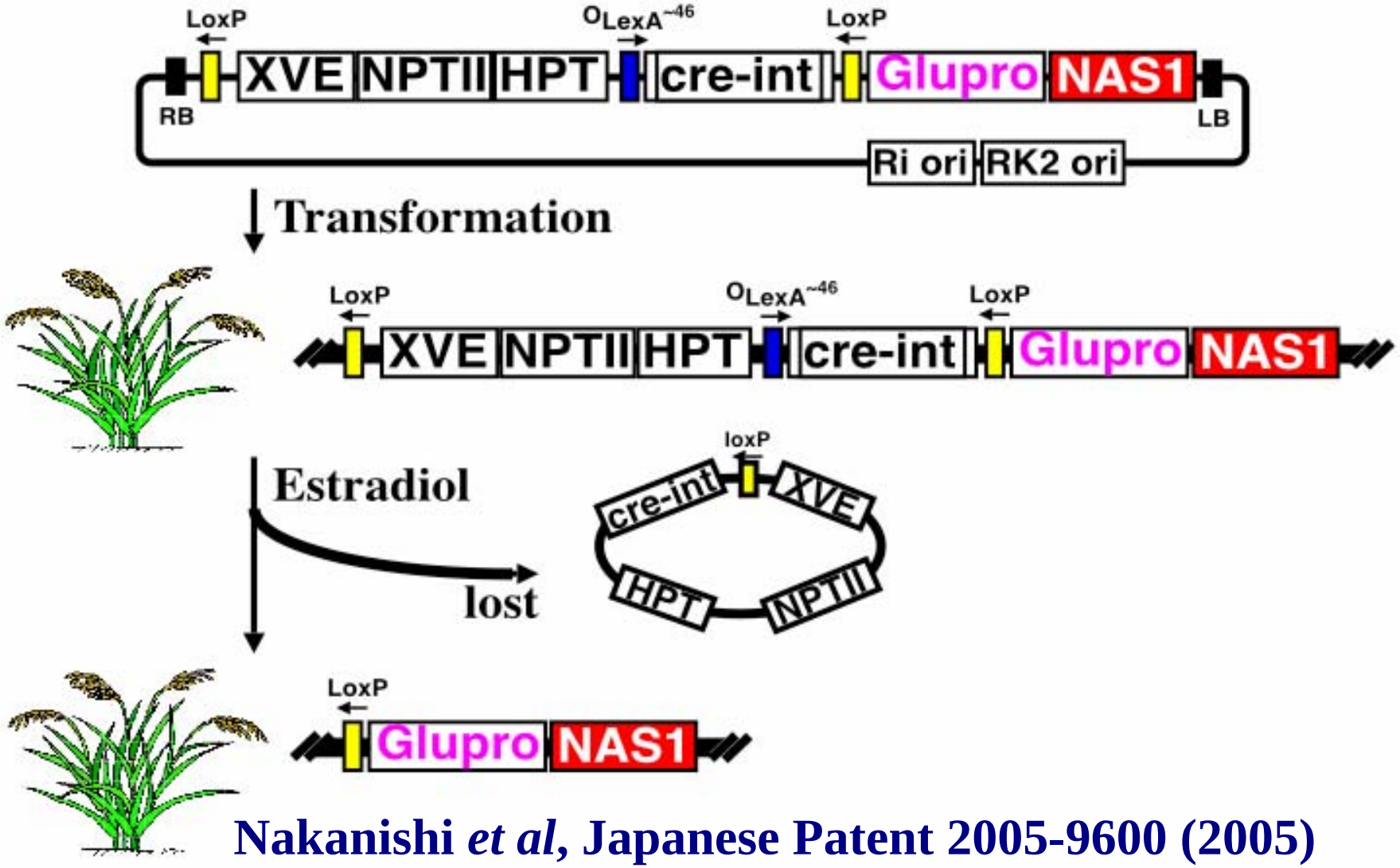


Field evaluation of transgenic rice with enhanced tolerance to alkaline soils



Suzuki et al, *Soil Sci Plant Nutr*, 2008

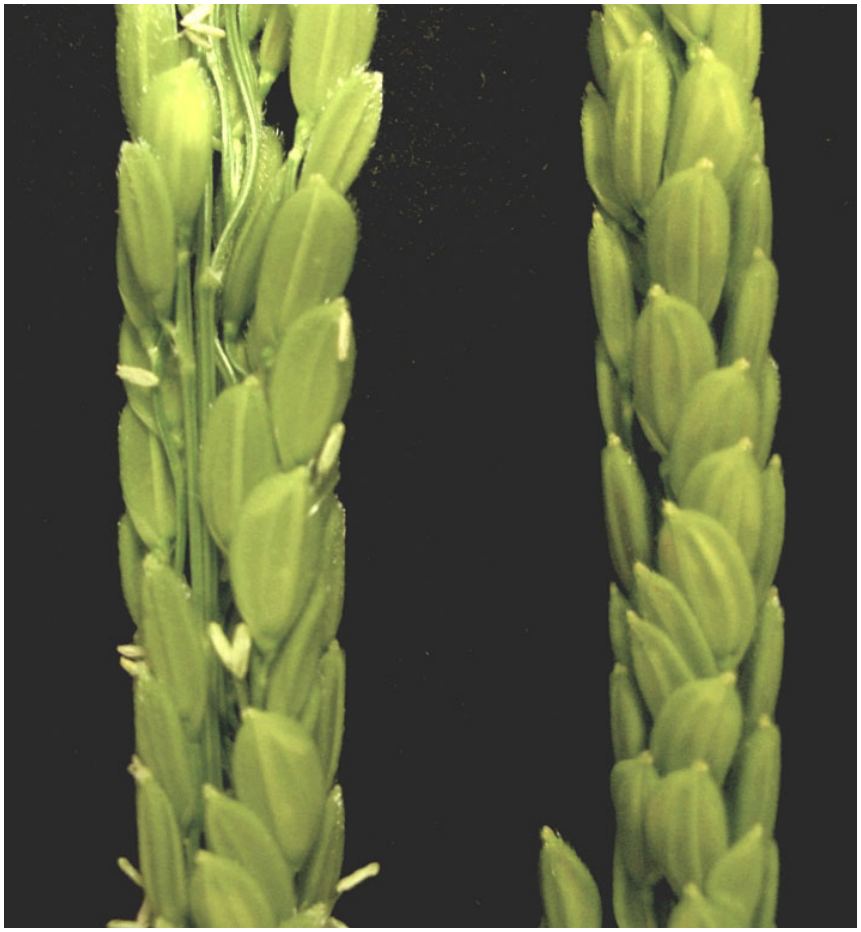
New System for Marker Free Transgenic Crops



Nakanishi *et al*, Japanese Patent 2005-9600 (2005)

Mutant, *spw1-cls*

Flower



WT ***spw1-cls*** **WT** ***spw1-cls***

Thank you for your attention !