

Assessing Nitrogen Use Efficiency Variability In Sorghum

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Introduction

▪ Nitrogen (N) is a vital nutrient for plants. It is mainly absorbed as nitrate (Crawford, 1995), which is chiefly used as a source of inorganic nitrogen in the production of fertilizers. Whether fertilizers are artificial or organic, they can cause serious pollution problems. In fact, nitrogen can impair water and air quality, reduce plant species diversity and exacerbate global warming.

▪ Gaining a comprehensive understanding of nitrogen (N) assimilation and remobilization is important for developing new crop cultivars with improved N use efficiency (NUE) which maintain yield at lowered fertilizer inputs.



Deficiency signs

- ✓ reduced growth
- ✓ Chlorosis

Nitrate 10 mM 0.5 mM

Material under study



Sorghum bicolor

5th most important cereals

- ✓ C4 metabolism
- ✓ Drought and salinity tolerance
- ✓ Genome sequenced

ACCESSIO NS	Days from sowing to flag leave	Days from sowing to heading	Days from sowing to flowering	Number of panicles per plant (3 hills averaged)	Plant height to flag leave (3 plants averaged in cm)	Plant height to tip of panicle (3 plants averaged in cm)	Number of leaves (3 plants averaged)
IS 6193	70,0	77,5	80,0	1,3	221,7	260,8	23,0
IS 14317	56,5	61,5	65,0	1,6	272,5	315,0	18,8
IS 29407	45,5	52,0	54,5	1,1	137,9	215,0	17,7
IS 30436	39,0	42,0	45,5	1,4	197,5	224,2	15,3
SSM 973	83,0	88,0	91,0	1,7	313,3	341,7	26,7
SSM 1049	59,0	64,5	67,0	0,9	292,1	302,5	18,7
SSM 1057	50,0	53,5	57,5	3,0	228,3	277,5	17,0

Material provided by CIRAD collection (210 accessions)

Methodology

An integrated approach to elucidate the genetic architecture of NUE in sorghum using

Biochemistry

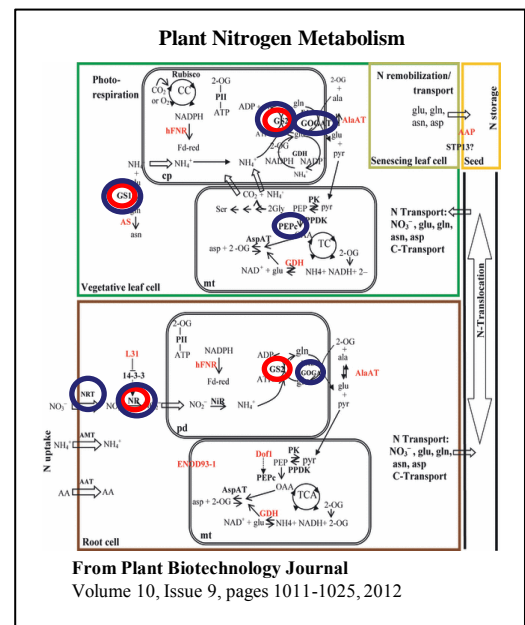
- Nitrate, Nitrogen, Carbon content
- Chlorophyll, amino acid and protein content
- Enzymatic activity of key enzymes (circled in red)

Genetics :

- Gene expression of key actors (circled in blue)
- Association genetics to unravel genomic regions involved in NUE

References

Crawford NM. 1995. Nitrate: nutrient and signal for plant-growth. The Plant Cell 7, 859-868.
 McAILister CH. Et al., 2012. Engineering nitrogen use efficient crop plants: the current status. Plant Biotechnology Journal 10, 1011-1025, 2012



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