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DIFFERENCIAL NITROGEN SOURCE ASSOCIATED METABOLITE CHANGES OF *MEDICAGO TRUNCATULA* INDUCED BY SHORT TERM SALT AND MILD DROUGHT STRESS

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Background

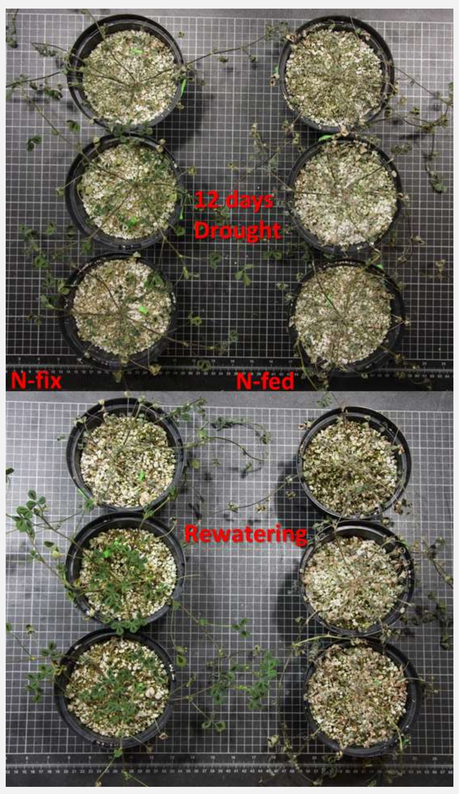
We will show that depending on nitrogen sources, the response of *Medicago truncatula* to abiotic stresses is resulting in differential metabolic changes. Possible mitigation effects of salt and drought stress due to plants-symbiont interactions were previously reviewed by Dimpka et al. (2009). However, the underlying molecular mechanisms remain to be unraveled. Therefore we used *M. truncatula* growing under two different nitrogen nutritions:

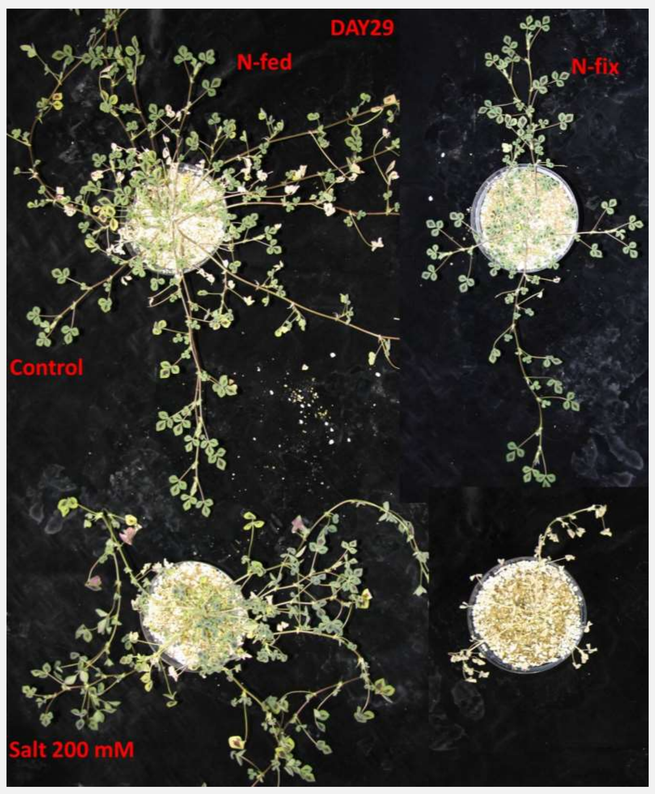
a) fertilized with 2,5mM ammonium nitrate and
b) nitrogen fixing plants inoculated with *Sinorrizobium meliloti*.

Methanol/chloroform/water extracts from shoots and roots were analyzed using triple quadrupole and GC-TOF mass spectrometry.

Results

N-fixing plants show a higher tolerance to **DROUGHT** than the fertilized plants (le)
While he nitrogen fertilized plants show a higher tolerance to **SALT** (ri)





Metabolite fold changes	root			shoot		
	S_{50}io vs Cio	S_{200}io vs Cio	Dio vs Cio	S_{50}io vs Cio	S_{200}io vs Cio	Dio vs Cio
gaba	0.5	0.5	2.0	1.2	1.1	0.5
aspartate	3.3	0.6	2.8	0.6	1.2	0.3
leucine	ns	1.1	ns	2.2	2.2	2.0
threonate	2.9	ns	2.8	0.6	0.8	0.7
glutamate	0.6	0.9	ns	ns	1.1	ns
proline	ns	1.5	12.1	0.8	0.8	ns
fumarate	2.3	ns	3.3	1.5	1.7	0.5
galactonate	2.8	ns	2.0	1.9	0.9	ns
sucrose	4.4	ns	2.1	1.3	1.4	1.0
myo-inositol	0.7	1.6	2.0	24.2	1.2	ns
ononitol	ns	ns	2.0	2.0	1.2	ns
pinitol	ns	1.2	ns	1.5	1.6	ns

Drought (D)
Salt stress (S):
S_{50}= 50mM
S_{200}=200mM
io= Inoculated with *S.meliloti*

Specific significant changes observed on the **N-fixing** plants:

- **DROUGHT**

  Shoots DECREASE of aspartate, malonate, maleate, fumarete, threonate,
  Roots: INCREASE of beta-alanine, ribitol, threonate, malate, ribonate, gluconate, succinate

- **SALT**

  S50-Shoots: DECREASE of glycerate and pyroglutamate and INCREASE of benzoate, ononitol and oxalat
  S50-Roots: DECREASE of fumarate, maleate, glycerate
  S200-Shoots: DECREASE of ketoglutarate, methyl-d-glycoside and succinate and INCREASE of isoleucine, glutamate and maltose
  S200-Roots: DECREASE of benzoate and ethanolamine

Conclusion

- Significant difference between nitrogen metabolism in response to salt and drought stress.
- Type of the N-source seems to have a major impact on the differential regulation to stress

  DROUGHT : the roots of the **N-fixing** show stronger increase of metabolites than **N-fertilized** plants
  SALT : the roots of the **N-fertilized** plants show stronger increase of metabolites than **N-fixing** plants

References& Acknowledgement

Dimpka, Ch., Weinand, T., & Asch, F. (2009), **Plant–rhizobacteria interactions alleviate abiotic stress,** *Plant, Cell and Environment,* Vol. **32**, pp. 1682–1694.

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