

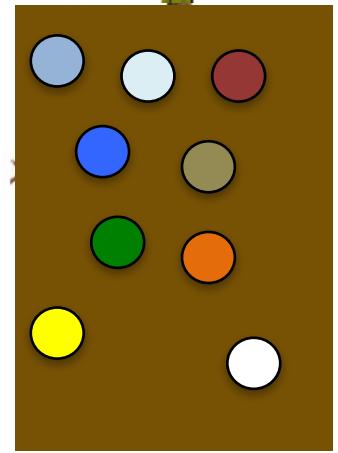
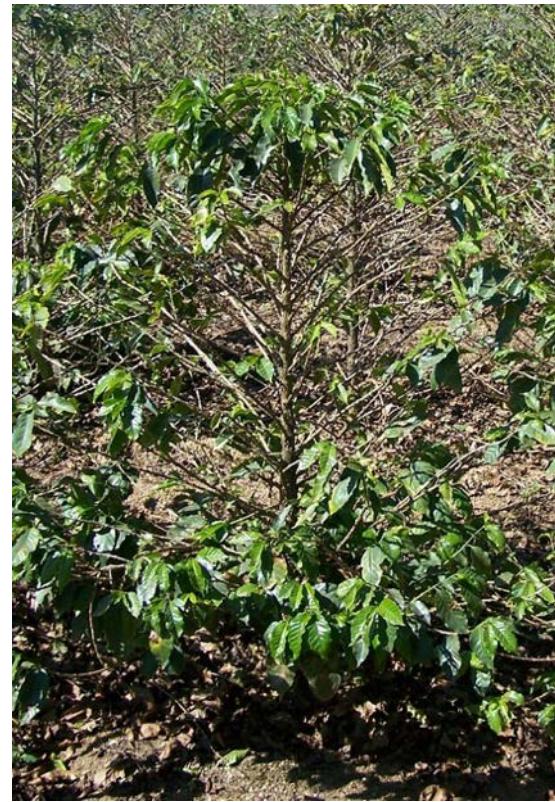
Simpósio IPNI Brasil

BOAS PRÁTICAS PARA USO EFICIENTE DE FERTILIZANTES EM CAFÉ

Poços de Caldas - MG • 27 e 28 DE SETEMBRO/2016

Atualidades em nutrição do cafeiro

Prof. Dr. Tiago Tezotto
Unifeob



Demandas de nutrientes

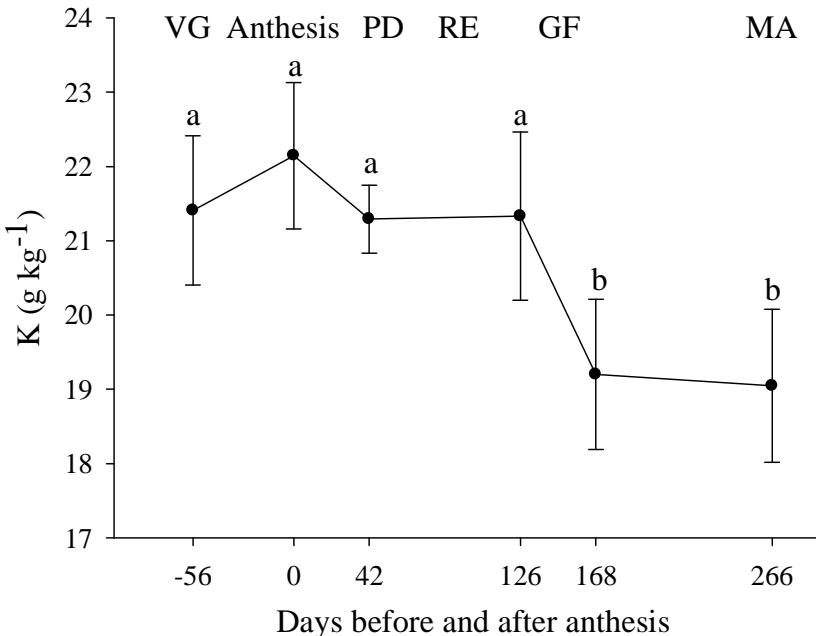
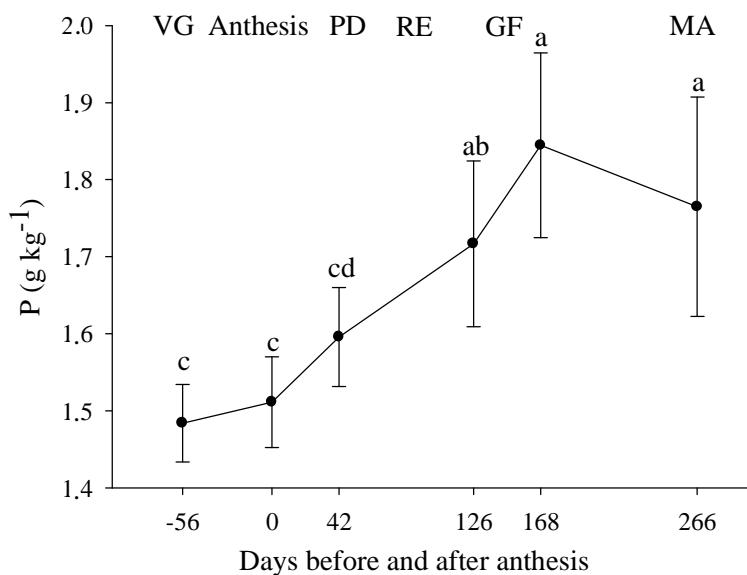
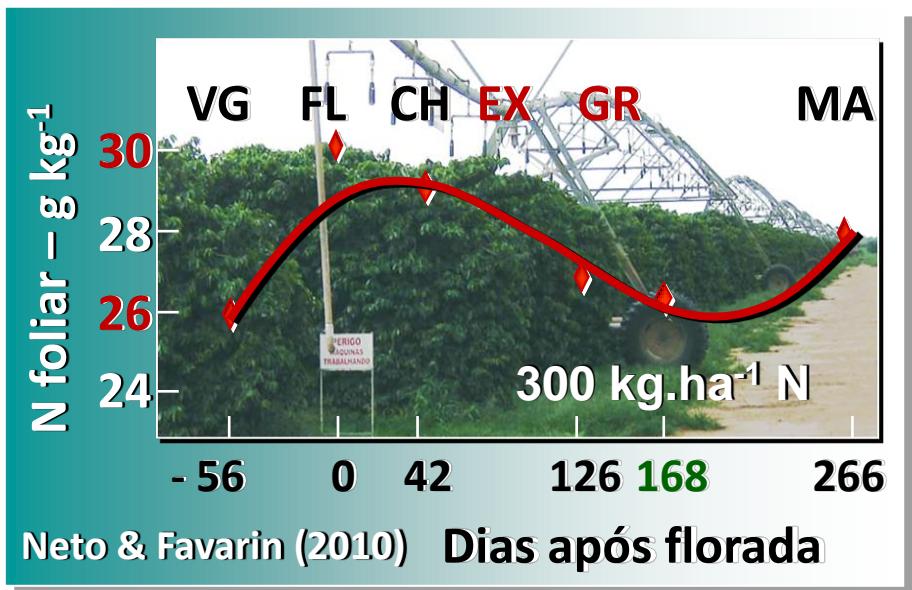
scs ha ⁻¹	vegetação			Frutos			Total		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
29,6	114,0	6,2	117,5	110,5	7,8	152,6	224,5	14,0	270,1
61,3	62,9	10,8	123,8	228,4	10,5	226,3	291,3	21,3	350,1

Santinato et al. (2006) - 5.000 plantas ha⁻¹

Changes of nutritional status during a phenological cycle of coffee under high nitrogen supply by fertigation

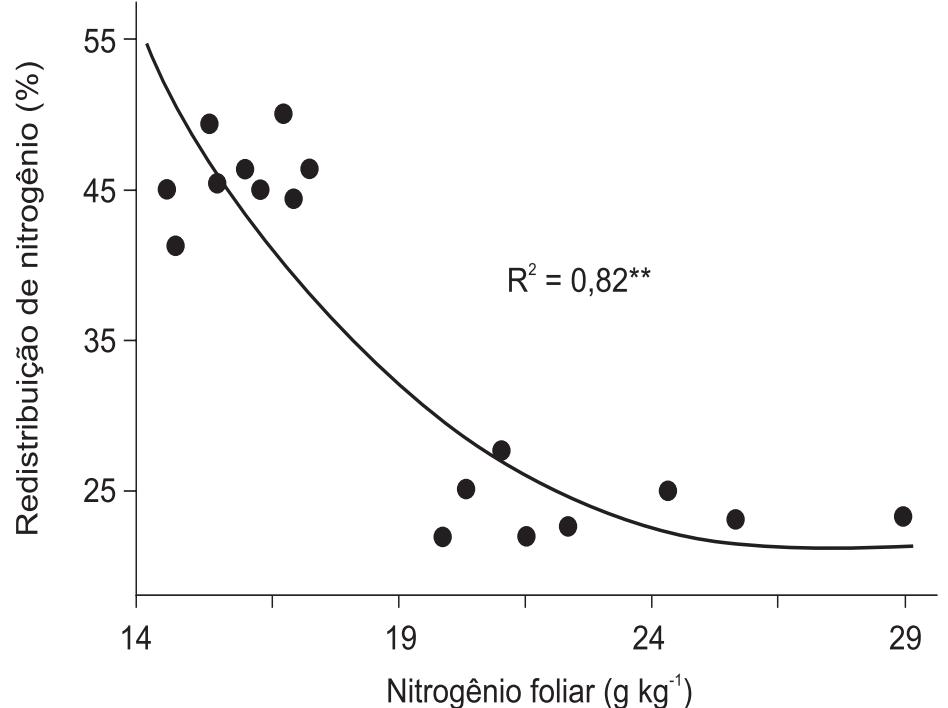
Ana Paula Neto,¹ José Laércio Favarin,¹ Rodrigo Estevam Munhoz de Almeida,¹ Carlos Tadeu dos Santos Dias,¹ Tiago Tezotto,¹ André Luís Garcia Alves,¹ and Milton Ferreira Moraes¹

¹Luiz de Queiroz College of Agriculture, University of São Paulo, Piracicaba, Brazil

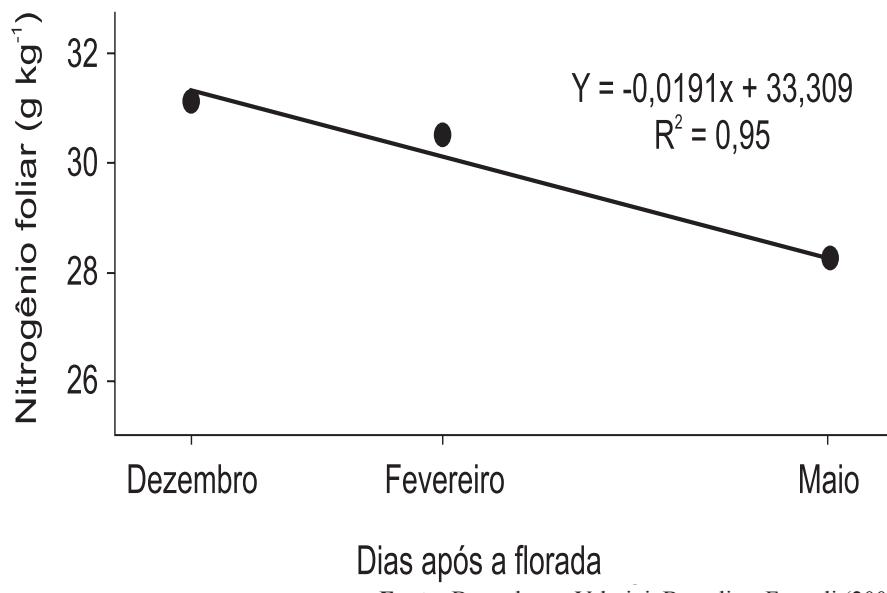


	N	P	K g kg ⁻¹	Ca	Mg	S	B	Cu	Mn	Zn
Cafeiro*	29-32	1,6-1,9	22-25	13-15	4-4,5	1,5-2	50-60	11-14	80-100	15-20

*Malavolta et al. (1997)



Fonte: Baseado em Lima Filho e Malavolta (2003).

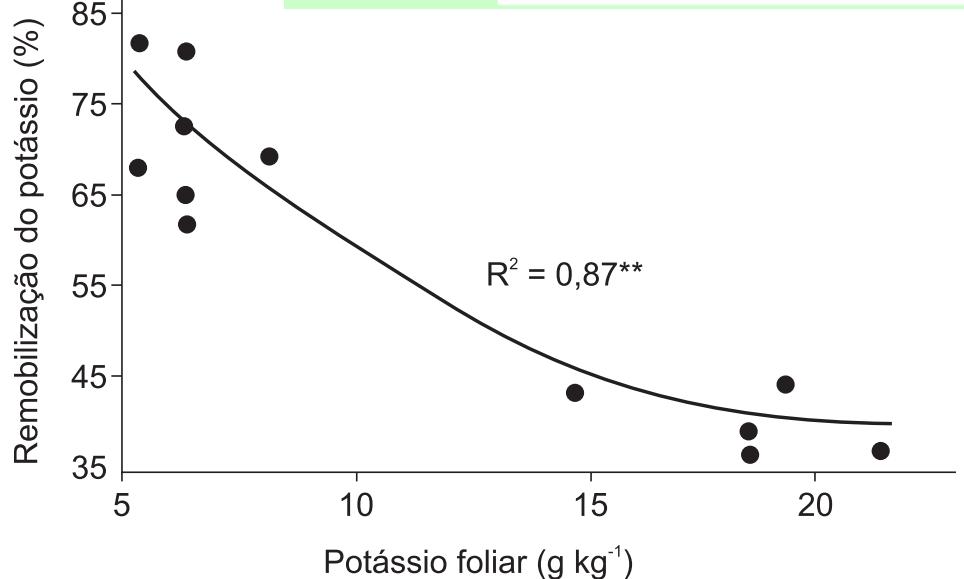


Dias após a florada

Fonte: Baseado em Valarini, Bataglia e Fazuoli (2005).

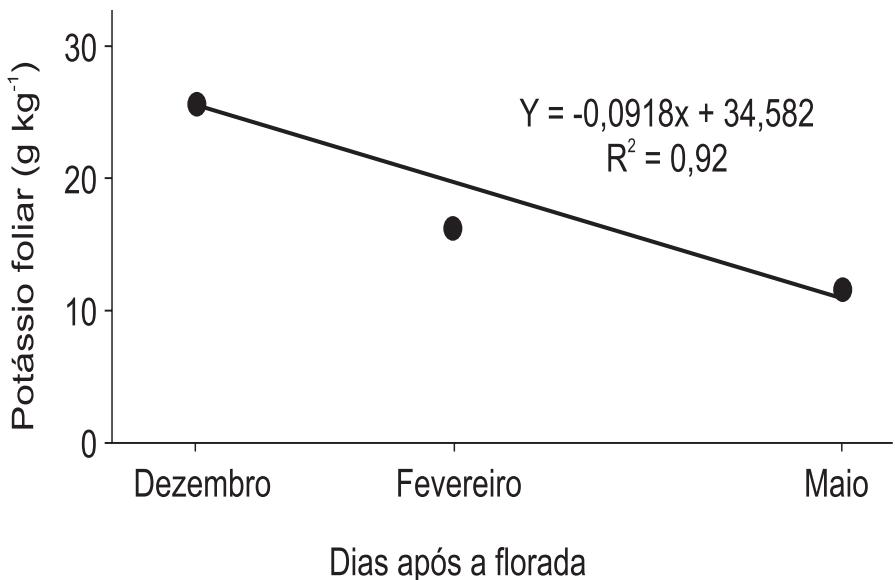
N	P	K	Ca	Mg	S	B	Cu	Mn	Zn	
						g kg ⁻¹	mg kg ⁻¹			
29-32	1,6-1,9	22-25	13-15	4-4,5	1,5-2	50-60	11-14	80-100	15-20	

Cafeiro*



*Malavolta et al. (1997)

Fonte: Baseado em Lima Filho e Malavolta (2003).



Fonte: Baseado em Valarini, Bataglia e Fazuoli (2005).



Analysis of Phosphorus Use Efficiency Traits in *Coffea* Genotypes Reveals *Coffea arabica* and *Coffea canephora* Have Contrasting Phosphorus Uptake and Utilization Efficiencies

Ana P. Neto^{1*}, José L. Favarin¹, John P. Hammond², Tiago Tezotto³ and Hilton T. Z. Couto⁴

Key Results: Coffee plant growth was significantly reduced under low Pi availability, and P concentration was higher in cultivars of *C. canephora*. The young leaves accumulated more P than any other tissue. The cultivars of *C. canephora* had a higher root/shoot ratio and were significantly more efficient in P uptake, while the cultivars of *C. arabica* were more efficient in P utilization. Agronomic P use efficiency varied among coffee cultivars and E16 Shoa, E22 Sidamo, lêmen and Acaiá cultivars were classified as the most efficient and responsive to Pi supply. A positive correlation between P uptake efficiency and root to shoot ratio was observed across all cultivars at low Pi supply. These data identify *Coffea* genotypes better adapted to low soil Pi availabilities, and the traits that contribute to improved P uptake and use efficiency. These data could be used to select current genotypes with improved P uptake or utilization efficiencies for use on soils with low Pi availability and also provide potential breeding material and targets for breeding new cultivars better adapted to the low Pi status of Brazilian soils. This could ultimately reduce the use of Pi fertilizers in tropical soils, and contribute to more sustainable coffee production.

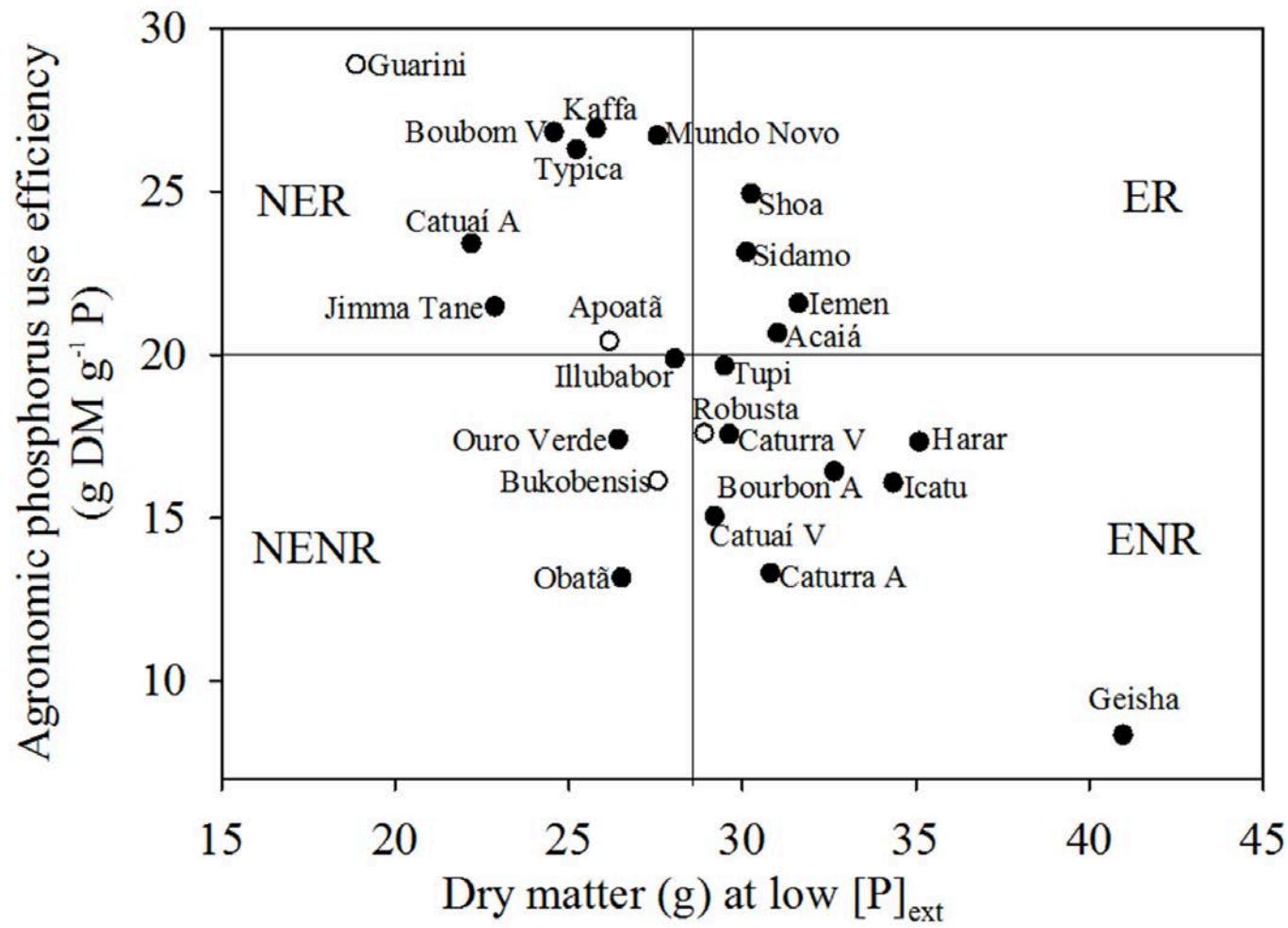


FIGURE 2 | Relationship between shoot dry matter (DM) at low P and responsiveness to P, measured as agronomic phosphorus (P) use efficiency for different coffee cultivars. *Coffea arabica* (closed symbols) and *C. canephora* (open symbols). Solid lines represent the mean value for the axis. NER, non-efficient and responsive; ER, efficient and responsive; ENR, efficient and non-responsive; NENR, non-efficient and non-responsive.

Boro



- Baixa matéria orgânica
- Textura arenosa

Tratamentos	M 3 safras Sacas ha ⁻¹	Boro mg dm ⁻³
Sem boro	44,4	0,4
H_3BO_3 (0,5%) - 4x	43,6	0,6
H_3BO_3 - 3 kg.ha ⁻¹	43,0	0,5
H_3BO_3 - 6 kg.ha ⁻¹	42,4	0,4
H_3BO_3 - 9 kg.ha ⁻¹	48,2	0,5

Garcia & Fioravante (2003) - **Boro solo: 0,2 a 0,6**



Coffee is highly tolerant to cadmium, nickel and zinc: Plant and soil nutritior status, metal distribution and bean yield

Tiago Tezotto ^a, José Laércio Favarin ^a, Ricardo Antunes Azevedo ^b, Luis Reynaldo Ferracciú Alleoni ^c
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Zinco ⁽¹⁾ mg dm ⁻³	Folha mg kg ⁻¹ - 128 DAP	Ramo 128 DAP	Fruto 128 DAP	Sacas ha ⁻¹
4,8	10,0	26,2	4,0	59,9a
115,6	13,0	39,5	5,3	45,6a
193,3*	11,8	83,0	5,0	55,1a
328,2*	20,2	217,0	6,3	27,4b

Tezotto & Favarin (2010) - ⁽¹⁾ DTPA (0,6 a 1,2) - *morte

Evolução do cafeiro exposto as doses de Zn

60 dias



321 dias



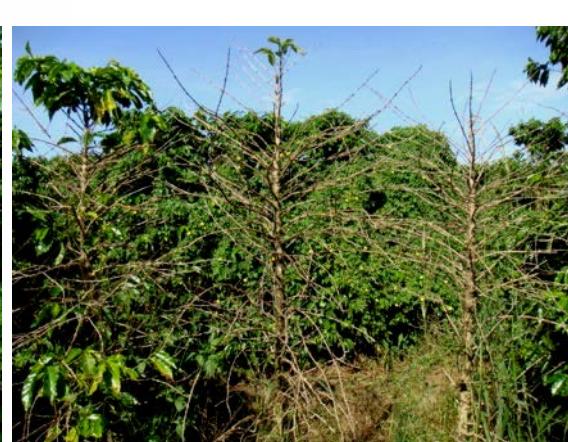
660 dias



100



300



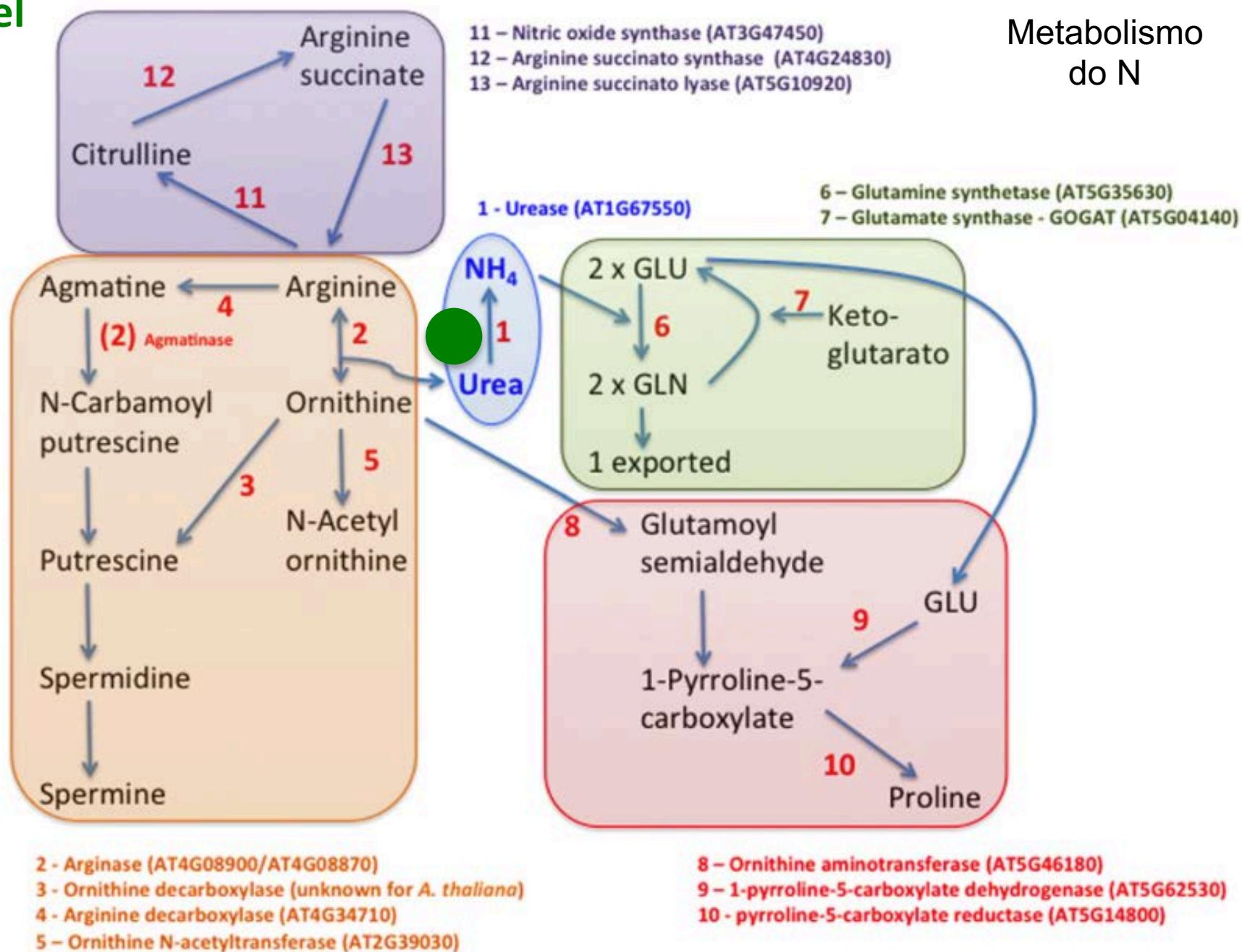
600

Molibdênio



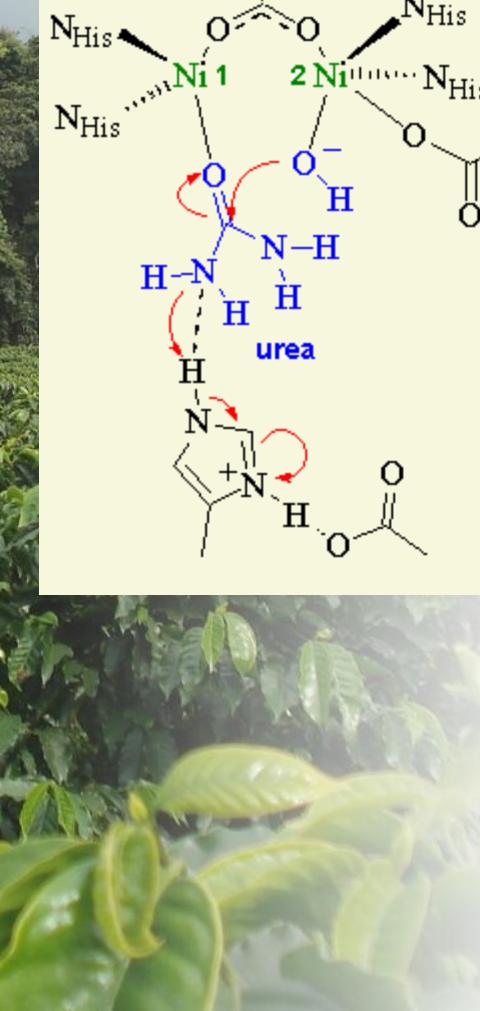
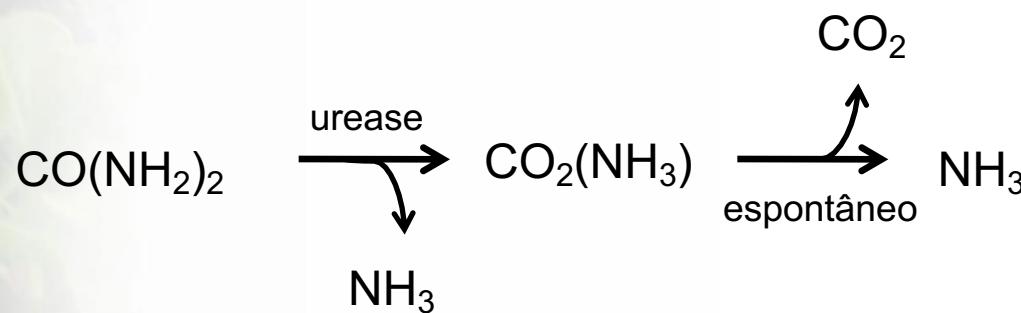
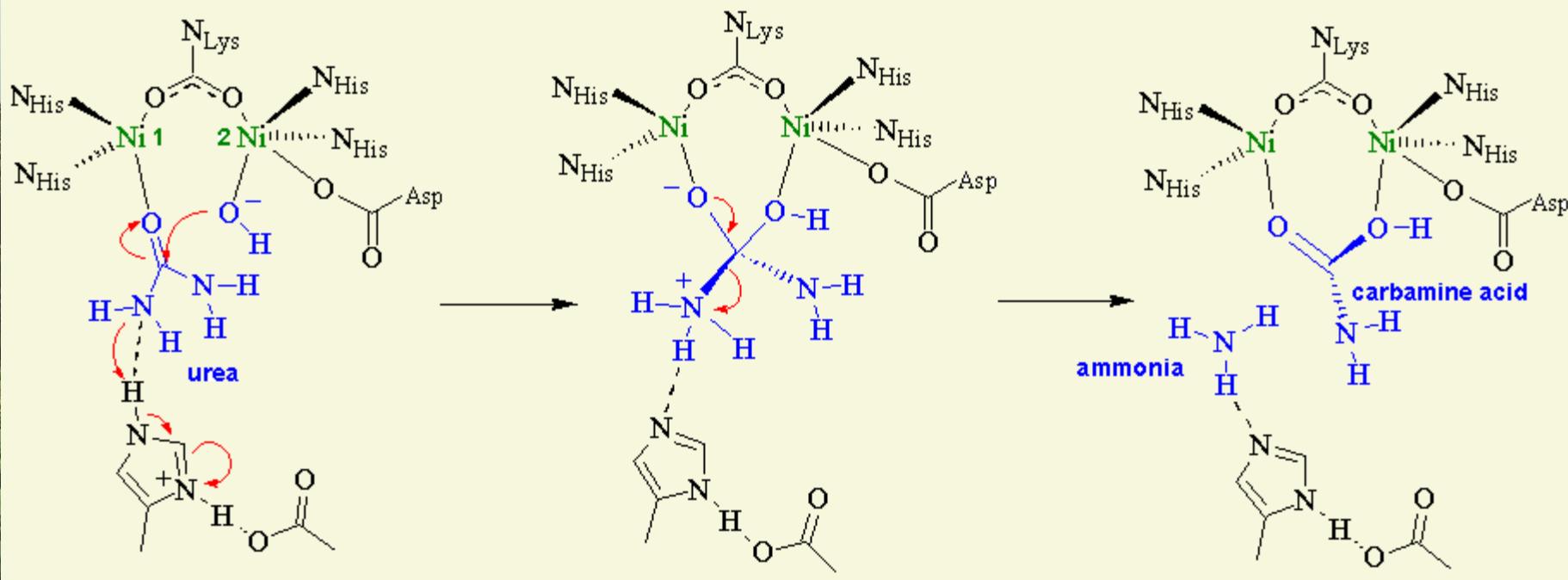
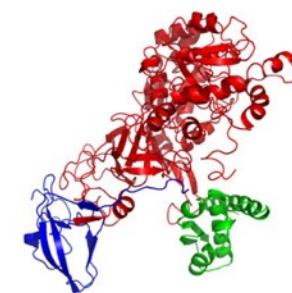
Enxofre	Molibdênio foliar (mg kg^{-1})
Sem	2,3
59 kg ha^{-1} de enxofre	1,7

Fonte: Baseada em MacLeod, Gupta e Stanfield (1997).

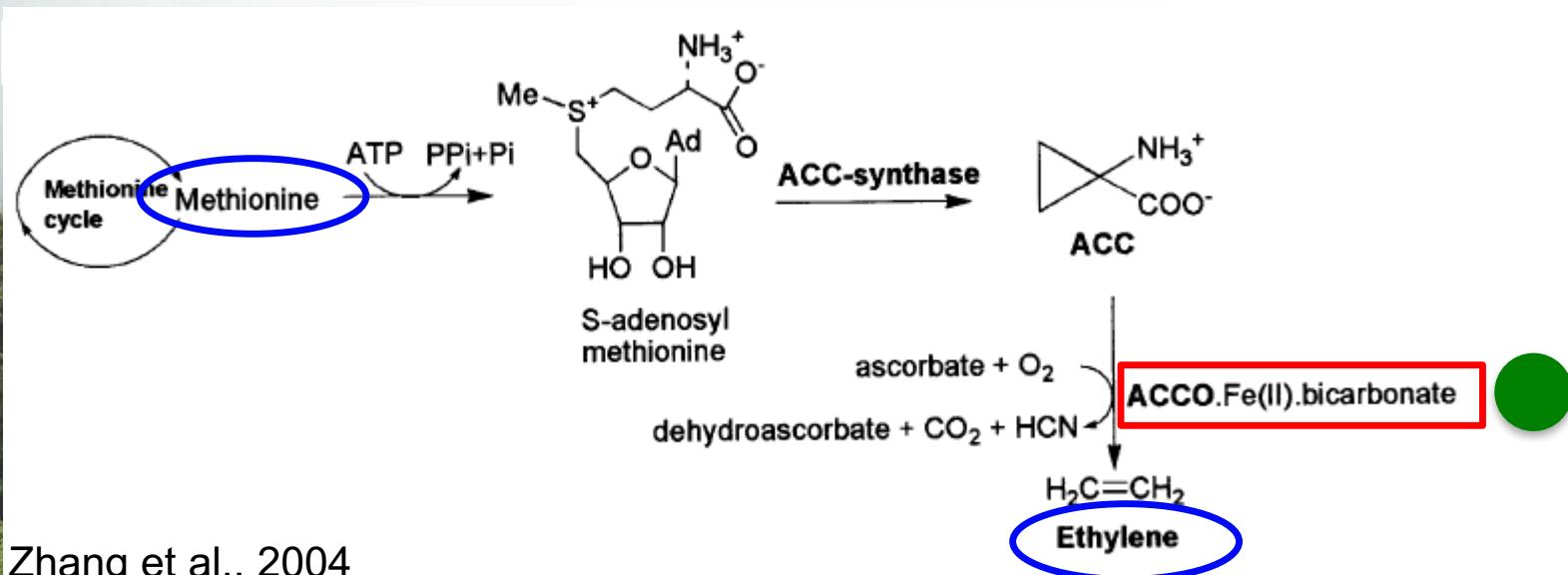


Como Nutriente...

Metaloenzima urease e Ni

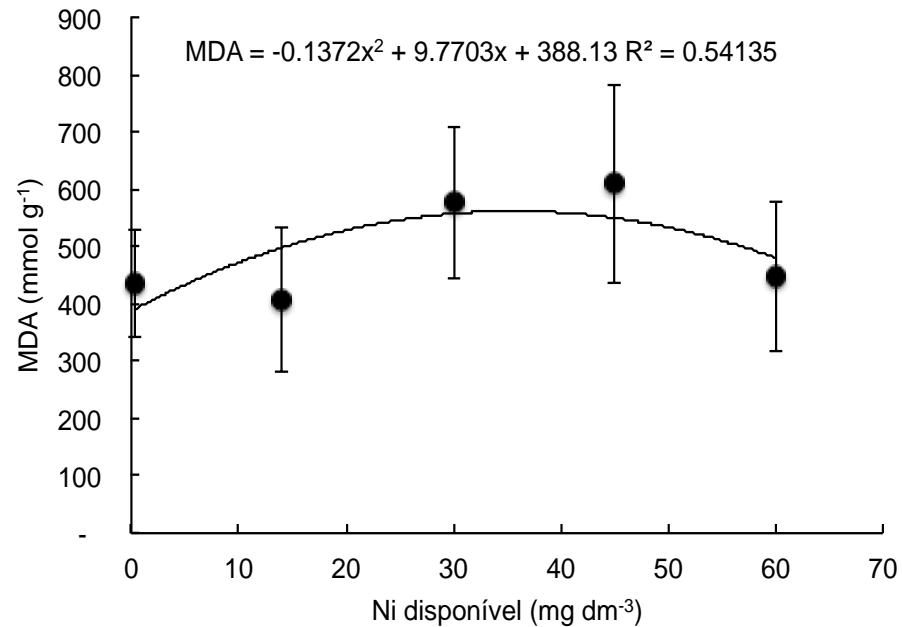
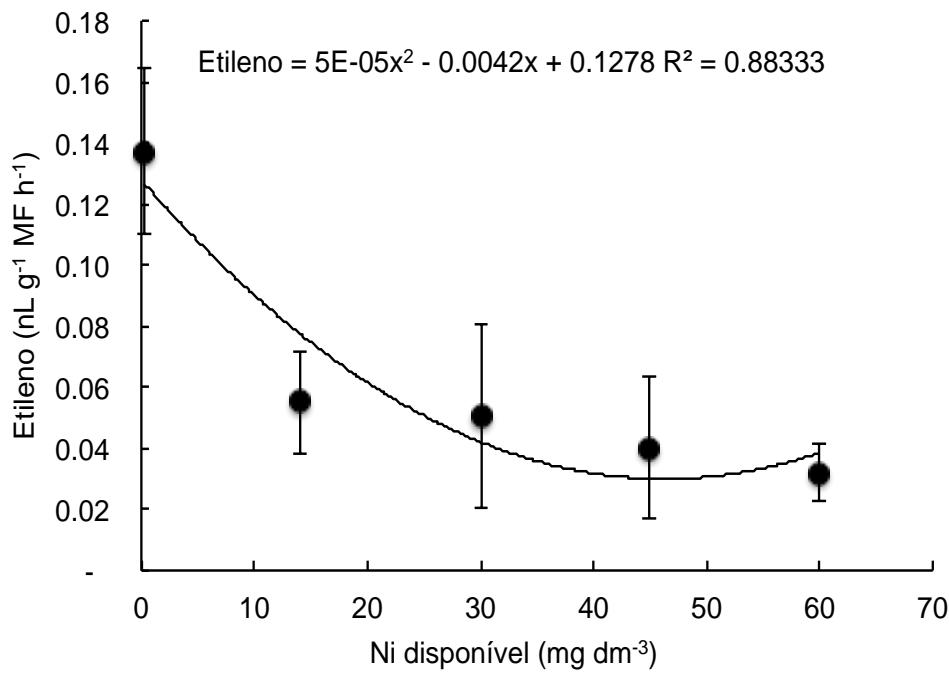


Metabolismo da biossíntese do etileno



Zhang et al., 2004

Ni²⁺ inibe a atividade da ACC oxidase, possivelmente pela substituição do Fe²⁺ (McGarvey & Christoffersen, 1992)



Estádio de maturação dos frutos nas safras 2007/2008 e 2008/2009, em razão da aplicação de Ni

Aplicado g planta ⁻¹	Verde			Cereja			Seco			
	2008	2009	Média	2008	2009	Média %	2008	2009	Média	
Ni	35	19,6 ± 8,3	61,6 ± 16,1	40,6 ± 8,4	66,3 ± 12,8	35,2 ± 16,7	50,8 ± 6,4	14,1 ± 7,8	3,1 ± 6,8	8,6 ± 4,3
	105	22,9 ± 12,7	56,8 ± 19,4	39,8 ± 10,7	71,3 ± 14,3	34,2 ± 7,8	52,7 ± 10,6	5,8 ± 1,8	9,0 ± 18,0	7,4 ± 9,4
	210	8,6 ± 6,1	77,7 ± 5,2	43,1 ± 3,1	75,9 ± 5,5	21,0 ± 6,5	48,5 ± 4,8	15,5 ± 5,1	1,1 ± 2,2	8,3 ± 2,8



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Coffee is highly tolerant to cadmium, nickel and zinc: Plant and soil nutrition status, metal distribution and bean yield

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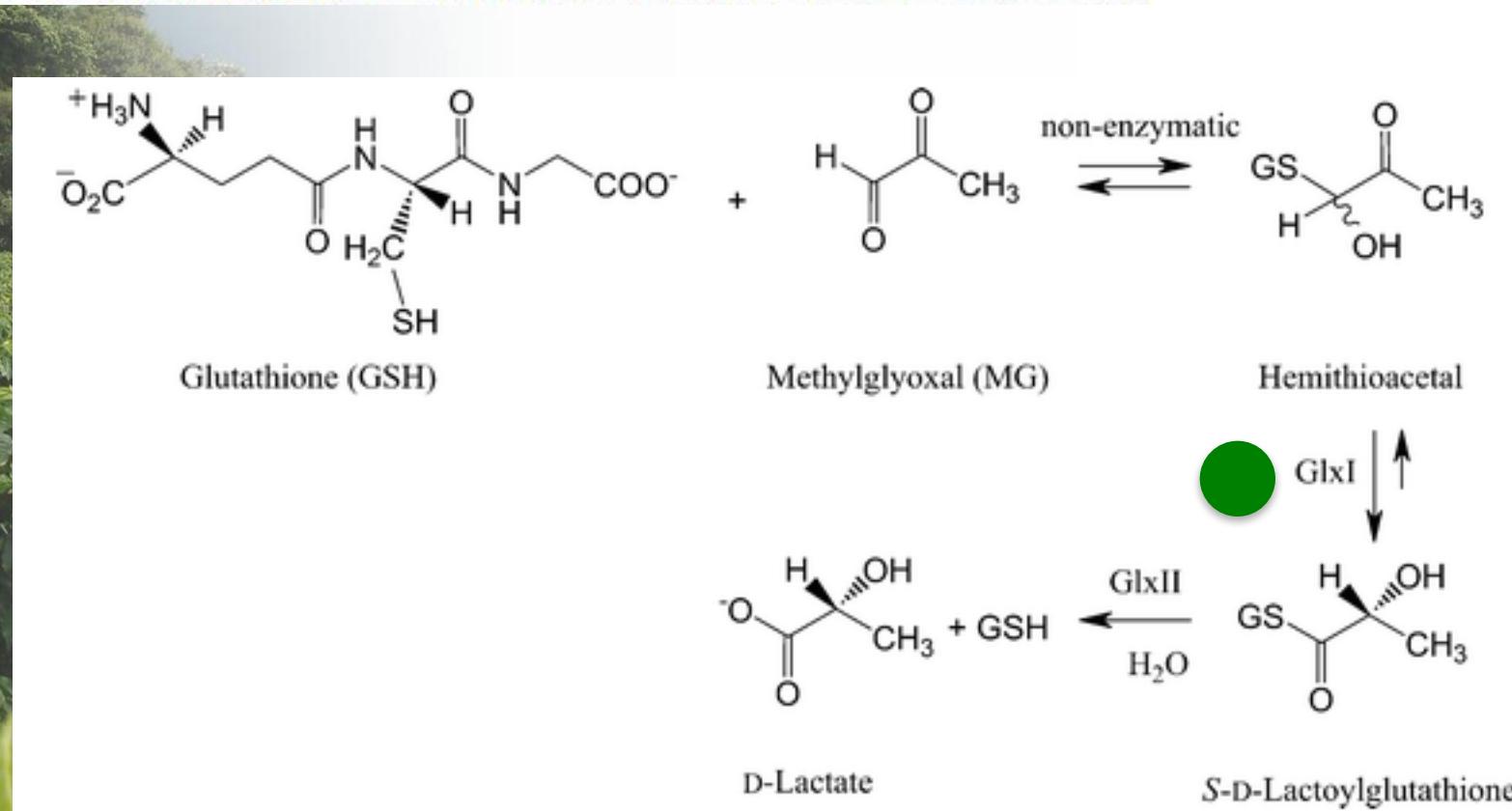
^b Departamento de Genética, Escola Superior de Agricultura Luiz de Queiroz, CP 9, Universidade de São Paulo, 13418-900 Piracicaba, SP, Brazil

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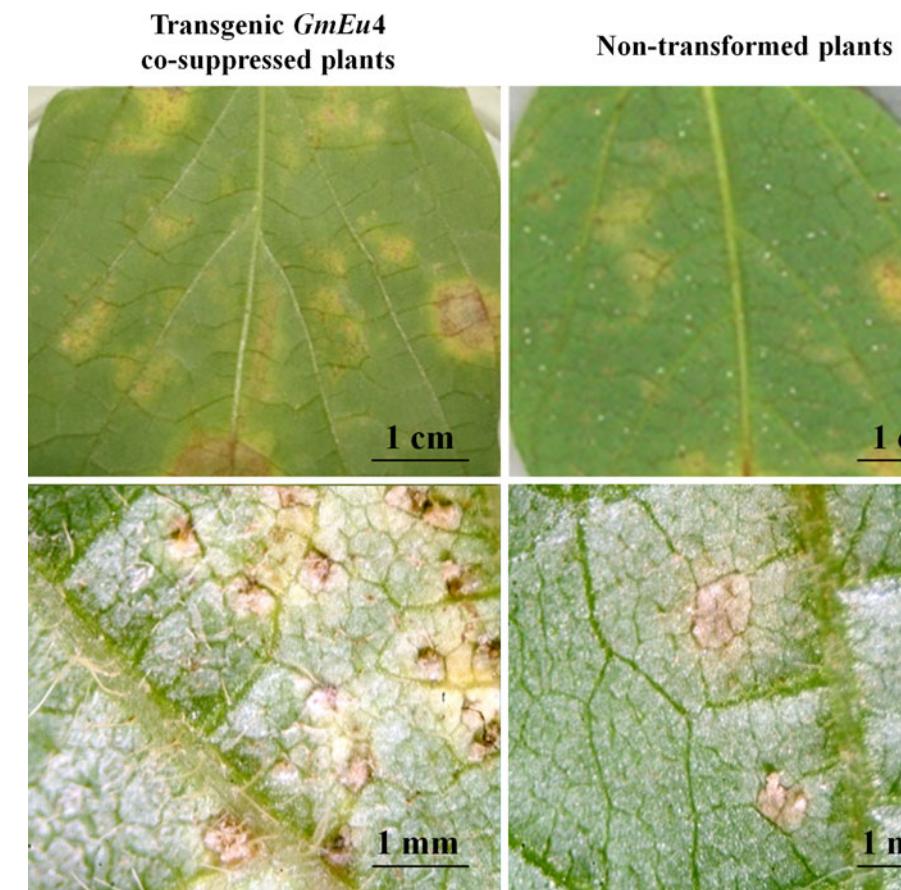
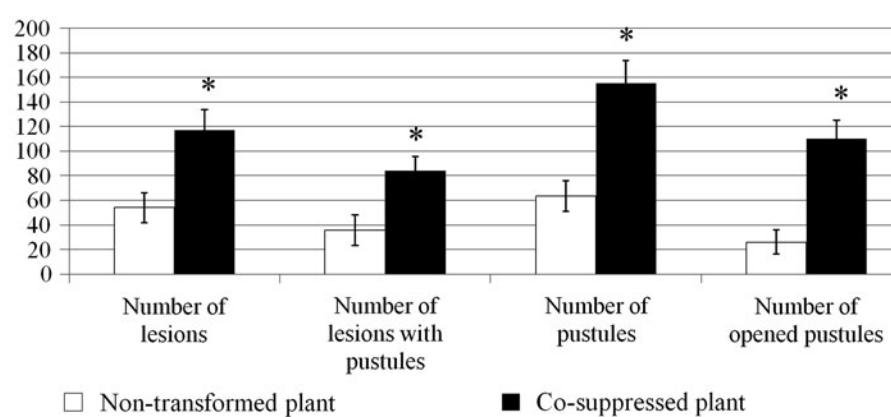
A unique Ni²⁺-dependent and methylglyoxal-inducible rice glyoxalase I possesses a single active site and functions in abiotic stress response

Ananda Mustafiz^{1,†}, Ajit Ghosh^{1,†}, Amit K. Tripathi¹, Charanpreet Kaur¹, Akshay K. Ganguly², Neel S. Bhavesh², Jayant K. Tripathi³, Ashwani Pareek⁴, Sudhir K. Sopory¹ and Sneh L. Singla-Pareek^{1,*}

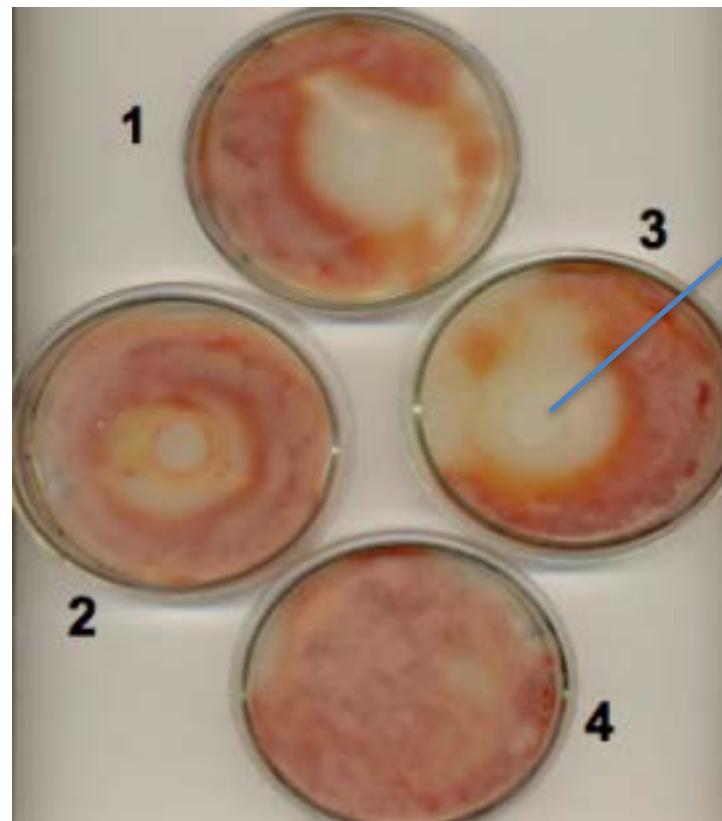


Ubiquitous urease affects soybean susceptibility to fungi

Beatriz Wiebke-Strohm · Giancarlo Pasquali · Márcia Margis-Pinheiro ·
Marta Bencke · Lauro Bücker-Neto · Arlete B. Becker-Ritt · Anne H. S. Martinelli ·
Ciliana Rechenmacher · Joseph C. Polacco · Renata Stolf · Francismar C. Marcelino ·
Ricardo V. Abdelnoor · Milena S. Homrich · Emerson M. Del Ponte ·
Celia R. Carlini · Mayra C. C. G. De Carvalho · Maria Helena Bodanese-Zanettini



500 µg urease



fungo Penicillium herquei



Obrigado ...

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