TALLER METRICE 2010

"Mejorar la eficiencia en el uso de insumos y el ajuste fenológico en cultivos de trigo y cebada"

Universidad de la República, Paysandú, Uruguay

FISIOLOGÍA DE LA GENERACIÓN DEL RENDIMIENTO AFECTADA POR ENFERMEDADES FÚNGICAS FOLIARES

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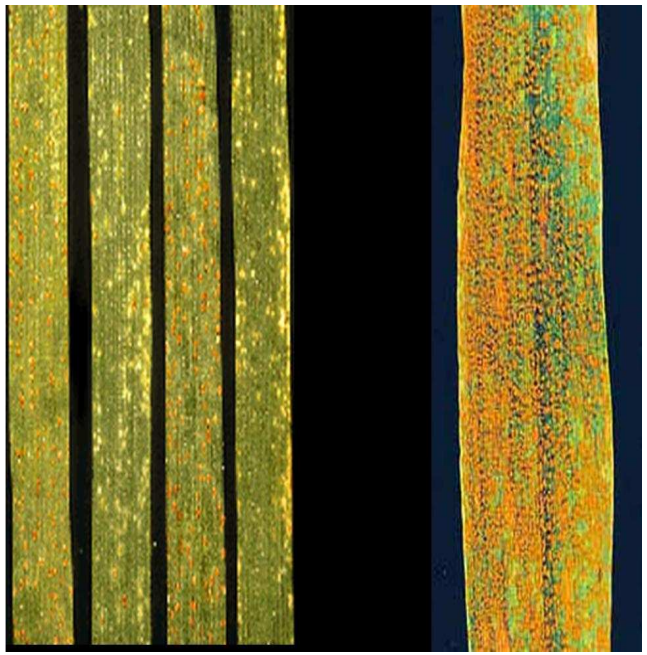
Dr. Daniel J. Miralles

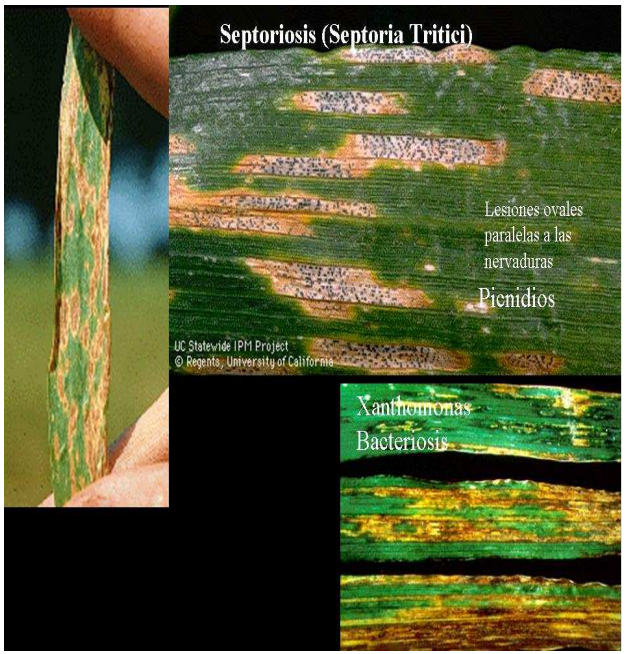
Introducción

Las enfermedades foliares son las principales restricciones bióticas que reducen los rendimientos de trigo en Argentina.

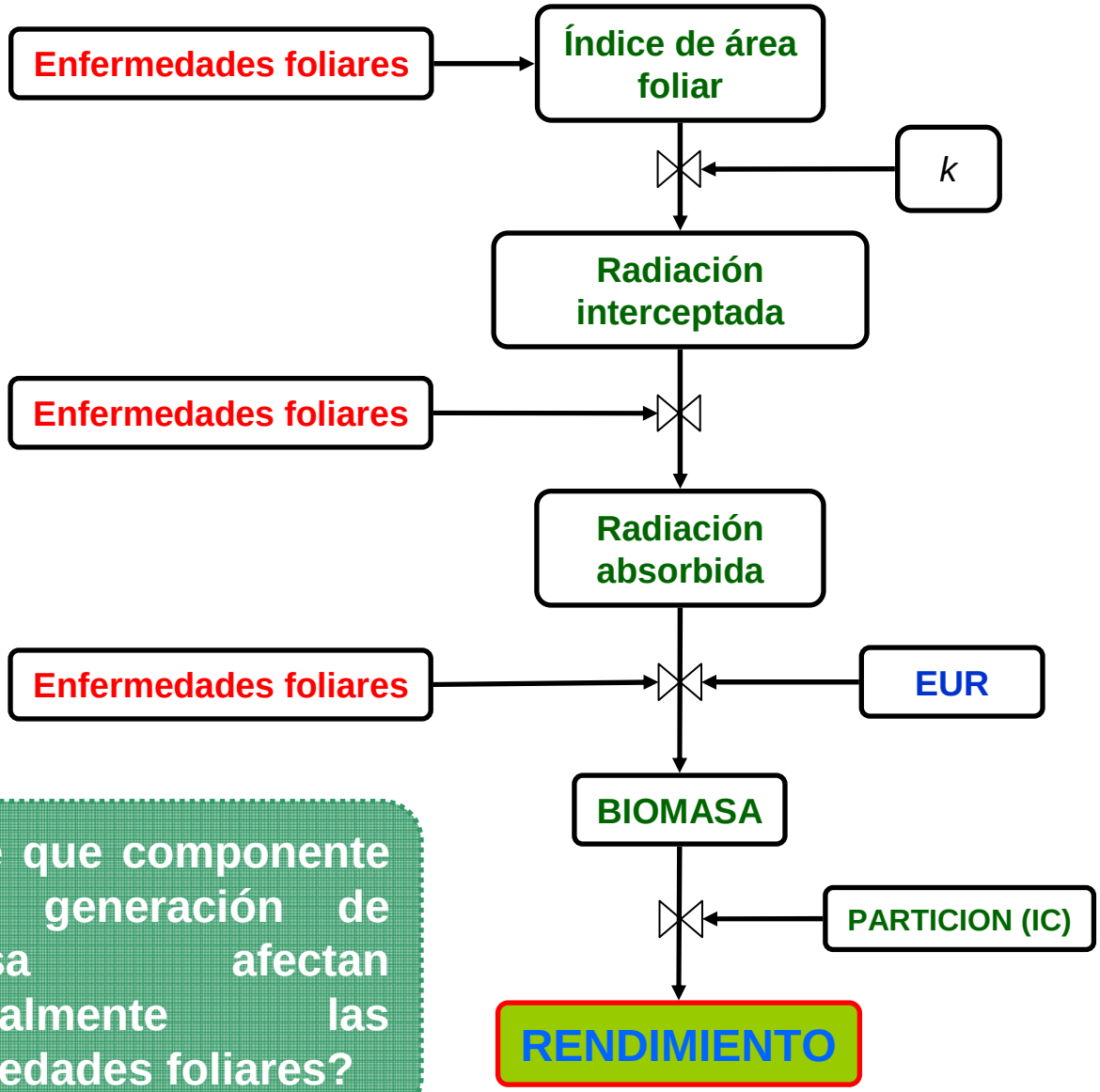
Por su frecuencia de aparición y los niveles de incidencia y severidad, las mas importantes son:

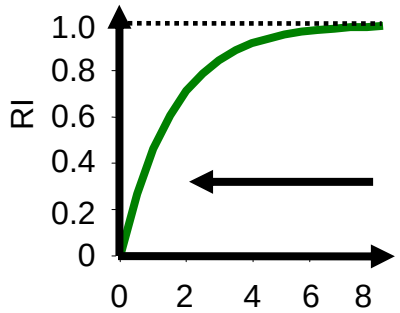
“Roya de la hoja” **“Mancha amarilla”** **“Septoriosis”**

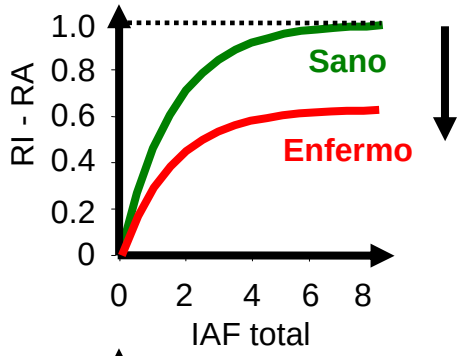


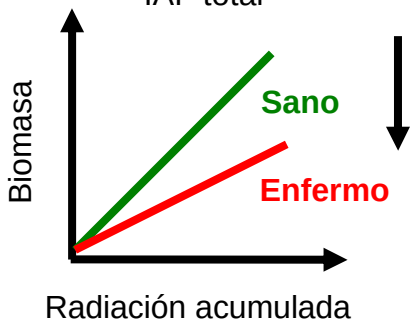


Introducción





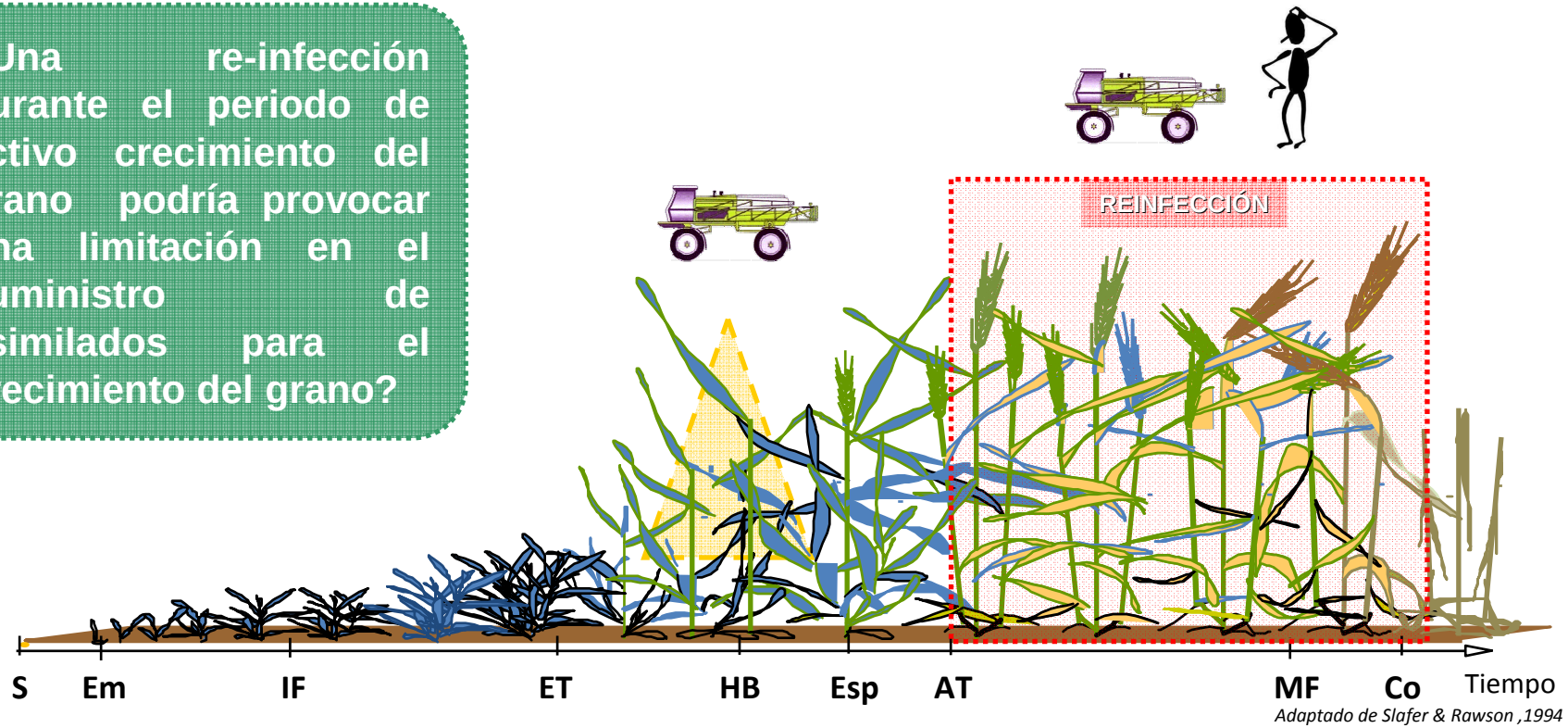




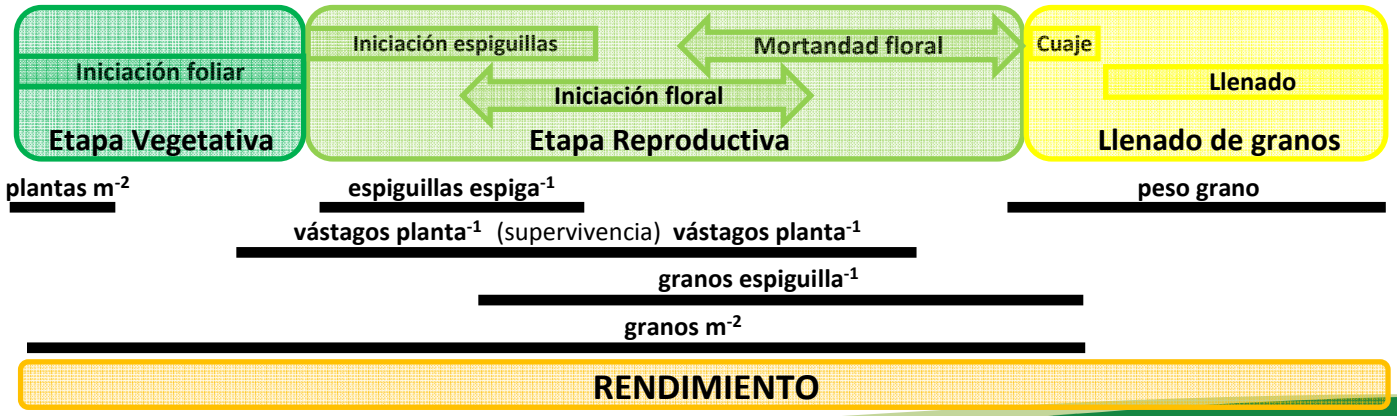
¿Sobre que componente de la generación de biomasa afectan principalmente las enfermedades foliares?

Introducción

¿Una re-infección durante el periodo de activo crecimiento del grano podría provocar una limitación en el suministro de asimilados para el crecimiento del grano?



Adaptado de Slafer & Rawson ,1994



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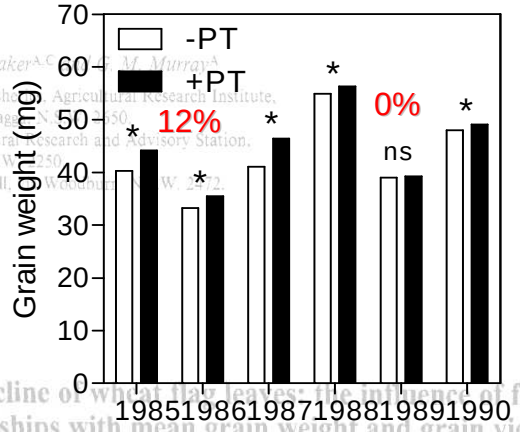
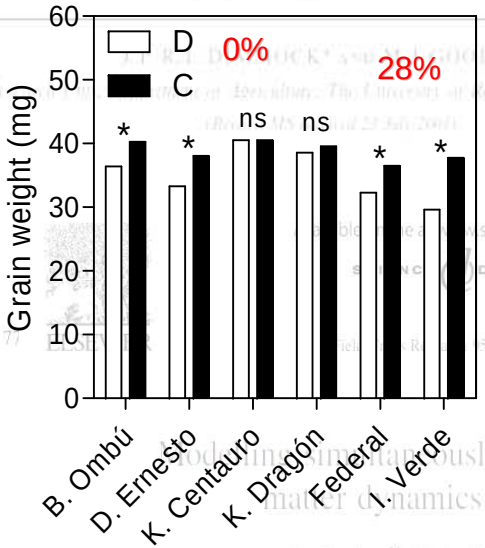
Introducción

Numerosos autores (Cornish et al., 1990; Dimmock et al., 2002; Gooding et al, 2002; Pepler et al., 2006) han mostrado una amplia variabilidad en la respuesta del PG a las enfermedades foliares (0 – 25 %).



Adaptado de Gooding et al. (1994)



Adaptado de Simón et al. (2002)

¿Qué factor/es podrían estar involucrados en la variabilidad de respuesta en el peso de grano?

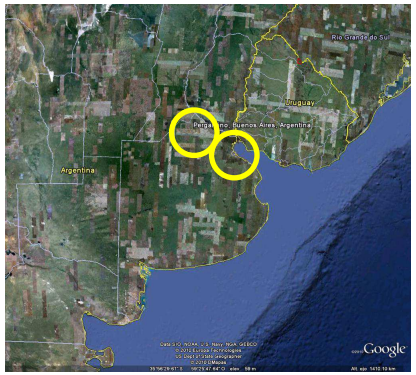
Objetivos

Explorar cual/es atributos de la generación de biomasa (RI-EUR) son afectados principalmente por enfermedades foliares.

Determinar a que factor/es del cultivo podría estar asociada la variabilidad encontrada en las respuestas del PG a la presencia de enfermedades foliares.

Determinar si las reducciones en el PG por enfermedades foliares son producto de disminuciones en el PG potencial o si estan asociadas a limitaciones en el suministro de asimilados para el crecimiento de los granos.

Materiales y Métodos



ARRECIFES (2002)

PERGAMINO (2004-2005)

(2004/05/07/08/09)

FAUBA

GRIGNON (2004-2005)

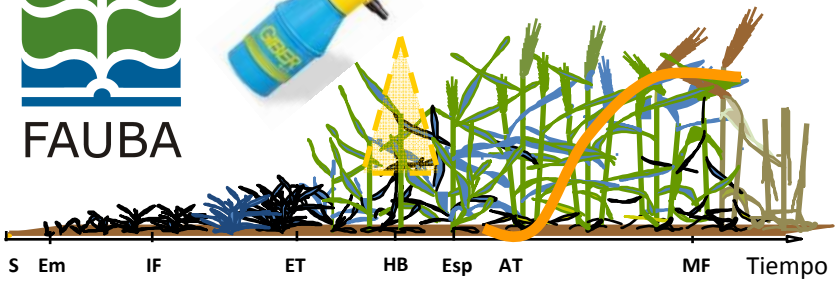
INRA

Tratamiento

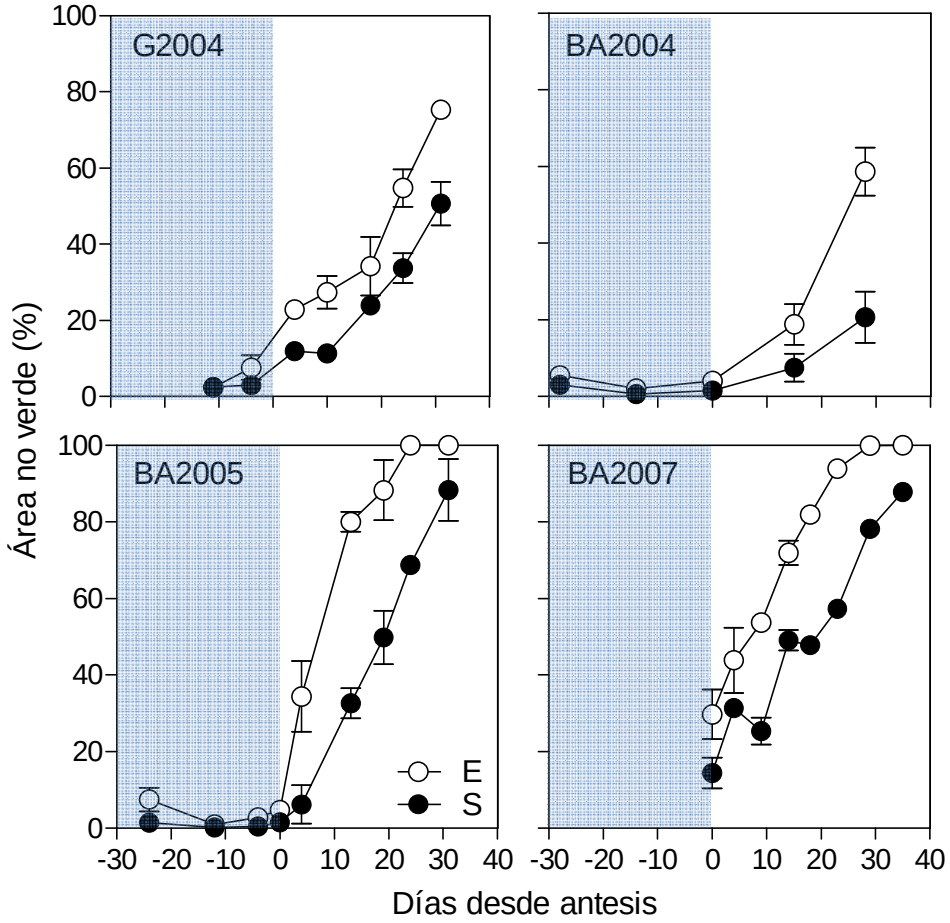
Primeros síntomas-MF
Folicur ®

FAUBA

Inoculación artificial



Resultados. *Evolución de las enfermedades en el cultivo*



El complejo de enfermedades foliares aparecieron en el cultivo durante el período de llenado de granos. La severidad fue muy baja durante el período crítico.

Resultados. *Captura de radiación*

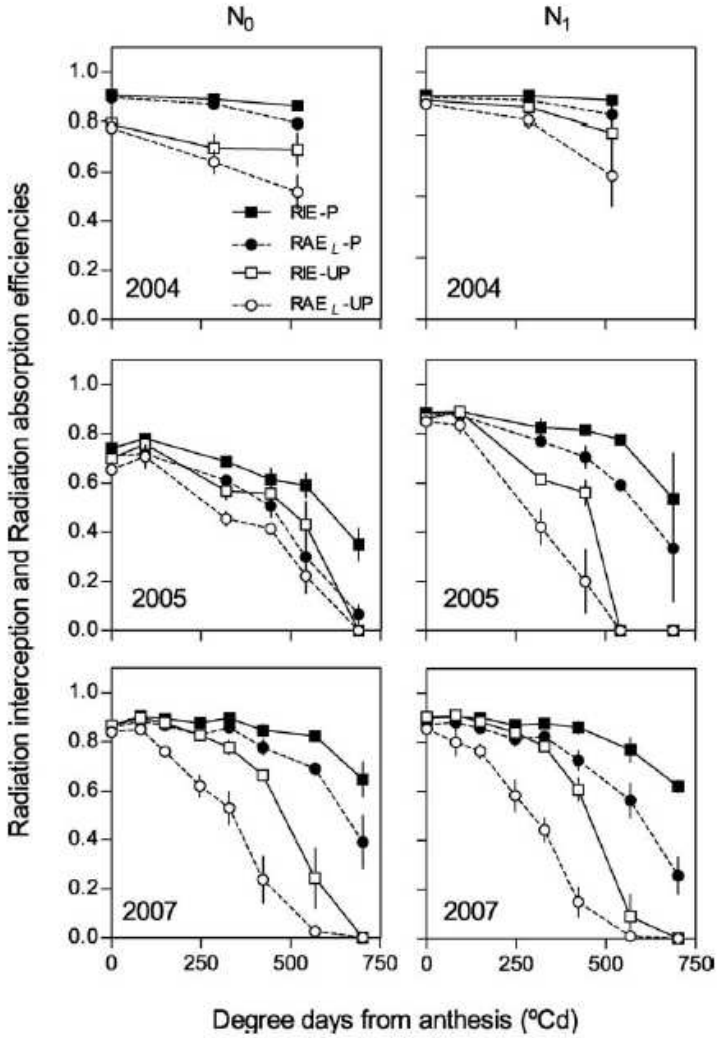


Fig. 4. Dynamics of the radiation interception efficiency (RIE, squares with continued lines) and radiation absorption efficiency calculated by leaf layer model (RAE_L, circles with dotted lines) during the grain filling period for P (solid symbols) and UP (open symbols) treatments and both nitrogen situations (N_0 and N_1), in three years (2004, 2005 and 2007). Vertical bars indicate standard error.

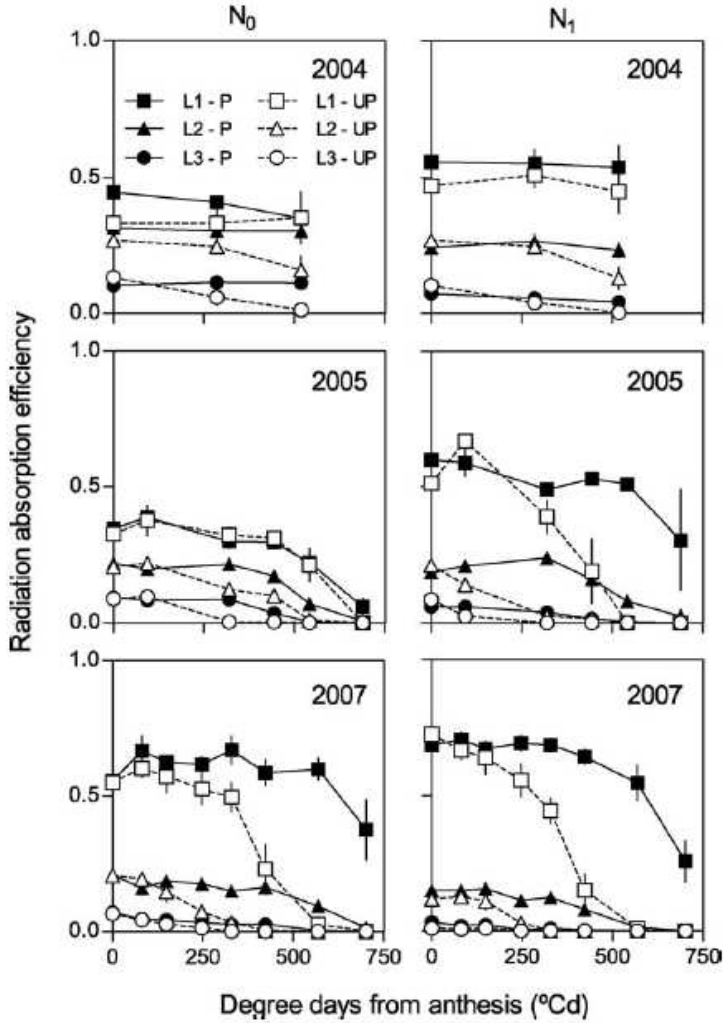


Fig. 6. Dynamics of the radiation absorption efficiency (RAE_L) for different leaf layers during the grain filling period for P (solid symbols) and UP (open symbols) treatments and the two nitrogen situations (N_0 and N_1), in three years (2004, 2005 and 2007). L1 (flag leaf), L2 and L3 are represented as squares, triangles and circles, respectively. Vertical bars indicate standard error.

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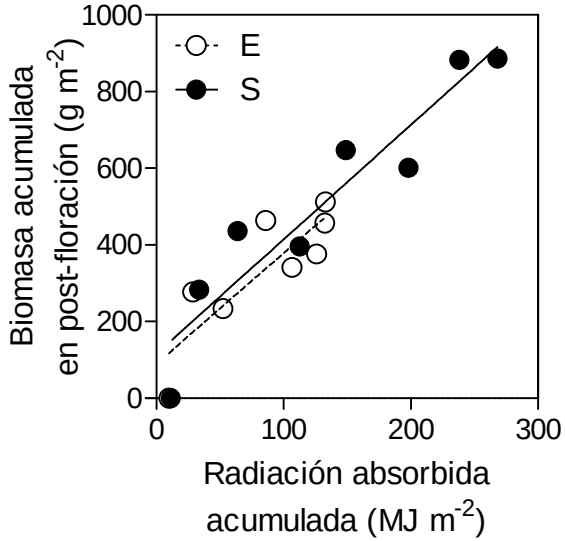
Resultados. *Eficiencia de uso de la radiación*



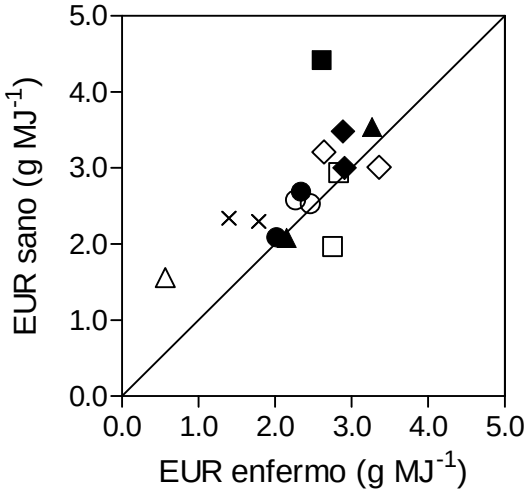


Table 3
Healthy area absorption (HAA) and radiation use efficiency calculated from accumulated intercepted radiation (RUE_{int}) and from accumulated absorbed radiation values (RUE_{abs}) for unprotected (UP) and protected (P) treatments. For details of the experiments and nitrogen rates associated to the codes see Table 1.

Experiment code	Nitrogen	HAA ($MJ\ m^{-2}$)[a]		RUE_{int} ($g\ MJ^{-1}$)[b]	
		UP	P	UP	P
A2002	N_1	49.3 b	73.1 a	0.57 a	1.56 a
BA2004	N_0	165.1 b	216.4 a	3.59 a	2.35 a
	N_1	169.2 b	192.3 ab	3.53 a	3.80 a
G2004SO	N_0	261.4 b	346.3 ab	2.23 a	2.39 a
	N_1	291.3 ab	375.5 a	2.28 a	2.28 a
G2004IS	N_0	290.8 a	323.3 a	1.94 a	1.96 a
	N_1	322.0 a	385.4 a	2.16 a	2.49 a
P2005E	N_0	132.2 a	156.6 a	2.91 a	3.00 a
	N_1	145.2 a	170.1 a	2.89 a	3.52 a
P2005L	N_0	153.8 c	204.7 b	3.36 a	3.01 a
	N_1	171.0 bc	252.6 a	2.64 a	3.15 a
BA2005	N_0	170.8 b	190.4 b	2.21 a	2.19 a
	N_1	149.1 b	243.4 a	2.93 a	3.49 a
BA2007	N_0	150.7 b	291.7 a	1.79 a	2.17 a
	N_1	132.8 b	268.2 a	1.40 a	2.24 a

[a] Different letters indicate significant differences ($p < 0.05$) for the interaction nitrogen × fungicide treatments within each experiment.
[b] Different letters indicate significant differences ($p < 0.05$) for the fungicide treatments within each experiment and nitrogen treatment.

Las enfermedades foliares no afectaron la EUR a nivel de canopeo.

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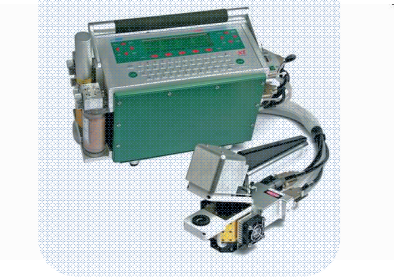
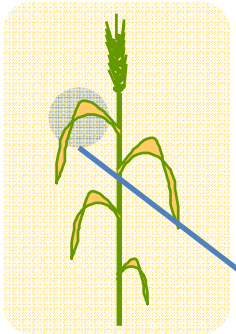
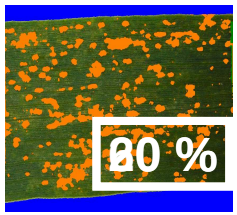
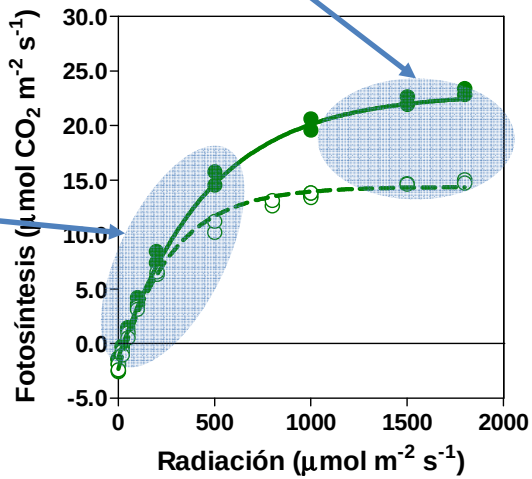
Resultados. *Fotosíntesis foliar*

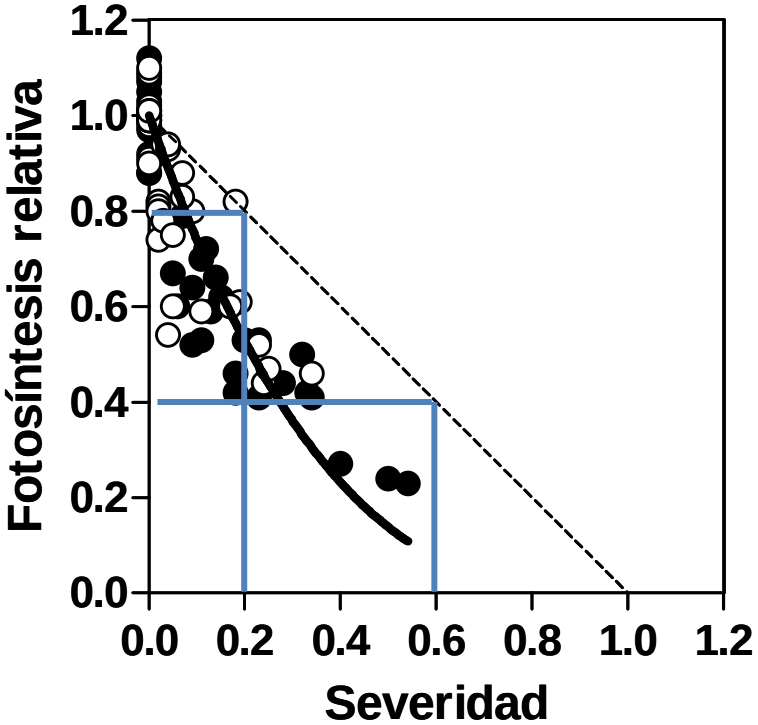
Fotosíntesis Máxima











¿Por qué las enfermedades foliares afectan la fotosíntesis máxima de la hoja bandera pero no la EUR a nivel de canopeo?

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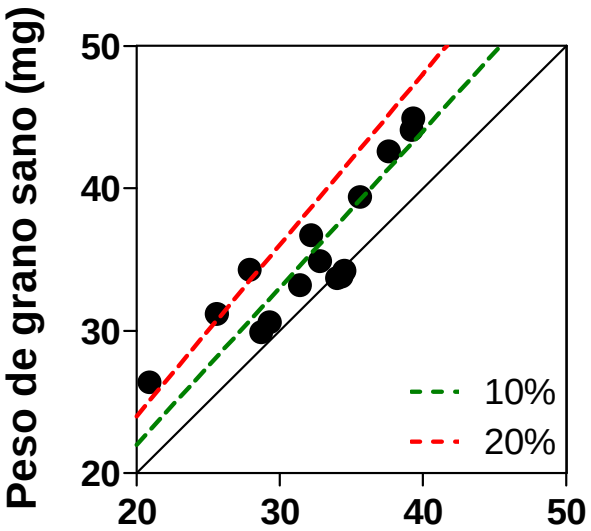
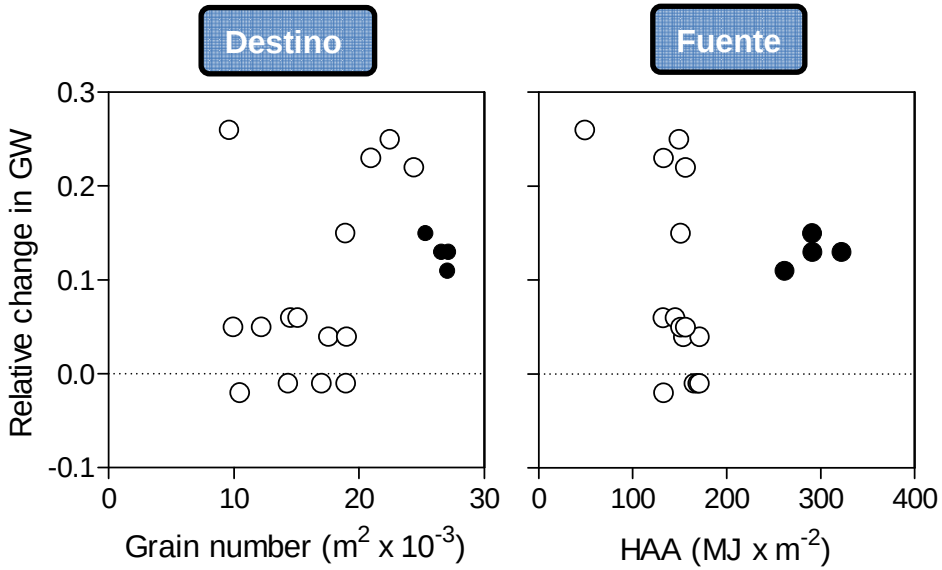
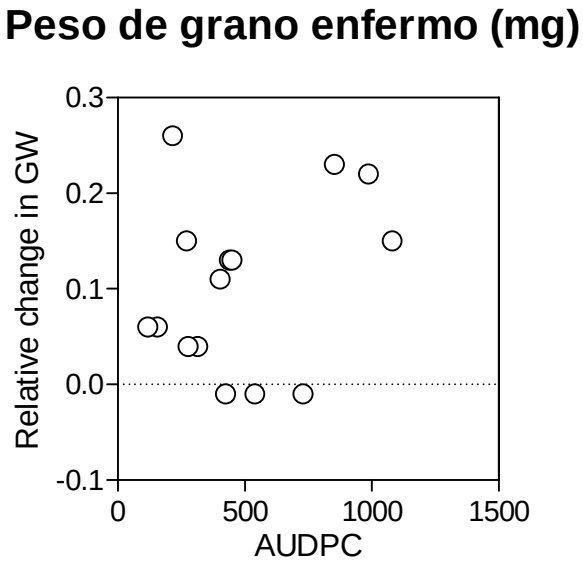
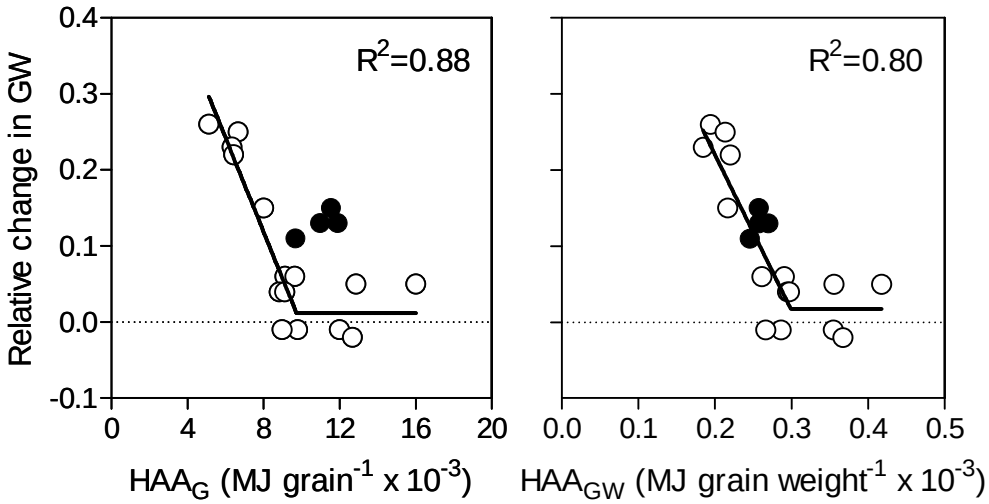
Resultados. *Crecimiento del grano*





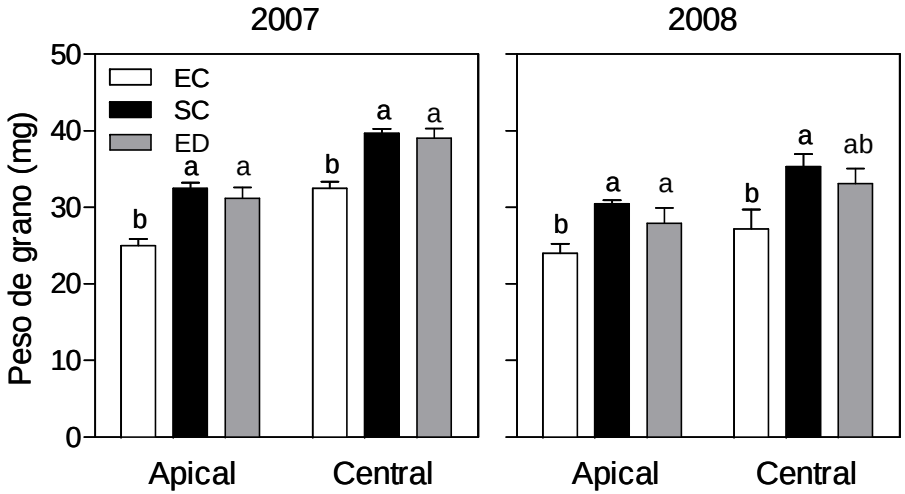




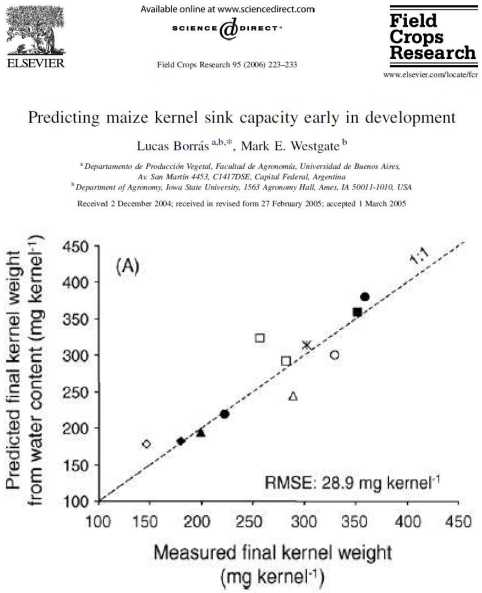
R.A. Serrago et al./ Field crop research (2010). en revisión

Resultados. *Crecimiento del grano*

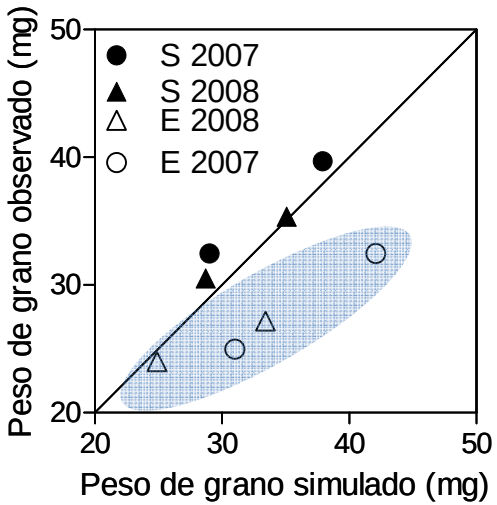
FUENTE-DESTINO



MODELO HÍDRICO



Borras y Westgate, 2006



SANO
RMSD=6.2%

ENFERMO
RMSD=23.9%

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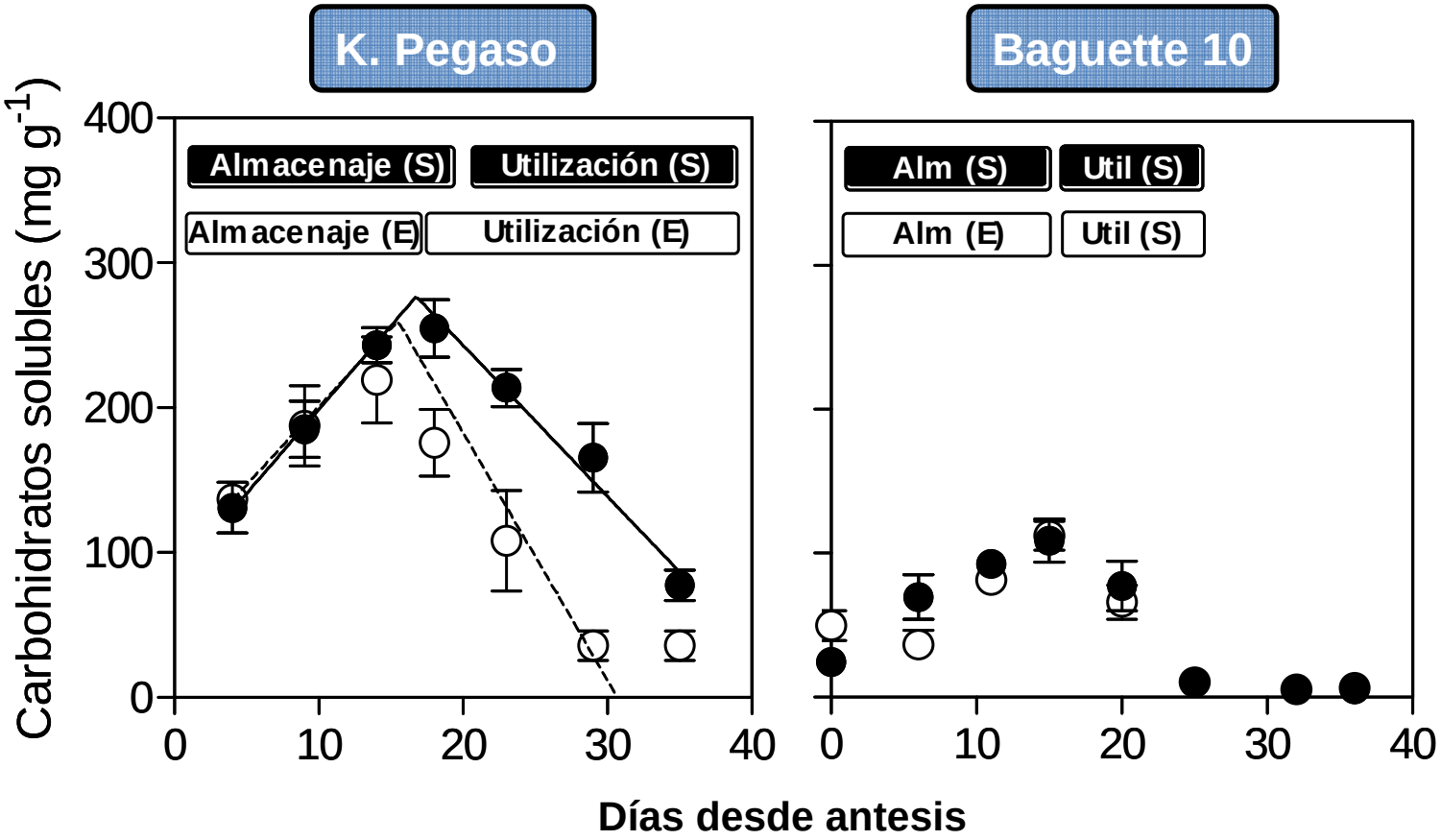
Resultados. *Utilización de reservas*



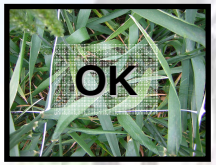
1) Determinar como las enfermedades foliares afectan el consumo de CSA.

2) Evaluar al contenido de CSA como estrategia para aumentar la tolerancia a enfermedades foliares.

Estudios futuros

Fotosíntesis

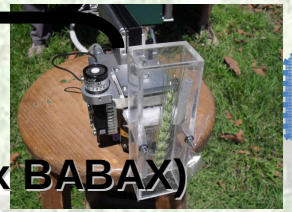
Cultivo Sano = + Reservas + Espigas

Cultivo Enfermo = Fotosíntesis 

+ Reservas

+ Espigas

2010 Cebada

2011 RIL´S (SERI x BABAX) 

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Muchas Gracias!

Ing. Agr. Juan Annone