

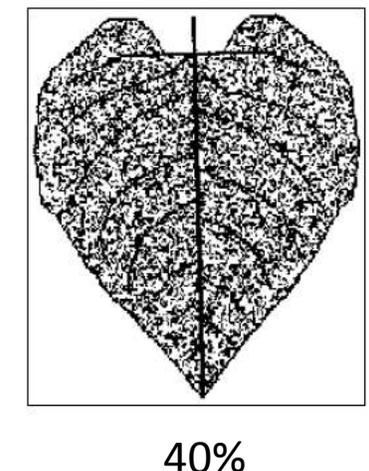
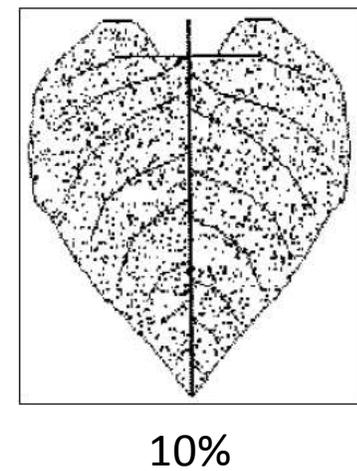
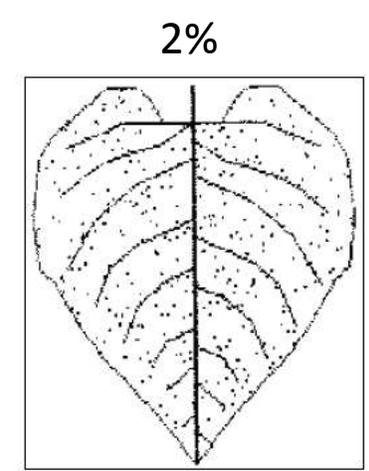
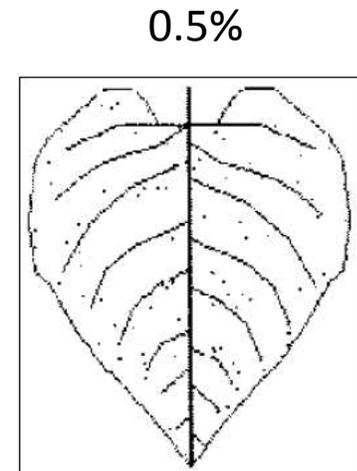


X Congreso Latinoamericano de Agronomía

Evaluación del índice de severidad de
Phyllachora maydis, *Mycosphaerella*
fijiensis y *Moniliophthora roreri* usando
Leafdoctor[®] en Mocache, Ec.

Favio Herrera Eguez, PhD.

Fitopatología UTEQ



(Intagri, 2019)

(Gulya *et al.*, 1998)

Severidad por evaluación visual

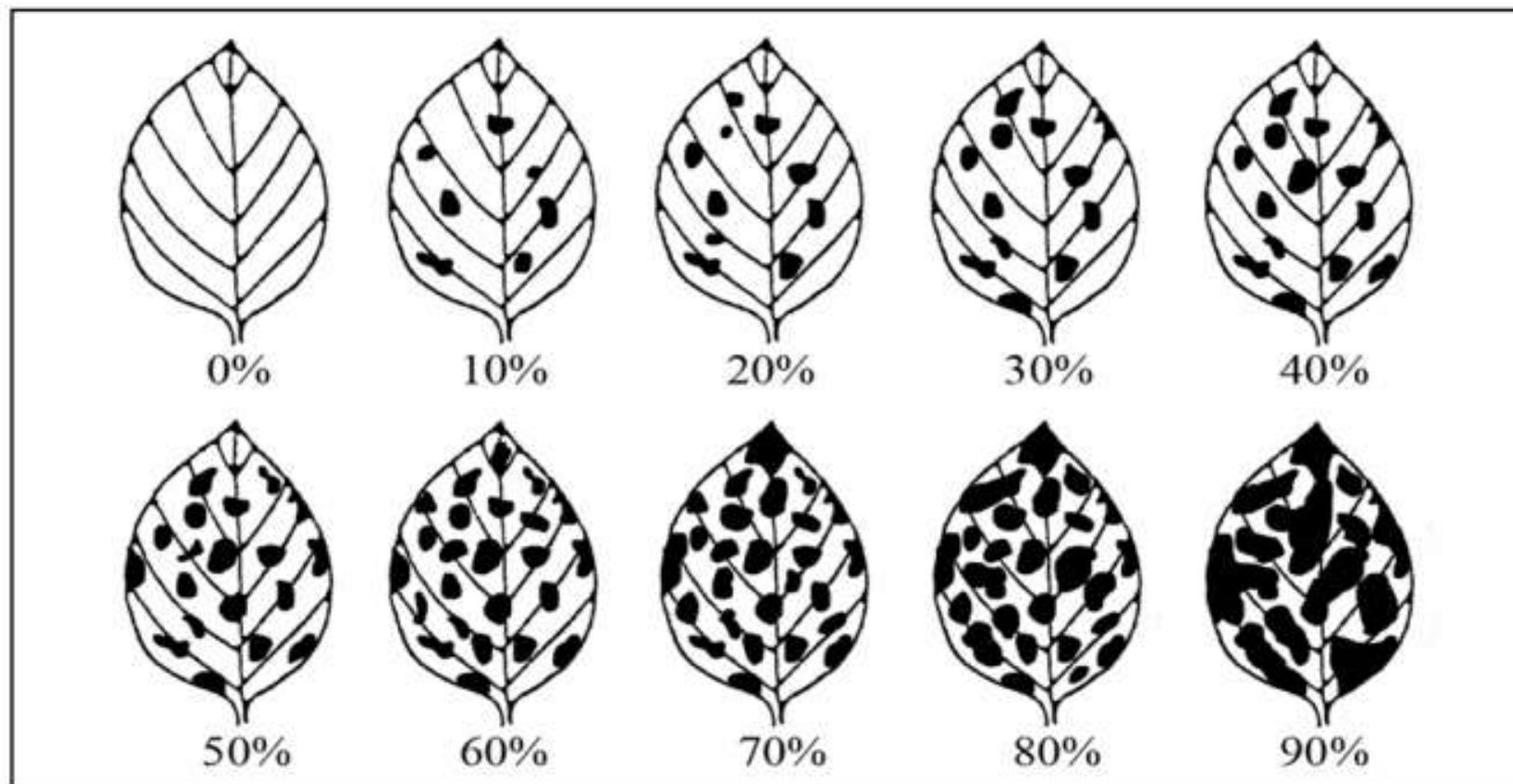


FIGURE 3. THIS FIGURE ILLUSTRATES A SYSTEM OF RATING FOLIAR DISEASES OF SOYBEAN. (BASED ON A FIGURE IN *KENTUCKY INTEGRATED CROP MANUAL FOR SOYBEANS, IPM-3*. 2009. PG.3)

Beneficios:

- ✓ Rápidas
- ✓ Sin costo
- ✓ Fáciles

Problemas:

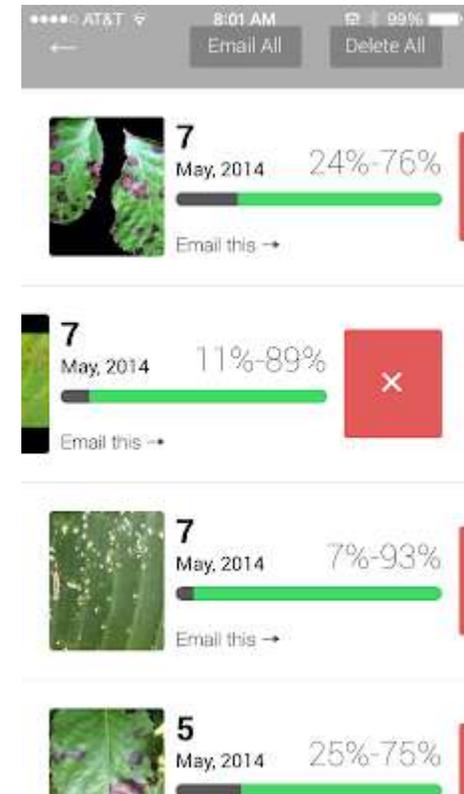
- ✓ Conocimiento
- ✓ Inexactas
- ✓ Alto # muestras

Evaluación de severidad por Leafdoctor®

e-Xtra*

Leaf Doctor: A New Portable Application for Quantifying Plant Disease Severity

Sarah J. Pethybridge, School of Integrative Plant Science, Section of Plant Pathology and Plant-Microbe Biology, Cornell University, Geneva, NY 14456; and Scot C. Nelson, College of Tropical Agriculture and Human Resources, Department of Plant and Environmental Protection Sciences, University of Hawaii at Manoa, Honolulu, HI 96822



(Pethybridge, 2015)

Evaluación eficiencia de Leafdoctor®

Table 1. Characteristics of disease images used to test the precision and accuracy of Leaf Doctor ($n = 50$ individual leaves/disease)

Disease (host)	Pathogen	Disease lesion description	Host leaf shape (margin)	Minimum disease intensity (%)	Maximum disease intensity (%)
Tan spot (lima bean)	<i>Boeremia exigua</i> var. <i>exigua</i>	Necrosis, variable lesion size and color	Oval (entire)	0.29	35.42
Downy mildew (collards)	<i>Peronospora parasitica</i>	Chlorosis	Oval (entire)	0.59	67.38
Rust (mallow)	<i>Puccinia malvacearum</i>	Pustules (abaxial)	Circular (crenate)	0.25	46.63
Powdery mildew (lilac)	<i>Microsphaera alni</i>	Mycelia	Oval (entire)	14.21	93.19
Foliar disease complex (tomato)	<i>Alternaria solani</i> + <i>Septoria lycopersici</i>	Necrosis and chlorosis	Variable (lobed)	4.18	83.01
Gummy stem blight (watermelon)	<i>Didymella bryoniae</i>	Necrosis	Variable (lobed)	0.72	87.57

Table 2. Lin's concordance correlation coefficient and regression statistics and model parameters for linear regression analyses between disease severity assessments from Assess and Leaf Doctor within each of the six disease datasets ($n = 50$)

Disease (host)	C_b^a	R^{2b}	Intercept	Slope	SEEy ^c	$P =$
Tan spot (lima bean)	0.997	0.94	-0.11	0.95	2.65	<0.001
Downy mildew (collard)	0.994	0.96	1.54	0.99	4.05	<0.001
Rust (mallow)	0.959	0.88	1.68	0.73	4.93	<0.001
Powdery mildew (lilac)	0.963	0.79	16.63	0.65	12.22	<0.001
Foliar disease complex (tomato)	0.990	0.95	-1.67	0.98	4.22	<0.001
Gummy stem blight (watermelon)	0.998	0.98	0.83	0.94	3.60	<0.001

^a Lin's concordance correlation coefficient.

^b Coefficient of determination.

^c Standard error of the estimate of y .

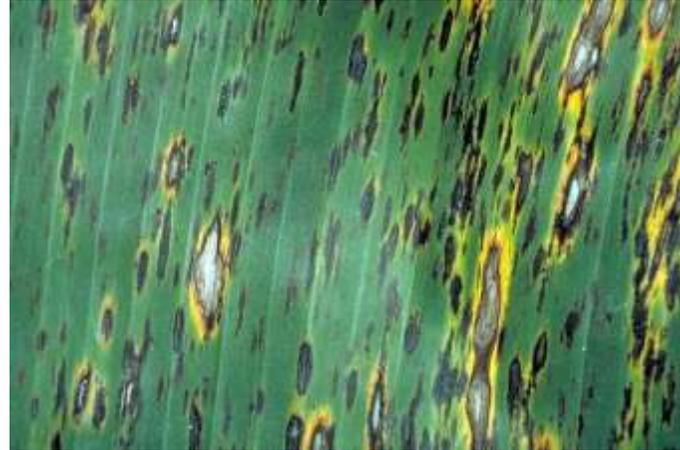
Table 3. Mean, minimum, and maximum coefficient of variation of disease severity estimates made by Leaf Doctor on 10 randomly selected leaves within each of the disease databases. Each image was imported separately into Leaf Doctor on five separate occasions for assessment of disease severity (%)

Disease (host)	Coefficient of variation (%)		
	Mean	Minimum	Maximum
Tan spot (lima bean)	2.26	0.57	6.96
Downy mildew (collard)	0.51	0.05	2.74
Rust (mallow)	14.10	3.17	37.50
Powdery mildew (lilac)	13.16	6.90	38.61
Foliar disease complex (tomato)	7.74	2.65	13.01
Gummy stem blight (watermelon)	5.27	2.47	9.28

Leafdoctor[®] en cultivos de la zona



Phyllachora maydis (mancha de asfalto)



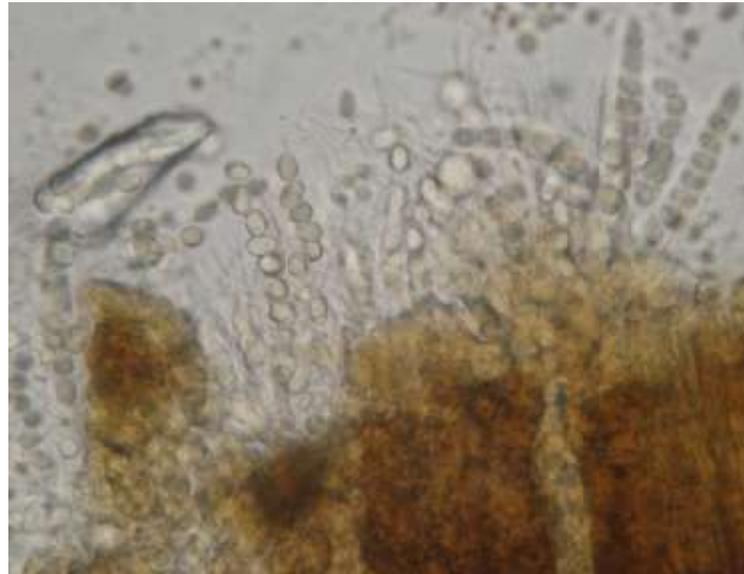
Mycosphaerella fijiensis (Sigatoka negra)



Moniliophthora roreri (Moniliasis)

P. maydis (mancha de asfalto)

Reino	Fungi
Filo	Ascomycota
Subfilo	Pezizomycotina
Clase	Sordariomycetes
Subclase	Sordariomycetidae
Orden	Phyllachorales
Familia	Phyllachoraceae
Género	Phyllachora
Especie	maydis



Evaluación visual de *P. maydis*



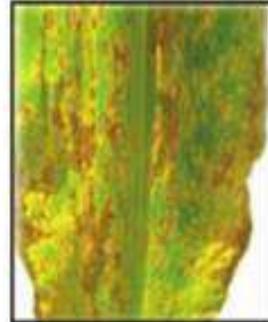
Clase 0
Sev. 0 %



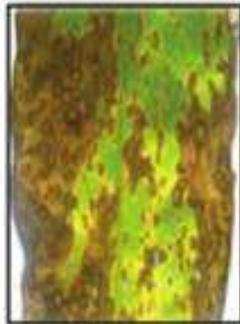
Clase 1
Sev. 1-6 %



Clase 2
Sev. 7-22 %



Clase 3
Sev. 23-55 %



Clase 4
Sev. 56-84 %



Clase 5
Sev. 85-95 %



Clase 6
Sev. 96-100 %



Fase 1
25%



Fase 2
50%



Fase 3
75%



Fase 4
100%

Materiales y métodos



- Finca Experimental La María
 - Nov-Mar 2018-2019
- 4 grupos/2 parcelas
 - Trueno
 - DK7088
- Parcela
 - Distancia entre hilera: 0.80 m
 - Distancia entre plantas: 0.20 m
 - Semillas por golpe: 1
 - Hilera por parcela: 10
 - Población de plantas: 600 plantas
- Manejo convencional

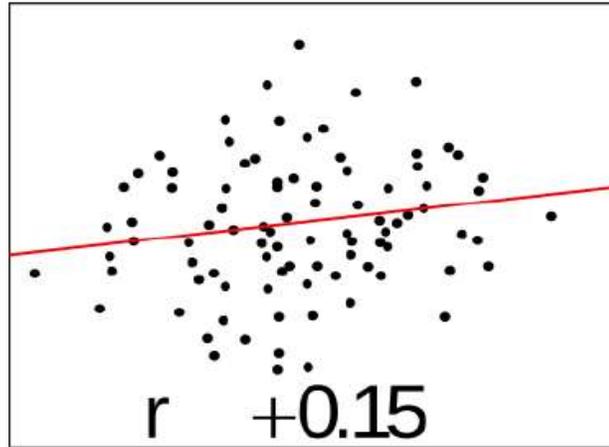
Comparación visual vs Leafdoctor[®]



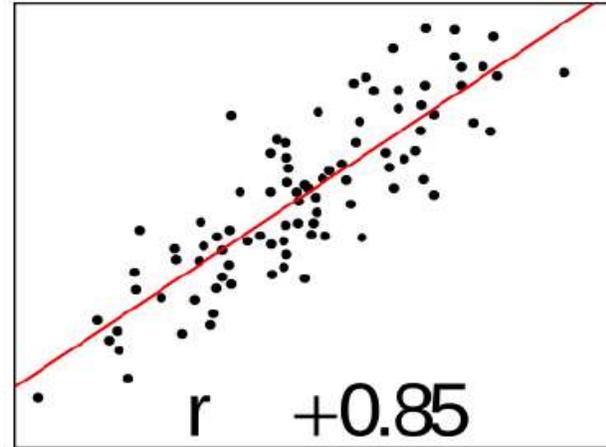
- 27 estudiantes tomaron 10 datos
 - Evaluación visual previo foto
- 10 fotos
 - 5 de Trueno
 - 5 de DK7088
- Análisis de Correlación

Análisis de Correlación

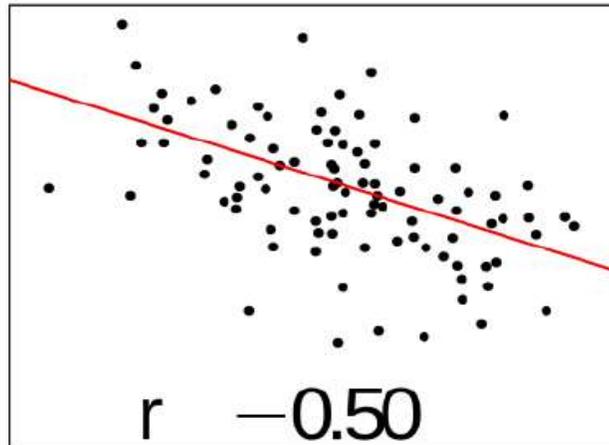
Baja



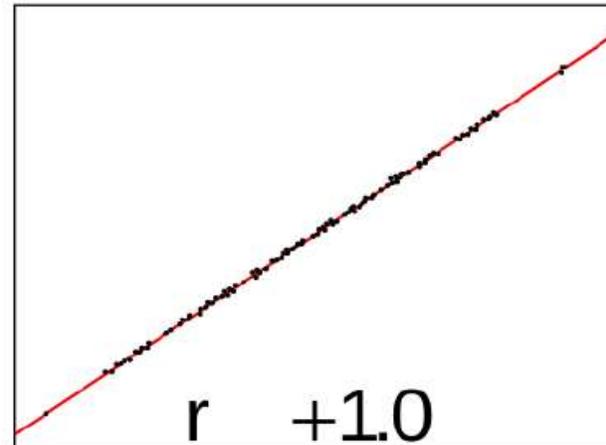
Alta



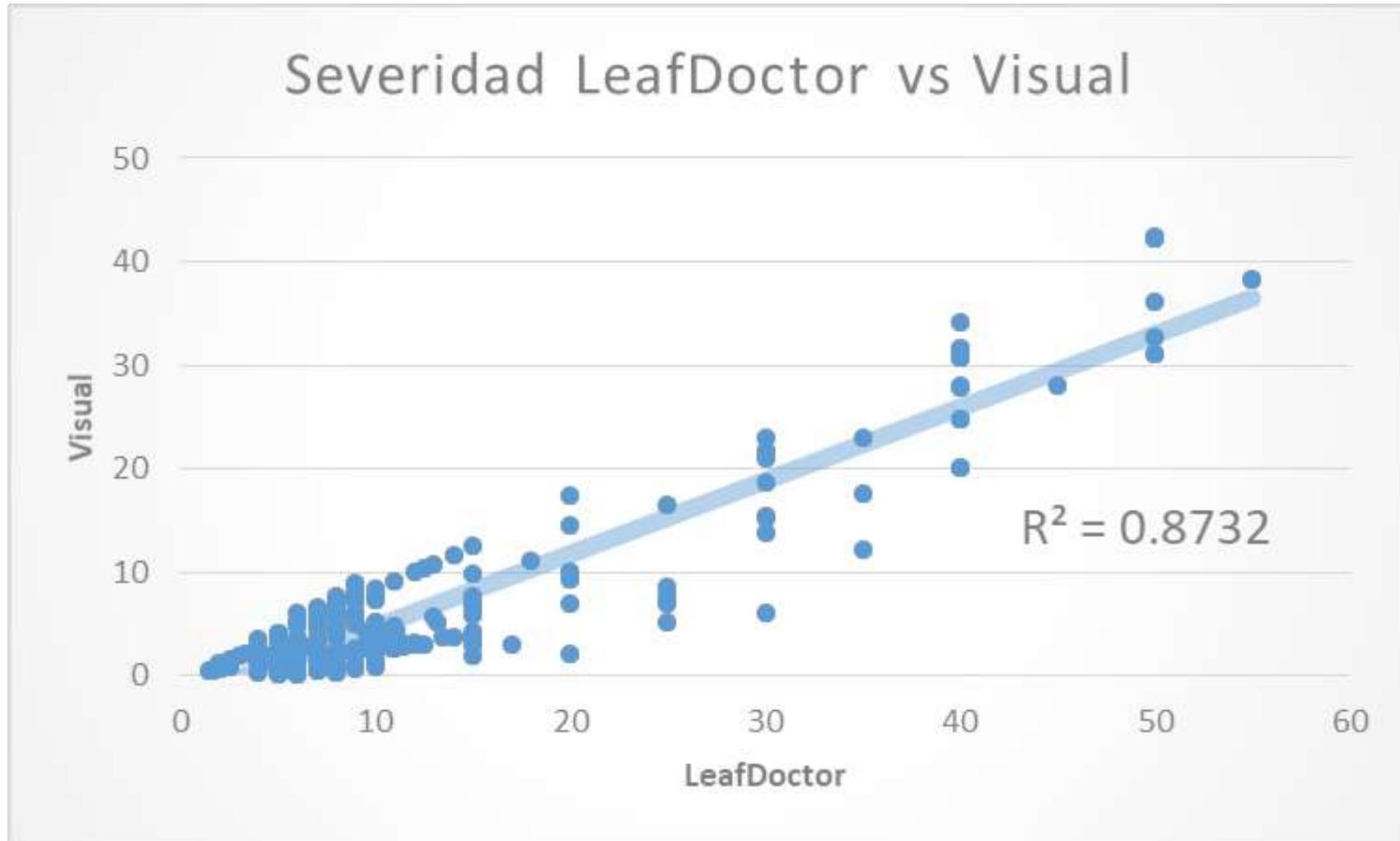
Inversa



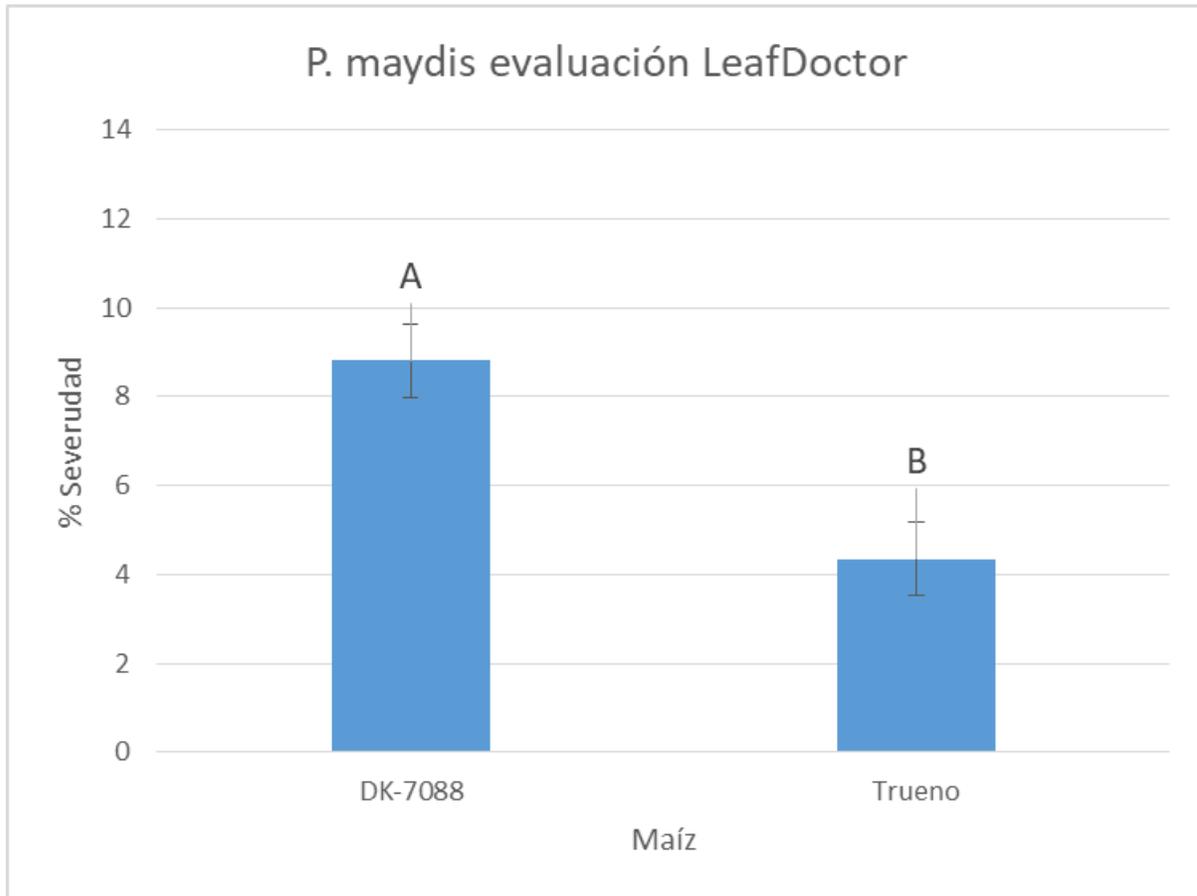
“Perfecta”



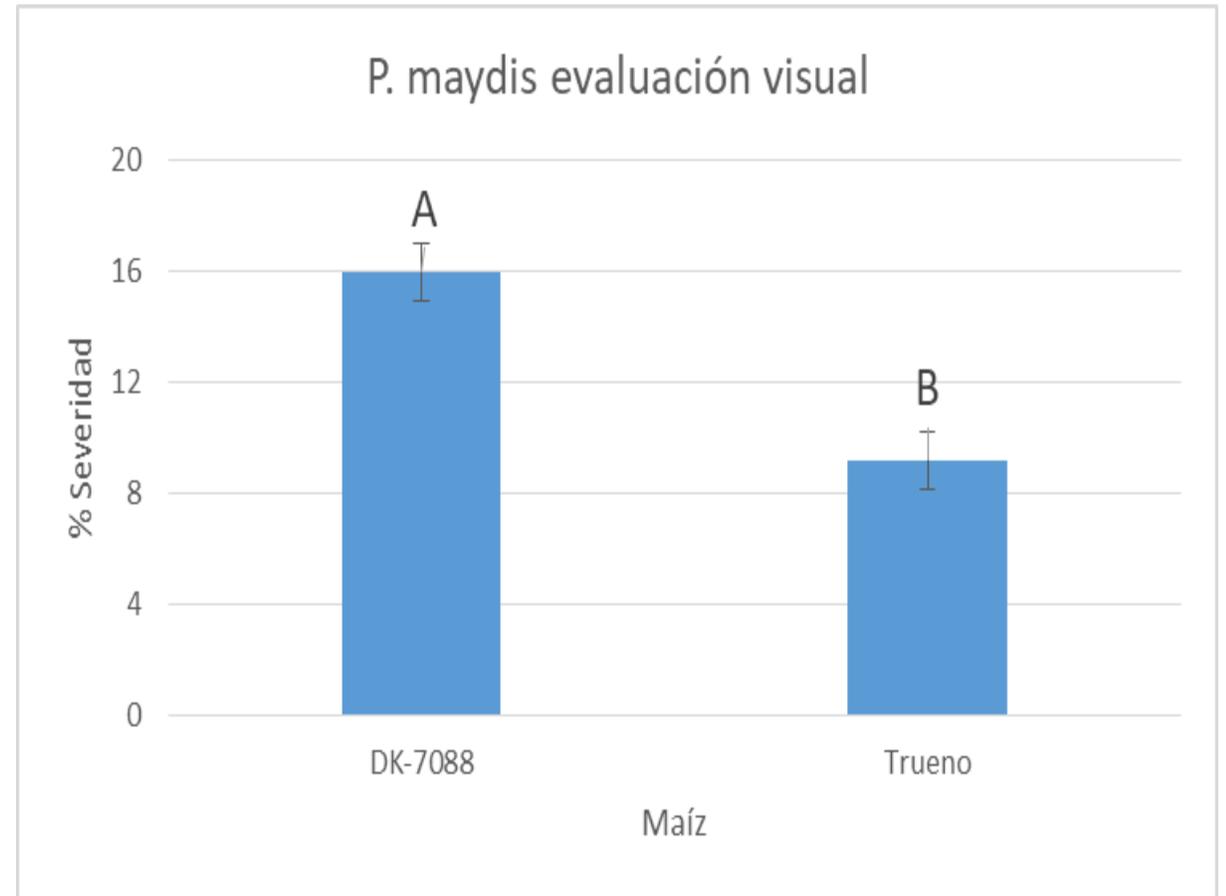
Resultados



Comparación Severidad de 2 métodos



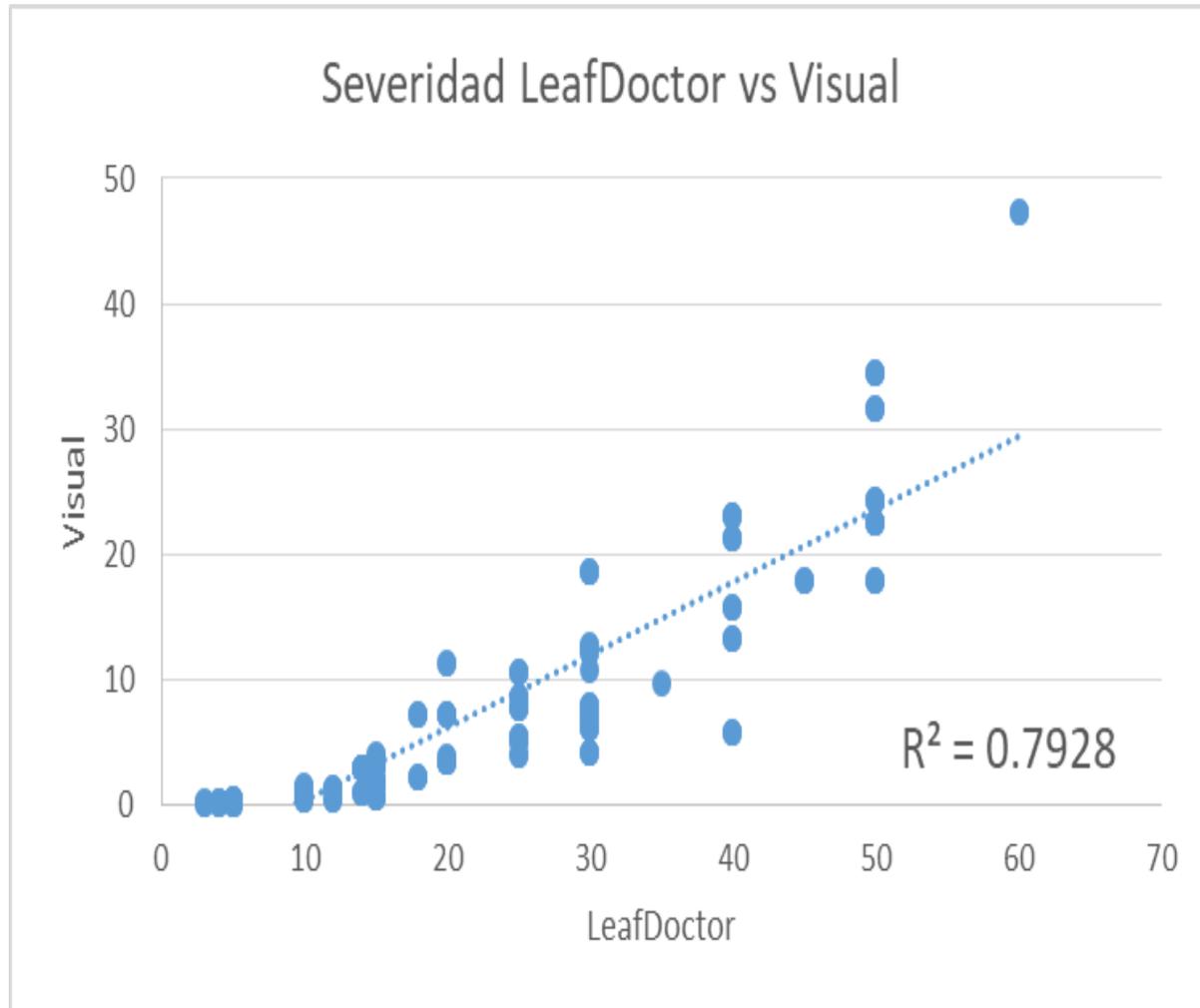
Error Estándar: 0.83



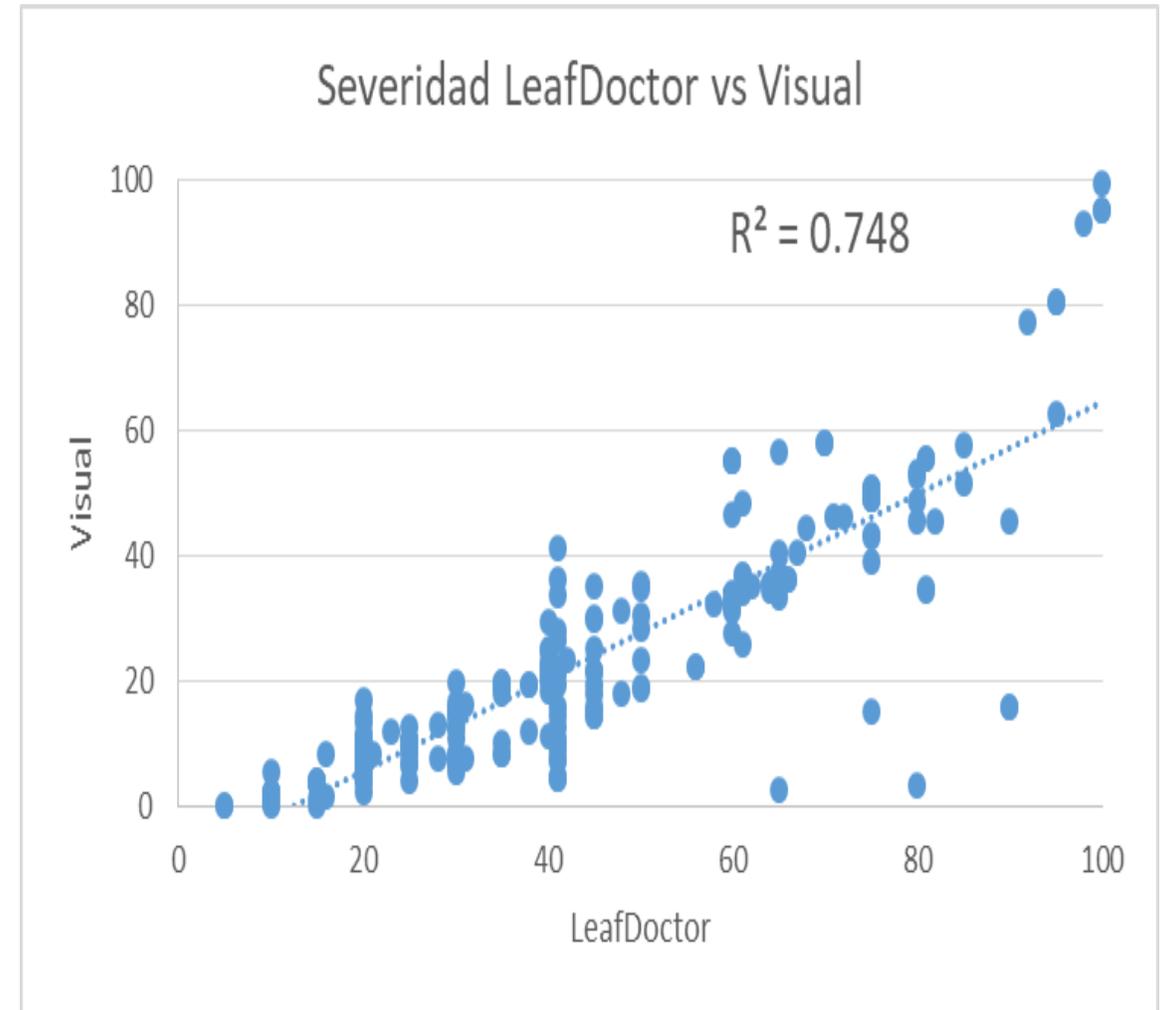
Error Estándar: 1.03

Tukey $P < 0.05$

Problemas con otras dos enfermedades



Banano



Cacao

Conclusiones

- Ventajas

- Gratis (vs con otros programas)
- Rápido y fácil uso
- Interactivo con el usuario
- Algoritmo simple
- Portable (celular)
- Disponible iOS/Android
- Alta sensibilidad

- Desventajas

- Lesiones de color negro pueden no ser reconocidas
- El fondo debe ser negro puro, no gris u otro
- Colores amarillos suelen ser subjetivos al evaluador
- Calidad foto influye mucho en resultado final
 - Sin flash
 - Claridad
 - Órganos no planos o muy grandes

Agradecimientos



Centro de Investigación
y Desarrollo Ecuador

