Cactoblastis cactorum

hembra

macho

Juan Cibrián Tovar


Opuntia dillenii

Cactus pear deserves a place on the menu

Turning a useful food-of-last-resort into a managed and valuable crop


BRAZIL
Pernambucu
ANDES
PARAGUAY
URUGUAY
ARGENTINA

- *Cactoblastis cactorum*
- Lepidoptera: Pyralidae, Phycitinae

- Pyralidae – 20 géneros y 60 especies asociadas con Cactáceas

- *Ozamia* en los dos hemisferios
- *Cactoblastis* en Sud-América
- *Melitara* y *Olycella* en Norte

Cactoblastis cactorum

adulto

larva


C18

- Género *Cactoblastis*
- 5 especies descritas
- *C. cactorum*, *C. bucyrus*, *C. mundelli*, *C. doddi* y *C. ronnai*
- Parte del Perú y Bolivia, Paraguay, Uruguay, Argentina y el sur de Brasil
- Larvas de todas las especies son rojas con bandas negras
- Solo *C. cactorum* es "oligofaga" (se alimenta de varias especies)


C18


C18


15


C15
C15

en Queensland, Australia

ASCENSION ISLAND

Cactoblastis cactorum

15p

La hembra produce de 3-4 palitos de huevecillos durante su vida

Hembras recién apareadas depositan sus huevecillos en las espinas y en los gloquidios localizados en las areolas. Las hembras se mantienen en cajas de acrílico y el nopal se introduce en la caja. Tifton, Georgia, Mayo 2010.

Colocación de huevecillos en los gloquidios del nopal

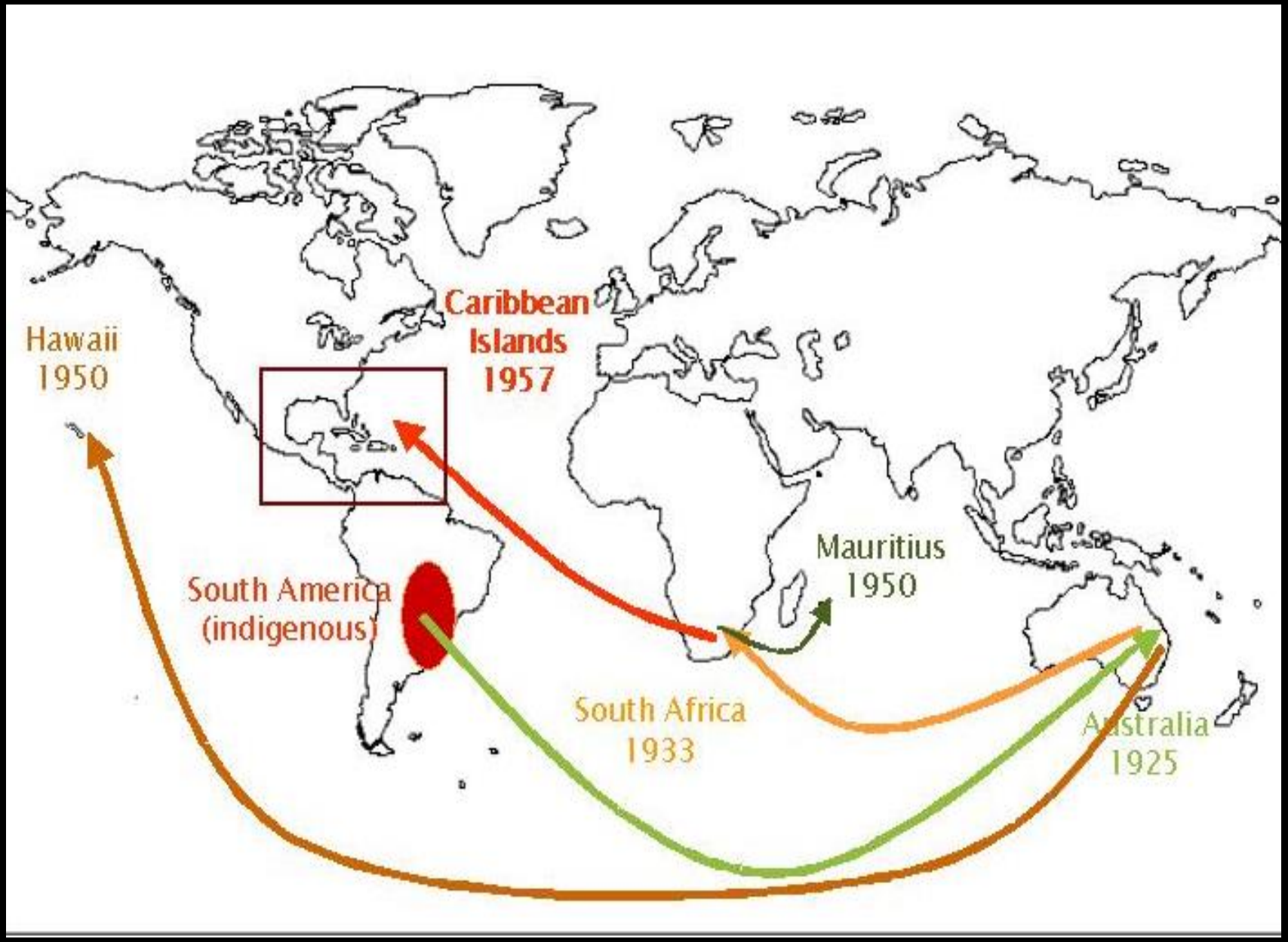
Detalle de la adherencia del primer huevecillo para que sostenga el resto de los mismos

Larvas de la palomilla cerca del palito de huevecillos. Tifton, Georgia 2010

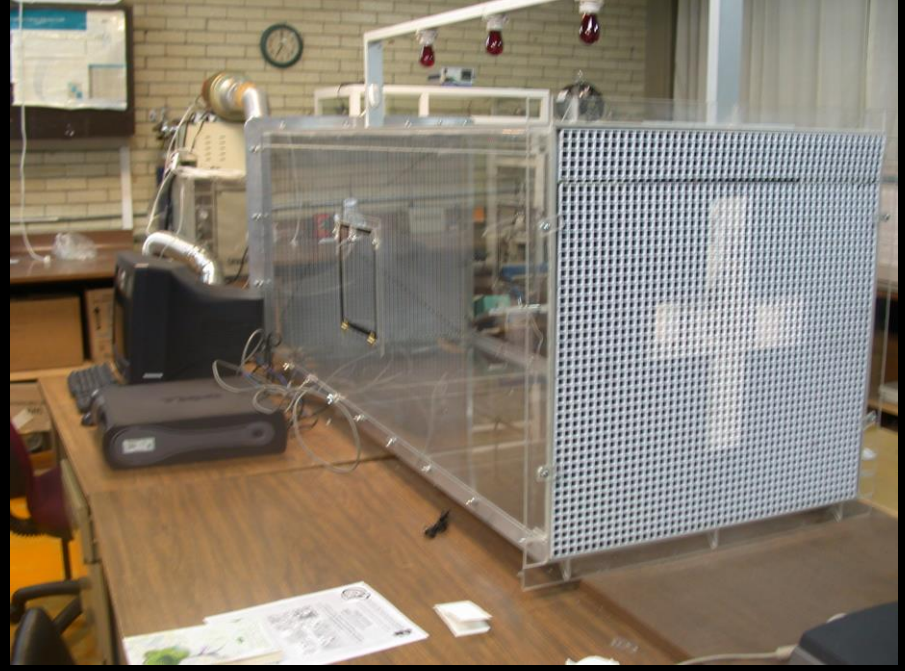
Bandas negras transversales no fusionadas enmedio

Olycella sp. larvae

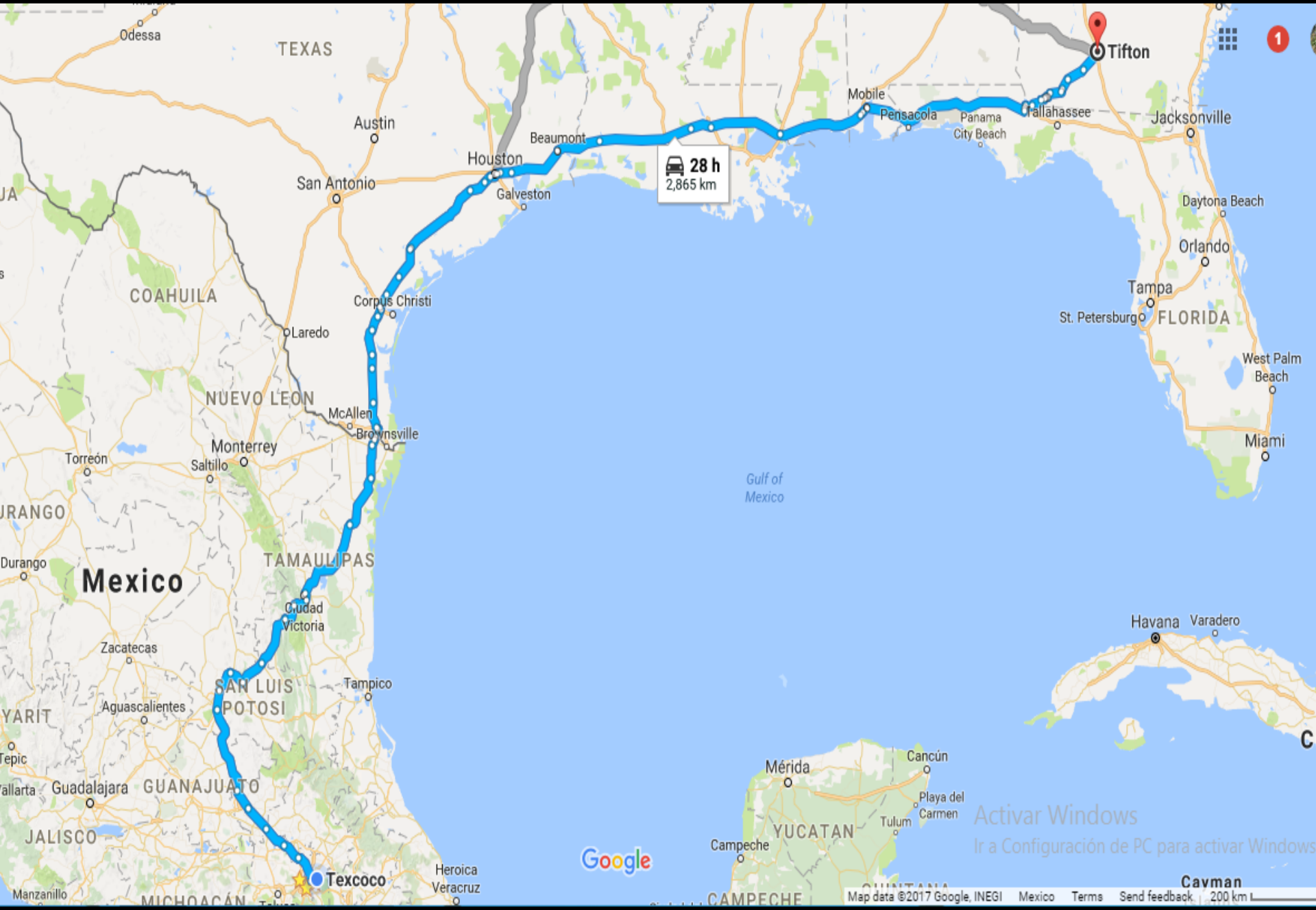
Melitara prodenialis


Hawaii
1950
Caribbean
Islands
1957
South America
(indigenous)
Mauritius
1950
South Africa
1933
Australia
1925


Gulf of Mexico
United States
North Atlantic Ocean
Florida Keys, USA 1989
Bahamas
Cuba
Guantanamo Bay
Cayman Islands
Haiti
Dominican Republic
U.S. Virgin Islands
Puerto Rico 1963
Nevis
Antigua & Barbuda
Montserrat
Jamaica
Honduras
Caribbean Sea
Nicaragua
Trinidad
Costa Rica
Panama
Colombia
Venezuela

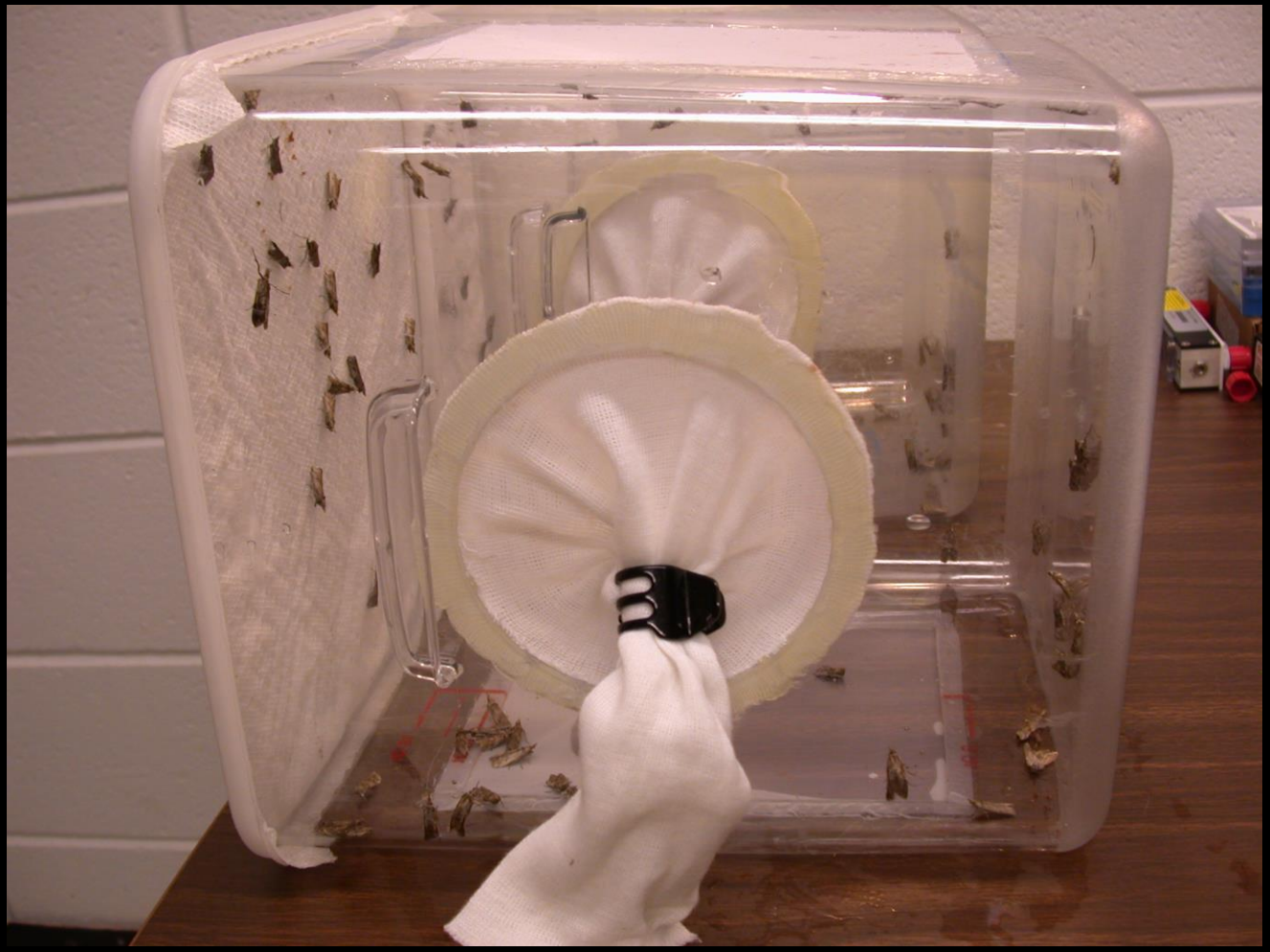


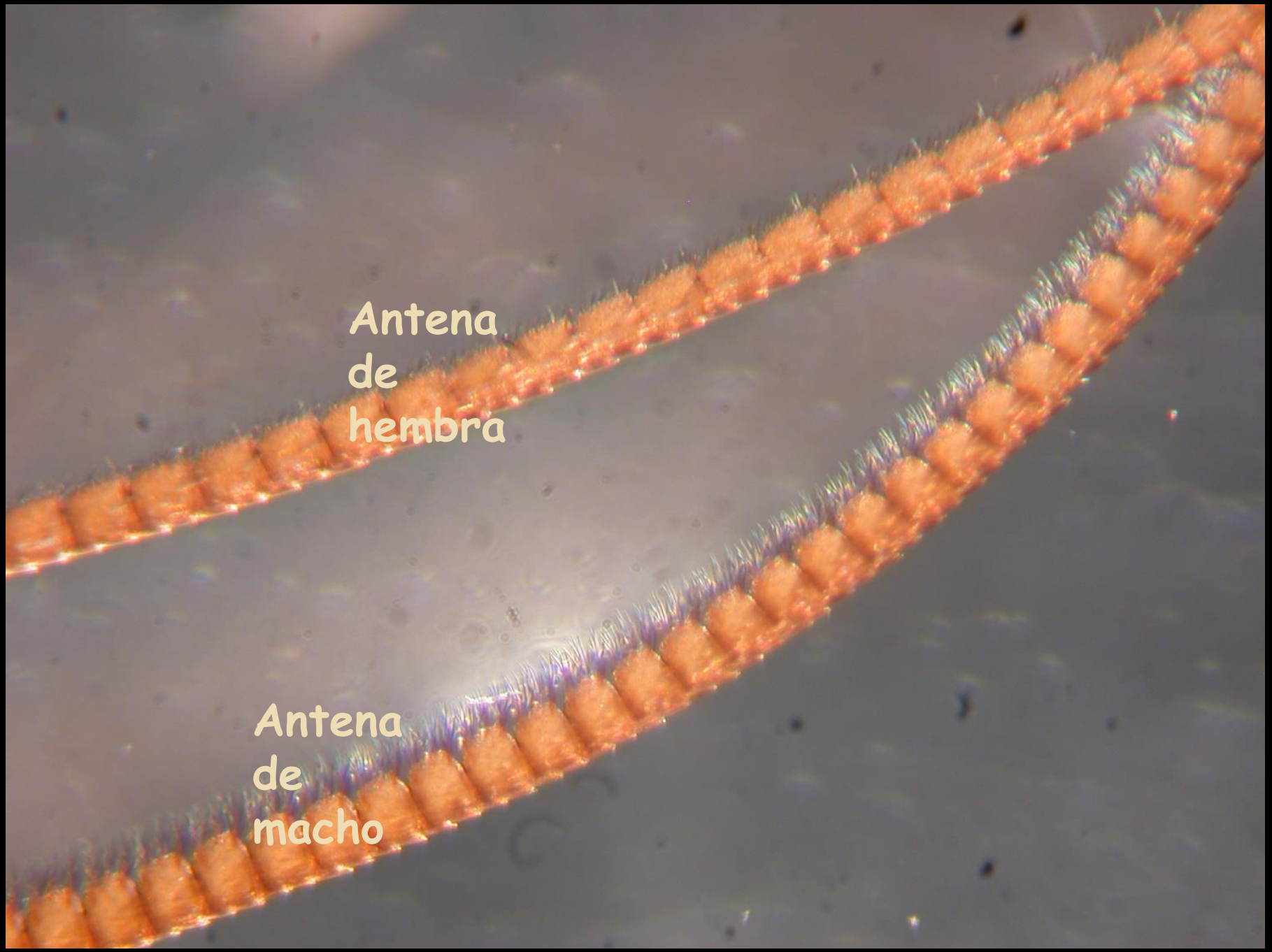
Se construyo el túnel de viento,
Luego se desarmo para
transportarse a Tifton, Georgia
El financiamiento provino de
SAGARPA-DGSV.

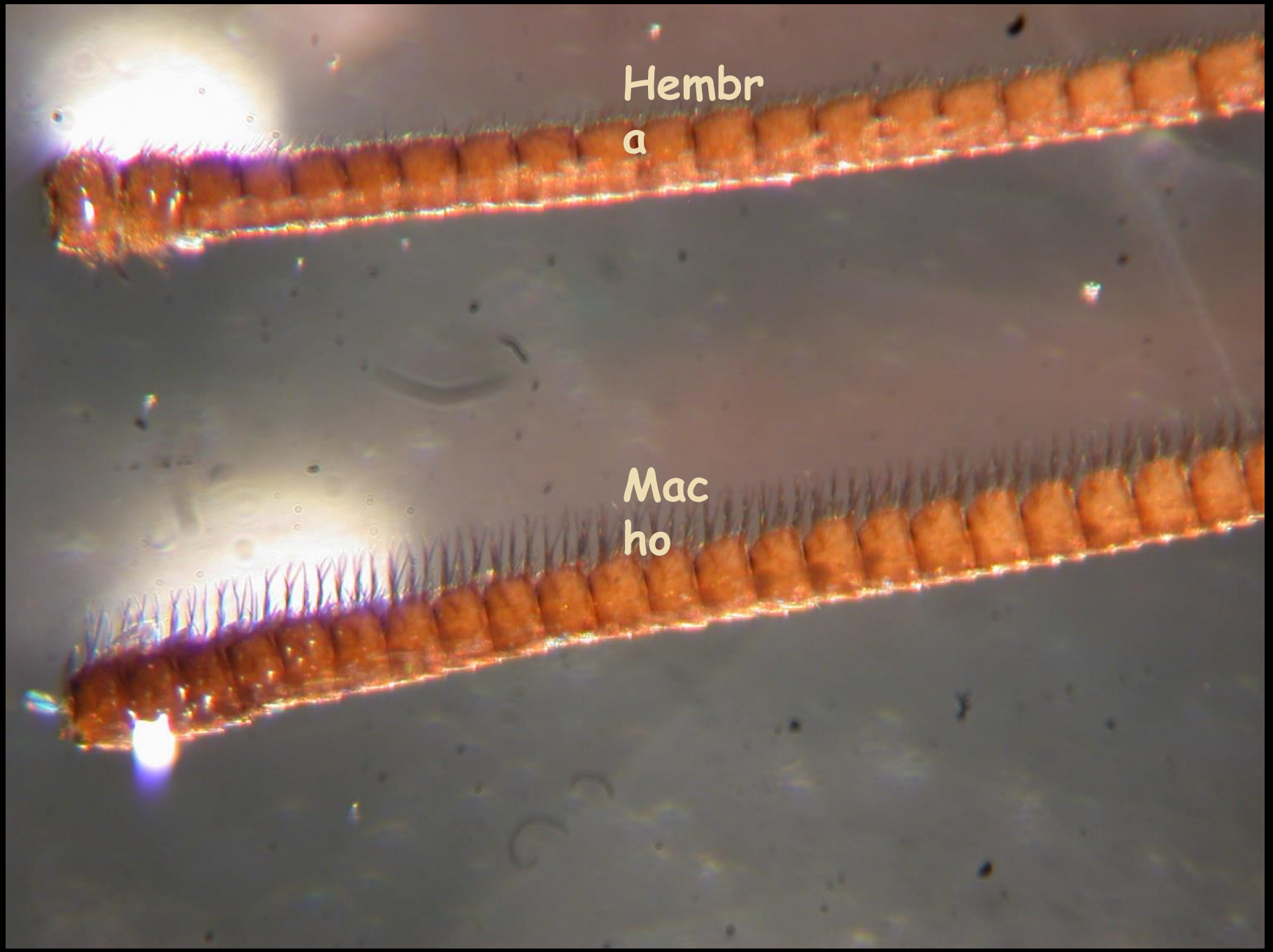

Tifton
28 h
2,865 km
Texcoco
Mexico
Gulf of Mexico
TEXAS
COAHUILA
NUEVO LEON
TAMAULIPAS
YUCATAN
CAMPECHE
FLORIDA
Odessa
Austin
San Antonio
Houston
Beaumont
Galveston
Mobile
Pensacola
Panama City Beach
Tallahassee
Jacksonville
Daytona Beach
Orlando
Tampa
St. Petersburg
West Palm Beach
Miami
Corpus Christi
Laredo
McAllen
Brownsville
Monterrey
Torreón
Saltillo
Durango
Ciudad Victoria
Tampico
Zacatecas
Aguascalientes
Guadalajara
Manzanillo
Heroica Veracruz
Havana
Varadero
Mérida
Cancún
Playa del Carmen
Tulum
Campeche
Cayman
Google
Map data ©2017 Google, INEGI
Mexico
Terms
Send feedback
200 km
Activar Windows
Ir a Configuración de PC para activar Windows


1032
STOP
Tifton, Georgia 2010


2747 Davis Road
CROP PROTECTION AND
MANAGEMENT RESEARCH LABORATORY
AGRICULTURAL RESEARCH SERVICE
U.S. DEPARTMENT OF AGRICULTURE




Antena
de
hembra
Antena
de
macho


Hembr
a
Mac
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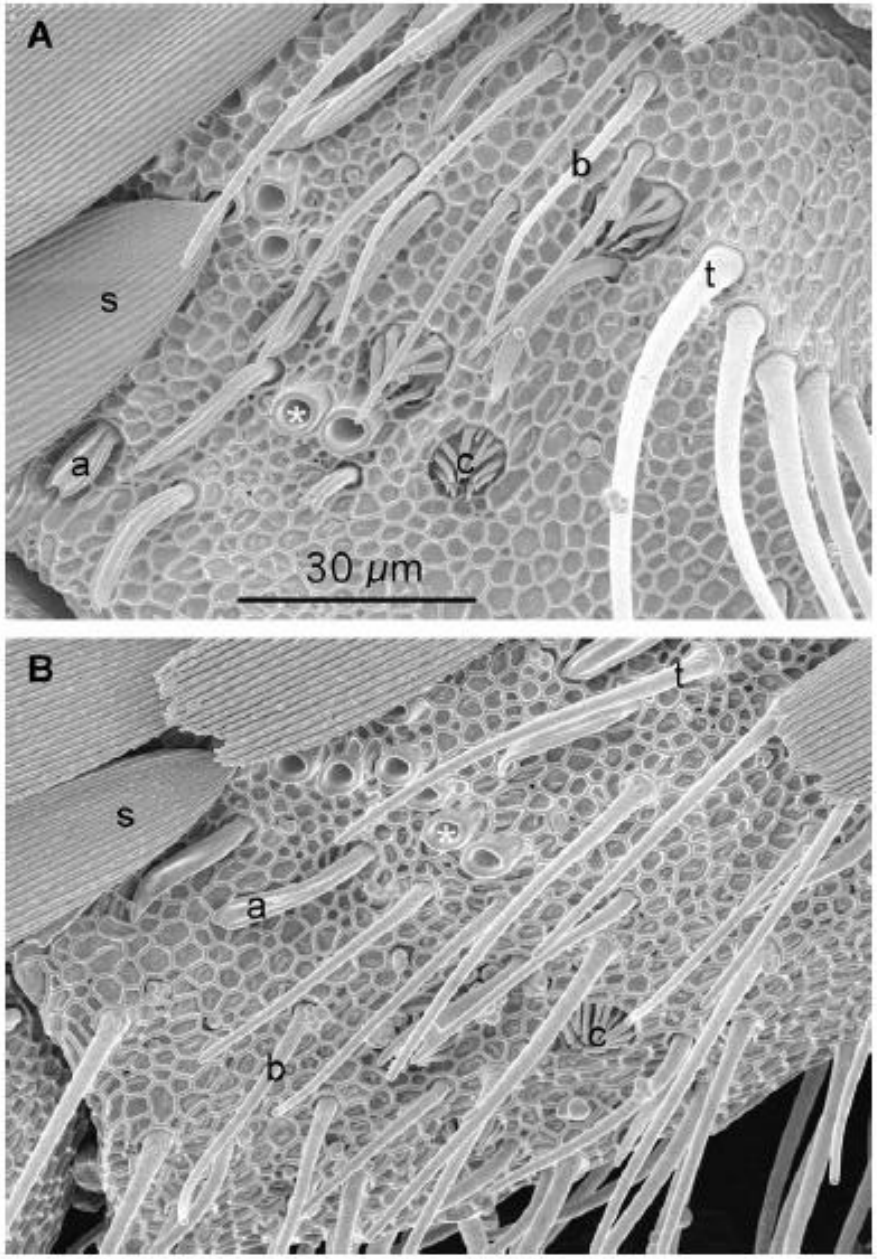


Figure 1 Scanning electron micrographs of a male **(A)** and female **(B)** antenna of *Cactoblastis cactorum*. a, s. auricillicum; b, s. basiconicum; c, s. coeloconicum; s, scale (on dorsal part of antenna); t, s. trichodeum. Asterisk denotes base of removed scale.

Detalle de antena de hembra de *C. cactorum*, note la menor cantidad de sensilas. *b, basiconica; t, tricoidea*

Detalle de antena de macho de *C. cactorum*, note la mayor cantidad de sensilas. *A*, auriciculum; b, basiconica; t, tricoidea

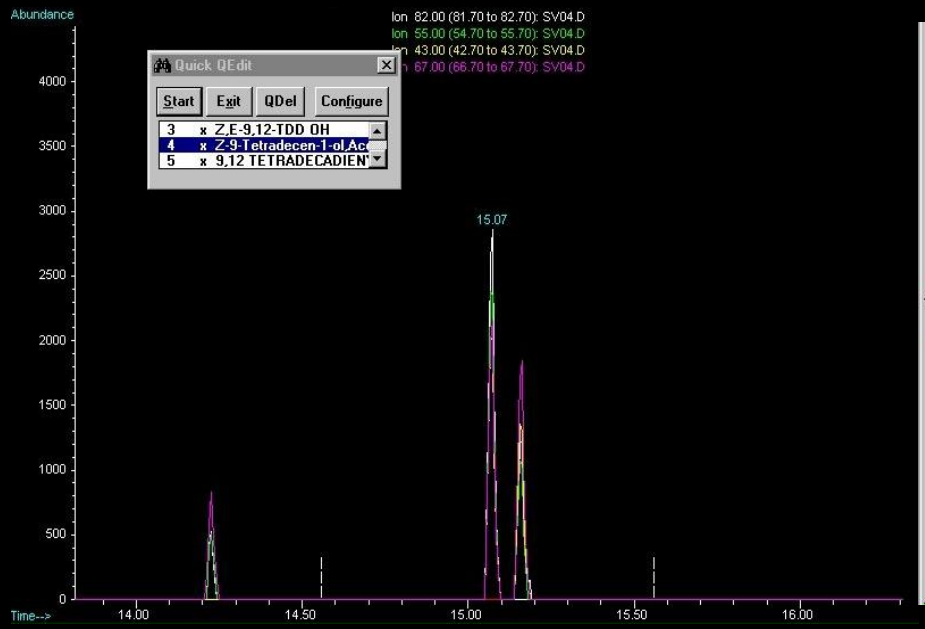
Pophof *et*

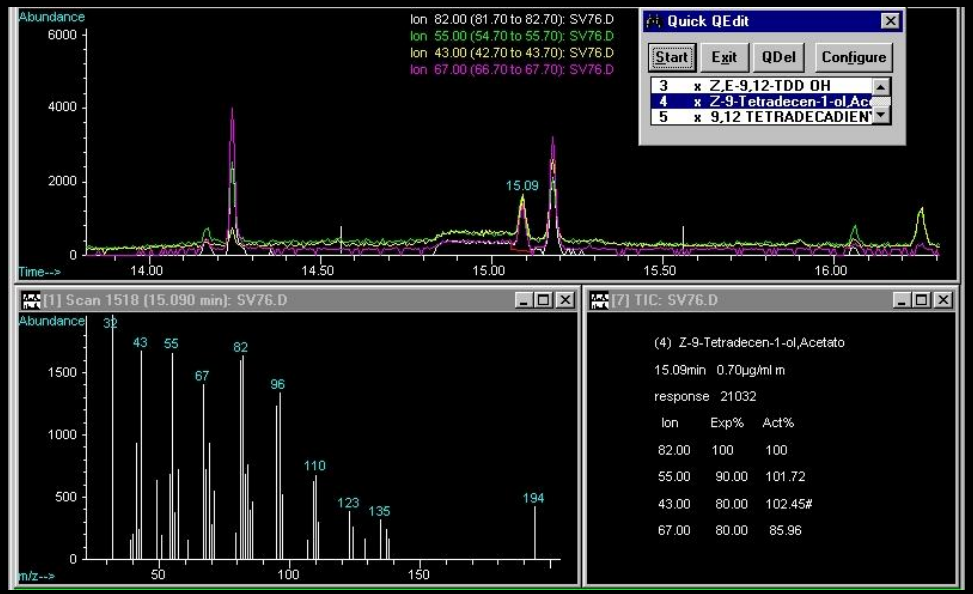
Cactoblastis cactorum
Hembra en la posición de "llamado".

Glándula de feromona sexual de la palomilla del nopal.

Glándulas productoras de feromona sexual en *Cactoblastis cactorum*

At the begining we make extracts of the sexual gland pheromone. We cut the gland At 6:00 AM and put the gland in a one mililter of hexane for one minute. We make around 500 female extracts. The chemical analysis was made In Dr. Potter lab (Southeast Watershed Research Laboratory, USDA) and my lab in Mexico.

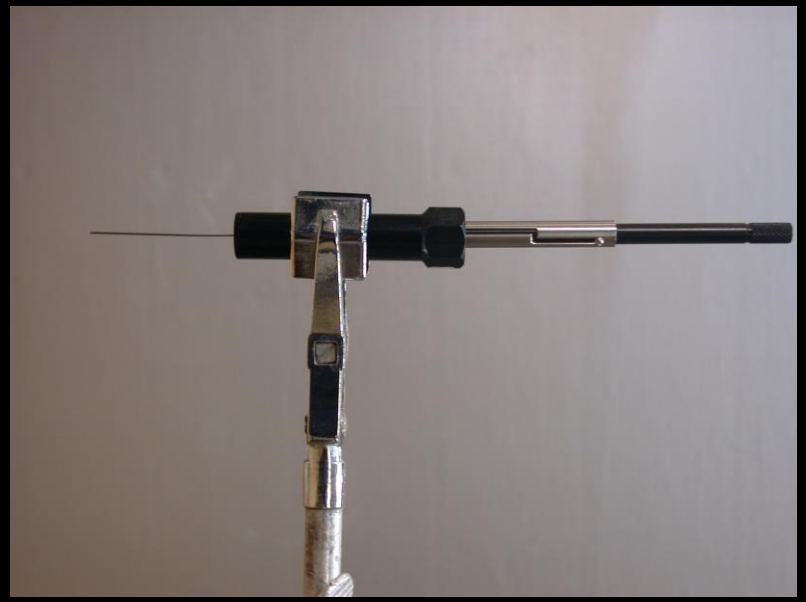


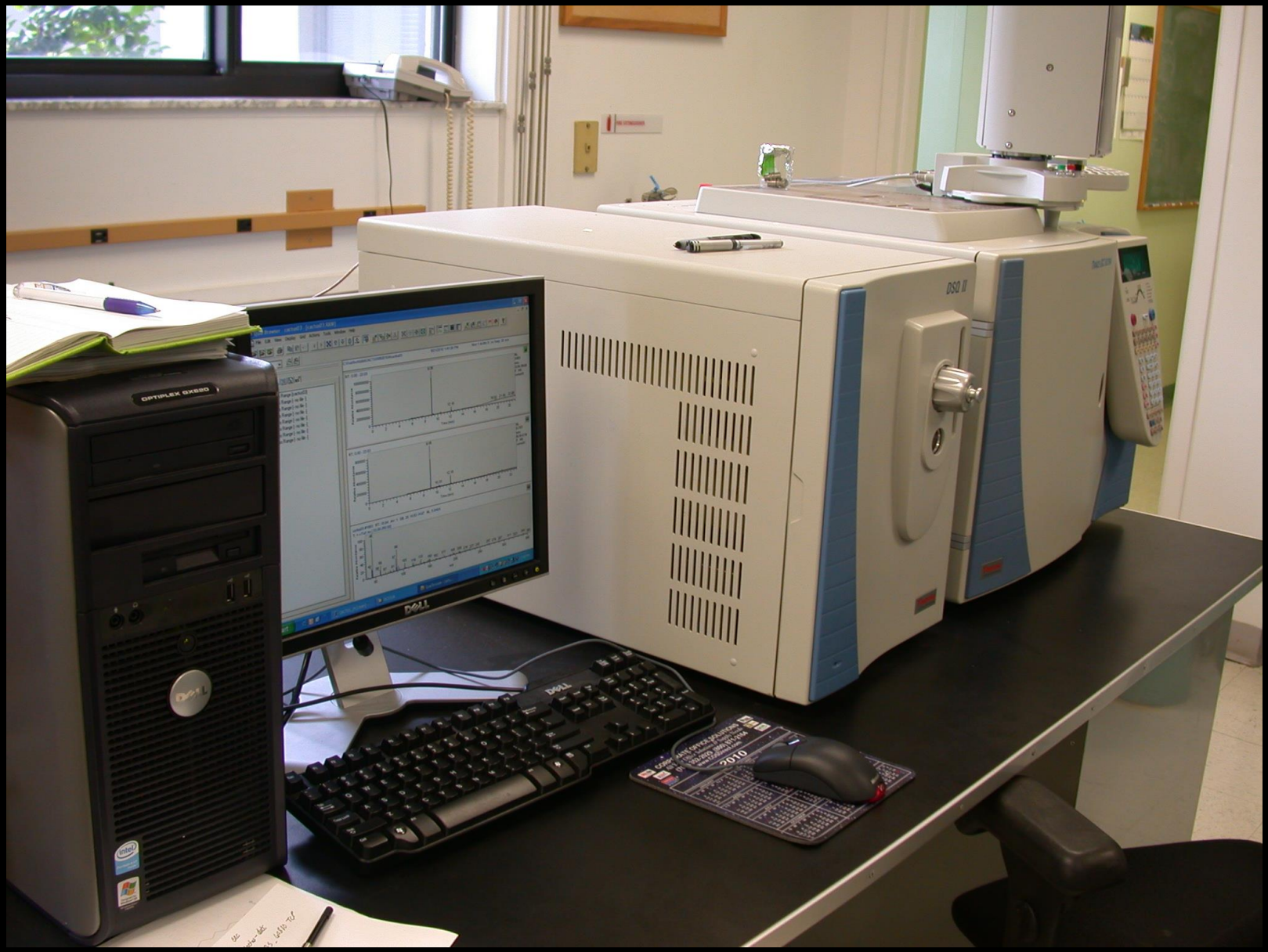


Analysis of the sample of April 27, integration of peak 3 with retention time 15.18 for the Z9, E12-tetradecadienyl acetate. For this sample we found a concentration of 0.97 mg / mL. Montecillo, Mexico, May 2010.

Collection of sexual pheromone volatiles from individual females. Tifton, Georgia, Spring 2010.

La glándula de feromona sexual fue cortada y frotada en la fibra de Microextracción en Fase Sólida.





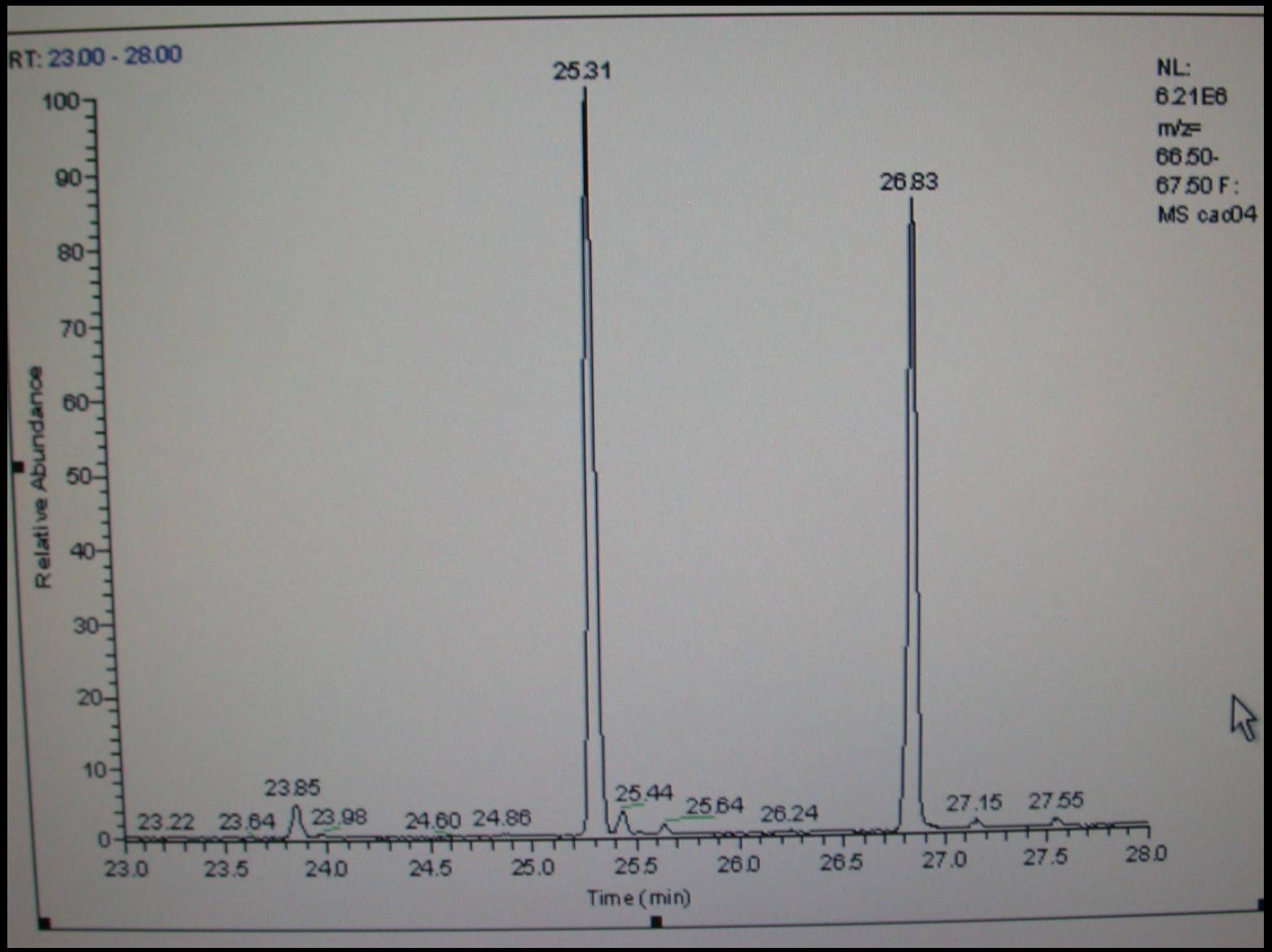
El anáisis químico de los extractos crudos fue hecho en Cromatografía de gas acoplado a espectometría de masas en el laboratorio Southeast Watershed Research Laboratory, USDA,Marzo- Abril 2010.

The participation of Dr. Thomas Potter was invaluable for identifying additional compounds of the cactus moth sexual pheromone.

Robert Caldwell an excellent technician

Volatile capture from one cactus moth female

Inyección de una sola glándula en el cromatografo de gas acoplado a espectometría de masas, Tifton, GA.


RT: 23.00 - 28.00
NL:
6.21E6
m/z=
66.50-
67.50 F:
MS cad04
25.31
26.83
23.85
23.22
23.64
23.98
24.60
24.86
25.44
25.64
26.24
27.15
27.55
Relative Abundance
Time (min)
100
90
80
70
60
50
40
30
20
10
0
23.0
23.5
24.0
24.5
25.0
25.5
26.0
26.5
27.0
27.5
28.0

Feromona sexual de la palomilla del nopal

En 2005 estaba trabajando con Bob Heath en el Subtropical Horticultural Research Station in Miami, Florida. Al final nosotros encontramos:

(Z,E)-9-12-tetradecadien-1-ol-acetate (54%)

(Z,E)-9-12-tetradecadien-1-ol (42%)

(Z)-9-tetradecen-1-ol-acetate (4%)

Cambios en la proporción de estos componentes tenían poco efecto en la eficacia del atrayente . Estos son compuestos comunes entre las especies de Pycitinae.

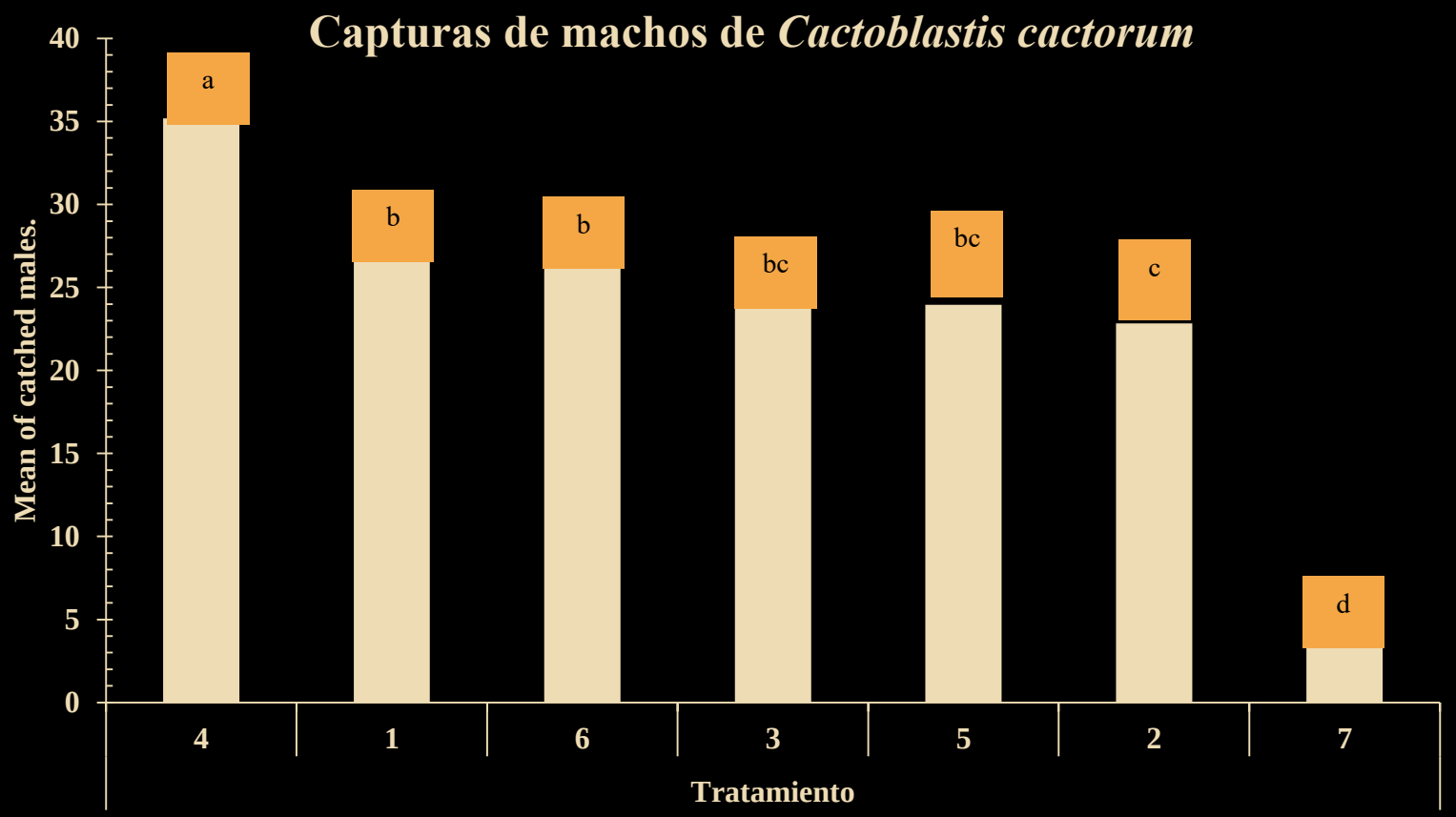

Hacia
Dauphin
Island

Inspección de capturas en Dauphin Island, Alabama, USA, 2010

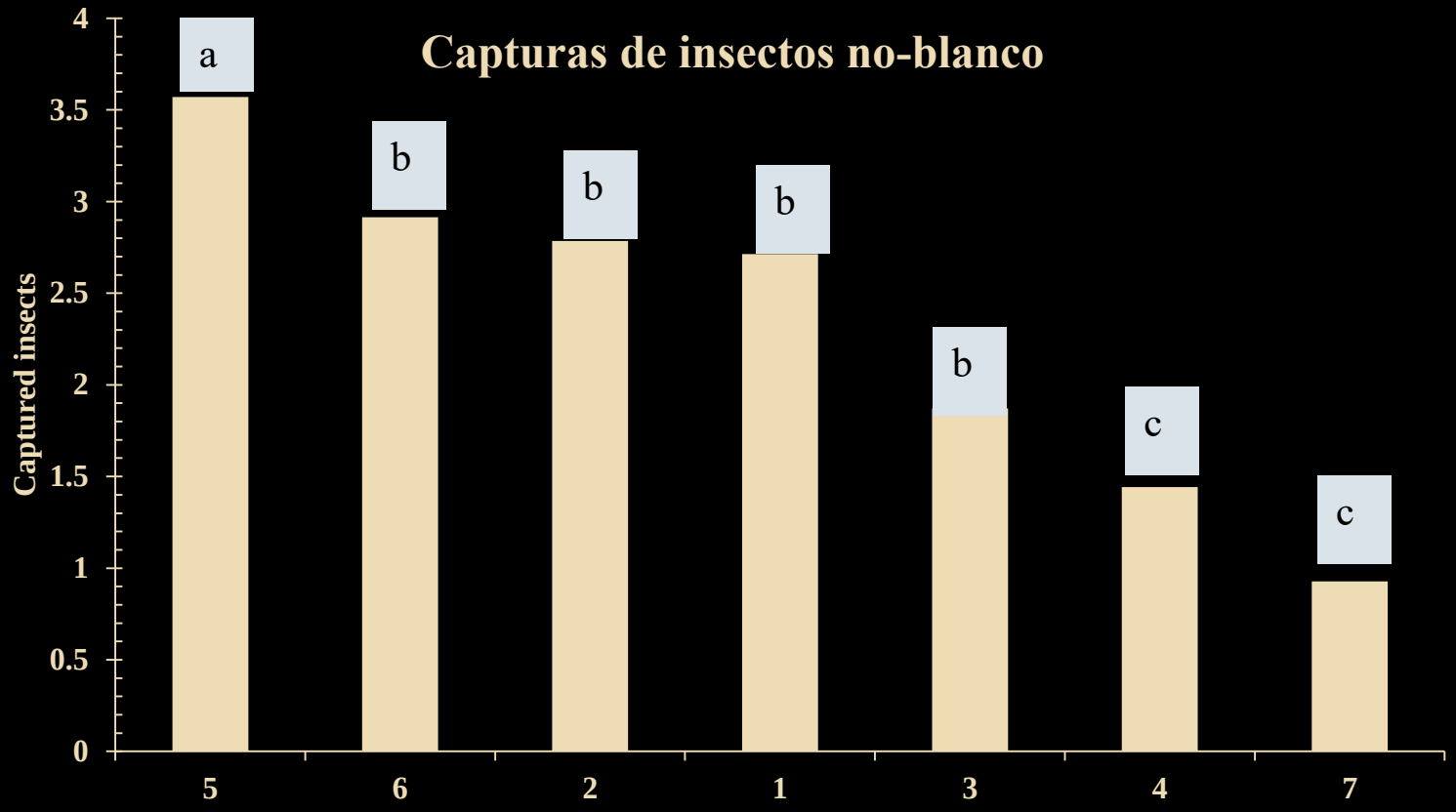

Evaluando la feromona de la palomilla del nopal
en Dauphin Island, Alabama, EUA


Dauphin Island, Alabama,

Actualmente se tienen tres substancias para la detección de esta palomilla.

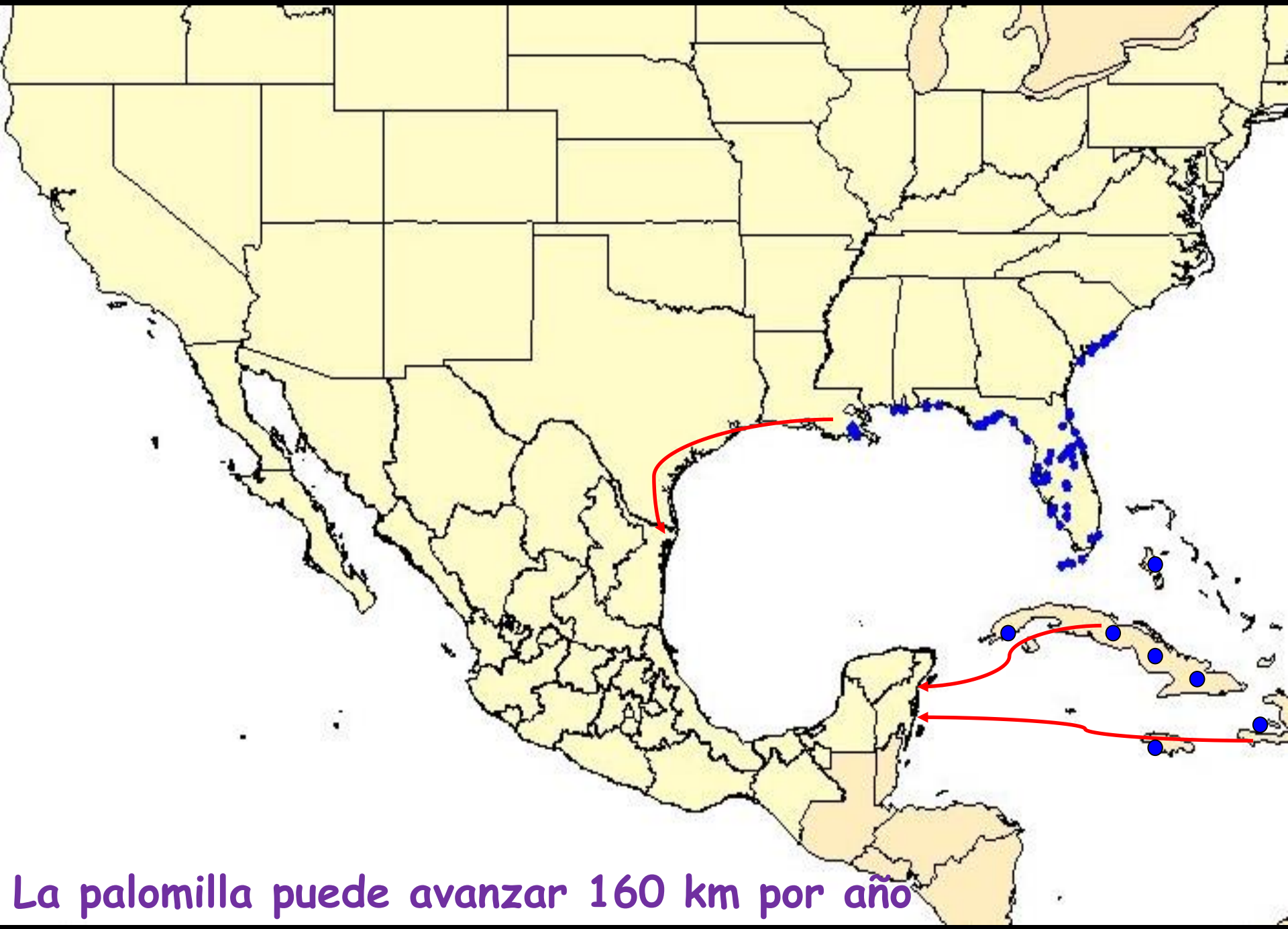


Treat	Compounds					
	ZE9-12-14-AC	ZE9-12-14-HO	Z-9-C-14-AC	Z-9-C-14-HO	Ac.Tetranoico	Nonanal.
T1=	56	41	4			
T2=	44	38	4	4	4	12
T3=	Commercial					
T4=	Virgin females (n=2).					
T5=	44	38	4	4	4	
T6=	38	44	4	4	4	
T7=	Control (empty trap).					



Treat.	Compounds					
	ZE9-12-14-AC	ZE9-12-14-HO	Z-9-C-14-AC	Z-9-C-14-HO	Ac.Tetranoico	Nonanal.
T1=	56	41	4			
T2=	44	38	4	4	4	12
T3=	Commercial					
T4=	Virgin females (n=2).					
T5=	44	38	4	4	4	
T6=	38	44	4	4	4	
T7=	Control (empty trap).					

Tetranoico acid, Z9-14: OH and Z9-14: Ac addition increased catching non-target insects



La palomilla puede avanzar 160 km por año

Otros lepidópteros capturados en Florida, Georgia, Mississippi y Alabama in EUA, 2009. Stephen Higth.

1.) Beet Armyworm, *Spodoptera exigua* (Noctuidae)
2.) Dolichos Armyworm, *Spodoptera dolichos* (Noctuidae)
3.) Yellow-Collared Scape, *Cisseps fulvicollis* (Arctiidae)
4.) Lesser Cornstalk Borer, *Elasmopalpus lignosellus* (Pyralidae)
5.) Subterranean Dart, *Agrotis subterranea* (Noctuidae)
6.) Grass-veneer, *Crambus* spp. (probably *C. quinquareatus*) (Pyralidae/Crambidae)

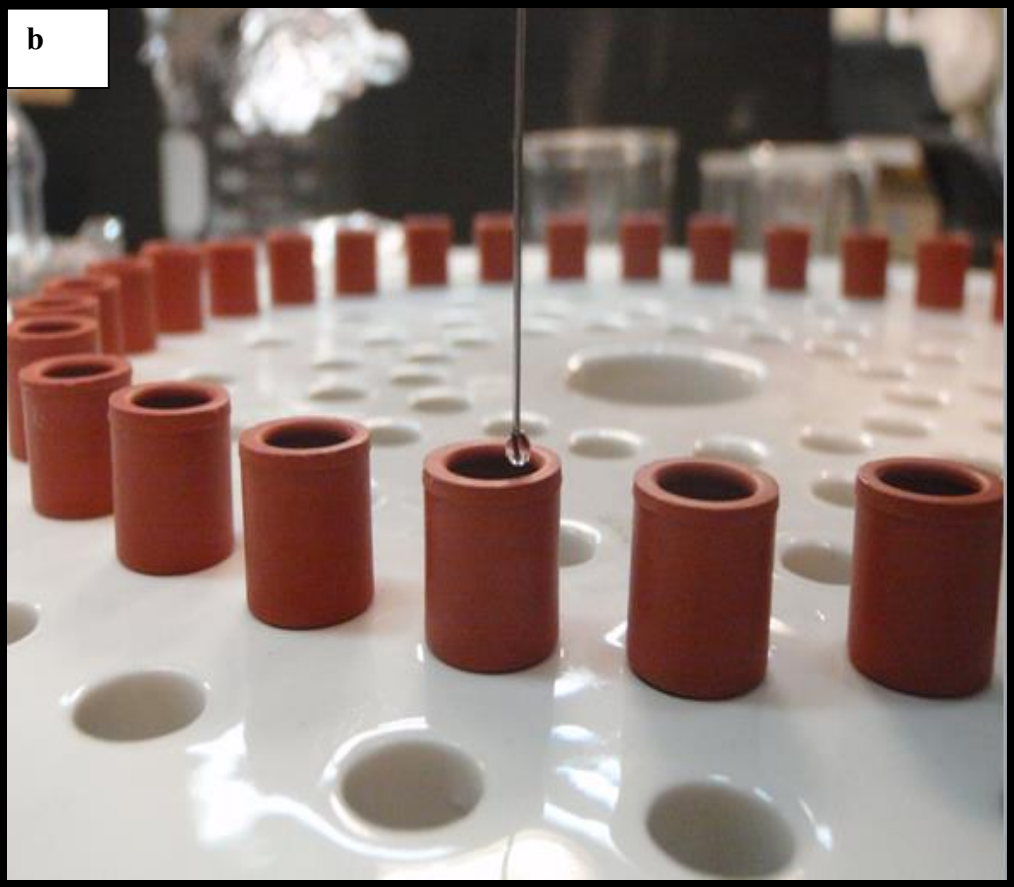
En México al menos otras 6 especies

Cuadro 2. Composición de feromonas de *Spodoptera* y varias especies de Phycitinae que comparten los compuestos de la palomilla del nopal. Se incluye la feromona comercial actual y la encontrada en este trabajo.

Especie/ Comp	Cc Heath	Cc act	Hu	Sp	Eph	El	Pl	Hy	Gl	Ca
Z,E-9,12-14:AC	53	30	0	22	0	80	77	50	0	60
Z9-14:Ac	4	19	80	55	20	20	0	30	0	40
Z,E-9,12-14:OH	42	50	0	0	0	0	17	0	0	0
Z9-14:OH	0	0	4	0	10	0	0		10	0
Z,9-14:AL	0	0	0	0	20	0	5	20	10	0

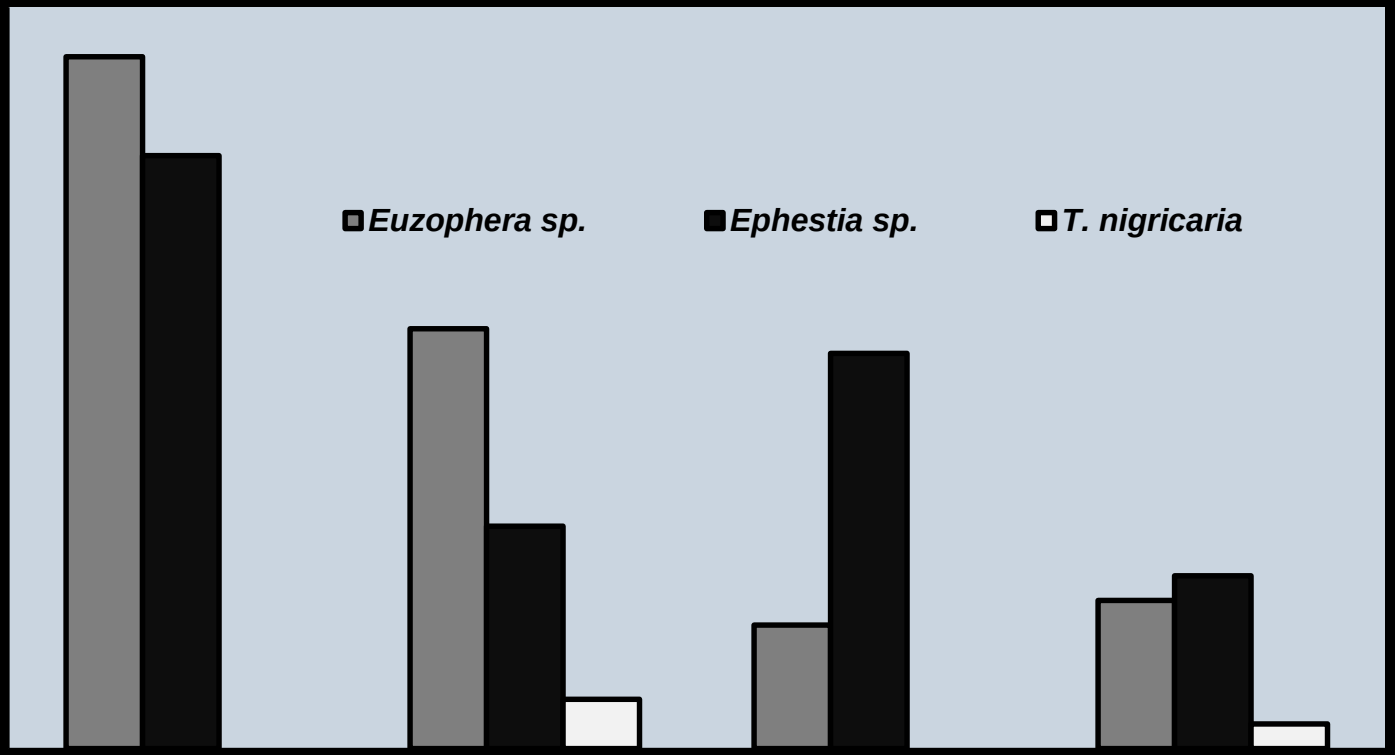
Fuente: Pherolist, 2004.
Cc=*Cactoblastis*, H=*Hulstia*, Sp=*Spodoptera*, Eph=*Ephestia*, El=*Elasmopalpus*, Pl=*Plodia*, Hy=*Hysipyla*, Gl= *Glyptoteles*, Ca=*Cadra*.

In both types of traps (treatments) was installed a rubber septum (white, 8 mm internal diameter) with 1 mg of the mixture of compounds of the sex pheromone of *C. cactorum*.



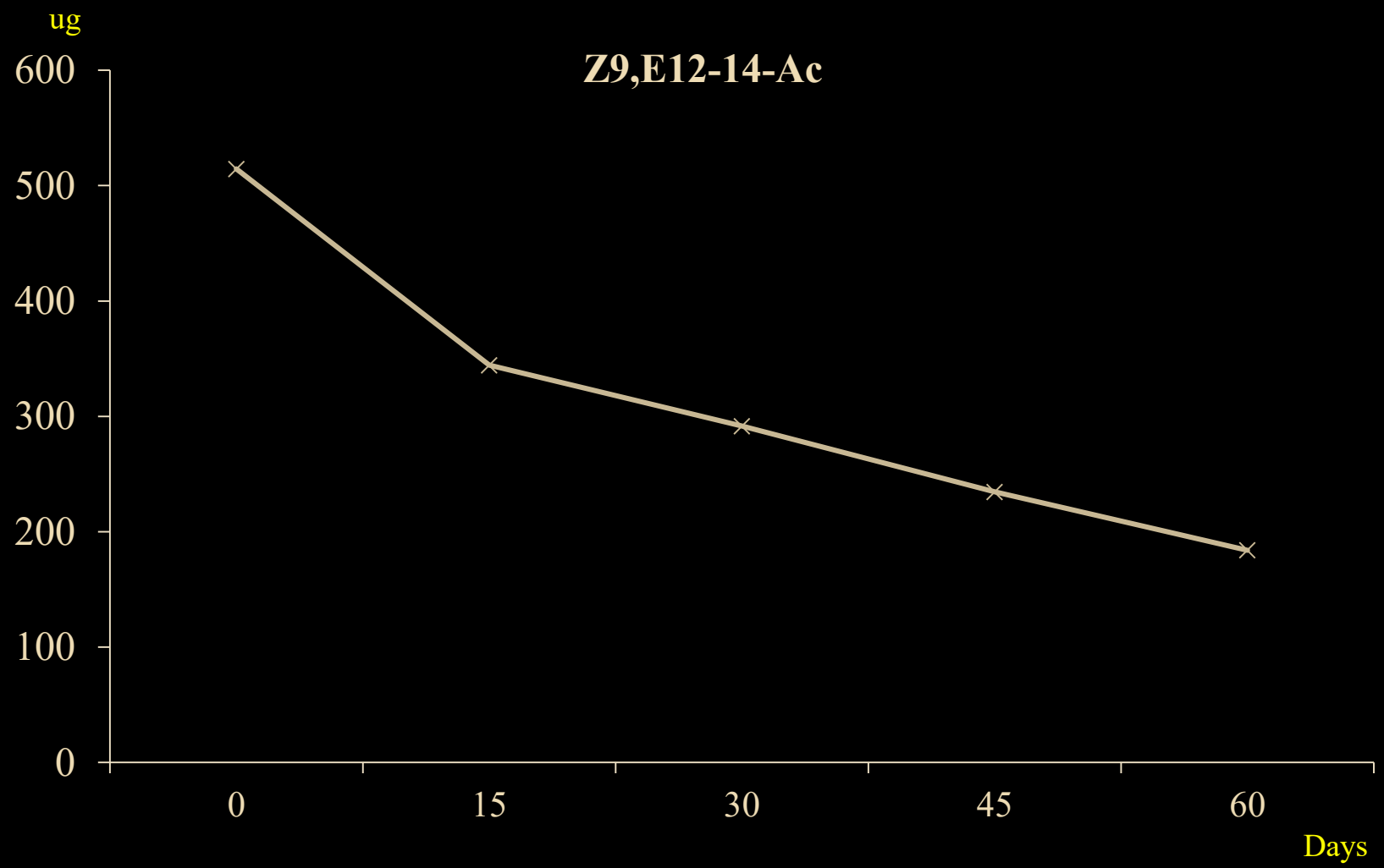
Washing (a) and preparation (b) of the septa with the pheromone of *C. cactorum*.

Las “cuijas” son atraídas por las palomillas atrapadas y pueden afectar el monitoreo de las palomillas



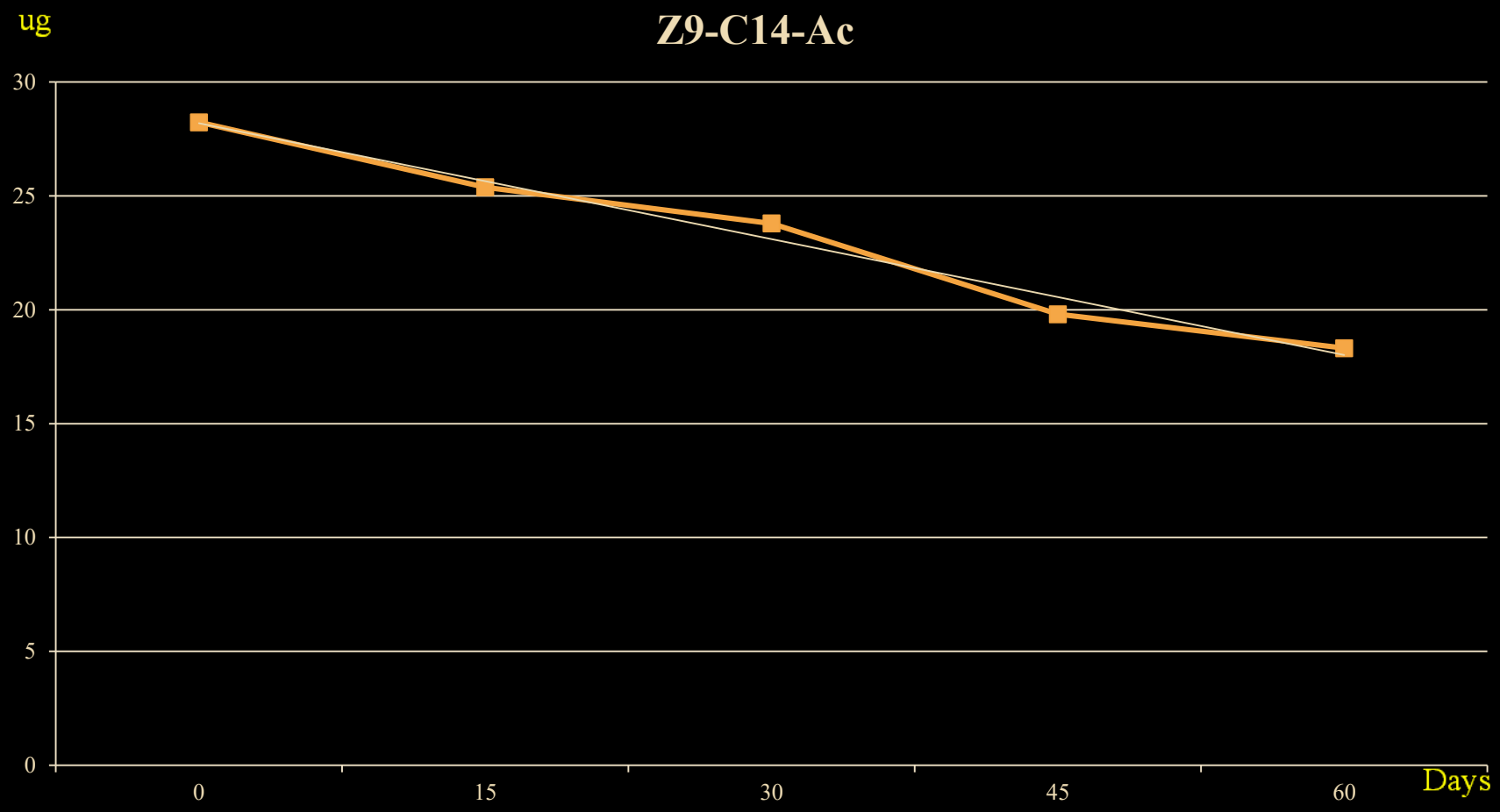
Non-target insects captured with the pheromone of *C. cactorum* from 01 to 22 October 2010.

Ecuación de concentración = 70.34-5.18 * (días) R2 = 89.89 y CV = 12.22 La proporción media de liberación del Z9-E12-tetradecadienyl-acetate fue de 5.18 ug por día. La tendencia es mostrada en la figura de abajo.

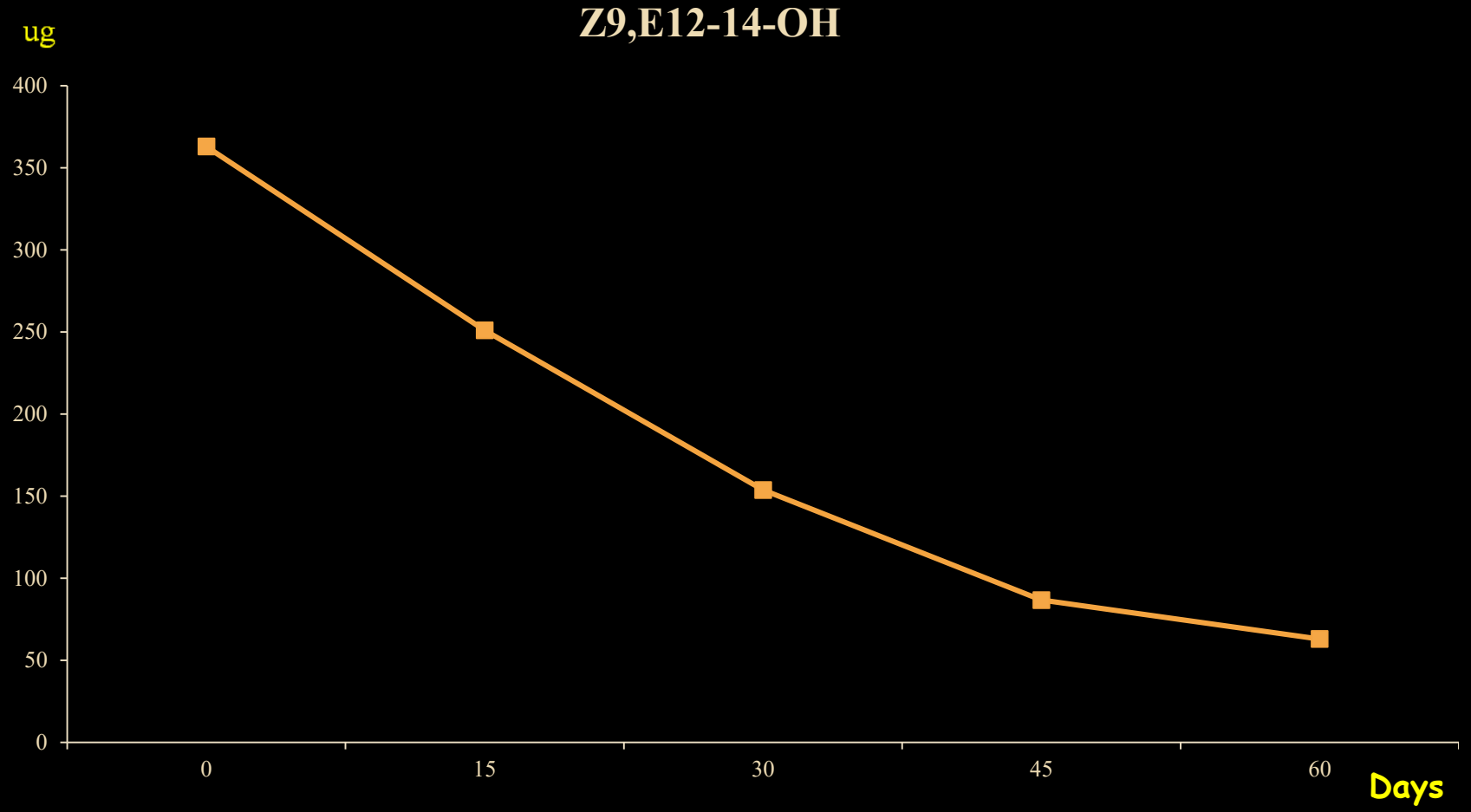


Ecuación

Concentración= 28.29-0.17*(días) R^2=92.45 y CV=4.68 la tasa promedio de liberación para el Z-9-tetradeceny acetato es de 0.17 µg por día. La tendencia se presenta en la siguiente figura.



Concentración= 339.04-5.15 * (días) R2 = 93.84, el promedio de la tasa de liberación del ZE, 9.12 - Tetradecadienol fue de 5.15 ug por día. La tendencia es mostrada en la figura de abajo.



Larvas de la palomilla del nopal vistas a trasluz. Isla Mujeres, QR, México, agosto, 2006

Trampa de feromona para la palomilla del nopal en Isla Mujeres, QR, México Agosto, 2006

Estos resultados confirman que bajo las condiciones de Cancún, QR, los septos duran al menos 45 días.

Los dos tipos de trampas son efectivas para capturar insectos NO-Blanco.

Habra que determinar si el color de la trampa influye en la captura

Trampas diseñadas con envases vacios son mas baratas 10 pesos que trampas comerciales 35

Villa Quilino: Plantación con manejo *O. ficus-indica*

- Podas
- Sin eliminación de malezas
- Riego ocasional
- Sin plaguicidas
- Altura de plantas 1-1.5 m

Logarzo, 2009

Pampa Muyoj: Plantacion sin manejo

O. ficus-indica

- Sin poda
- Eliminación de malezas
- Sin riego
- Sin insecticidas
- Altura de plantas, 3-4 m

Logarzo, 2009

Cuadro 1. Número de machos capturados con trampas cebadas con diferentes componentes y proporciones de la feromona sintética de *Cactoblastis cactorum* en Argentina: Quilino (1), Pampa Muyoj (2), Febrero 2011.

Tratamiento	Machos capturados (1)	Machos capturados (2)	Total
1	33	41	74
2	33	51	84
3	16	40	56
4	10	34	44
5	23	47	70
6	16	46	62
7	9	13	22
8	50	81	131
9	25	64	89

Se destaca el tratamiento ocho.


TRÉCÉ
Pheromone Trap
3/09/09
TRÉCÉ

Gracias!

Dr. Javier Trujillo
Dr. Robyn Rose
Rebeca Gutiérrez
Robert Caldwell
Susan Drawdy
Judy Hayes
Heather Sheppard
Shaun Shiver
Morgan Moser
Julio Velazquez
Ausencio Azuara

Informes:
Juan Cibrian Tovar
jcibrian@colpos.mx
Tel. 595-9511580
595-9520200-1657

Pheromone-Based Attractant for Males of *Cactoblastis cactorum* (Lepidoptera: Pyralidae)

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Environ. Entomol. 35(6): 1469–1476 (2006)

ABSTRACT The cactus moth, *Cactoblastis cactorum* (Berg), is an invasive pest of *Opuntia* spp. Since its arrival in the Florida Keys in 1989, it has moved rapidly up the east and west coasts of Florida, threatening to invade the southwestern United States and Mexico. Female moths produce a sex pheromone that attracts male moths. In this study, we report on mating behavior observed in the laboratory and the identification of putative pheromonal chemical components based on mass spectral analysis of volatiles collected from virgin female moths and from solvent extraction of excised glands. Three candidate components, formulated on rubber septa in different release rates and ratios, were tested in laboratory olfactometer and flight tunnel experiments, and in field tests in areas with known feral populations of cactus moths. Lures formulated with the three-component blend of 54% (*Z*,*E*)-9,12 tetradecadien-1-ol acetate, 42% (*Z*,*E*)-9,12 tetradecadien-1-ol, and 4% (*Z*)-9- tetradecen-1-ol acetate were the most effective, although changes in the ratio of these components had little effect on lure efficacy. For field deployment, traps baited with synthetic lures with a 1 mg load of the three component blend captured equal or higher numbers of males than traps baited with two virgin females. Trapping systems using this pheromone-based attractant will be useful for population delineation in areas currently infested.

KEY WORDS sex pheromone, field trapping, lure, gland extracts, olfactometer

USDA

United States Department of Agriculture

Research, Education, and Economics
Agricultural Research Service

January 3, 2012

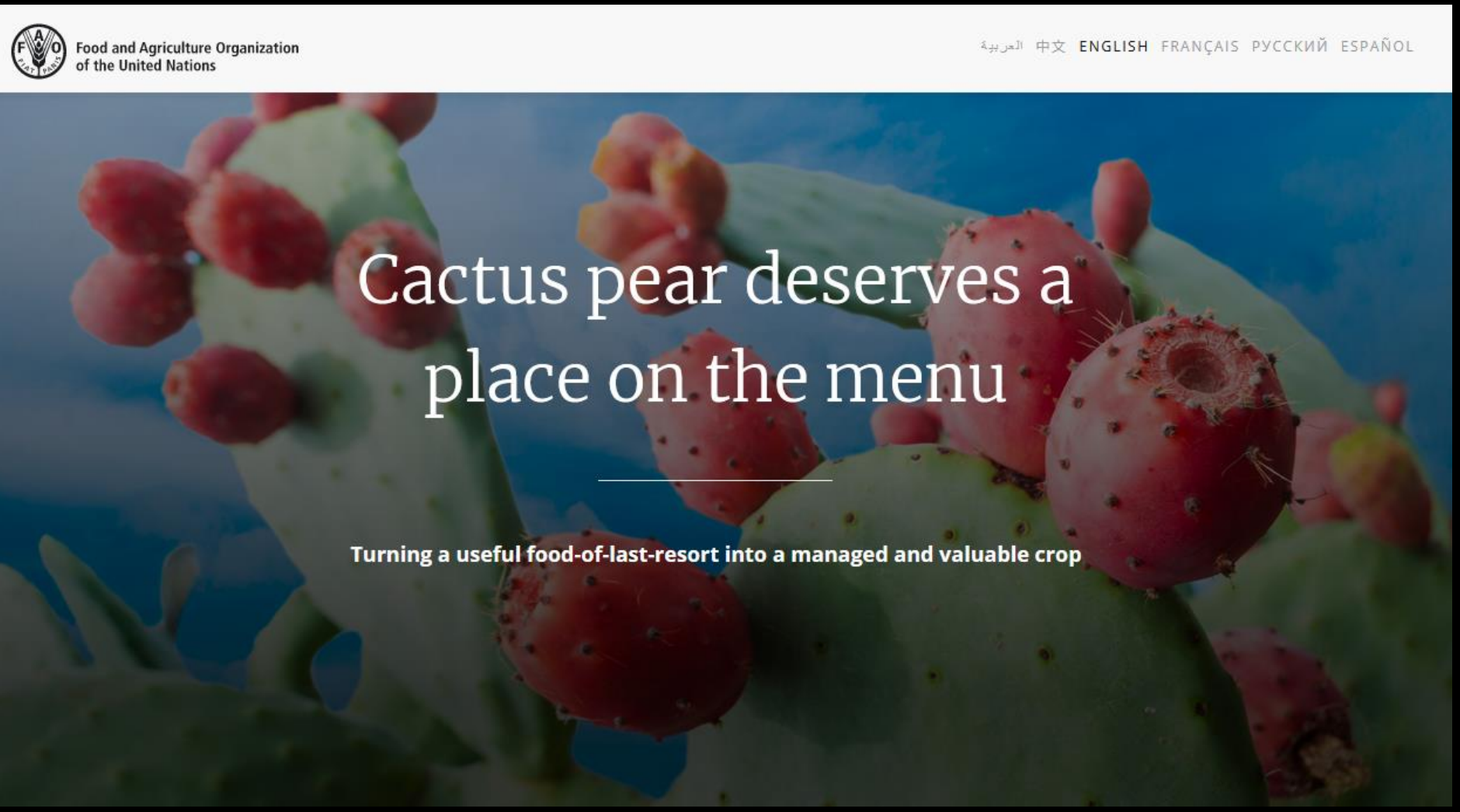
To: Administrator's Council and South Atlantic Area

From: Dr. Deborah Brennan, Director South Atlantic Deborah Brennan Date: 2012.01.03 14:18:29 -05'00'

Subject: The Death of Mr. Robert (Bob) Heath

I am deeply saddened to report that Mr. Robert (Bob) Heath passed away on December 29, 2011. In his 43-years of service with ARS, he has served as Research Leader/Supervisory Research Chemist as well as Location Coordinator at the Subtropical Horticultural Research Station, Miami, FL (1999-2011), Research Chemist at the Center for Medical, Agricultural, and Veterinary Entomology, Gainesville, FL (1978-1999) and in support staff positions at Beltsville, MD and Gainesville, FL (1968-1978).

Mr. Heath was an internationally recognized scientist with specialization in the development and applications of insect semiochemicals and other attractants for the control of agricultural insect pests. He developed considerable expertise in the areas of chemical separation science, microanalytical techniques, formulations of semiochemicals, and identification of novel pheromones. The international recognition and pioneering status of Mr. Heath's research is evidenced by his 210 refereed publications and book chapters. He authored or co-authored three symposia chapters, nine book chapters, nine patents recorded and two pending. Twenty-two of his publications were the result of collaborative efforts with scientists from several countries world-wide. Additionally, Mr.



Diciembre 1, 2017

"Climate change and the increasing risks of droughts are strong reasons to upgrade the humble cactus to the status of an essential crop in many areas" - Hans Dreyer, director of FAO's Plant Production and Protection Division.

Cactus plants need not be prickly and can act as precious natural resources, especially in dryland areas where they can make important food-security contributions for people and livestock.

FAO gathered experts on the hardy plant to pool their knowledge in a bid to help farmers and policy makers make more strategic and efficient use of landscapes often dismissed as arid and infertile.

During the recent intense drought in southern Madagascar, cactus proved a crucial supply of food, forage and water for local people and their animals. The same area had once suffered a severe famine as the result of efforts to eradicate the plant, which some saw as a worthless invasive species. It was quickly reintroduced.

Cactus pears in a market garden in Morocco. Apart from providing food, cactus stores water in its pads, and can provide up to 180 tonnes of water per hectare – enough to sustain five adult cows. Photo: FAO/Abdelhak Senna

Yields of commercially grown *Opuntia* vary substantially according to place, cultivar and growing technique. Harvesting more than 20 tonnes of fruit per hectare is common in Israel, Italy and where irrigation is used in Mexico – a few cases of 50-tonne yields have been reported – but output is lower in most arid and rainfall-dependent locations.

The cactus pear's biological trick is a special kind of photosynthesis – crassulacean acid metabolism – that allows them to take in water during the night.

Read FAO's new publication:

Crop Ecology, Cultivation and Uses of Cactus Pear

Learn more:

Cactus pear as a traditional crop

The Cactus Network

International Center for Agricultural Research in the Dry Areas (ICARDA)

Exporting Ethiopia's cactus pear jam

El Universal , diciembre 1, 2017

La capacidad del nopal para sobrevivir en climas áridos y secos lo convierte en un elemento clave en la seguridad alimentaria. (Foto: Pixabay)

Diciembre 1, 2017

Food and Agriculture Organization of the United Nations