

Fructanos de Agave y ALGUNAS de sus Bondades.....

Mercedes G. López

Profesor SNI III

Laboratorio de Química de Productos Naturales

Cinvestav Unidad Irapuato

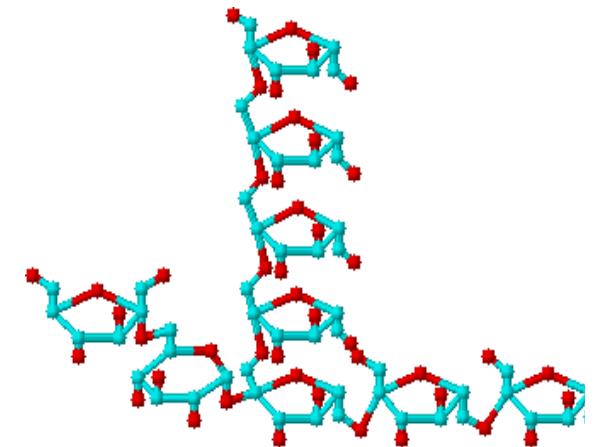
Agave tequilana Weber var. azul



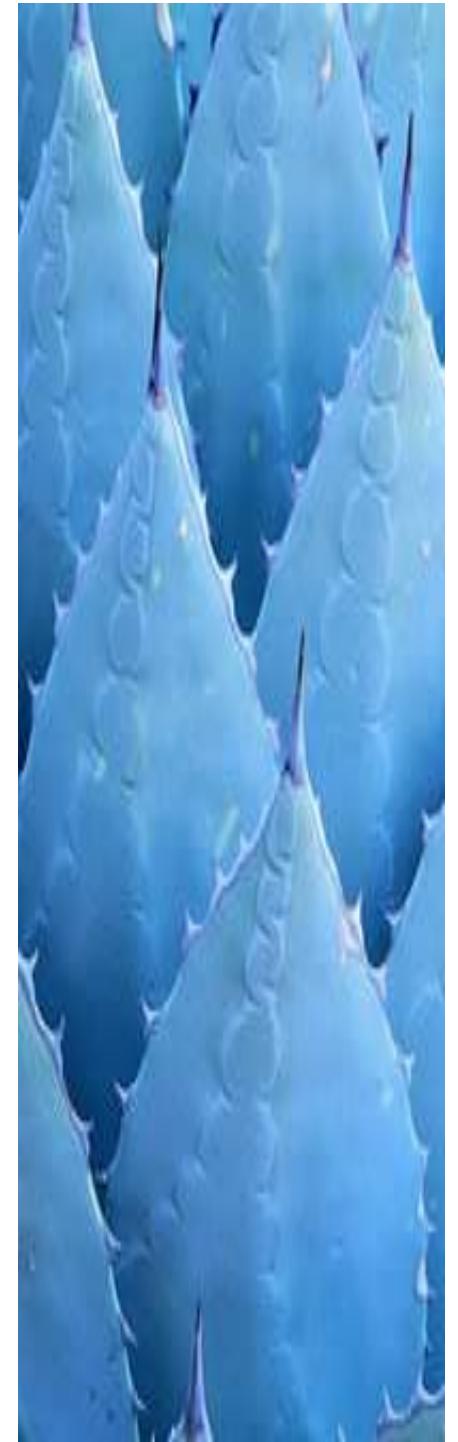
Agave tequilana Weber var. azul



Agave tequilana Weber var. azul



Fructanos



Fuentes de fructanos

Fructanos DP< 10 (SDP) “Fructooligosacáridos”



<1%



1-4%



1-8%

Fructanos DP> 10 (LDP) “Fructanos”



3-10%



10-20%



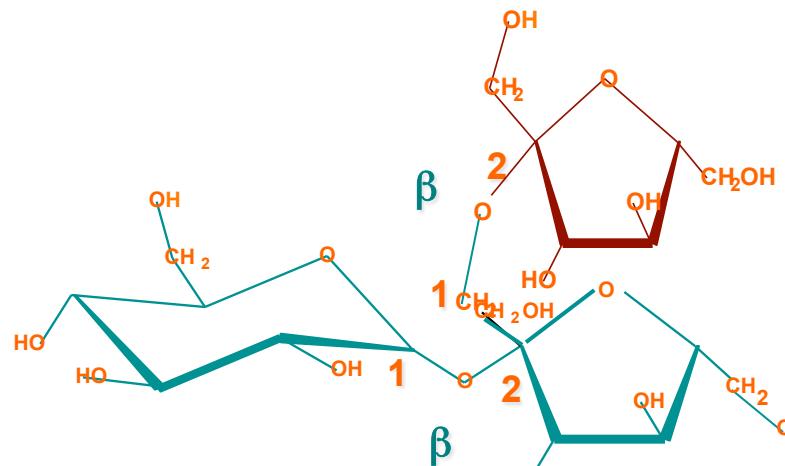
15-25%



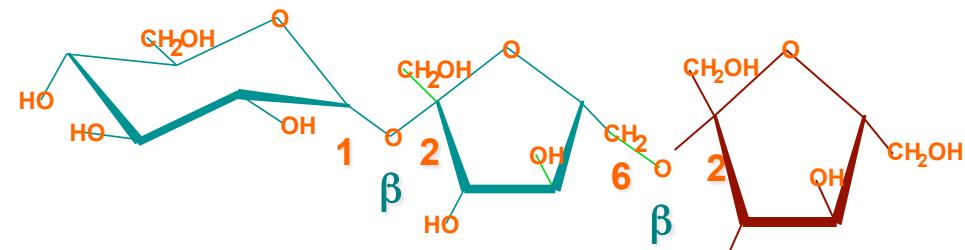
15-22%

Mitsuoka y col., 1987; Roberfroid y col., 1993; Modler y col., 1994; Vjin y Smeekens, 1999; Mancilla-Margalli y López, 2006

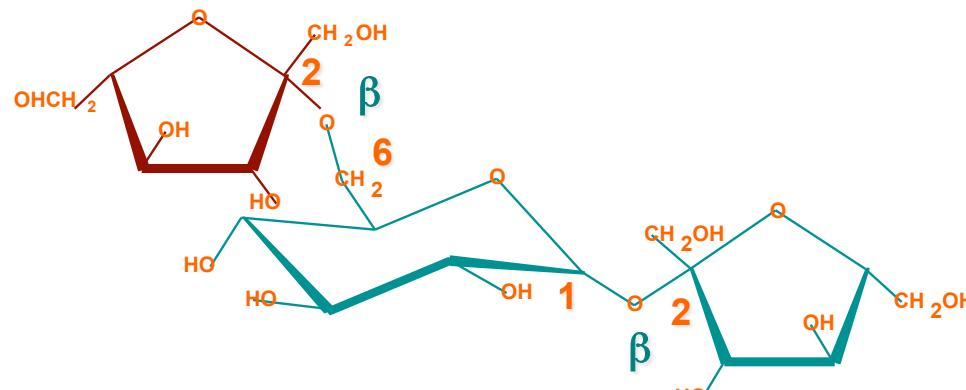
CLASIFICACION DE FRUCTANOS



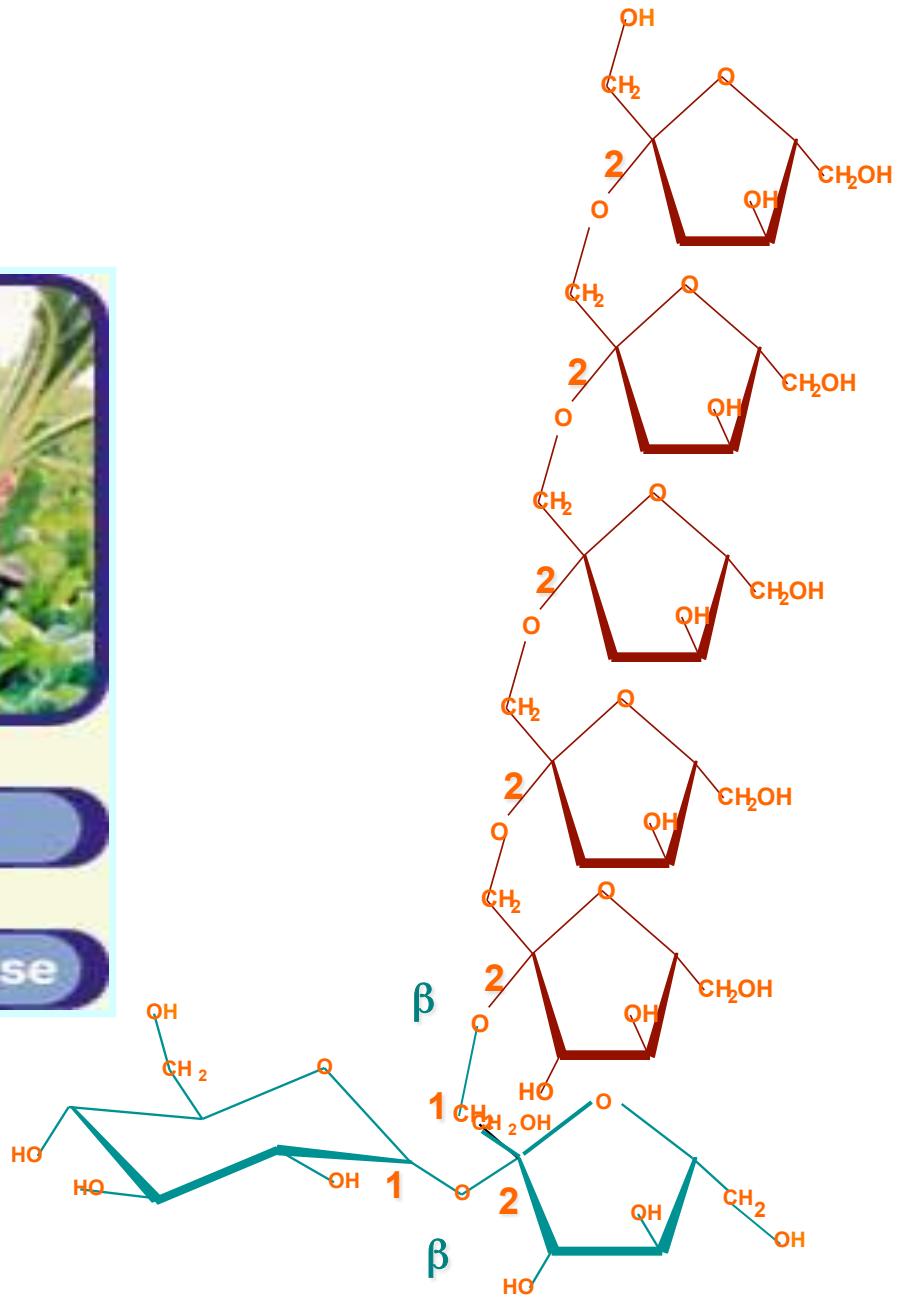
INULINAS (DP=60)
Plantas



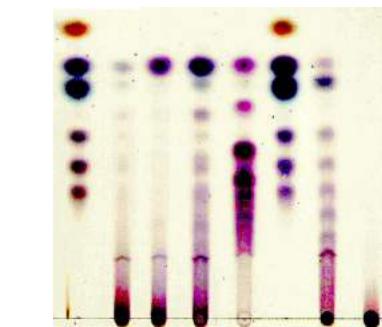
LEVANOS (DP=1000)
Microorganismos



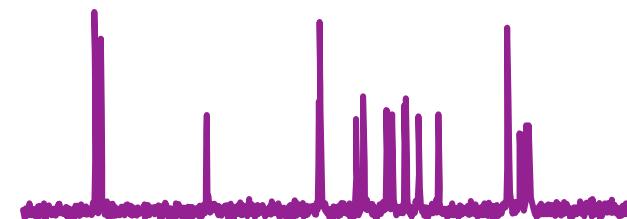
NEOINULINAS
(DP=3-20) Plantas



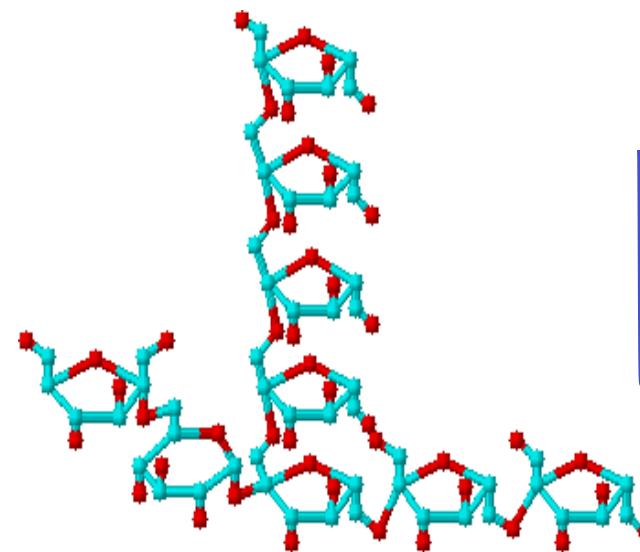
CARACTERIZACION ESTRUCTURAL



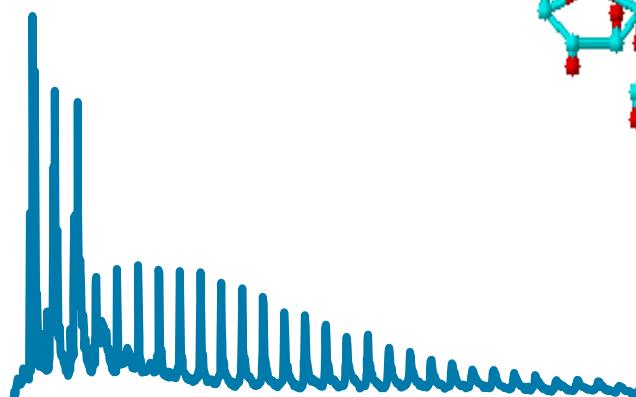
PURIFICACION



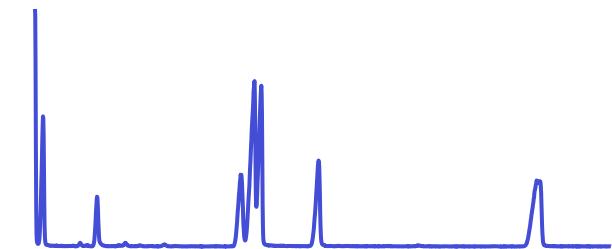
NMR



ESTRUCTURA



MALDI-TOF-MS



GC-MS

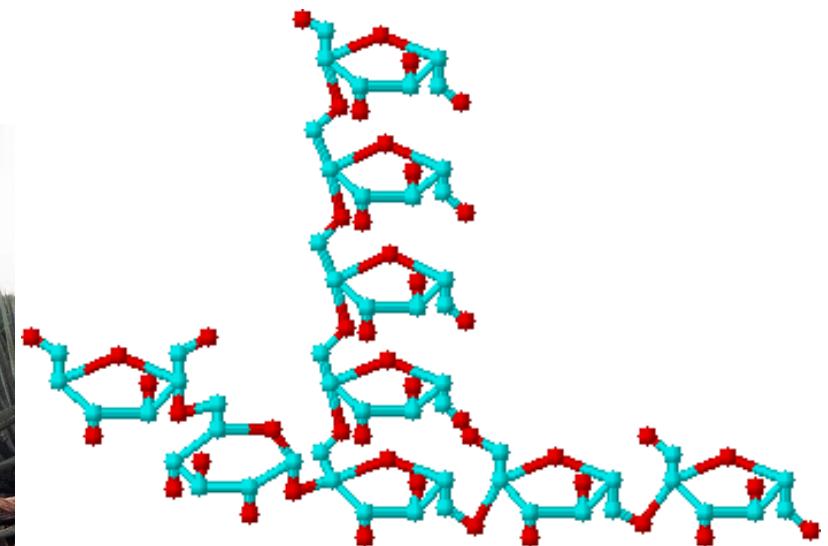


HPAEC

Molecular Structures of Fructans from *Agave tequilana* Weber
var. *azul*

MERCEDES G. LOPEZ,*† NORMA A. MANCILLA-MARGALLI,† AND
GUILLERMO MENDOZA-DIAZ‡

Departamento de Biotecnología y Bioquímica, Centro de Investigación y de Estudios Avanzados del IPN, Unidad Irapuato, Apartado Postal 629, Irapuato, Gto., 36500 México, and Facultad de Química, Universidad de Guanajuato, Noria Alta s/n, Guanajuato, Gto., 36050 México

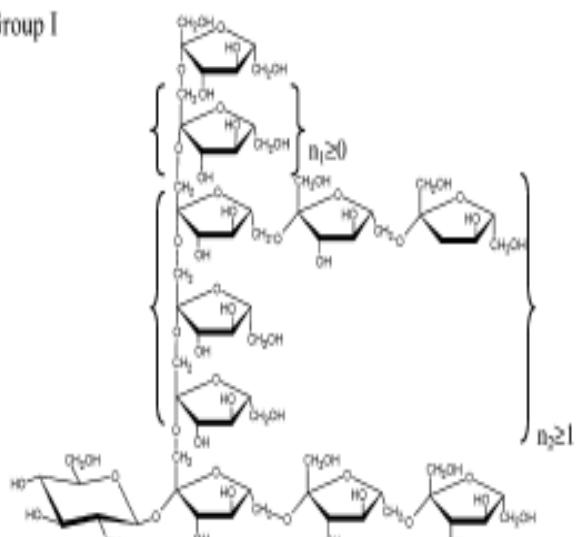




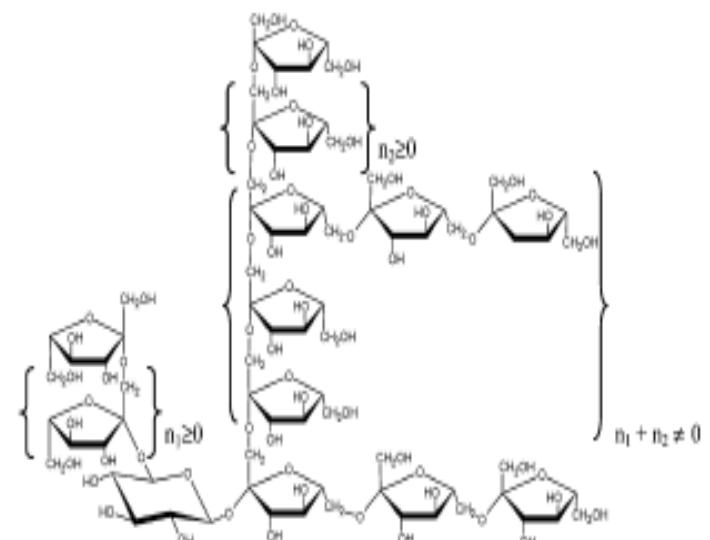
Mancilla-Margalli & López 2006

Graminans

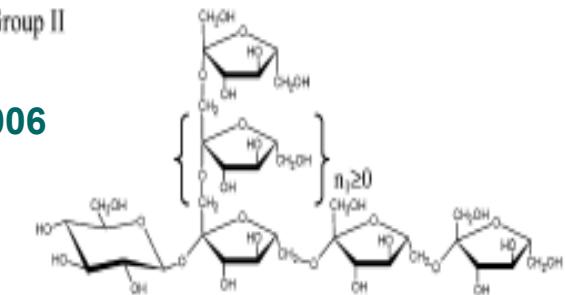
Group I



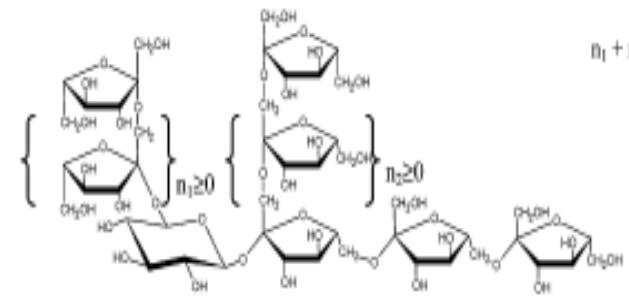
Neofructans (Agavins)



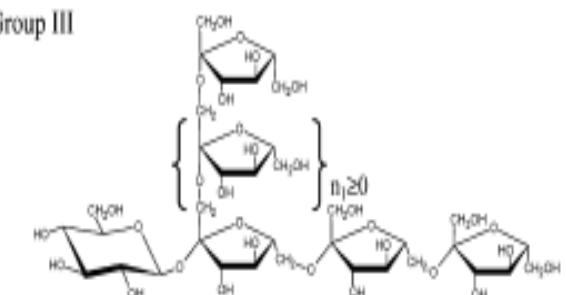
Group II



$$\beta_1 + \beta_2 \geq 4$$



Group III



$$\beta_1 + \beta_2 \geq 3$$

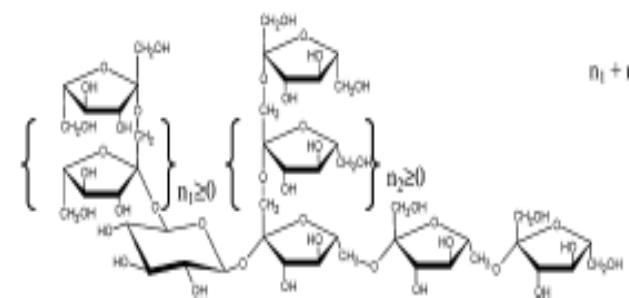
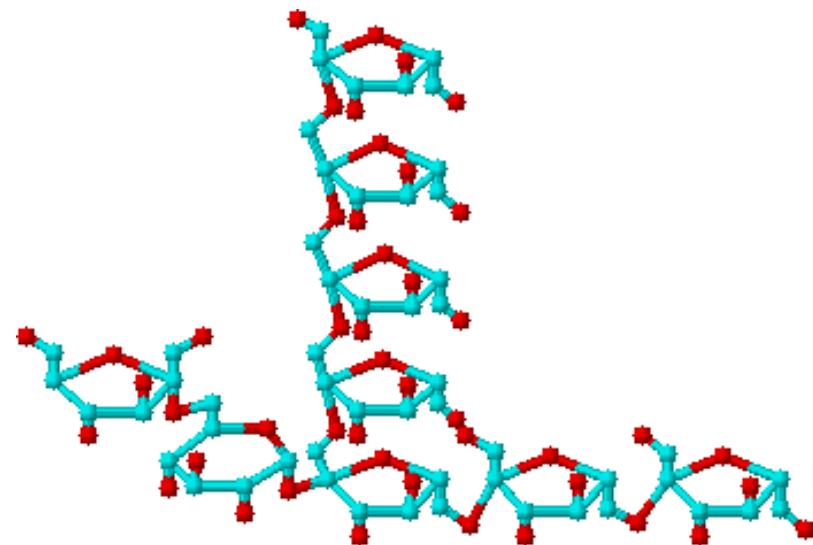
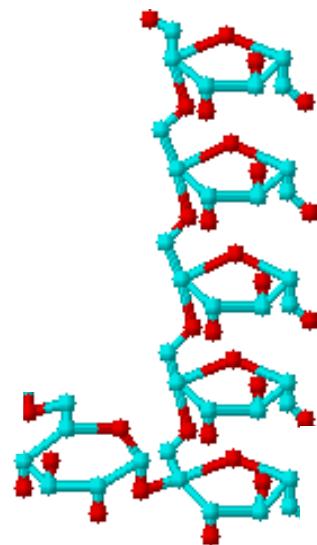


Figure 4. Proposed fructan structures for *Agave* and *Dasyliion* species. Molecular structures based on the three proposed groups, and two types of fructans within the groups (A for graminans and B for agavins).

FRUCTANOS DE ACHICORIA Y AGAVE



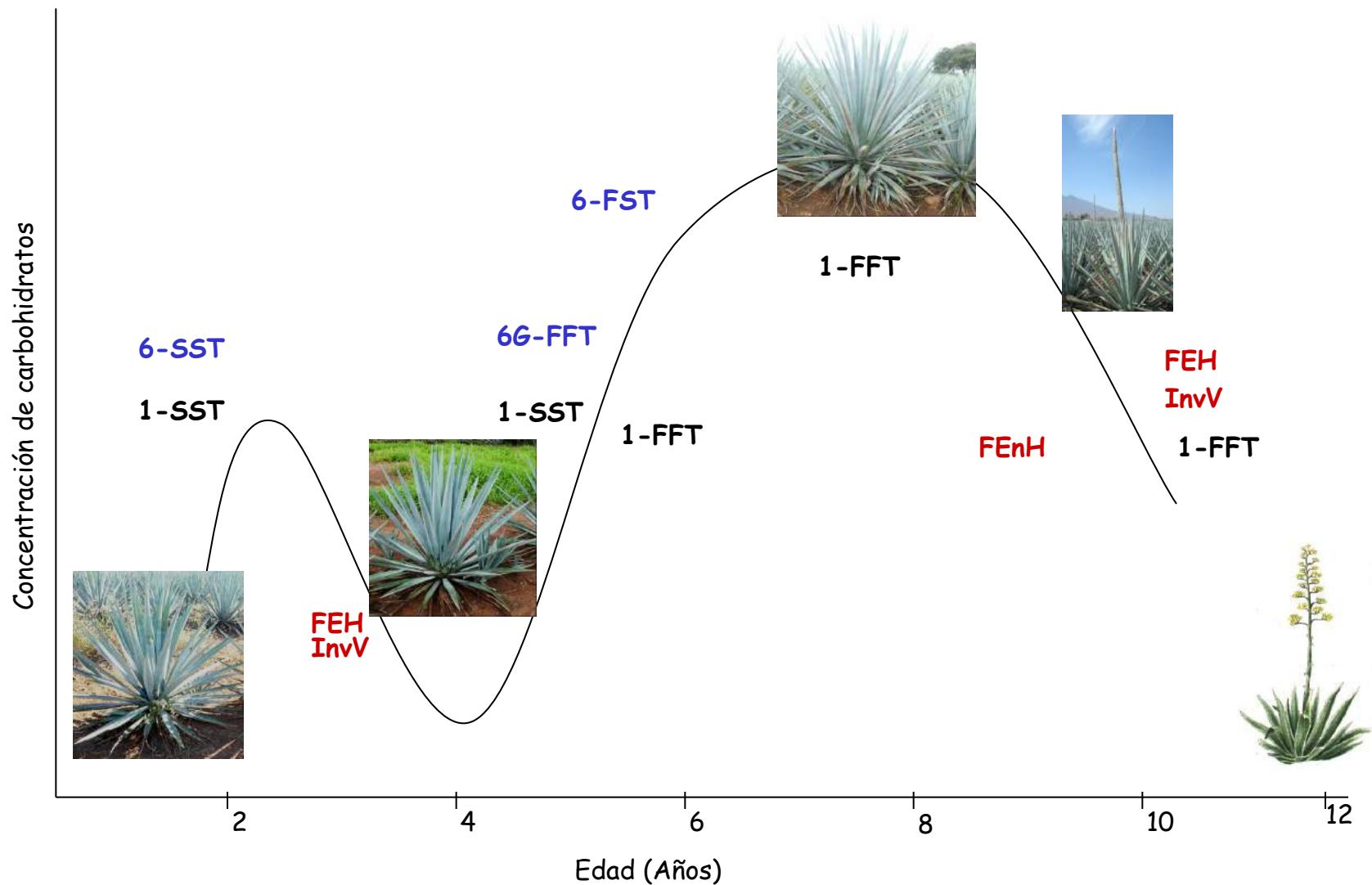
BUSQUEDA DE OTRAS ESTRUCTURAS



¿Cómo es el metabolismo de fructanos a lo largo del ciclo biológico de *A. tequilana* Weber var. azul?

¿Qué fructosiltransferasas están presentes en *A. tequilana* Weber var. azul?

¿Cuál es la relación que existe entre fructanos, edad de la planta y actividad fructosiltransferasa?



Funciones



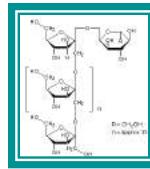
FRUCTANOS



BENEFICIOS EN LA SALUD



FIBRA SOLUBLE
PREBIOTICOS
OBESIDAD
DIABETES
OSTEOPOROSIS

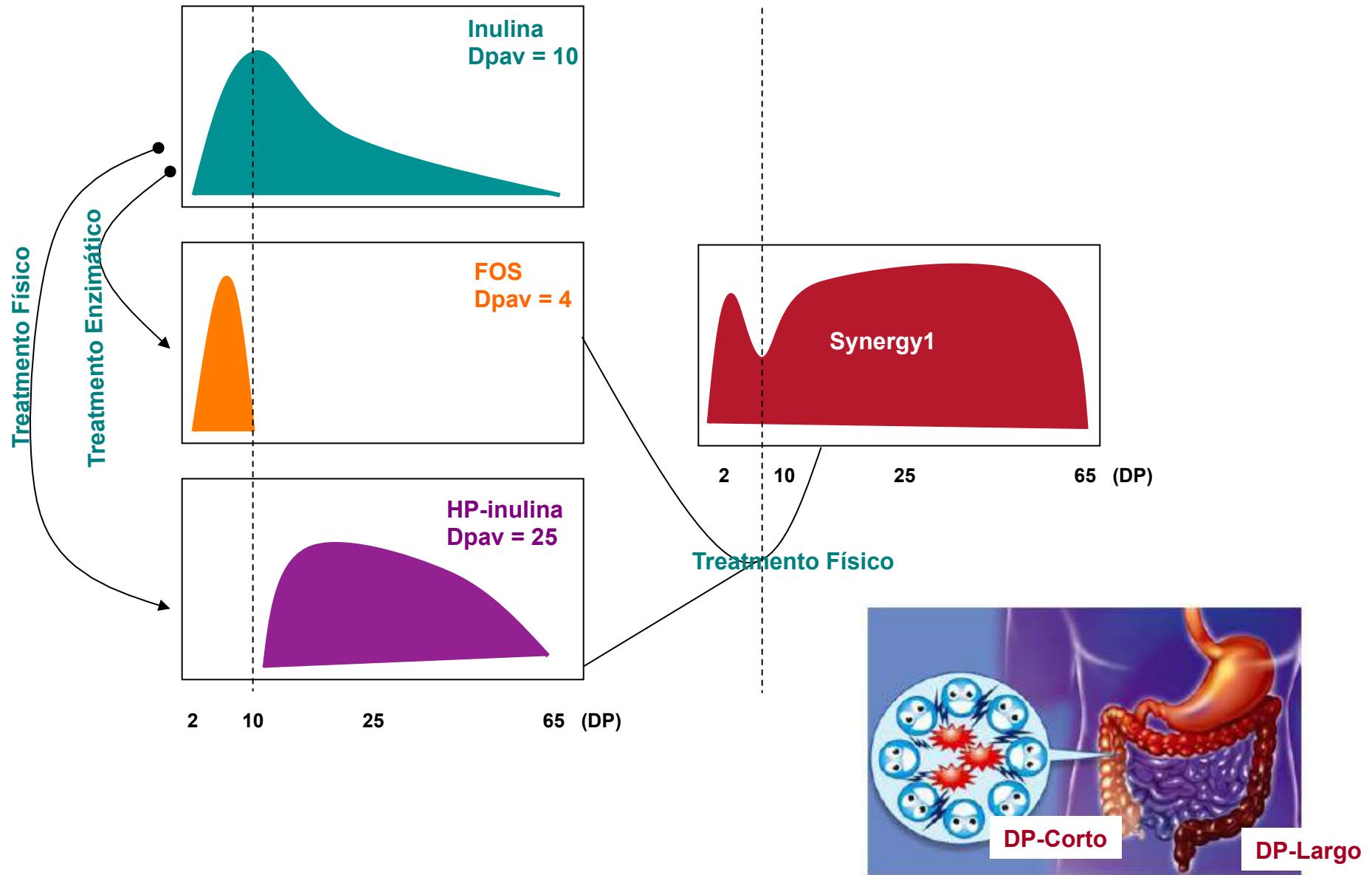


PROPIEDADES FUNCIONALES



SUSTITUTO DE GRASA
EDULCORANTE
CRIOPROTECTOR
ESPESANTE

INULINAS DE ORAFTI



HORMONAS

Grelina

Insulina

Incretina

Leptina

DIABETES

METABOLISMO LIPIDICO

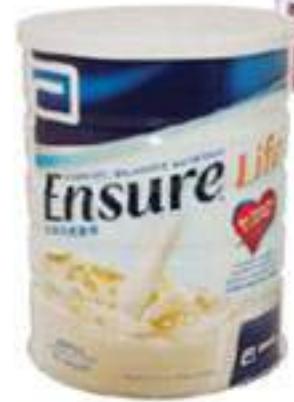
OBESIDAD



CANCER DE COLON

GASTRO- INTESTINAL

OSTEOPOROSIS



Nutrientes	
Contenido energético, kilocalorías	2 000
kilocalorías	472
Hidratos de Carbono (carbohidrato del cual: fibra)	720
Lípidos (grasa)	120
Proteínas, g	
Sodio, mg	
• Calcio, mg	
• Fósforo, mg	
• Magnesio, mg	
• Vitamina C,	
• Hierro, mg	
• Niacina, mg	
• Zinc, mg	
• Vitamina E,	
• Ácido Pantoténico	
• Vitamina B2,	
• Vitamina B6,	
• Vitamina B1,	

Por 100 g de NIDO 3+ con LACTO HIERRO

(200 ml de agua y 36 g de NIDO 3+)

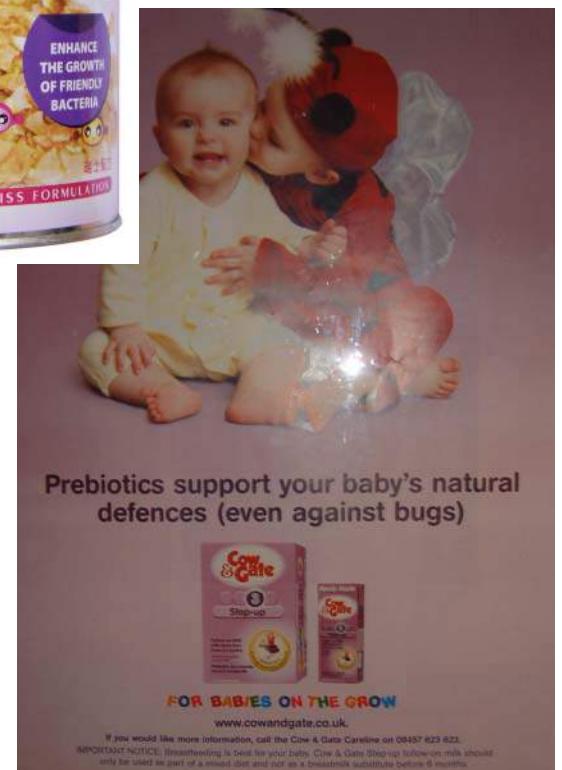
Por 1 porción (% de la IDR*)

(200 ml de agua y 36 g de NIDO 3+) para niños de 3 a 5 años que cubre una porción

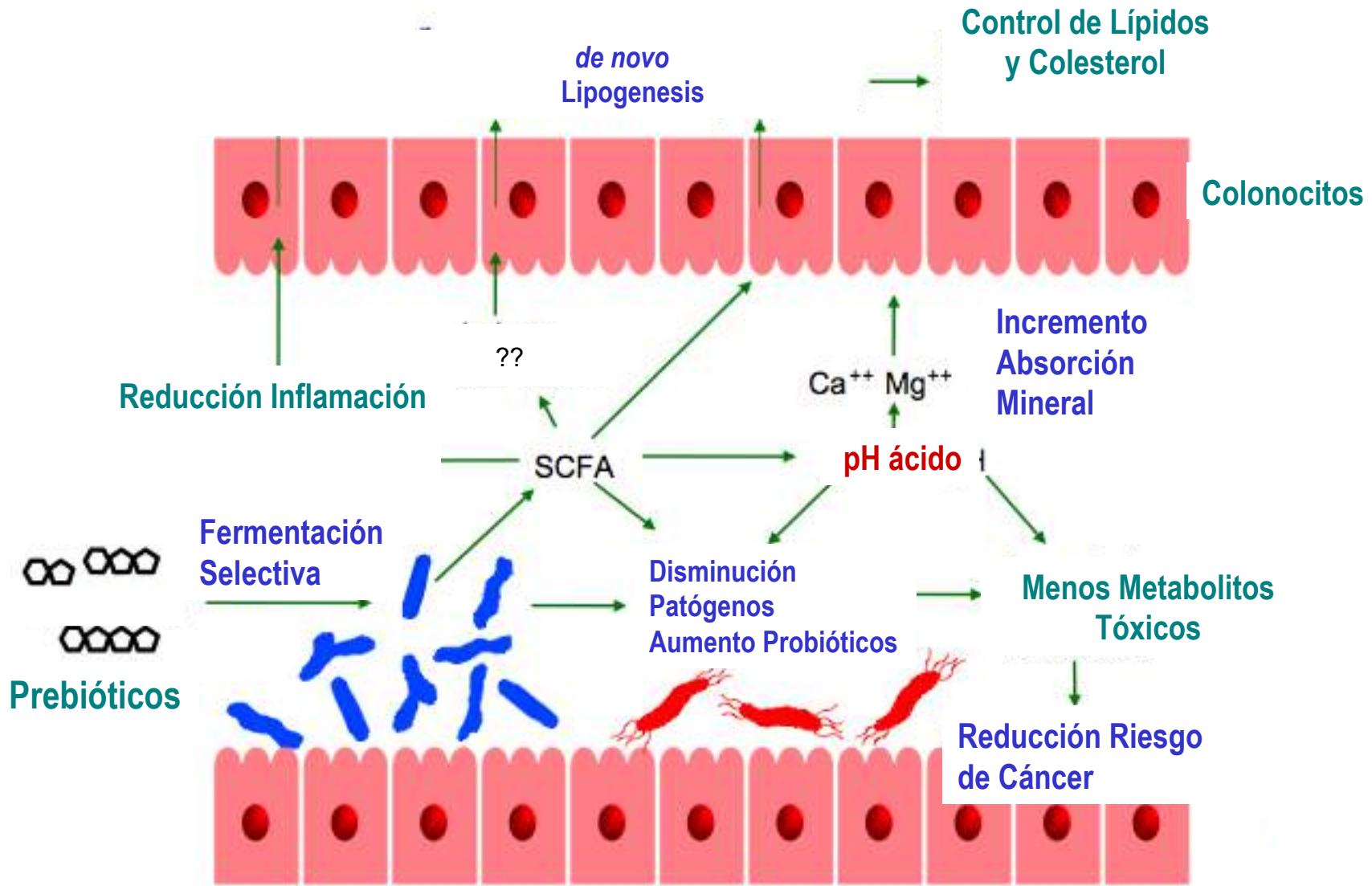
	1,6	1,7	17
	1,2	0,4	43
Total Nacional de Nutrición + Contenido Natural			
• de proteína láctea, 8,5 % grasa butiraria, 50 µg de retinol.			

NEW!

Leche descremada en polvo adicionada de oligofructosa e inulina, minerales y vitaminas A y D

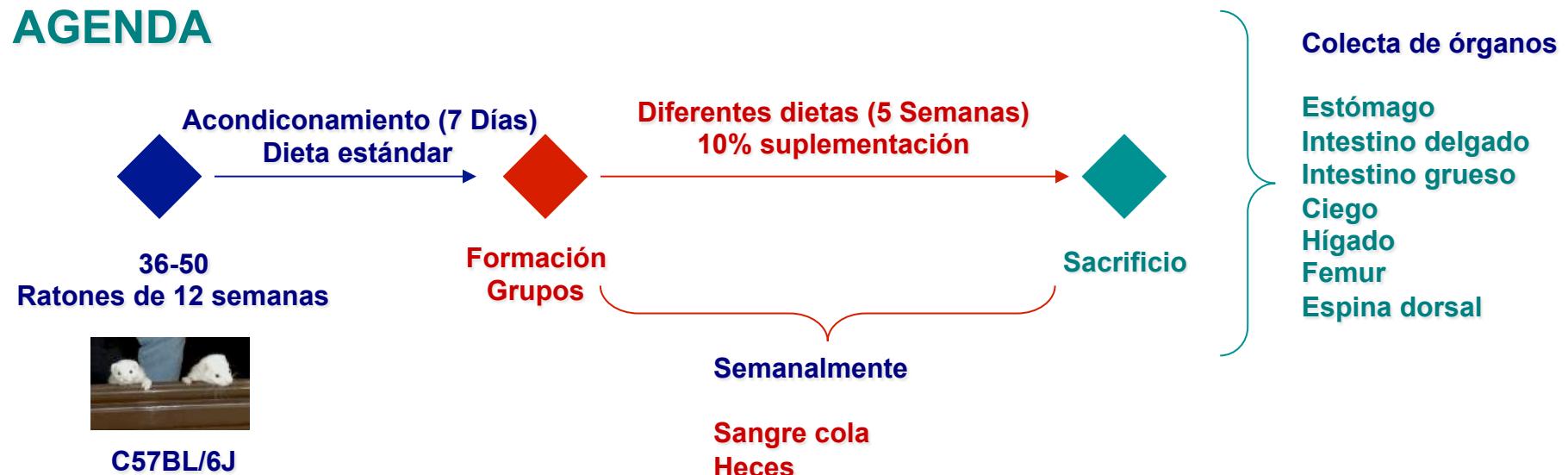


BENEFICIOS DE LOS PREBIOTICOS



ESTRATEGIA EXPERIMENTAL *in vivo*

AGENDA



ANALISIS

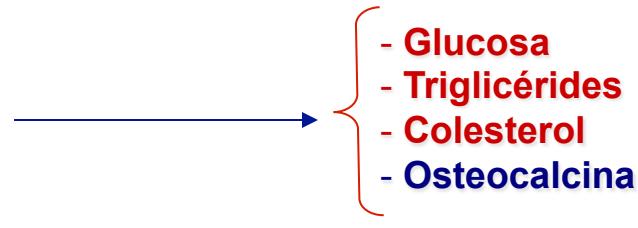
Diario

- Ingesta
- Peso

Semanal

- Sangre cola

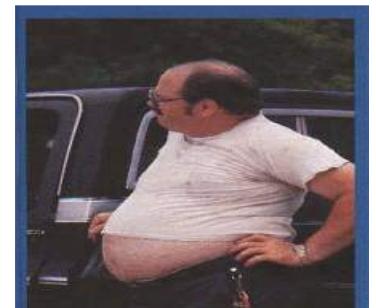
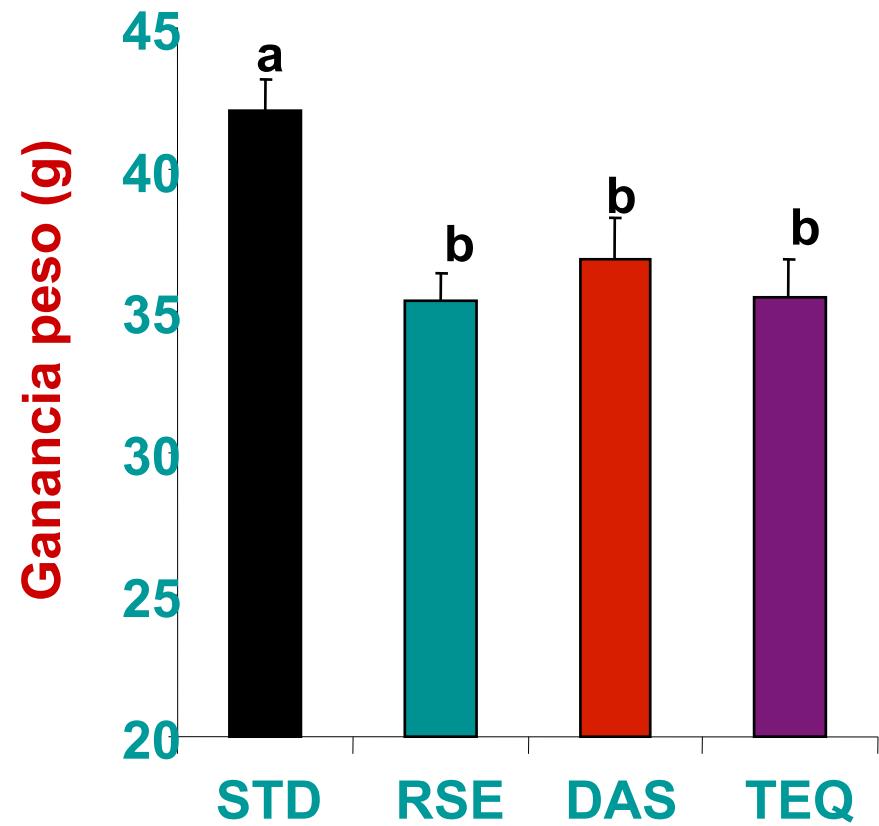
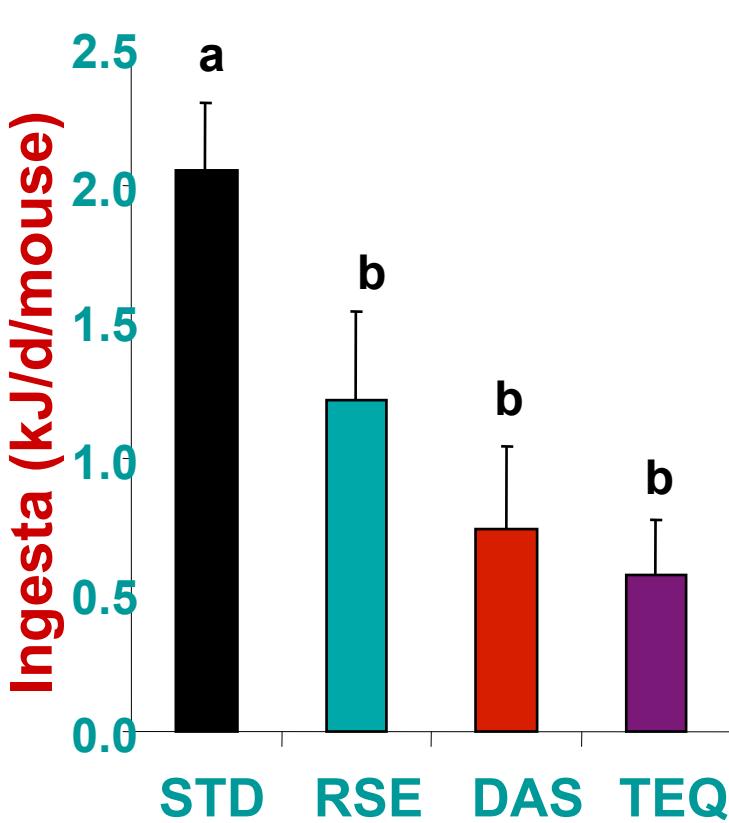
- Heces



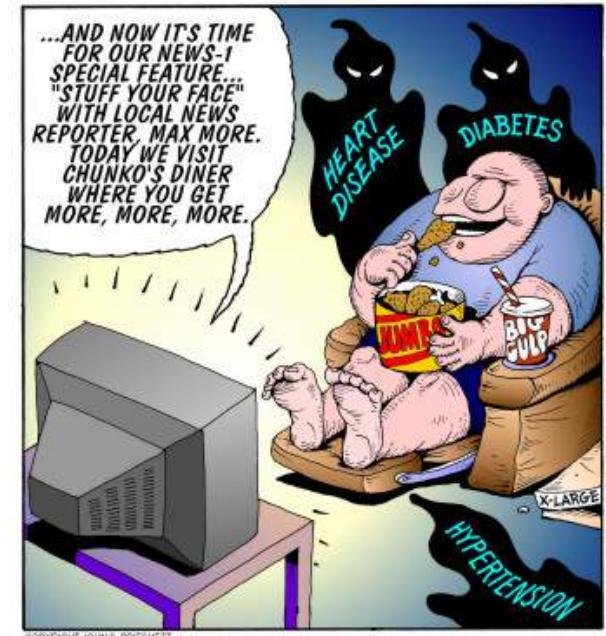
ORGANOS

- Estómago
 - Grelina
- Intestinos
 - SCFA
 - A, P, B
 - Proximal
 - GLP-1
- Femur
 - Ca, Mg

IMPACTO EN OBESIDAD

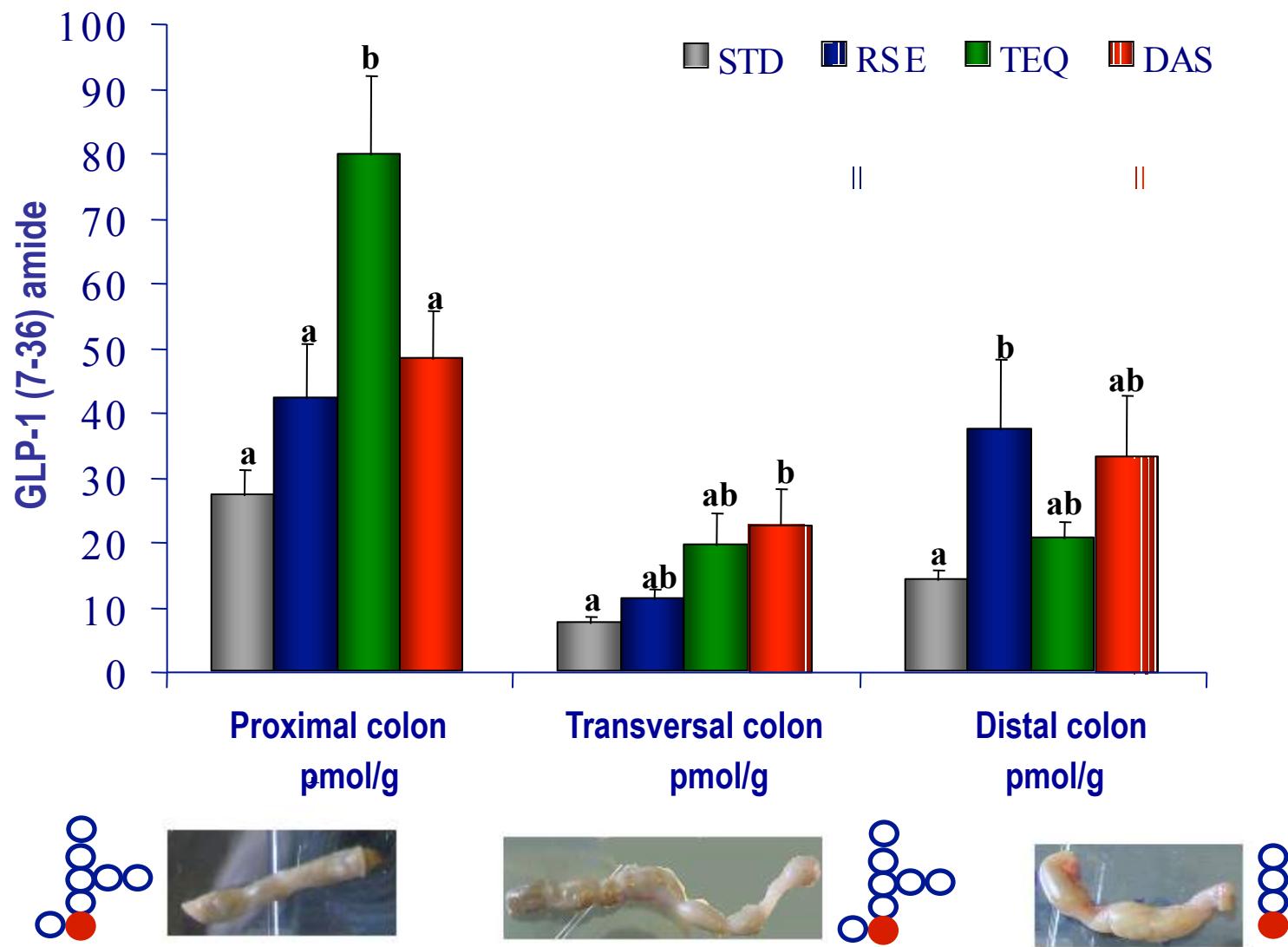


RELEVANCIA DE LOS FRUCTANOS DE AGAVE EN SALUD



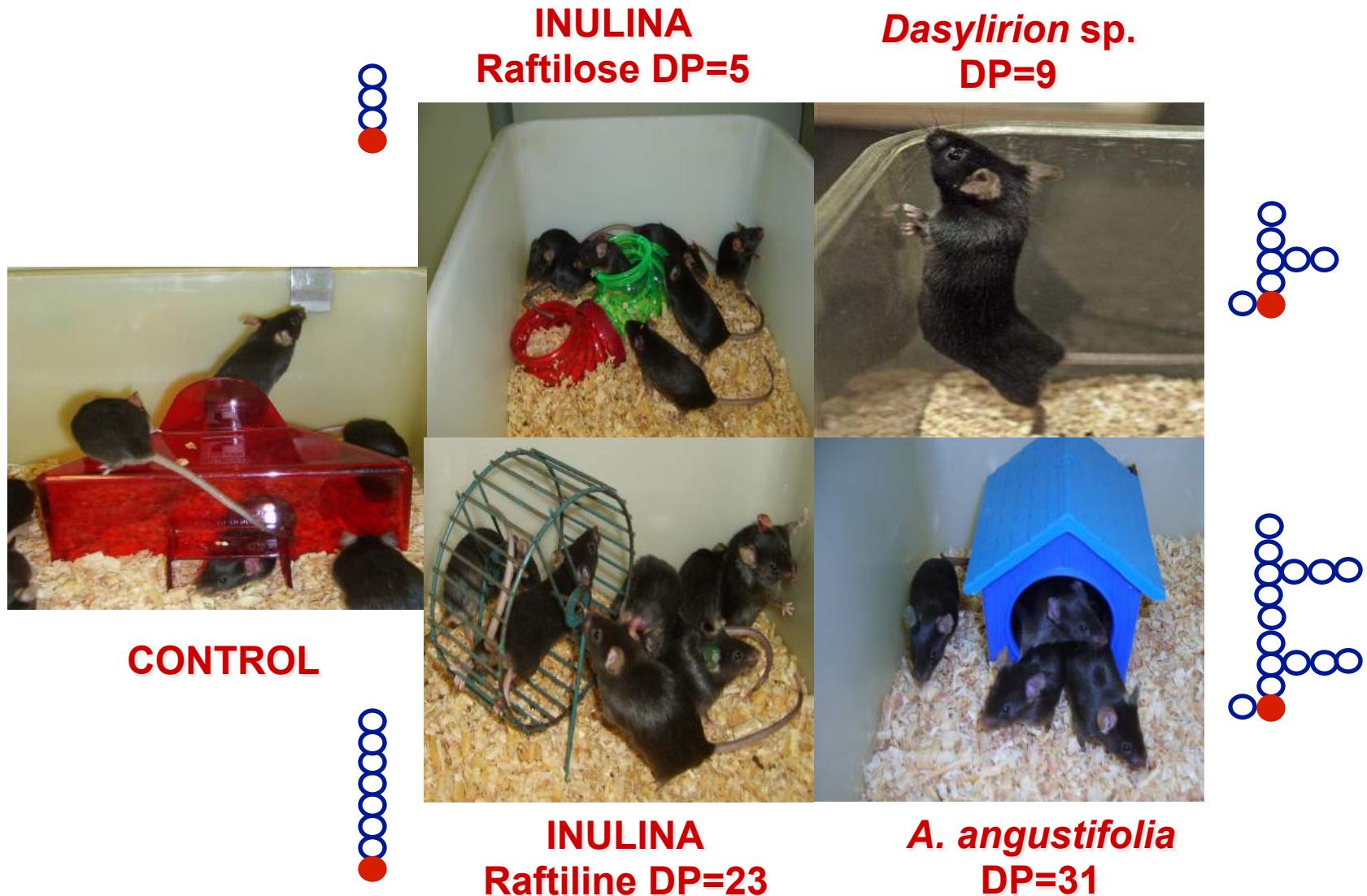
	Glucosa [mM]	TGA [mM]	Colesterol [mM]
Estándar	10.36 ^a	1.40 ^a	2.88 ^a
Raftilose	8.44 ^b	0.97 ^b	2.40 ^b
<i>A. tequilana</i>	8.91 ^b	1.31 ^{ab}	2.30 ^b
<i>Dasyllirion</i>	8.76 ^b	1.24 ^{ab}	2.40 ^b

GLP-1 in Large Intestine

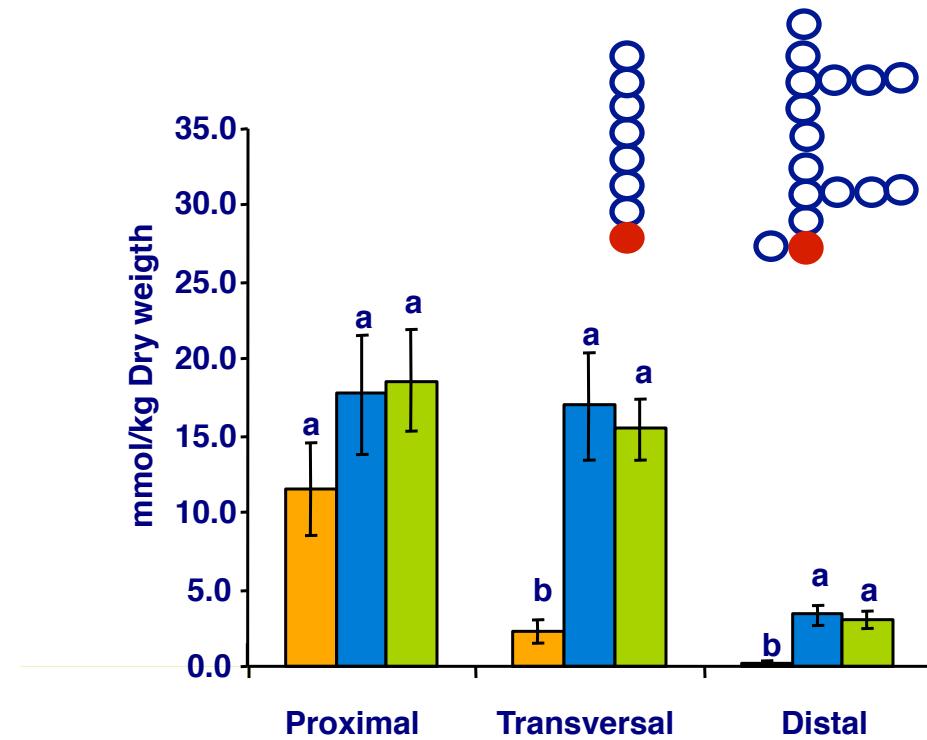
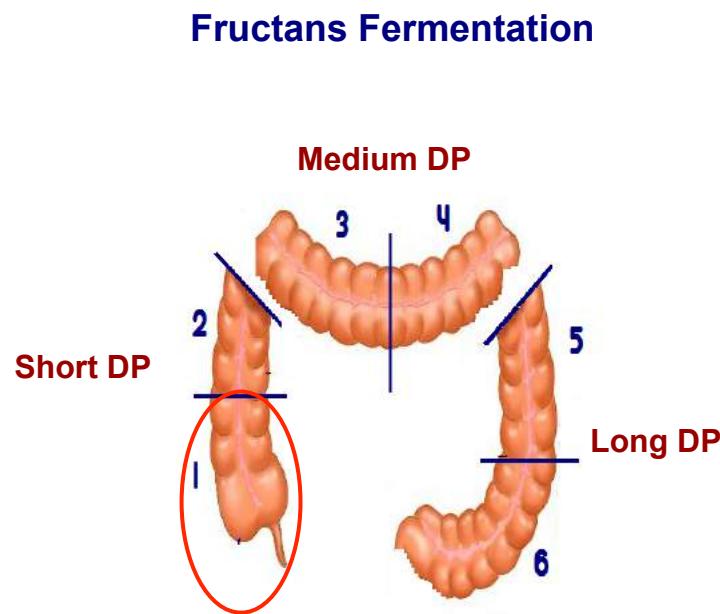


STD = Standard diet; RAF = Raftilose DP=5; TEQ = *A. tequilana* DP=7; Dasylirion sp. DP=9

EFFECTO DE FRUCTOOLIGOSACARIDOS Y FRUCTANOS



Can fructans fermentation be relevant in colon cancer?



STD: Standard diet 5053, **RNE:** Raftiline, **ANGUS:** Fructans *A. angustifolia*.

$P<0.05$

ESTUDIO CON FRUCTANOS COMERCIALES DE AGAVE

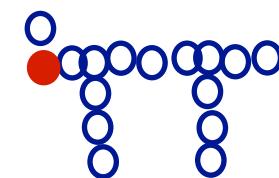


CONTROL

INULINA
Raftiline DP=25
●○○○○○○

A. tequilana
Compañía X
DP=22

A. tequilana
Compañía Z
DP=13

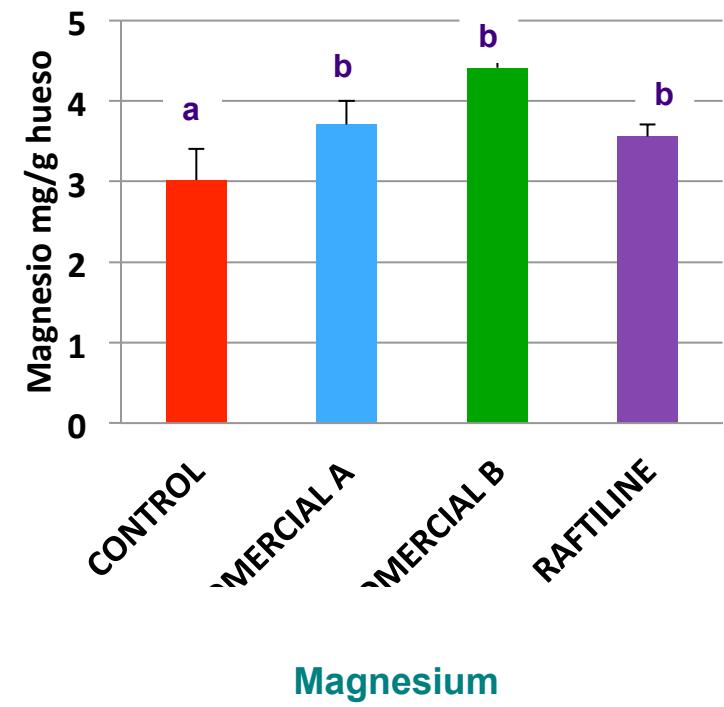
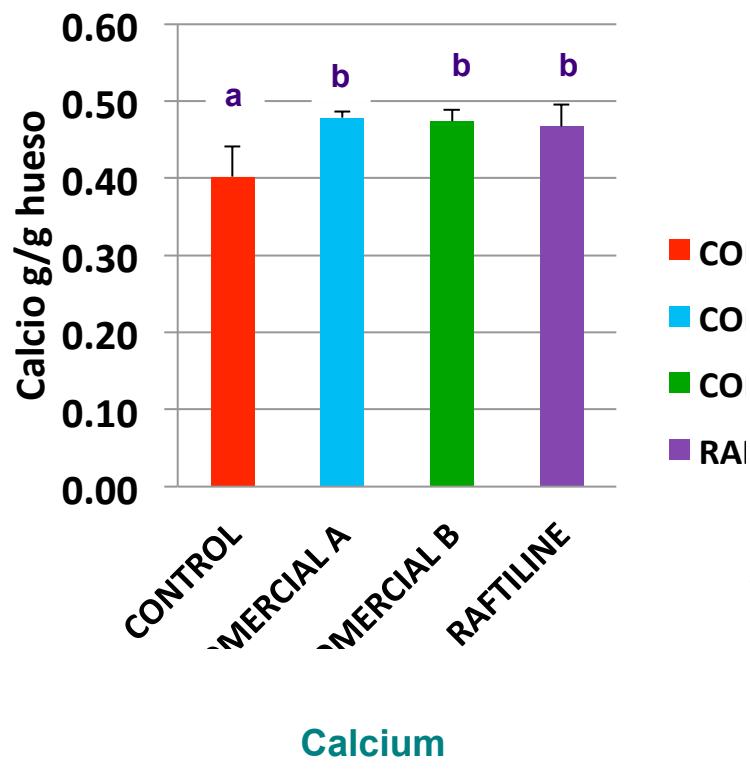


Para el efecto en absorción de minerales los ratones hembras fueron
ovarioctomizadas

CALCIUM AND MAGNESIUM ABSORPTION IN OVARIECTOMIZED MICE



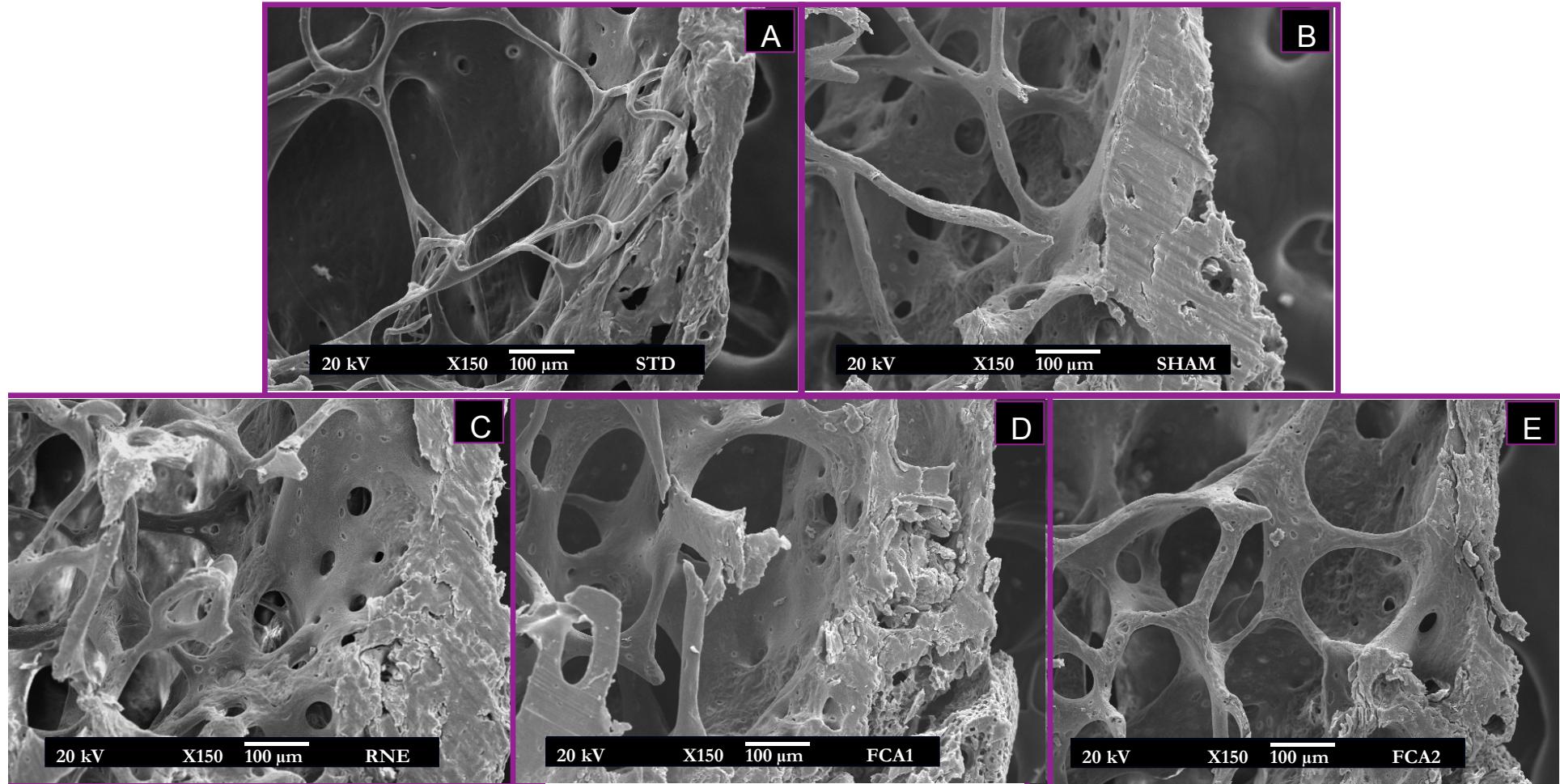
Atomic
Absorption



García-Vieyra et al 2014

(P ≤ 0.05)

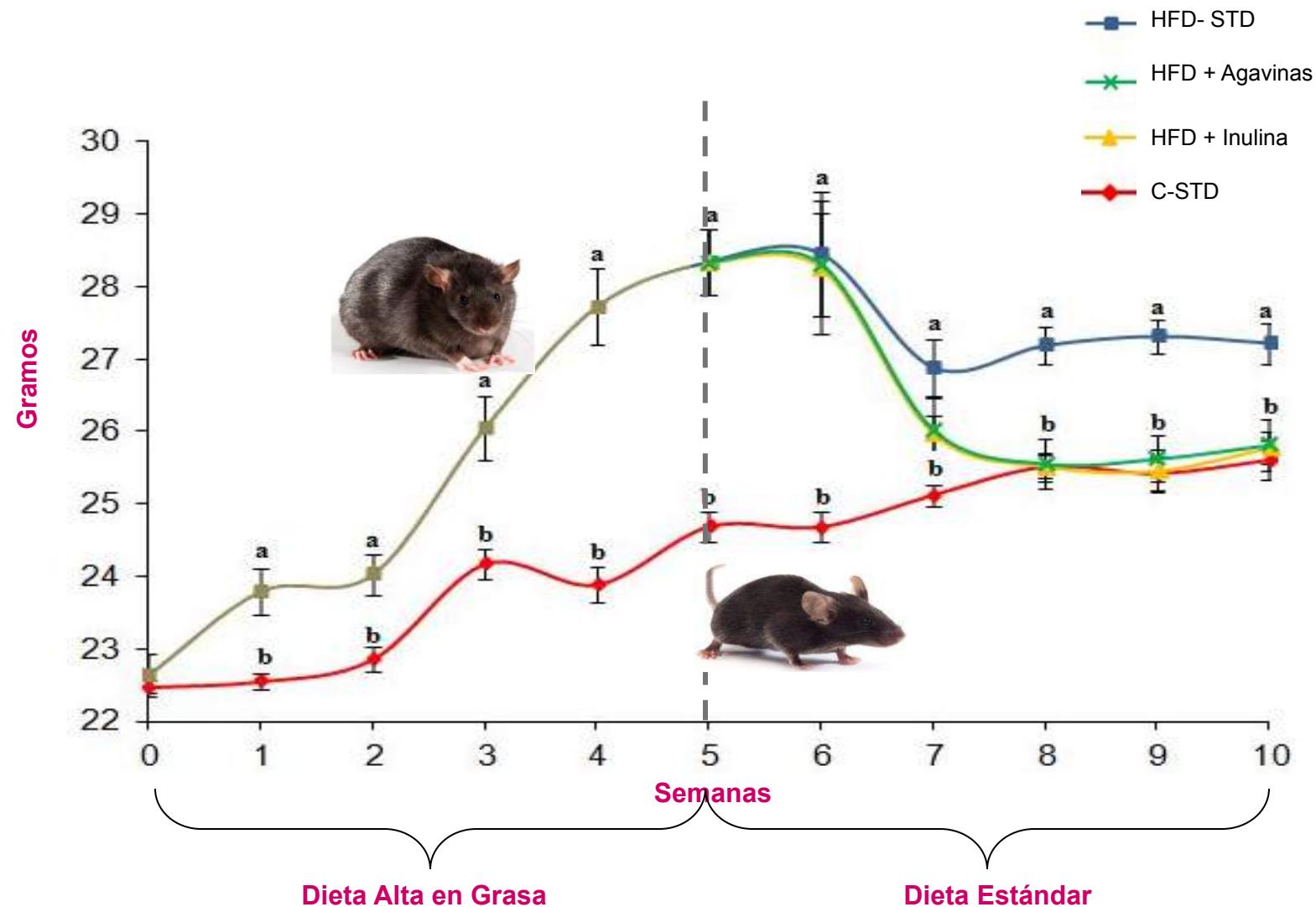
Scanning Electron Microscopy of Femurs

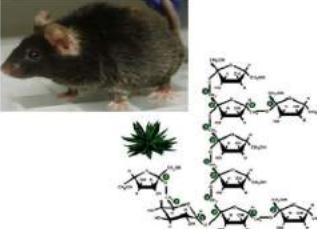


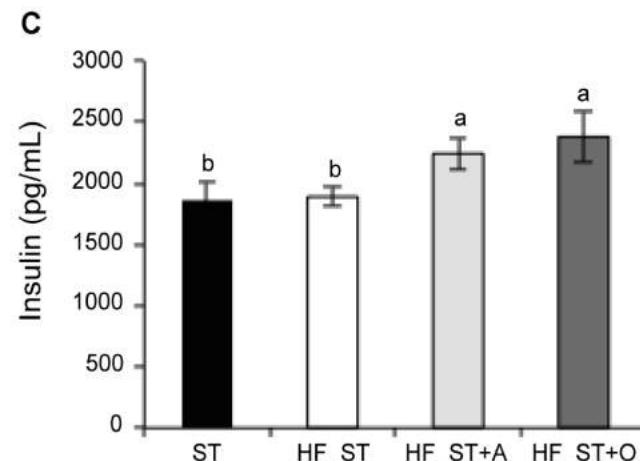
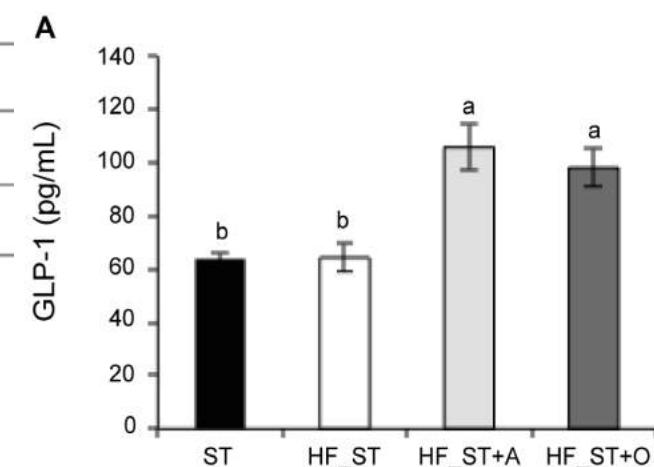
A). Control; B). SHAM; C). Raftiline; D). FCA1, and E). FCA2

García-Vieyra et al 2014

AGAVINAS EN OBESIDAD

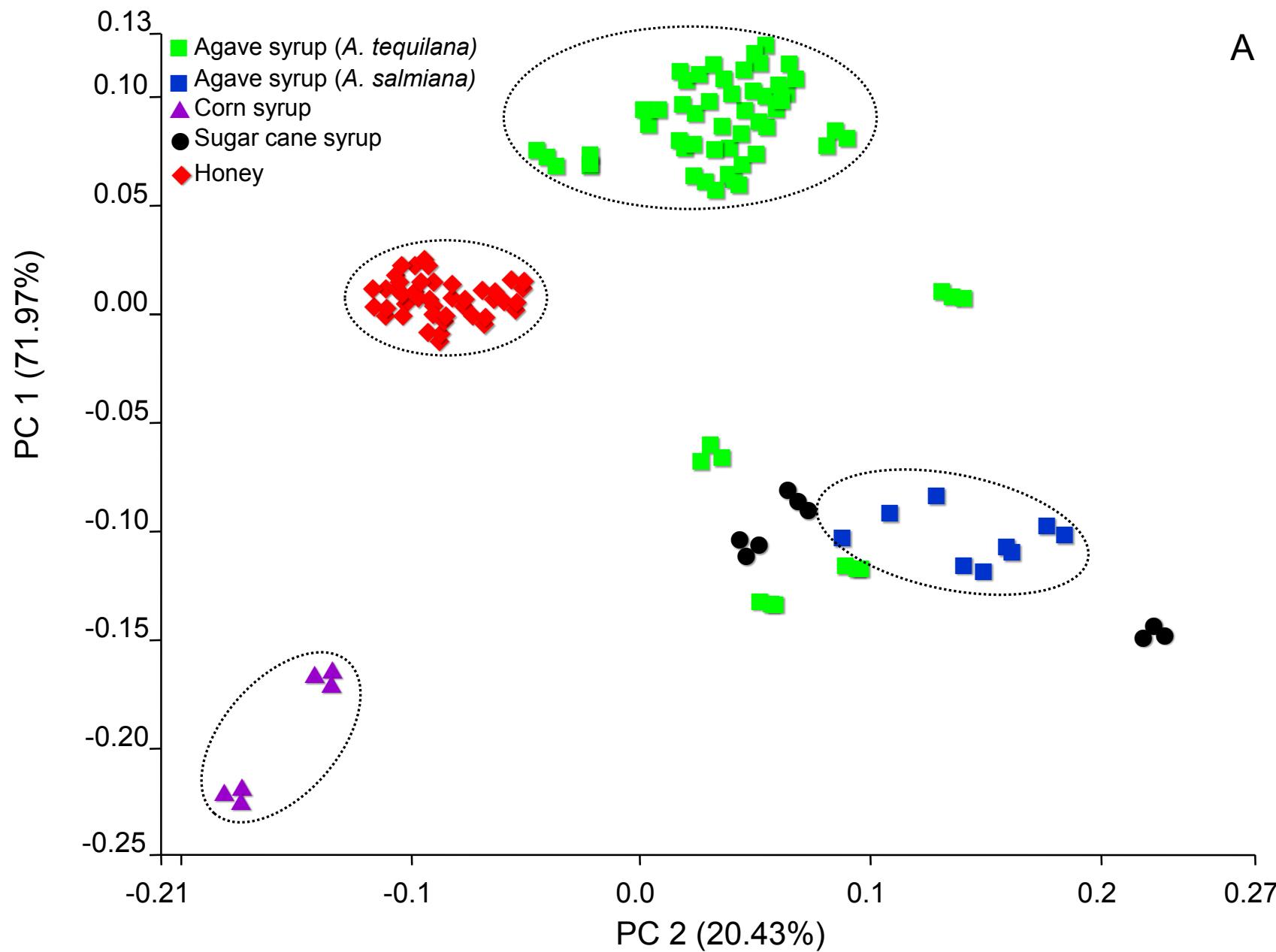


Treatment	High fat diet	Standard diet	Standard diet + agavins
		Diet shift to: 	 or 
Metabolic parameters			
Body weight (g)	29.34	27.22	25.82
Glucose (mM)	7.33	7.36	6.40
Triglycerides (mM)	0.95	0.82	0.61
Cholesterol (mM)	2.37	2.37	1.89



JARABES DE AGAVE







GRACIAS



8th International Fructan Symposium

Oaxaca, Oaxaca

Junio 25-30, 2016

Mercedes G. López (mlopez@ira.cinvestav.mx)