

The Role of Sorghum in Food Security in Central America



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*Características del
grano de sorgo,
producción de harina y
uso en la elaboración
de alimentos*

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Sorghum a Native of Africa



- Brown (tannin) sorghum for stomach ailments: **East and Southern Africa**



Sorghum Products S.Africa-07



Sorghum Production Advantages



- Drought Tolerant, Consistent Production under dry/hot climates
- Produces grain where maize fails
- Does not produce aflatoxins & fumonisins in the field.
- A major advantage over Maize which is heavily contaminated with aflatoxins

Cultivo del Sorgo en El Salvador



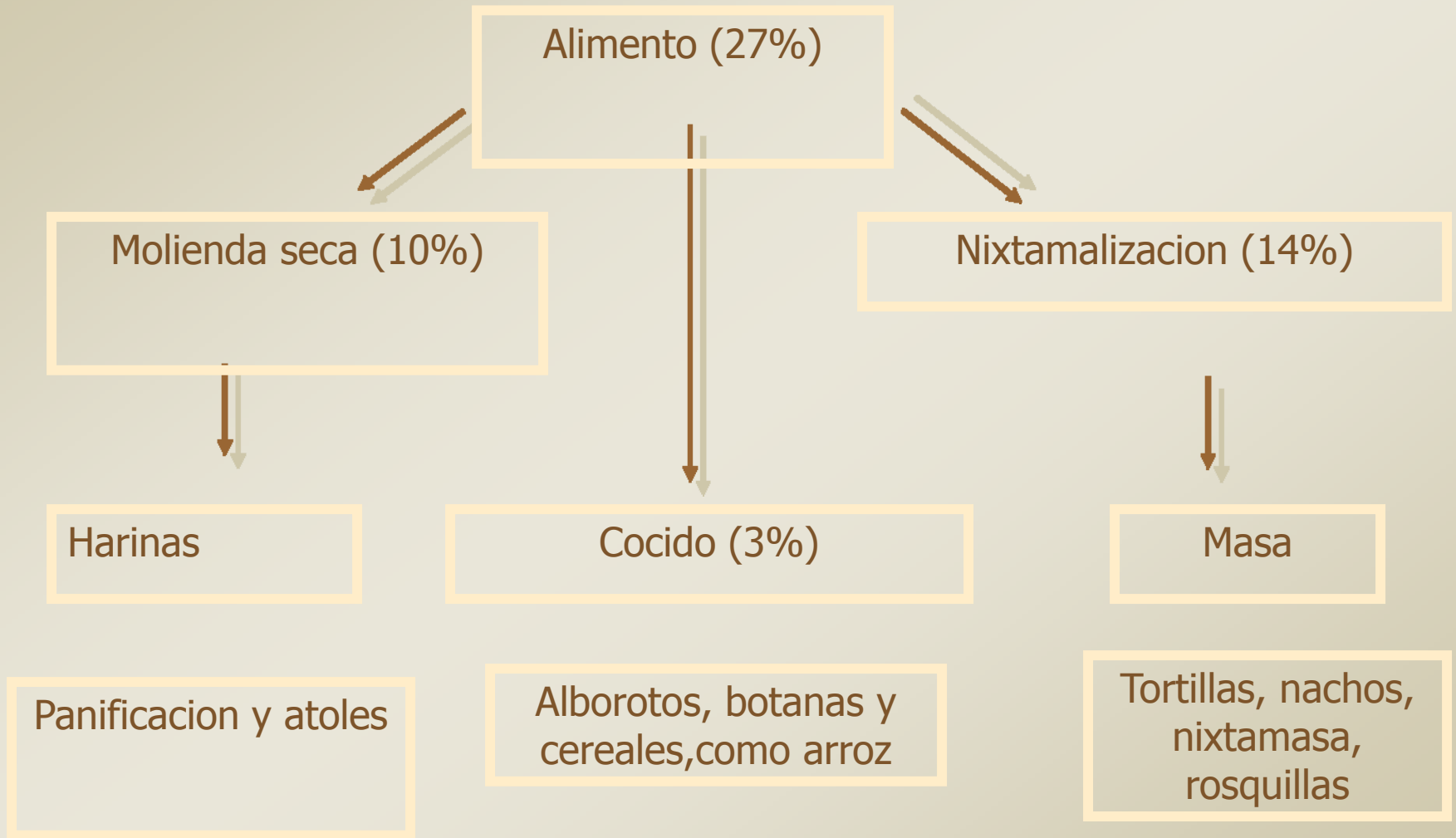
Consumo de sorgo en C.A.



Country	Alimentacion animal (%)	Consumo Humano (%)
Nicaragua	80	10
El Salvador	73	27
Honduras	80	20

Fuente : INE 2003.

Usos del Sorgo en Centro America



Sorgos blancos y color de gluma



Maicillo Criollos Caracteristicas



- Gluma oscura que afecta el color de la harina
- Productos son de color mas oscuros
- La semilla se degenera
- Para algunos criollos la molienda es pobre porque el grano se quiebra mas
- Suceptible a enfermedades y plagas (granos suaves)



Sorgos Mejorados para elaborar alimentos



Características de sorgos mejorados



- Sustitutos del maíz, trigo, arroz y otros cereales.
- Tienen sabor suave y color claro de grano, sin afectar el color de los alimentos
- Buenas propiedades para moler
- La semilla no se degenera
- Diferentes colores de glumas y resistentes a enfermedades e insectos



red



purple



tan

New Varieties of Sorghum Produced



- Excellent food quality
- White tan plant color
- Bland flavor, light color
- Good yields of forage and grain
- Drought resistance

Advantages of Sorghum



- Drought resistance
- Dual purpose use
 - Grain
 - Forage
- White tan varieties
 - Tortillas
 - Flour
 - Milling

Grain With Excellent Food Processing Properties



- Rice substitute
- Bland flavor
- Advantages for wheat flour blends

Processing – Use in Mills



- Uses in large and small mills
 - CTI – small, low cost plate mill
 - Hammer mill & Omega plate mill

Food Sorghum Uses

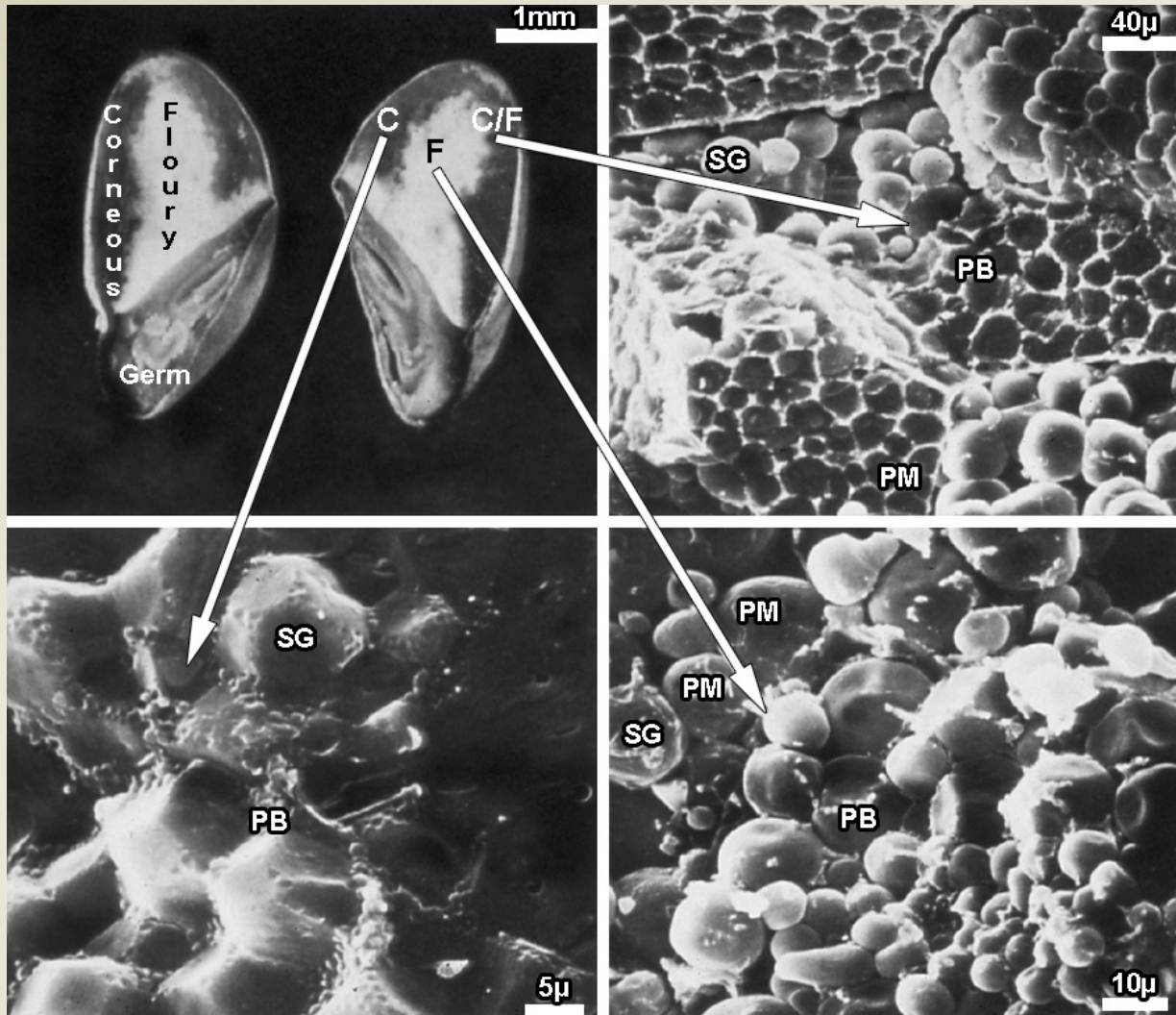


- Processed flour, meal and grits
- Soy fortified sorghum grits
- Brewers grits
- RTE breakfast cereals
- Snacks
- Gluten free foods
- Ethnic foods
- Multigrain products
- Pet foods
- Feeds

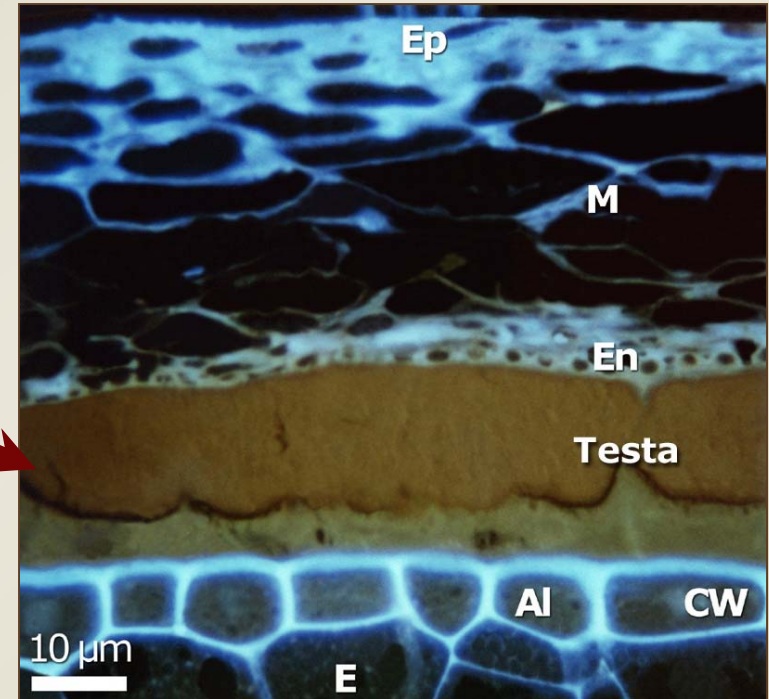
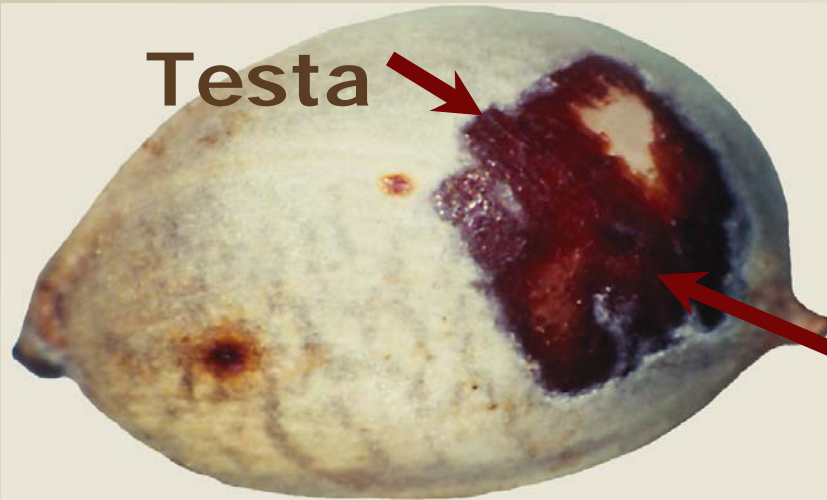
White Sorghum



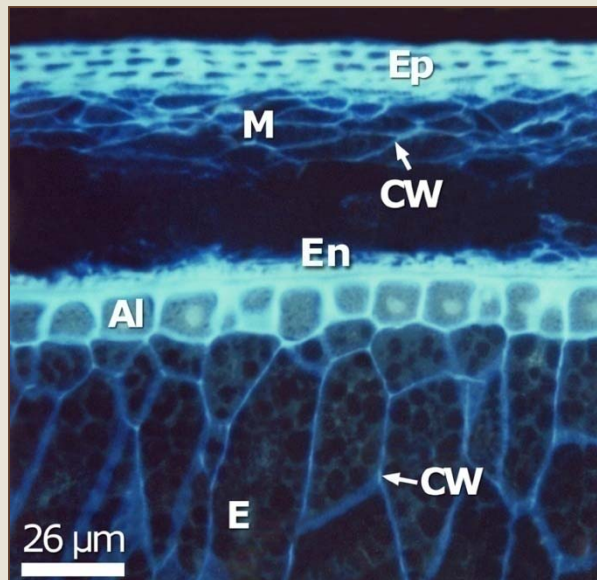
Sorghum Endosperm Structure



NON-TANNIN VS. TANNIN SORGHUMS



Tannin Sorghum



Non-Tannin Sorghum

(Adapted from Earp et al. 2004)

Composicion del grano de sorgo



Composicion Nutricional similar a la del maiz

- Proteina: 8%-10% DB
- Grasa : 2.7%-2.8%
- Carbohidratos: 78-79%
- Fibra Cruda: 1.5-2.5%
- Cenizas: 1.7-2.5%
- Dureza : 80-85%
- Fibra Dietetica: 10-12.1%

Fuente Laboratorio de Quimica Agricola CENTA, 2004, CQL, 2007

Composition of Sorghum vs Maize



- Similar to maize
- 1% less fat
- Protein slightly higher
- Tryptophan slightly higher
- Lysine slightly lower
- Tannins in sorghum with pigmented testa only
- Total phenols similar to maize
- Phytin content similar to maize

Sorghum Genetics



- Pericarp color:
 - Controlled by the *R* and *Y* genes;



White

*R_**yy*

*rr_**yy*



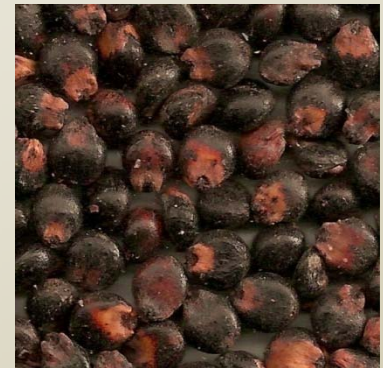
Yellow

*rr_**Y_*

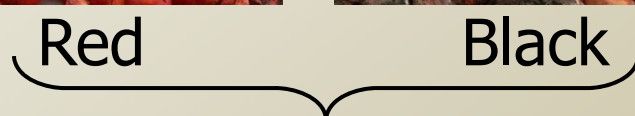


Red

*R_**Y_*



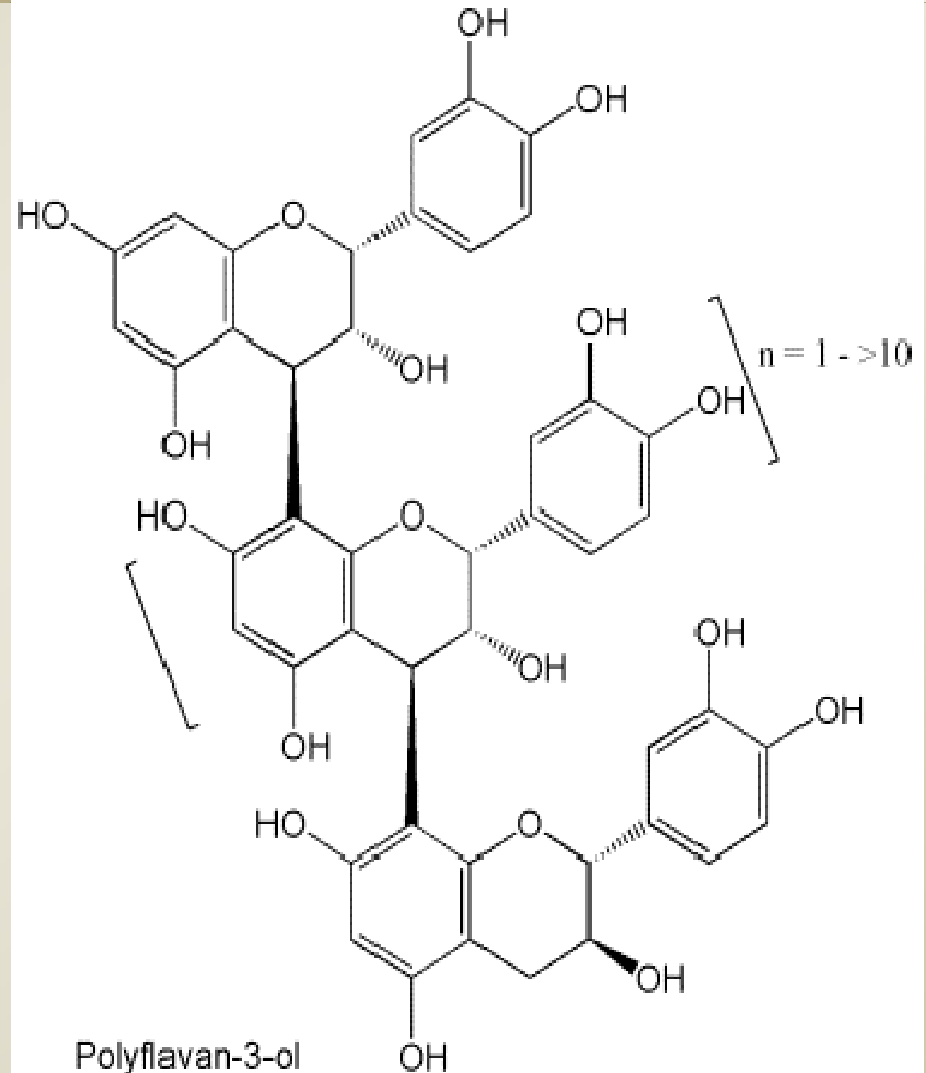
Black



Condensed Tannins



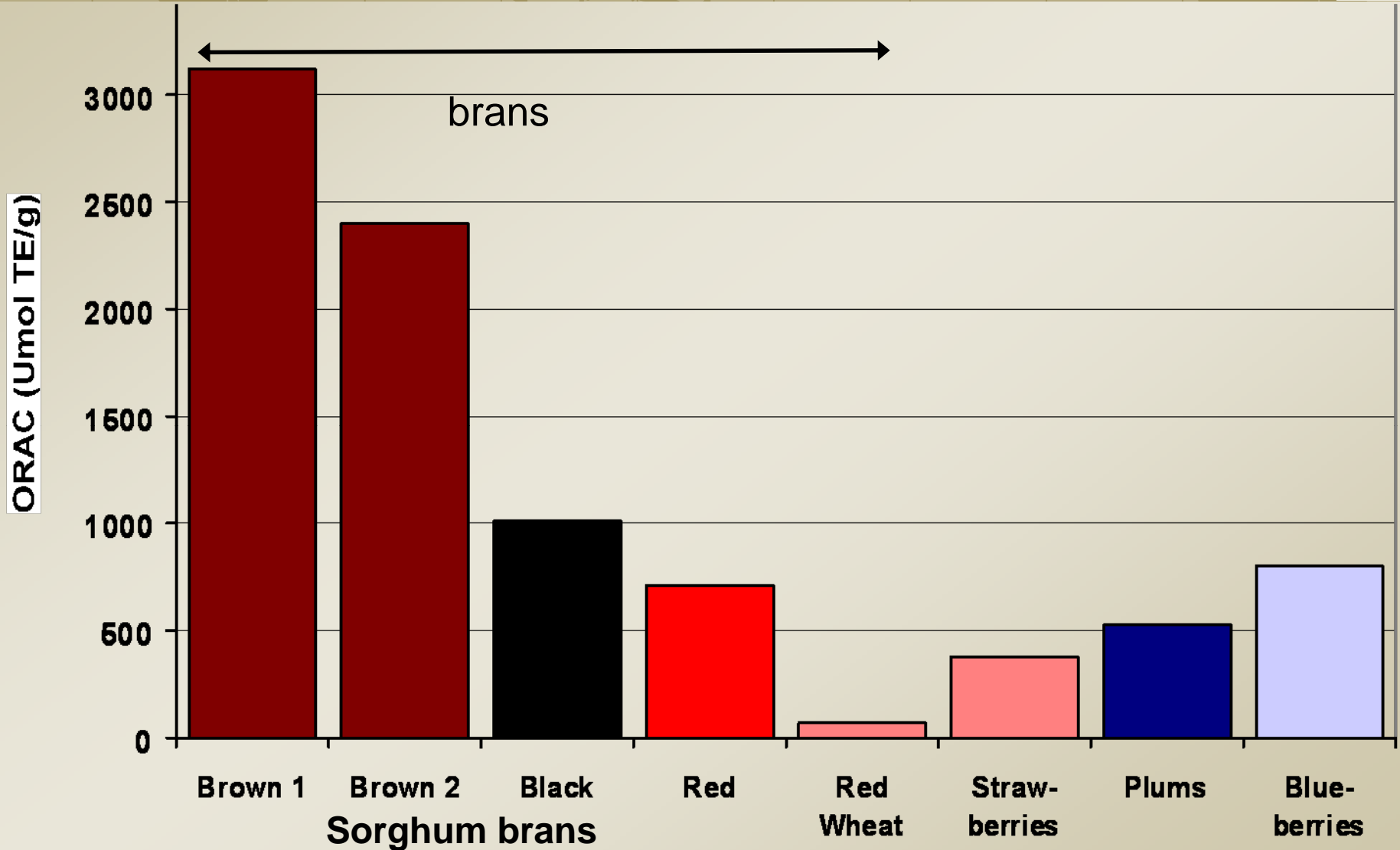
- All 'condensed'
- Expressed differently in different varieties



Specialty Sorghums-Treasure Trove of Bioactive Compounds



Antioxidant (ORAC) levels in sorghum and wheat bran compared to fruits (dry wt)



Tannin Sorghums for Healthy Foods



- Antioxidants
- Slowly digested starch in tannin types
 - Type 2 Diabetics
 - Weight Control Diets
- High Dietary fiber
- Natural dark color
- Waxes, Policosanols
- Meat Preservation Applications
- Bread mixes
- Gluten free bread mixes--Celiacs

Factors Affecting Flour Quality



- Hybrid
- Environmental conditions
- Composition
- Decortication level
- Degermination
- Grinding methods
- Moisture level
- Storage
- Particle size distribution
 - Sandy particles
- Baking methods

Sorghum Extrusion



- Excellent extrusion properties
- Equivalent to maize or rice
- Waxy expands significantly more
- Heterowaxy available
- Flavor bland
- Light color
- Improves nutritional value
- Excellent snacks, RTE breakfast cereals

Extruded White Sorghum



Decorticated
Grain



White
Sorghum



Corn Meal



Rice



Savory/Salty Snacks



Japanese Sorghum Snacks





Krunchips
the perfect trio

Nutrition Facts
Serving Size (43g)
Servings Per Container

Amount Per Serving		% Daily Value*
Calories 190	Calories from Fat 100	
Total Fat 11g		17%
Saturated Fat 1.5g		8%
Trans Fat 0g		
Cholesterol 0mg		0%
Sodium 60mg		2%
Total Carbohydrate 21g		7%
Dietary Fiber 2g		8%
Sugars 0g		
Protein 3g		
Vitamin A 0%	Vitamin C 0%	
Calcium 0%	Iron 45%	

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

	2,000	2,500
Total Fat	Less than 65g	80g
Saturated Fat	Less than 20g	25g
Cholesterol	Less than 300mg	300mg
Sodium	Less than 2,400mg	2,400mg
Total Carbohydrate	300g	375g
Dietary Fiber	25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

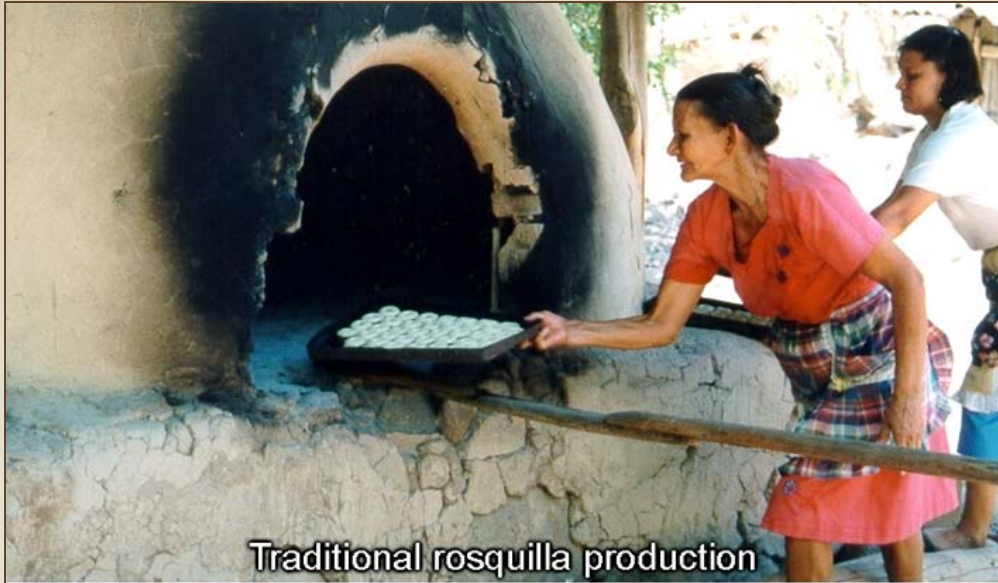
What is sorghum bran?
... the outer layer of sorghum, a grain which is the fifth most important cereal in the world.

What is good about the sorghum bran?

- 40% of the sorghum bran is fiber.
- Black and brown sorghum brans are naturally rich in color.
- Black sorghum bran contains anthocyanins, which are also found in blueberries.
- Brown sorghum bran contains tannins, which are also found in red wine.
- Both anthocyanins and tannins are full of antioxidants!

Ingredients: corn masa flour, vegetable oil, brown sorghum bran, black sorghum bran, salt.

Central America



Traditional rosquilla production



Baked products



Tostacas



Quesadilla

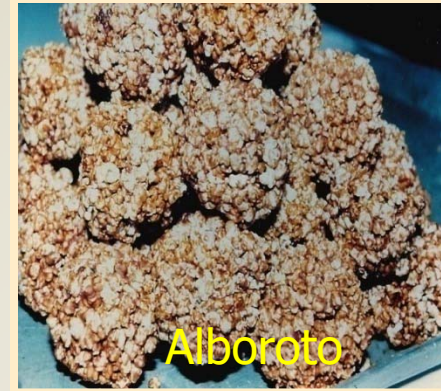
Personal capacitado en area rural



Sorgo en Productos Etnicos



- Alboroto (sorgo reventado con miel)
- Atole con harina precocida entera, leche o agua,, canela y azucar o pimienta gorda
- Pupusas o tortillas, usando hasta un 40% de sustitucion
- Sorgo entero o descascarado cocido en agua y comido como arroz servido con salsas o en leche



Porcentajes recomendados de harina de sorgo en mezclas con harina de trigo en algunos tipos de pan



TIPO DE PAN	HARINA DE SORGO (%)	HARINA DE TRIGO (%)
Galletería	75-100	25
Pan menudo	40	60
Semita pacha	50	50
Semita alta	25	75
Quesadilla	50	50
Pan molde	20	80
Pan francés	15	85

Tipos de pan y % de sustitucion



- Panes leudados (pan fiancés) 5% a 20% de sustitucion .
- Semitas, galletas, rosquetes, muffins y otros desde un 50% hasta un 100% de sustitucion por otras harinas.



French bread 20%



Bolillo 25%



Cookies 100%



Muffin 35%



Semita 50%

Food Sorghums



- Extrusion properties like rice or maize
- Great expansion
- Bland flavor, light color extrudates
- Good flavor carrier & compatibility
- Variation in amylose content possible
- Gluten free, ethnic appeal
- Reduced risk of mycotoxins
- Environmentally friendly
- Identity preserved production



Como se usa el sorgo en Panificacion?



- Los alimentos pueden ser preparados usando harina de sorgo en un 100% o usando mezclas de harina de sorgo con trigo o con otras harinas (harinas compuestas)
- Trigo, maiz, arroz o soya pueden ser sustituidos por sorgo en una gran variedad de productos
- La cantidad de harina de sorgo a utilizar varia dependiendo del producto a elaborar.
- Si usamos sorgos de color blanco y glumas claras, el color y la textura de los productos elaborados, no se ve afectado.

Instituciones Colaboradoras



- *Centro Nacional de tecnologia Agropecuaria (CENTA, El Salvador)*
- *Programa Colaborativo Internacional para la investigacion en sorgo y Mijo (INTSORMIL/USAID)*

