The Sorghum Story
An Ancient, Healthy and Nutritious Old World Cereal

Sorghum is Africa's contribution to the small number of elite grains that supply about 85% of the world's food energy. Only four other foods rice, wheat, maize, and potatoes are consumed in greater amounts. Sorghum is the dietary staple of more than 500 million people in more than 30 countries of the semi arid tropics, thus being one of the most familiar foods in the world (1). Sorghum is indeed an ancient grain. Dahlberg and Wasylikowa (2) reported on sorghum remains found in the Nabta Playa archaeological site in the Western Desert, in southern Egypt, dating back to 8000 B.C.E.

Sorghum is valued for its grain, stalks and leaves. Many people in the U. S. are familiar with sorghum for the syrup made from the sweet juice in stalks of certain sorghum varieties or for the use of sorghum in silage or for pastures. The U.S. produces "Food Grade Sorghums" a white colored grain grown on a "tan" plant that produces light colored glumes that are used to produce a gluten free, bland flour suitable for incorporation into many cereal-containing food products. Specialty sorghums are under study for health promoting properties.

Sorghum is inherently gluten-free and was demonstrated to be safe for people with celiac disease (3). Gluten enteropathy or celiac disease is caused by sensitivity of the gut to the grain storage protein, gluten. Gluten is a component of wheat, and gluten-like proteins are found in oats, barley and rye that are also problematic. Diarrhea occurs in about 70% of patients often up to 3-4 times per day (4) with accompanying nutrient and fluid losses. Celiac disease results in malabsorption of nutrients and thus other problems in many patients. In an already nutritionally vulnerable person, celiac disease can be devastating. The treatment for individuals with celiac disease is to avoid all foods containing gluten (5).

Sorghum is used extensively worldwide in food production systems (6). Around the world, many types and colors of sorghum are used to produce various types of traditional foods and beverages. Unfermented bread, such as chapatti and roti are common in India, while tortillas are made from sorghum in Central America and Mexico. Fermented breads such as kisra and dosa are found in Africa, Sudan, and India, while injera is popular in Ethiopia. Stiff porridges called ugali, tuwo, karo, and mato are found throughout Africa, India and Central America, while thin porridges such as ogi, koko, and akasa can be found in Nigeria and Ghana. Couscous from sorghum can be found throughout West Africa, and boiled whole or pearled sorghums are consumed in Africa, India, and Haiti. Snack foods containing sorghum are widely produced and are found in the markets of Japan. Many types of alcoholic beverages and sour/opaque beers can be found in markets worldwide.

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Nutritional Attributes of Grain Sorghum

Macronutrients. Sorghum is an excellent source of energy, containing about 75% complex carbohydrate. Complex carbohydrates (fibers and starches) are usually digested slowly and therefore provide satiety and delayed hunger. Sorghum flour is whole grain and thus aligns well with the 2010 Dietary Guidelines to increase dietary whole grains while keeping the suggested total dietary carbohydrate intake the same (1). A Nutrient comparison of the commodity grains — sorghum, wheat, corn, and rice— shows that with about 3.3% fat content, grain sorghum contains more fat than wheat and rice, but slightly less than corn. Sorghum and wheat grain contain similar amounts of protein (~11-12%) while both contain more protein than rice and corn (~6-9%) (2). Sorghum is naturally gluten free.

Micronutrients. A comparison of 100 g of commodity sorghum to the World Health Organization (WHO) Recommended Nutrient Intakes (RNI) (3-5) for children ages 1-3 years shows the following micronutrients are met: Magnesium = 366% RNI; Iron based on 10% bioavailability = 73% RNI; Zinc based on moderate bioavailability = 38% RNI; Thiamin = 47% RNI; Riboflavin = 28% RNI; Niacin = 49% RNI; Pantothenate = 63% RNI; Vitamin B-6 = 118% RNI. WHO does not have an established RNI for copper and manganese, thus using the United States Recommended Dietary Allowance (RDA) (6) criteria, 100g sorghum meets the RDA for children ages 4-8 years as follows: Copper = 245% RDA; Manganese = 92% RDA.

Iron and zinc are two of the four micronutrients (iron, zinc, iodine, vitamin A) identified (7) as at risk in populations of developing countries. Sorghum is a good to excellent source of iron and zinc. Sorghum is rich in B complex vitamins that play a major role in energy metabolism. Sorghum's high-energy content and ready supply of B-complex vitamins are a perfect combination for energy utilization.

Phytochemicals. Depending on the variety, sorghum provides good to excellent sources of such phytochemicals as phenolic acids, anthocyanins, phytosterols and policosanols. These compounds are familiar to the public as a result of health claims around sterols and stanols (heart health) and the publicity attributed to the anti-oxidant properties of anthocyanins (pigmented berries-blueberries, strawberries, etc.). Awika and Rooney (8) provide an excellent review of the potential health benefits of phytochemicals in sorghum. One category of phytochemicals, condensed tannins – regardless of grain color- is not found in U.S. sorghum varieties and most sorghum produced elsewhere (8).

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Gluten-Free Whole Grain Sorghum: An Excellent Source of Dietary Fiber

Whole grain gluten-free sorghum flour is an excellent source of dietary fiber with 6.6g/100g flour (1). Most Americans of all ages under-consume dietary fiber with an average intake of about 15 grams versus the 25 grams that are recommended (2). Concentrated sources of fiber include whole grains, dried peas and beans, vegetables, nuts and fruits. Fiber is intrinsic and intact only in plants.

Dietary fibers are nondigestible forms of carbohydrates and lignin. Dietary fiber can be classified as fermentable or non-fermentable---both forms are needed for good health. Along with helping provide satiety, a moderate amount of evidence suggests that dietary fibers from whole food sources protect against cardiovascular disease, obesity, and type 2 diabetes and is essential for optimal digestive health (3).

The *2010 Dietary Guidelines* for Americans was careful to point out that increasing total grains was not recommended. However increased consumption of the proportion of *whole grains to total grains was recommended* because of the need to increase whole grain fiber (3). In particular, individuals with celiac disease may not consume enough dietary fiber and need gluten-free whole grains such as sorghum in their diets.

A recent study with adolescents (4) found that higher dietary fiber intakes, but not low saturated fat or cholesterol intakes, were associated with lower incidence of metabolic syndrome. Since metabolic syndrome in adolescence leads to a higher incidence of metabolic syndrome, type 2 diabetes, and cardiovascular disease in adulthood, teens are a major group in need of education about whole grains and other sources of dietary fiber.

The Nutrition Facts panel on food labels requires that the amount of dietary fiber per serving be shown. If a food product contains at least 2.5 g/serving, the label may state the food is a good source of fiber.

Based upon an extensive review of the evidence, the FDA recently approved a health claim for whole grains that permits manufacturers to state on foods: "Diets rich in whole grain foods and other plant foods and low in total fat, saturated fat, and cholesterol may reduce the risk of heart disease and some cancers" (5). In order to use the claim, the serving size must contain a specified amount of dietary fiber per serving. Four serving sizes are specified ranging from a 35 gram serving with 1.7 grams of fiber to a 55 gram serving with 3.0 grams of dietary fiber (5). Thus sorghum grain is an excellent source of dietary fiber.

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1. USDA National Nutrient Database for Standard Reference, Release 24 (2011). Item # 20648.
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Nutrient values for 100 g uncooked gluten-free grains: sorghum, buckwheat, amaranth, and quinoa

Nutrient	Unit	Sorghum NDB # 20067	Buckwheat NDB # 20008	Amaranth NDB # 20001	Quinoa NDB # 20035
Energy	kcal	339	343	371	368
Protein	g	11.3	13.25	13.56	14.12
Total Fat	g	3.3	3.4	7.0	6.1
Carbohydrate	g	74.6	71.5	65.25	64.16
Fiber	g	6.3*	10.0	6.7	7.0
Calcium	mg	28	18	159	47
Iron	mg	4.4	2.2	7.6	4.57
Magnesium°	mg	190	231	248	197
Phosphorus	mg	287	347	557	457
Potassium	mg	350	460	508	563
Sodium	mg	6	1	4	5
Zinc°	mg	2.3	2.4	2.9	3.1
Copper°	mg	1.08	1.10	0.52	0.29
Manganese°	mg	1.63	1.30	3.33	2.03
Iodine	ug	n/a	n/a	n/a	n/a
Selenium∝	mcg	trace	8.3	18.7	8.5
Vitamin C	mg	0	0	4	n/a
Thiamin	mg	0.237	0.101	0.116	0.360
Riboflavin	mg	0.142	0.425	0.200	0.318
Niacin	mg	2.927	7.020	0.923	1.520
Pantothenate°	mg	1.25	1.233	1.457	0.772
Vitamin B-6°	mg	0.59	0.210	0.591	0.487
Folate, total°	mcg	0.02	30	82	184
Vitamin B-12	mcg	0	0	0	0
Vitamin A∂	IU	16	0	2	14
Vitamin D	ug	0	0	0	0
Vitamin E°	mg-ATE	1.2	n/a	1.19	2.44

Nutrient values: USDA National Nutrient Database for Standard Reference, Release 24 (2011)

*Total dietary fiber value is for white sorghum. Updated by USDA 2011. Other types of sorghum range from 8.8 to 11.1 g/100g

Additional published sorghum data as noted.

° Waniska and Rooney 2000.

∝Neucere and Sumrell 1980.

∂ Barrow-Agee Laboratories, LLC, Memphis, TN 2010.

n/a = not available

Nutrient values for 100 g whole grain sorghum, wheat, and rice flours and whole grain yellow cornmeal

Nutrient	Unit	Sorghum NDB # 20648	Wheat NDB # 20080	Rice NDB # 20090	Cornmeal NDB # 20020
Energy	kcal	361	340	363	362
Protein	g	7.87	13.21	7.23	8.12
Total Fat	g	3.29	2.50	2.78	3.59
Carbohydrate	g	77.47	71.97	76.48	76.89
Fiber	g	6.6	10.7	4.6	7.3
Calcium	mg	12	34	11	6
Iron	mg	2.99	3.60	1.98	3.45
Magnesium	mg	120	137	112	127
Phosphorus	mg	288	357	337	241
Potassium	mg	311	363	289	287
Sodium	mg	4	2	8	35
Zinc	mg	1.44	2.60	2.45	1.82
Copper	mg	0.222	0.410	0.230	0.193
Manganese	mg	1.262	4.067	4.013	0.498
Iodine	ug	n/a	n/a	n/a	n/a
Selenium	mcg	12.2	61.8	n/a	15.5
Vitamin C	mg	0.0	0.0	0.0	0.0
Thiamin	mg	0.277	0.502	0.443	0.385
Riboflavin	mg	0.053	0.165	0.080	0.291
Niacin	mg	5.187	4.957	6.340	3.632
Pantothenate	mg	0.930	0.603	1.591	0.425
Vitamin B-6	mg	0.345	0.407	0.736	0.304
Folate, total	mcg	25	44	16	25
Vitamin B-12	mcg	0.0	0.0	0.0	0.0
Vitamin A	IU	n/a	9	0.0	214
Vitamin D	ug	n/a	0.0	0.0	0.0
Vitamin E	mg-ATE	0.50	0.71	1.20	0.42

Nutrient values: USDA National Nutrient Database for Standard Reference. Release 24. 2011.
n/a = not available

Sorghum grain nutrients compared to the WHO RNI of children ages 1-9 years

Nutrient	Unit	Sorghum 100 g	RNI 1-3 y	%RNI 1-3 y	RNI 4-6 y	%RNI 4-6 y	RNI 7-9 y	%RNI 7-9 y
Energy	kcal	339.0	997	34	1301	26	1629	21
Protein	g	11.3	12.25	92	16.65	68	26.05	43
Total Fat	g	3.3						
Carbohydrate	g	74.6						
Fiber	g	6.3						
Calcium	mg	28	500	6	600	5	700	4
Iron*	mg	4.4	5.8	73	6.3	70	8.9	49
Magnesium°	mg	190	60	366	76	250	100	190
Phosphorus	mg	287						
Potassium	mg	350						
Sodium	mg	6						
Zinc* °	mg	1.54	4.1	38	4.8	32	5.6	28
Copper°	mg	1.08		**		**		**
Manganese°	mg	1.63		**		**		**
Iodine	ug	n/a	90		90		120	
Selenium∞	mcg	trace	17	<1	22	<1	21	<1
Vitamin C∂	mg	2	30	<1	30	<1	36	<1
Thiamin	mg	0.237	0.5	47	0.6	40	0.9	26
Riboflavin	mg	0.142	0.5	28	0.6	24	0.9	16
Niacin	mg	2.927	6.0	49	8.0	37	12.0	24
Pantothenate°	mg	1.25	2.0	63	3.0	42	4.0	31
Vitamin B-6°	mg	0.59	0.5	118	0.6	98	1.0	59
Folate, total°	mcg	0.02	150	<1	200	<1	300	<1
Vitamin B-12	mcg	0	0.9	0	1.2	0	1.8	0
Biotin	ug	n/a	8.0		12.0		20.0	
Vitamin A∂	IU	16	1333	1	1500	<1	1666	<1
Vitamin D	ug	n/a	5		5		5	
Vitamin E a-TE°	mg	1.2	5	<1	5	<1	7	<1
Vitamin K	mcg	n/a	15		20		25	

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Nutrient Values: USDA National Nutrient Database for Standard Reference. Total dietary fiber value is for white sorghum. Other types of sorghum range from 8.8 to 11.1 g/100g. Release 24. 2011.
Published sorghum data as noted.
° Waniska and Rooney 2000.
∞ Neucere and Sumrell 1980.
∂ Barrow-Agee Laboratories, LLC, Memphis, TN 2010.
* Iron RNI based on 10% bioavailability; Zinc RNI based on moderate bioavailability.
n/a = not applicable or not available
** Using the US RDA of 1.5 mg for copper and 440 mcg for manganese, the percent of RDA for children 4-8 years of age for manganese (1.63 mg/100g) is 92% and for copper (1080 mcg) is 245%.

10 Reasons to Eat Sorghum Grain

1. **Sorghum grain tastes good!**

2. **Sorghum grain is *always whole grain* whether popped as a snack, milled into flour or cooked whole as a cereal or pilaf.**

3. **Sorghum grain is high in potassium (350 mg/100 g) and low in sodium (6 mg/100 g) therefore promoting healthy blood pressure (1).**

4. **Sorghum grain is gluten-free enabling those with celiac disease to consume a healthy whole grain product.**

5. **Sorghum grain is rich in health promoting phytochemicals: phenolic acids, sterols, policosanols, and anthocyanins (2).**

6. **Sorghum grain and sorghum flour are rich in minerals: magnesium, copper, manganese, iron and zinc (1).**

7. **Sorghum grain and sorghum flour are rich in vitamins: thiamin, riboflavin, niacin, vitamin B-6 and pantothenate (1).**

8. **Sorghum grain is rich in macronutrients: containing 11% protein, 75% carbohydrate and 3% total fat (1).**

9. **Sorghum grain grown in the U.S. is free of condensed tannins that may interfere with mineral absorption (2).**

10. **Sorghum grain (1) and sorghum flour (3) are excellent sources of fiber with 6.3 g and 6.6 g per 100 g respectively.**

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1. USDA National Nutrient Database for Standard Reference, Release 24 (2011). Items #20067 and 20648.
2. Awika JM, Rooney, LW. Sorghum phytochemicals and their potential impact on human health. *Phytochemistry* 2004;65:11991221.
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Sorghum Grain and International Food Aid

Special populations such as infants and children, pregnant and lactating women and the elderly are at nutritional risk in affluent developed countries, but their vulnerability increases when food-insecurity, diseases such as HIV/AIDS, malaria, intestinal worms, or poverty, civil unrest, and drought are imposed. These populations are at risk for both macronutrients (protein, fat, carbohydrate) and micronutrients (vitamins and minerals).

Child malnutrition is the first indicator that hunger problems exist in countries. Even though the incidence of global childhood malnutrition has declined, the incidence of childhood malnutrition in Africa has not. UNICEF (1) reported that in sub-Sahara Africa in 2007 that the annual number of under-5 deaths was 4,480,000 and that the expected life span was 50 years. There are many reasons for stunting, low weights and deaths in children, but major among them are inappropriate or inadequate diets.

Sorghum grain is indigenous to Africa; therefore it is a familiar food. It is used in many different food systems, including porridges, gruels, breads, pancakes, dumplings, couscous and non-alcoholic fermented beverages. The FAS-USDA Food Aid Report for fiscal year 2010 shows shipments for sorghum grain through Sept. 30, 2010. The report shows that the sorghum grain shipped as part of food aid was 510,000 metric tons at a value of $105,585,500 (2). In addition to sorghum grain's flexibility in food systems and high consumer acceptability, it makes significant contributions to the nutritional value of diets of populations at risk. It is competitively priced, and non-GMO.

Emphasis on more traditional African diets such as sorghum grain or millet rather than an introduced crop such as maize needs more consideration. Researchers (3) questioned the wisdom of increasing maize consumption in Africa relative to its aflatoxin (*Aspergillus*) content and health consequences. The U.S. limits aflatoxin levels in sorghum grain to 20 ppb, as does Nigeria (4). Williams et al. (5) reported a positive association between HIV transmission frequency and maize consumption in Africa and suggested that fumonisin (*Fusarium verticillioides*), primarily a maize contaminate, was more likely than aflatoxin to explain the relationship between food and cancer in Africa. His group (5) concluded that the corn-fumonisin-HIV link needs more research and that by removing or reducing maize or by consuming alternate foods, 1,000,000 HIV transmissions could be avoided annually (cutting transmission rates by 50%). Sorghum grain is a good choice for food aid.

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How to Bake Gluten Free and Cook with Grain Sorghum Flour
By Carol Fenster, author of *Gluten- Free 101* and ***125 Gluten-Free Vegetarian Recipes***
Blog and Cookbook Reviews: www.CarolFensterCooks.com

Baking Gluten Free with Sorghum Flour
"*What can you bake with if you can't use wheat flour*?' Sorghum is an excellent replacement for wheat flour in baking because its light color and mild flavor won't interfere with the color or flavor of food, making it appropriate for all types of baked items—breads, muffins, pasta, cakes, cookies, and pies. In fact, sorghum tastes much like wheat flour and produces baked goods that look and taste much like wheat versions. Sorghum flour does not require refrigeration and is readily available in health food stores and many supermarkets.

Gluten-free flours work better when blended with other flours. Sorghum flour's protein provides structure and stability. It blends well with potato starch (or cornstarch), which lightens the crumb and tapioca flour, which promotes browning of the crust and a bit of "chew" for mouth-feel. The following general-purpose blend works well in all types of gluten free baking:

Carol's Sorghum Flour Blend
1 ½ cups sorghum flour
1 ½ cups potato starch (or cornstarch)
1-cup tapioca flour
Whisk together until thoroughly blended. Store, tightly covered, in a dark, dry place.

Converting Recipes to Gluten-Free
Many people want to bake their family favorites without wheat flour. The easiest way to convert an existing recipe is to replace the wheat flour with the same amount of Sorghum Flour Blend (see above). Then, add xanthan gum (a polysaccharide in powder form that is essential for replacing the function of gluten—available in health food stores) in appropriate amounts so baked goods rise and don't crumble. Some recipes convert with no changes; others require some adjustment. If the batter or dough looks too stiff, add more liquid (a tablespoon at a time) to reach the desired consistency. If the batter is too wet, add more sorghum flour blend (a tablespoon at a time) to reach the desired consistency. Write the changes you make in the margin of your recipe so you know what to do next time.

Sorghum Flour for Frying
Sorghum flour can be used in the same amount as wheat flour for batters in deep-fat frying or dredging meats and vegetables before pan-frying. Its dry texture makes a crispy coating without gumminess or stickiness. Its mild flavor and color blend right in with the food you're frying.

Whole Grain Sorghum Cereal
Whole grain sorghum has a nutty flavor and a dense chewy texture that is similar to bulgur or pearl barley. For best results, soak the whole grain overnight in cool water, then drain and cook 1 cup of whole grain sorghum in 3 cups of water for about 45 to 60 minutes. Use cooked whole grain sorghum as a healthy side dish in place of rice or bulgur, as a hot breakfast cereal, or in soups, salads, or casseroles instead of bulgur or pearl barley. Find it at www.glutenfreemall.com or www.shilohfarms.com

125 Gluten-Free Vegetarian Recipes (Avery/Penguin Group, 2011)
100 Best Gluten-Free Recipes (Wiley, 2010)
Gluten-Free 101 (Savory Palate, 2010)
1,000 Gluten-Free Recipes (Wiley, 2008)
Gluten-Free Quick & Easy (Avery/Penguin Group, 2007)
Cooking Free (Avery/Penguin Group, 2005)
Wheat-Free Recipes & Menus *(*Avery/Penguin Group, 2004)

Sorghum Pizza Crust

*Adapted with permission from **Gluten-Free 101** by Carol Fenster (Savory Palate, 2010)*

Sorghum is a natural for this gluten-free pizza; its protein provides structure and stability for the dough and its flavor is similar to wheat. You can use your favorite toppings, but a thick pizza sauce works best to make sure the crust remains crisp.

1-tablespoon active dry yeast
¾ cup warm milk of choice (110 degrees)
1-teaspoon sugar
⅔ cup sorghum flour, plus more for sprinkling
½ cup tapioca flour
2 teaspoons xanthan gum
½ teaspoon salt
1 teaspoon Italian seasoning
2 teaspoons olive oil
2 teaspoons cider vinegar
Your favorite pizza sauce and toppings (such as cheese, vegetables, pepperoni)

[1] Place oven racks in the bottom and middle positions. Preheat the oven to 425ºF. Dissolve yeast and sugar in warm milk for five minutes.

[2] In a food processor, process all ingredients, including yeast mixture, until well blended. Or mix in a medium bowl on low speed with an electric mixer. The dough will be soft.

[3] Place dough on a greased (not cooking spray) 12-inch nonstick pizza pan. Liberally sprinkle sorghum flour on dough; then press dough into a smooth layer with your hands, continuing to dust with flour to prevent sticking. Make the edges somewhat thicker to keep the toppings in place.

[4] Bake pizza crust 10 to 12 minutes on the bottom rack. Remove from oven and add sauce and toppings. Bake on the middle rack until the top is nicely browned, about 15 to 20 minutes. Remove from the oven and cut into 6 slices. Serve warm. Makes a 12-inch pizza.

Sorghum Blueberry-Lemon Muffins with Crunchy Topping

*Adapted from **Gluten-Free 101** by Carol Fenster (Savory Palate, 2010)*

Sorghum's light color and mild flavor make it perfect for these breakfast muffins. Use this easy recipe as the basis for other flavor combinations, too; perhaps replacing the lemon zest and blueberries with orange zest and dried cranberries---or with a teaspoon of ground cinnamon and raisins.

Dry Ingredients
2 ⅓ cups Sorghum Flour Blend (see below)
3/4 cup granulated sugar
1-tablespoon baking powder
1 ½ teaspoons xanthan gum
3/4-teaspoon salt

Wet Ingredients
1-cup milk of choice, at room temperature
1/3 cup melted unsalted butter or canola oil
2 large eggs, at room temperature
1 tablespoon grated lemon peel
1-teaspoon vanilla extract

Add-Ins
1-cup fresh blueberries

Topping
1-tablespoon sugar
1-tablespoon sorghum flour
1 teaspoon melted butter or canola oil
1 teaspoon grated lemon peel

[1] Preheat the oven to 375ºF. Generously grease a standard 12-cup non-stick muffin pan.

[2] Whisk the dry ingredients together in a large bowl. In a separate bowl, whisk the wet ingredients thoroughly until very smooth.

[3] Make a well in the dry ingredients and add wet ingredients with a spatula until just moistened and then gently stir in the blueberries. Divide the batter evenly in the pan. In a small bowl, combine the sugar, sorghum, butter, and lemon peel with a fork until crumbly and sprinkle on each muffin.

[4] Bake until the muffin tops are lightly browned, approximately 20 to 25 minutes or until a toothpick inserted in the center of a muffin comes out clean. Serve warm. Makes 12 muffins.

Sorghum Flour Blend
1 ½ cups sorghum flour
1 ½ cups potato starch or cornstarch
1-cup tapioca flour
Whisk together and store, tightly covered, in a dark, dry place.

Ginger-Molasses Cookies

*Reprinted with permission from **125 Gluten-Free Vegetarian Recipes** by Carol Fenster (Avery/Penguin Group, 2011)*

> *Moist and very flavorful, these cookies are perfect for dessert. Or, process them into crumbs in a food processor for a pie crust (about 1 ½ cups for a 9-inch piecrust). Adding the optional black pepper turns them into Pfeffernüsse, a traditional German treat served during Christmas holidays.*

- ½ cup butter or buttery spread
- ¼ cup molasses (not blackstrap)
- ¾ cup packed light brown sugar
- 1-teaspoon pure vanilla
- 1-cup sorghum flour
- ½ cup garbanzo (chickpea) flour
- 1-teaspoon ground ginger
- 1-teaspoon ground cinnamon
- ½ teaspoon xanthan gum
- ½ teaspoon freshly grated nutmeg
- ½ teaspoon ground cloves
- ¼ teaspoon baking soda
- ¼ teaspoon sea salt
- ¼ teaspoon freshly ground black pepper (optional)
- 2 tablespoons evaporated cane juice or sanding sugar, for rolling

[1] Place a rack in the lower third of the oven. Preheat the oven to 375°F. Line a 9x13-inch metal baking sheet (not nonstick) with parchment paper.

[2] In a medium sized mixing bowl, beat the butter, molasses, brown sugar, and vanilla with an electric mixer on low speed until well blended. Add the sorghum flour, garbanzo flour, ginger, cinnamon, xanthan gum, nutmeg, cloves, baking soda, salt, and black pepper (if using) and beat until well blended.

[3] With a #50 (1¼ tablespoon-size) metal ice cream scoop, shape 9 balls, roll each into a smooth ball with your hands, and roll each in the evaporated cane juice. Place them at least two inches apart on the sheet.

[4] Bake until the cookies look firm and began to show little cracks on top, about 8 to 10 minutes. Do not overtake. Cool the cookies on the baking sheet on a wire rack for 5 minutes, then transfer to the wire rack to cool completely. Repeat with the remaining dough. Makes 18 cookies.