COLLEGE OF AGRICULTURE & LIFE SCIENCES
Cooperative Extension

az1692 February 2016

Chia Seeds

Alexandra M. Franklin and Nobuko Hongu

Chia seeds have become popular in the health foods market recently, despite the fact that they are actually one of the oldest staples of the Aztec and Mayan diets. Most supermarkets and health food stores sell chia seeds, but they can sometimes be difficult to locate in the store. They can often be found in the produce section or the baking section, however some stores may keep them with their specialty items such as next to the flaxseeds. Consumers are adding chia seeds to baked goods, breads, smoothies, or simply sprinkling on top of salads, cereals, and soups. Because of their mild flavor, chia seeds can be added to a wide variety of dishes. This article can help you learn more about chia seeds, and show you how to incorporate them into a balanced diet.

What are Chia Seeds?

Chia (*Salvia hispanica L.*) is a desert plant that was cultivated for centuries by the Aztecs of ancient Mexico. Chia seeds were a very important crop of the Aztec people, along with corn, as they incorporated these seeds into their daily diet. *Salvia columbariae*, a slightly different plant than that grown in ancient Mexico, can be found in California, Nevada, Arizona, and New Mexico.[1,2] The Native American tribes of California used this variation of chia seeds as a source of food and for medicinal purposes. More recently, chia seeds are regaining the spotlight for their suspected nutritional benefits and have even been deemed a superfood.[3]

Unique Properties of Chia Seeds

When chia seeds are added to water and allowed to sit for 30 minutes, they form a gel. (See Figure 1. Chia seeds) Chia seed gum, a slimy material, begins to form in the solution.[4] The structural component responsible for their gelatinous quality in liquid is the water-soluble fiber of chia seeds. There is much interest in the characteristics of chia seeds and chia seed gum for use as a thickening or emulsifying agent in food products.[5]

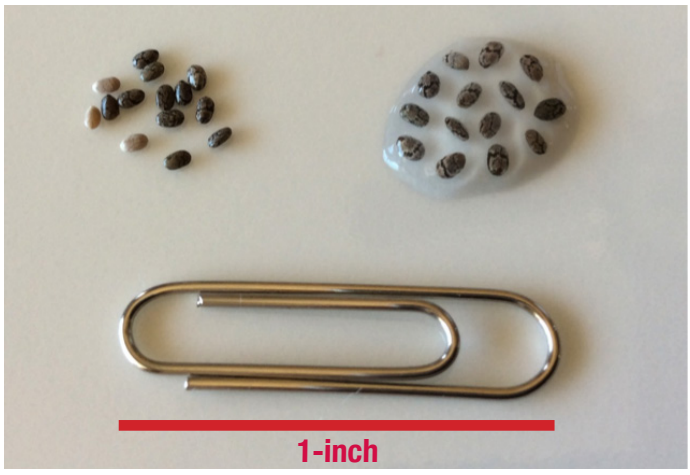


Figure 1. Chia seeds – Added water and allowed to sit for 30 minutes (right).

Nutritional Information and Health Benefits

Chia seeds are a rich source of healthy fats, dietary fiber, protein, and several minerals. The total calories in 1 tablespoon of chia seeds is 69 calories. (See Figure 2. Nutrition Facts Label) They also contain a high amount of antioxidants.[6]

Omega-3 Fatty Acids

Chia seeds are an excellent source of healthy polyunsaturated fats, especially omega-3 fatty acids, which are not made by the body and must be obtained from foods. The three main omega-3 fatty acids are: alpha-linolenic acid (ALA), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). ALA comes from plants, vegetable oils, nuts and seeds. EPA and DHA come from fish and fish oils. Our body converts ALA to EPA and DHA, which have the most potent health benefits (examples: reducing risk factors for heart disease, including high cholesterol and high blood pressure, and important roles in cognition and eyesight)[7]

Chia seeds contain approximately 26–35% oil by weight and have one of the highest known content of ALA.[8] A tablespoon of chia seeds and walnuts contains approximately 2.5g of ALA, compared to ½ cup of tofu containing 0.4 to 0.7g ALA. The American Heart Association recommends consuming two servings of fish (4 ounces / serving) per week, which may provide 1.3-2.7g of ALA and approximately 500 mg of EPA and DHA.[7, 9]

Fiber

One tablespoon of chia seeds provide a total of 5 grams of fiber, which contributes to the heart healthy nature of chia seeds. Soluble fiber, found in chia seeds, dissolves in water and passes though the digestive system more slowly than insoluble fiber. Soluble fiber with a healthy diet may help lower LDL (bad) cholesterol levels without lowering HDL (good) cholesterol.[10]

Protein

Chia seeds also provide 2 grams of protein per tablespoon, which is 4% of the daily recommended value (based on a 2,000 calorie diet). Protein provides amino acids that help in building and preserving body muscle and tissues. Inadequate protein intake in the United States is rare.

Minerals

Chia seeds are a rich source of several minerals, contributing significantly to the daily-recommended value of several of them. Containing 15% of the daily-recommended value of both magnesium and phosphorus, chia seeds are a good source of electrolytes, which regulate fluid and are important for muscle function. Calcium, typically obtained in the diet through foods like milk and cheese, is quite high in chia seeds. A milk based smoothie with an ounce of chia seeds mixed in would contain nearly 500 milligrams of calcium, about half of a typical adult's calcium needs. (1 ounce of chia seeds provides 180mg of calcium and 1 cup of any types of milk provides 300 mg of calcium.) Stir-fry with some of calcium-rich vegetables, such as broccoli, bok choy (leafy Chinese cabbage), beans, and tofu and sprinkling of chia seeds at the end of the cooking could make a half of a daily target of 1,000 mg of calcium in adults. Zinc, a mineral commonly found in meats like beef and pork, is found in moderate amounts in chia seeds, making them a great source for vegetarians or vegans. Zinc plays a role in immune function, protein synthesis, and wound healing.[11] Lastly, iron is found in moderate amounts in chia seeds, yet another nutrient typically found in meats.

Antioxidants

Recent studies have shown chia seeds are rich in antioxidants (phenolic compounds).[6] Antioxidants are substances found in foods, which inhibit ("anti-") a process called oxidation ('-oxidant") in the body's cells. Oxidation is a chemical reaction that produces free radicals. Free radicals cause destruction of our body's cells and antioxidants stop them. Studies have shown antioxidants reduce the risk of heart disease and cancer.[12]

The phenolic compounds found in chia seeds may decrease the invasiveness of cancer cells and improve the clinical outcomes.[6]

Nutrition Facts

Serving Size 1 Tablespoon (14g)
Servings Per Container 1

Amount Per Serving	
Calories 69	Calories from Fat 36
	% Daily Values*
Total Fat 4g	**6%**
Saturated Fat 0g	**0%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Potassium 58mg	**2%**
Sodium 2mg	**0%**
Total Carbohydrate 6g	**2%**
Dietary Fiber 5g	**20%**
Sugars 0g	
Protein 2g	**4%**

Calcium 9%	•	Iron 6%
Thiamin 8%	•	Niacin 9%
Phosphorus 17%	•	Magnesium 15%
Zinc 8%	•	Selenium 14%
Copper 15%		

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

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2400mg	2400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

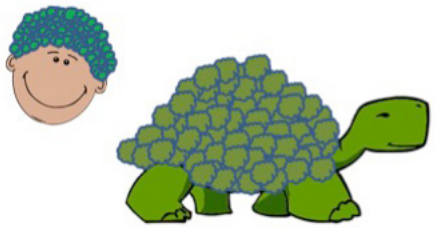
Figure 2. Chia seed Nutrition Facts (based on 1 Tablespoon, raw)
Reference: USDA, SuperTracker, Food-A-Pedia

Where to Purchase and the Cost

Chia seeds can be purchased in most major grocery stores and warehouse stores such as Fry's, Safeway, Albertson's, Costco, and Sam's Club. They can also be purchased at specialty foods stores such as Trader Joe's and Sprouts. Chia seeds can often be found in the produce section or the baking section, however some stores may keep them with their specialty items such as next to the flaxseeds.

Chia seeds, like olive oil, tend to be on the higher end in price, but a little goes a long way. A 12-ounce bag of chia seeds typically costs about $9-12, but contains approximately 30 servings, 1 tablespoon each. That means that each serving of chia seeds costs $0.30-0.40.

Chia Head & Chia Pet



Blast from the Past: In the 1980's the Chia Pet was a popular novelty that featured a ceramic animal body that seemingly grew fur after a few days of regular watering. What seemed to be the ceramic animal's fur was actually chia seed sprouts growing out of the ceramic body.

Suggested Uses and Recipes

It is very simple to add chia seeds to smoothies or juices, which is a great option to boost the nutritional value of your drink. A popular way to consume chia seeds is to simply add them to water with a splash of lemon or lime juice: this is called Chia Fresca (Figure 3. Chia Fresca). Mix 12 ounce cold, drinking water, 2-3 tablespoons of lemon juice, 1-2 teaspoons chia seeds and let it sit for about 5 minutes. Add sweeteners, if you desire. First, make simple syrup – dissolve sugar in boiling water, then add to your Chia Fresca.

There are several ways to incorporate chia seeds into baking, as well, with many recipes available online. Below simple and quick recipes are introduced.

Figure 3. Chia fresca

Lemon Chia Seed Muffins

Ingredients:

12 muffins, 2" diameter
1 ¾ cups all-purpose flour
¾ cup granulated sugar
2 teaspoons baking powder
¼ teaspoon salt
¾ cup part-skim ricotta cheese
½ cup water
¼ cup light olive oil
Zest of 2 lemons
3 tablespoons fresh lemon juice
1 egg
2 teaspoons chia seeds
Cooking Spray

Directions

1. Preheat oven to 375°F. Line a standard muffin pan with cupcake liners and lightly coat with cooking spray.
2. In a large bowl, whisk together the flour, sugar, baking powder, and salt.
3. In a separate bowl, mix together ricotta cheese, water, olive oil, lemon zest, and egg. (Careful not to overmix the ingredients. Avoid making a tough muffin!)
4. Make a well in the center of the dry ingredients, pour the wet ingredients into the middle, then mix together with a wooden spoon.
5. Next, add the chia seeds and gently fold into batter.
6. Evenly divide the batter into prepared muffin pan using a large scoop.
7. Bake for 16 minutes or until a toothpick inserted in the middle comes out clean.
8. Allow to cool completely and then store in an airtight container for up to 5 days.

Per Serving:

149 calories, 2.5g Total Fat, 28g Carbohydrates, 4.4g Protein, 1g Fiber

Estimated Total Cost:

$4.52, Cost per Serving: $0.38

Fresh Berry Chia Seed Jam

Ingredients:

1 Tablespoon, 15 servings
1 cup berries (Use fresh berries when in season, and use frozen in the off season. If you are using fresh berries, wash before using them!!)
1 tablespoon chia seeds
1 tablespoon warm water
½ tablespoon honey
½ tablespoon granulated sugar
1 teaspoon vanilla

Directions

1. Combine all ingredients in a food processor or blender and mix to desired consistency.
2. Place in airtight container and refrigerate for 60 minutes before serving.

Per Serving:

18 calories, 0.3g Total Fat, 4g Carbohydrates, 0.2g Protein, 1g Fiber

Estimated Total Cost:

$4.35, Cost per Serving: $0.44

References

1. Ricardo, A, & Coates W. (2005). Chia: Rediscovering a Forgotten Crop of the Aztecs. Tucson: The University of Arizona.
2. Immel, D.L. (2003). Plant Guide – Chia, Salvia columbariae Benth. Available at: http://plants.usda.gov/plantguide/pdf/cs_saco6.pdf
3. "What Are Chia Seeds?" Eat Right - Academy of Nutrition and Dietetics. Academy of Nutrition and Dietetics(2013).Available at: http://www.eatright.org/resource/food/vitamins-and-supplements/nutrient-rich-foods/what-are-chia-seeds
4. Capitani, M. I.,Ixtaina, V.I., Nolasco, S.M., &Tomás, M.C. (2013). Microstructure, Chemical Composition and Mucilage Exudation of Chia (Salvia Hispanica L.) Nutlets from Argentina. Journal of the Science of Food and Agriculture, 93(15), 3856-3862.
5. Segura-Campos, M. R., Ciau-Solís, N. Rosado-Rubio, G., Chel-Guerrero, L., & Betancur-Ancona, D. (2014). Chemical and Functional Properties of Chia Seed (Salvia Hispanica L.) Gum. International Journal of Food Science, 1-5.
6. Valdivia-Lopez,M., &Tecante, A. (2015). Chia (Salvia Hispanica): A Review of Native Mexican Seed and Its Nutritional and Functional Properties. Advances in Food and Nutrition Research, 75, 53-75.
7. Fish and Omeg-3 Fatty Acids. American Heart Association. Available at: http://www.heart.org/HEARTORG/GettingHealthy/NutritionCenter/HealthyEating/Fish-and-Omega-3-Fatty-Acids_UCM_303248_Article.jsp#.ViGi0ivG9sk
8. Ayerza R., & Coates, W. (2011). Protein content, oil content and fatty acid profiles as potential criteria to determine the origin of commercially grown chia (Salvia hispanica L.). Industrial Crops and Products, 34(2), 1366–1371.
9. Bellows, L., Clifford, J. Niebaum, K, & Bunning, M. (2015). Omega-3 Fatty Acids. Fact Sheet No.9.382. Colorado State University. Extension. Available at: http://extension.colostate.edu/docs/pubs/foodnut/09382.pdf
10. Hunter, J.G., & Cason, K.L. (2005). Fiber. Clemson Cooperative Extension. Available at: www.clemson.edu/extension/hgic/food/nutrition/nutrition/dietary_guide/hgic4052.html
11. Bobroff, L.B. (2013). Facts about zinc. University of Florida, The Institute of Food and Agricultural Sciences Extension. Available at: https://edis.ifas.ufl.edu/pdffiles/FY/FY21800.pdf
12. Devareddy, L., & Teeple J. Antioxidants. University of Arkansas, Cooperative Extension. Available at: http://www.uaex.edu/publications/PDF/FSFCS84.pdf

Abstract

Chia seeds are a popular food lately; which people have deemed as a superfood. Chia seeds are rich source of many vitamins and minerals as well as omega-3 fatty acids and fiber. This article explores the history of chia seeds, the nutritional benefits, as well as illustrates some ways to include this food into your diet.

COLLEGE OF AGRICULTURE & LIFE SCIENCES
Cooperative Extension

The University of Arizona
College of Agriculture and Life Sciences
Tucson, Arizona 85721

Alexandra M. Franklin
Undergraduate Research Assistant, Department of Nutritional Sciences, University of Arizona

Nobuko Hongu, Ph.D., M.Ed., R.D.
Associate Professor, Nutrition & Physical Activity Extension Specialist, Department of Nutritional Sciences, University of Arizona

Contact :
Nobuko Hongu
hongu@email.arizona.edu

This information has been reviewed by University faculty.
extension.arizona.edu/pubs/az1692-2016.pdf

Other titles from Arizona Cooperative Extension can be found at:
extension.arizona.edu/pubs