

Desert Foods

*For a
Resilient
Future*



Erin C. Riordan, Rebecca R. Renteria, Gary Paul Nabhan, Martha A. Burgess, Parker Filer, Glenda S. Garcia, Jesús García, Denisse Ortega Loroña, Jennifer M. Parlin, and Emily Rockey

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Pods and leaflets of honey mesquite (*Prosopis glandulosa*).
Credit: R. Sivinski via SEINet



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Narrow-leaf century plant, or maguey lechugilla (*Agave angustifolia*).

Credit: P. Mirocha

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Cholla buds ready for harvesting.

Credit: D. E. Cowan



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Credit: D. E. Cowan

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Desert Foods

for a *Resilient Future*

Have you ever baked with mesquite flour? Ever tasted grilled prickly pear?

These and many other local desert plants could grace your plate, boost food security and improve health outcomes in our community, all while taking less of a toll on the environment. Learn how you can help create a healthy, resilient, and climate-smart future by growing and eating desert-adapted foods.

Land Acknowledgement

We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with Tucson being home to the O'odham and the Yaqui. Committed to diversity and inclusion, the University strives to build sustainable relationships with sovereign Native Nations and Indigenous communities through education offerings, partnerships, and community service.

Building upon desert food knowledge shared by many Indigenous peoples of the U.S. Southwest, northwest Mexico, and other arid regions, this booklet was created by the following University of Arizona and local community partners: Desert Laboratory on Tumamoc Hill, Southwest Center, The Garden Kitchen, Pima County Master Gardener Program, Arizona Sonora Desert Museum, Borderlands Restoration Network, and Mission Garden. Funding was provided by the Technology and Research Initiative Fund (TRIF), administered by the Office of Research, Innovation & Impact and Arizona Institutes of Resilience (AIR) and supported by a small portion of Arizona sales tax revenues.



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Drawings Paul Mirocha

Text Erin C. Riordan, Rebecca Renteria, Gary Paul Nabhan, Martha A. Burgess

Spanish Translation Jesús García, Denisse Ortega Loroña

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Front, clockwise Flowering cholla and buds, Martha A. Burgess. Dried and cooked cholla buds, Martha A. Burgess. Grain and popped amaranth seed, Martha A. Burgess. Amaranth flower, D. E. Cowan.

Back, clockwise Agave flower, Martha A. Burgess. Agave palmeri plant, Borderlands Restoration Network. Chiltepín plant, D. E. Cowan. Tumacacori Mountains, the northern habitat of wild chiltepín in Arizona, Erin C. Riordan.

Our arid land food systems are at a crossroads.

Many familiar crops like lettuce and tomatoes are poorly equipped to survive in desert environments where heat and drought already limit flowering and fruiting. Growing these plants will become increasingly difficult as day- and night-time temperatures rise, droughts deepen, and water resources dwindle. Furthermore, the resource-intensive way we grow food is damaging the environment and our health. Industrialized agriculture, where crops are grown in large-scale monocultures, relies heavily on water and chemicals, degrades natural resources, and causes pollution. Worldwide, food production systems make up 19-29% of the human-driven greenhouse gas emissions that contribute to extreme heat, flooding, and droughts and threaten food security.

Desert-adapted food plants like cactus and mesquite, however, provide an alternative path forward. With remarkable adaptations to heat, drought, and poor soils, these plants are well-equipped to weather the sorts of stressful growing conditions we expect to see more of in the future — while using just a fraction of the water and fertilizer needed to grow conventional crops! Although unfamiliar to some, desert food plants have been tried and improved by hundreds to thousands of years of cultivation by the Indigenous people of the Sonoran Desert.

Desert food plants are not just good for the planet, they are good for our health. Prickly pear cactus pads and fruit aid in blood sugar regulation and contain antioxidants that decrease the risk of many

References

Gonzalez, P., Garfin, G. M., Breshears, et al. (2018). Southwest. In D. R. Reidmiller, C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, & B.C. Stewart (Eds.), Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II (pp. 1101-1184). Washington, DC: U.S. Global Change Research Program.

Intergovernmental Panel on Climate Change (2019). Climate change and land: An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems.

Nabhan, GP, Riordan, EC, Monti, L, et al. (2020). An Aridamerican model for agriculture in a hotter, water scarce world. *Plants, People, Planet*. 2: 627-639.

Vermeulen, S. J., Campbell, B. M., & Ingram, J. S. I. (2012). Climate change and food systems. *Annual Review of Environment and Resources*, 37(1), 195-222.



View of the City of Tucson from Tumamoc Hill.
Credit: P. Mirocha

Desert food plants are not just good for the planet, they are good for our health.

chronic diseases and boost immunity. Mesquite trees provide shade and reduce air temperatures, improve soil through the activity of roots and accumulation of leaf litter, improve rainwater retention, and serve as habitat for native wildlife and pollinators, in addition to producing nutritious, edible pods. Adding desert food plants to our gardens and plates can benefit our health and our environment, helping create a more resilient future.

Native bee pollinator visiting the flower of the domesticated Indian fig prickly pear (*Opuntia ficus-indica*)

Credit: D. E. Cowan



Wild Chile



SPANISH **chiltepín**
O'ODHAM **a'al ko'okol**

The small, fiery pepper called chiltepín is a perfect addition to your desert garden. Eat this wild chile raw, dried, picked green or ripe, and enjoy a powerfully spicy punch that will make your taste buds dance. Chiltepín ranks a whopping 50,000 to 100,000 units on the Scoville heat scale—hotter than tabasco and cayenne peppers!

Chiltepín thrives in the canyons and mountains of southern Arizona and northwestern Mexico. In your garden, wild chile bushes grow best in the shade of trees and large shrubs. Plants are perennial, growing up to four feet tall. Share the chiles with the local wildlife and enjoy the birds that come to your garden to dine on the ripe fruits, impervious to their heat.

Origin and History

Chiltepín is native to North America and reaches its northern range limit in the southwestern US. People throughout Central America and Mexico have long used the wild plants as food and medicine and domesticated the first plants 6,000 to 7,000 years ago. Because the chiltepín is a wild ancestor to domesticated peppers,

it is sometimes called the red-hot mamma of all pungent peppers. Today, wild chiltepín remains an important economic crop in Sonora and is popular in southwestern US and northern Mexican cuisines. In the mountains of the US-Mexico borderlands, wild chiltepín plants grow under the cover of nurse trees and shrubs like mesquite, graythorn, and hackberry. These nurse plants protect the chile plant. Their shade creates a moist growing environment during the summer and protects from frost and freeze damage during the winter. The ripe fruits of the wild chiltepín are a staple for birds who help spread the seeds. As birds perch in the branches of nurse plants, they deposit chiltepín seeds in their droppings to the ground below—exactly where the wild chile plants grow best.

Recently, the wild chiltepín has sparked interest among scientists concerned about climate change. As droughts and warming temperatures make it more difficult to grow some domesticated crops, scientists and farmers are looking to the hardy, wild ancestors, like the chiltepín, for clues on how to adapt crops to better withstand climate change.

Because the chiltepín is a wild ancestor to domesticated peppers, it is sometimes called the red-hot mamma of all pungent peppers.

Ripe fruits of the wild chile (*Capsicum annuum* var. *glabriusculum*).
Credit: E. C. Riordan



Good for Your Health

High in vitamins A and C

Causes the brain to release endorphins which act as natural painkillers

Capsaicin, the compound responsible for the chile's heat, has antimicrobial properties

Contains anti-oxidants that are useful food preservatives and reduce oxidative stress when consumed by humans

Good for The Planet

Fruits are a food source for birds and its flowers support native pollinators

Modest water requirement when grown in the shade of nurse plants

Roots stabilize soil, improving rainwater infiltration and soil retention

Natural immunity against plant diseases caused by microorganisms (viruses, bacteria, fungi) can help stop or reduce diseases, such as root rot, in root zone

Be careful!!

Handle wild chiles with care. Their spicy oils can irritate the skin and respiratory system. Wash hands and/or wear gloves and avoid contact with your eyes.



Dried chiltepín fruits or chiles (*Capsicum annuum* var. *glabriusculum*).
Credit: E. C. Riordan

Garden to Plate

- Plants are best grown from starts, available at local nurseries or native plant sales.
- If growing from seed, apply bottom heat to improve germination.
- Chiltepín is sensitive to summer heat and winter frosts. Plant in the shade of trees or shrubs.
- In the wild, chiles ripen in the fall (September–October).
- Unripe, green chiles can be pickled in vinegar with garlic and oregano and enjoyed as a condiment.
- Harvest, dry, and grind ripe chiles to use in salsas, soups, or any meal to add heat. Also try adding chiltepín to beverages and desserts!

Cholla Bud

SPANISH **capullos de choya**
O'ODHAM **ciolim**

Ranging from shrubby and furry-looking to wiry and tree-like, the cholla cactus is found throughout the Sonoran and Chihuahuan deserts. While intimidating in appearance, cholla's adaptations for arid and semi-arid climates and its highly nutritious buds make it an ideal crop for Arizona and other desert regions. Cholla have extensive, shallow root systems that soak up even the smallest amount of surface moisture. Like all cacti, cholla minimize water loss by using a special type of photosynthesis, called crassulacean acid metabolism (CAM), to uptake CO₂ during the night when temperatures are cooler. This CO₂ is stored in the cactus tissue as an acid until morning, when it is converted into sugar. This means that time of day the buds are harvested affects their flavor and tartness!

Origin and History

Cholla (*Cylindropuntia* spp.) are closely related to the prickly pear cactus (*Opuntia* spp.). Plants from both genera put on new growth, flowers, and spines at the areoles, giving them a segmented, or jointed, appearance. Cholla, however, is distinguished by its cylindrical shaped branches. At least 33 species

of cholla are native to the Americas, occurring in the southwest and south-central United States and throughout Mexico and the West Indies. Cholla are widely cultivated and have become invasive in South America and South Africa.

A dozen cholla species commonly occur in the Sonoran Desert in addition to many hybrids. While the buds of these cacti may seem anything but edible given their spine-covered exteriors, people have eaten cholla since time immemorial. Native American and Indigenous people throughout the southwest US and northern Mexico, including Baja California, continue to harvest cholla buds from multiple species. In Arizona, buckhorn (*Cylindropuntia acanthocarpa*) and staghorn cholla (*Cylindropuntia versicolor*) are among those species favored for bud size, edibility, and ease of harvest. When buds are not as readily available, the very young growth of the cactus itself has been used as food. The fleshy fruit of some species is also edible.

Cholla is highly resistant to heat and drought and can be easily propagated by planting jointed stem segments, which readily root and re-establish. Although cholla is often under-appreciated in the United States, today's changing climate brings renewed interest in cholla as a resilient food able to persist under increasingly stressful heat and drought conditions.

While intimidating in appearance, cholla's adaptations for arid and semi-arid climates and its highly nutritious buds make it an ideal food for Arizona and other desert regions.

Flower and unopened bud of staghorn cholla (*Cylindropuntia versicolor*).
Credit: M. A. Burgess.



Good for Your Health

High in available calcium — a great nutritional supplement for nursing parents and those with calcium-deficient diseases

Source of iron and potassium

High soluble fiber in the form of complex carbohydrates (mucilage) slows sugar absorption and may aid in diabetes management

Good for The Planet

Highly drought and heat tolerant

Roots stabilize soil, improving rainwater infiltration and soil retention

Low water requirement reduces need for supplemental water

Flowers support native pollinators

Source of shade, habitat, and food for wildlife (especially packrats and birds)

Be careful!!

Cholla buds contain oxalic acid which can impede calcium absorption and can cause digestive problems in large amounts. Cooking helps neutralize these effects.



Staghorn cholla (*Cylindropuntia versicolor*) flowering during the spring in the Sonoran Desert.
Credit: N. Georgiou

Garden to Plate

- Propagate by planting stem segments in sandy, well-draining soil.
- Harvest buds as weather warms and before blooms open (April–May).
- Use tongs to gently remove buds from the plant.
- Using a brush, broom, or similar tool, rake buds over a screen to detach the spines, which will fall through the screen.
- Enjoy boiled, roasted, pickled, sautéed, or frozen for later use after cooking.
- Boil and dry buds thoroughly (it may take up to a week!) to preserve for later use. Grind dried buds and add to porridges, smoothies, and other drinks, and rehydrate dry buds to use as you would freshly cooked buds.

Agave

SPANISH **mezcal** or **maguery**

O'ODHAM **a'ud**

Century plants (*Agave* spp.) are succulent perennials highly resistant to heat and drought, making them an important food plant for hot, dry climates. These plants can produce the same amount of edible biomass using just 18-50% of the water required by conventional crops! Patience, however, is key when growing agaves for food. The English name, century plant, refers to the long lifespan of plants, typically 8-30 years (not 100) to reach maturity. Once mature, agaves store sugars in their meristem (heart) to fuel the growth of one glorious flowering stalk before the plant dies. At flowering time, agave hearts and leaf bases are especially sweet — perfect for roasting and eating — which inspired its Aztec (Nahuatl) name *metl* (agave) + *calli* (cooked), hence its Spanish name mezcal.

Origin and History

Most of the 200+ species of Agave are native to arid, semi-arid, and seasonally dry tropical landscapes in North and Central America. Over millennia, people have domesticated a dozen or so agave species for cultivation. Seven of these originated in the Sonoran Desert and adjacent semi-arid regions. All domesticated species have hearts, stalks,

flowers, and sap that are eaten or drunk as non-alcoholic and alcoholic beverages. Species and varieties have distinctive flavors, fragrances, and levels of sweetness. All have starchy fibers called inulins that can be converted into sweet, low-glycemic probiotic or fermented products with antidiabetic properties. In Mexico, sweet agave sap, aguamiel (honey water), is traditionally fermented into pulque, a beverage that has been important to the diet and health of Indigenous people for at least eight millennia and is still consumed today. In the last five centuries, cultivated agaves have been introduced as fiber crops or ornamentals to Africa, the Middle East, South America, and Australia.

Agaves play a key role mitigating climate change. Because they are long-lived perennials with ample root systems, agaves sequester more carbon than annual crops. Their funneled leaves capture rainwater, concentrating moisture at the root zone. When planted with rock mulch, agaves need minimal additional water. Their roots harbor beneficial soil microbes that assist water and nutrient availability. Agave flowers are a critical food source for pollinators. The flower stalk (*quiote* in Spanish) grows to 15-36 feet (5-12 meters), attracting hummingbirds, bats and moths to sweet flowers day and night. It serves as perches, roosts, and nesting sites for songbirds and raptors. Below the agave leaf rosette, mice, shrews, lizards, and dozens of soil invertebrates find favorable habitat.

These plants can produce the same amount of edible biomass using just 18-50% of the water required by conventional crops.

Funnel shaped leaves of Parry's agave (*Agave parryi*).
Credit: M. Licher via SEINet

Good for Your Health

High in antioxidants, inulins, and fructans

High fiber content slows sugar absorption and helps aid diabetes management

Alternative source of carbohydrates for people with gluten sensitivities

Can be used as a molasses or syrup substitute due to natural sweetness

Good for The Planet

Highly heat and drought tolerant

Sequesters carbon and enriches soil

Creates favorable conditions for soil microbes, other plants, animals

Improves rainwater capture and combats soil erosion

Key food source for pollinators (bats, native bees, hummingbirds)

Be careful!!

Not all agaves are edible! Choose species carefully if growing for food. Raw sap can be caustic. Spiny teeth along leaf edges can be hooked and very sharp. Wear protective gloves and long sleeves when harvesting and roasting agaves.

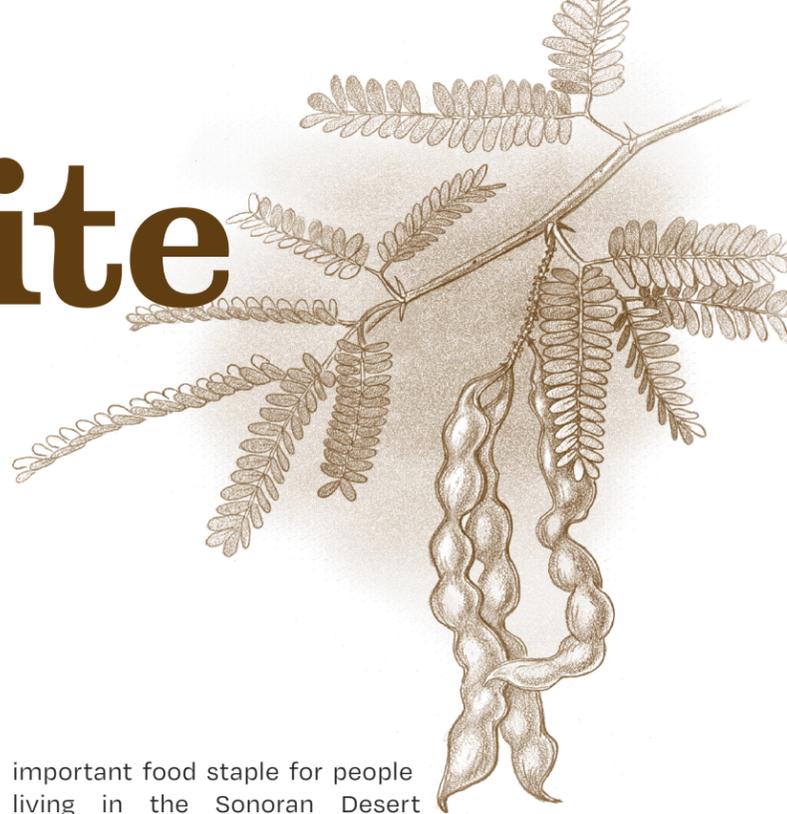


Mature desert agave (*Agave deserti*) with flowering stalk.
Credit: M. A. Burgess

Garden to Plate

- Plants grow best in rocky, well drained soils.
- Propagate by seed, vegetative 'pups', or plantlets called 'bulbils' that sometimes develop on the flower stalk.
- Create berms, terraces or rock piles around agave plantings to contain and harvest rainwater.
- For food, harvest agave hearts and young stalks from mature plants as they begin to bloom, removing leaves.
- Roast hearts and young flower stalks slowly (2-3 days); eat directly or ferment as a healthy probiotic beverage.

Mesquite Pod



SPANISH **péchita de mezquite**
O'ODHAM **kui wihog**

Mesquites are the hardy trees now found seemingly everywhere throughout arid and semi-arid landscapes worldwide—and it's no wonder given their versatility and ability to thrive in hot, dry climates. Mesquites (etymology: "mizquitl" from the Nahuatl language) can grow to 20 feet or more and provide much-welcomed summer shade. Their leaves are composed of small, pinnate leaflets which stay relatively cool and reduce water loss. Their roots can tap into deep, underground water, growing to 50 feet on average and in some species to 200 feet deep! Harvest and mill whole ripe bean-pods before the summer monsoon rain and use the flavorful flour throughout the year.

Origin and History

Mesquite trees are native to the arid and semi-arid areas of North and South America. Over time some species have been introduced to Africa, Asia, and Australia where they are now considered invasive. There are at least 44 mesquite species worldwide, three of which occur in the Sonoran Desert: honey mesquite (*Prosopis glandulosa*), velvet mesquite (*Prosopis velutina*), and screwbean mesquite (*Prosopis pubescens*). All of these species produce varying levels of sweet and edible seed pods. The pods can be ground and milled into flour and have been an

important food staple for people living in the Sonoran Desert from time immemorial to today.

Mesquite trees provide materials for medicines, paints and dyes, adhesives, tools, syrups, building structures, firewood, and other culturally important uses. They also play an important role sequestering carbon and nourishing the environment. Their canopies buffer harsh temperatures and improve soil water retention, creating favorable conditions for seedlings and other sensitive plants. With the help of nitrogen-fixing bacteria in root nodules, they enrich the surrounding soil, providing a rich growing environment providing a rich microhabitat for a diversity of native cacti, shrubs, vines and forbs, earning them the moniker "nurse plants." For gardeners, soil under mesquites can also provide more fertile ground for planting crops such as corn and squash—expanding their role as nurturers. On your next hike, observe the many desert plants, like the saguaro cactus, paired with a mesquite or other leguminous tree. Without the help of these nurse trees, the cacti would not survive the first few years of their sunny, dry desert lives.

Mesquite trees are not just a climate-smart addition to your garden or yard, their edible pods also provide nutritious additions to your breakfast, dinner, and dessert plates.

Velvet mesquite tree
(*Prosopis velutina*).
Credit: D. E. Cowan



Good for Your Health

High in calcium, magnesium, iron, fiber and zinc

Properties to aid in the management of diabetes, such as high gummy fiber to slow the absorption of sugar

Alternative source of flour for those with gluten sensitivities or preferences

Can be used as a sugar substitute given its natural sweetness

Good for The Planet

Tolerates drought and heat, creating favorable conditions for other plants and animals

Shade combats warming temperatures and urban heat island effects

Sequesters carbon and enriches soil

Stabilizes soil and improves rainwater infiltration

Food source for pollinators, native songbirds, and other desert animals

Be careful!!

Fungus can infect mesquite pods and produce a harmful chemical to humans. Only harvest brittle, dry pods from trees and never collect off the ground. For information about safe harvesting visit the 'Resources' page on the Desert Harvesters website.
desertharvesters.org/dh-resources



Mesquite flowers and pollinator.
Credit: D. E. Cowan

Garden to Plate

- Mesquite grows best in deep, well-drained soils.
- Harvest, dry, and grind the pods to make your own mesquite flour.
- If harvesting, pick ripe pods early summer (June – July) before monsoon rains to avoid aflatoxin contamination.
- Mesquite flour or meal is gluten free and can be used in cakes, breads, smoothies, and tortillas.
- For best baking results and flavor, use up to 25% of mesquite flour when mixing with other grain flours.

Amaranth

SPANISH **quelite** or **bledo**
 O'ODHAM **cuhuggia i:wagī** (greens)
cuhuggia i:wagī kaij (seeds)

As summer nears, consider adding Amaranth (*Amaranthus* spp.) to your garden. The English word amaranth derives from the Greek *amárantos* meaning unfading flower, referring to the plant's long-lasting flower bracts. The Spanish derivation of quelite comes from the Náhuatl *quilitl* meaning edible greens. Though many consider this colorful plant a weed, it deserves recognition as climate-smart food. Amaranth herbs use C4 photosynthesis which requires less water under hot and sunny conditions. This allows Amaranth to grow much more rapidly in hot temperatures compared to most conventional C3 crops. Don't be surprised if you hear names like pigweed or carelesslyweed for this resilient plant. In fact, amaranth is one of the world's most productive crops! It is also beneficial for your health, loaded with antioxidants, minerals, and protein. Use the seeds and leaves in savory or sweet meals while enjoying the beauty that some colorful amaranths can bring to your summer and fall gardens.

Origin and History

The amaranth family (Amaranthaceae) has over 150 genera and 2,000 species. This family includes amaranth, beets, chard, quinoa, saltbush, and

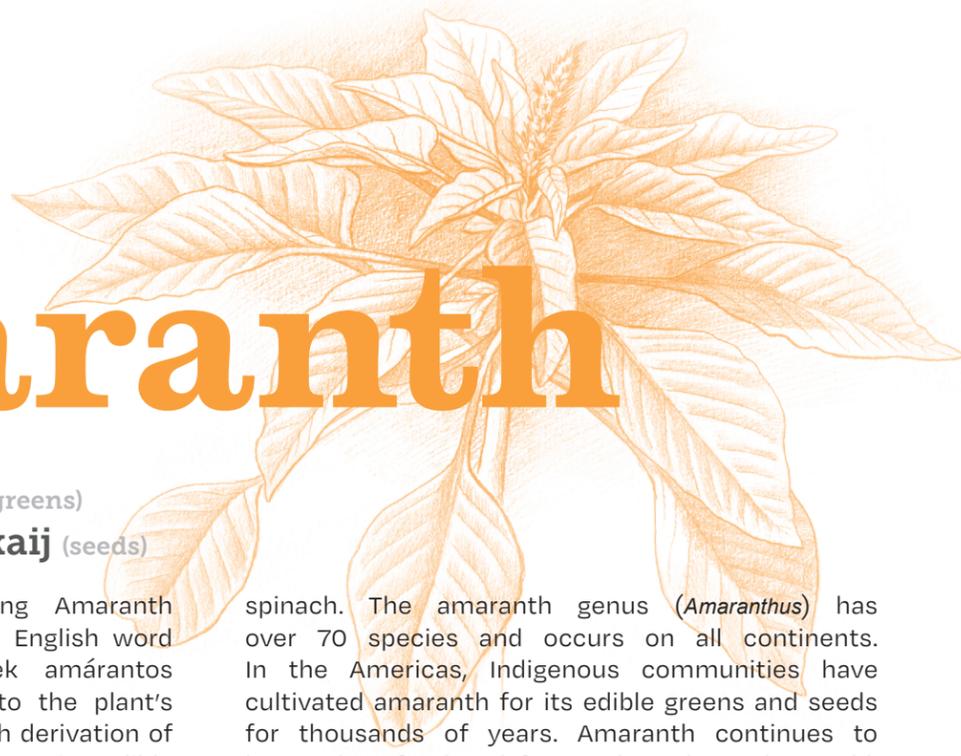
spinach. The amaranth genus (*Amaranthus*) has over 70 species and occurs on all continents. In the Americas, Indigenous communities have cultivated amaranth for its edible greens and seeds for thousands of years. Amaranth continues to be used as food and forage throughout the world.

In the Sonoran Desert, there are at least nine edible, native species of amaranth, as well as a number of cultivated and naturalized species. Palmer's amaranth (*A. palmeri*), tumbleweed or quelite manchado (*A. albus*), red-root amaranth (*A. retroflexus*), and grain amaranth (*A. hybridus*) are among the species most used by Indigenous communities in the region. The leaves of these plants have been and continue to be prepared in a variety of ways from sautéing to baking in tortillas. The seeds are used as a high protein grain, eaten popped like mini-popcorn or ground into flour.

Despite amaranth's long history of culinary use, it remains an under-utilized food in the United States. Arid-adapted amaranth species, such as those native to the Sonoran Desert may be especially important as temperatures rise. These plants germinate readily and grow rapidly with summer rains, making them promising candidates for highly nutritious and highly productive climate-smart crops.

The seeds are used as a high protein grain ground into flour or eaten popped like popcorn.

Colorful bracts of an amaranth (*Amaranthus fimbriatus*).
 Credit: P. Alexander via SEINet



Good for Your Health

Amaranth greens are rich in dietary minerals like calcium, iron, and niacin, and high in vitamins (A, C), folate and antioxidants

Amaranth seeds are high in protein, fiber, and amino acids while naturally gluten free

Oils may help cholesterol management

Good for The Planet

Natural pest control for other crops

Food source for native animals

Highly productive even under high temperatures

Tolerates drought, heat, and saline conditions allowing for minimal resources from planting to harvest

Be careful!!

Some amaranth greens are high in oxalic acid which can impede calcium absorption and causes digestive problems in large amounts. Cooking helps neutralize these effects.



Edible leaves and ripening seeds of red-root amaranth (*Amaranthus retroflexus*).
 Credit: P. Alexander via SEINet

Garden to Plate

- Seeds germinate easily and plants grow well in many soil types and conditions, especially disturbed areas.
- Plant throughout the warm season with spring and summer rain moisture.
- Harvest young leaves in the spring and summer. Fresh leaves may be harvestable within a week of the first monsoon rain.
- Use young leaves raw in salads, pesto, and any other way greens are used. Boil, steam, or sauté both young and maturing leaves.
- Grind seeds into a flour and add to hot cereal, biscuits, bread and other baked goods; or pop them like you would popcorn and use in cereals, energy bars, and other sweet treats.



Purslane

SPANISH **verdolaga**
O'DHAM **ku'ukpalk**

With the summer rains comes common purslane (*Portulaca oleracea*), a warm-season annual often found sprouting in yards and along roadsides. While considered a weed by many, this unassuming plant can make a breakfast omelette into gourmet fare and has promise as an introduced crop for a hotter, drier future. Common purslane has a unique adaptation to heat and drought—it can switch between two different types of photosynthesis! When summer rains are plentiful, purslane uses the C4 pathway, a specialized photosynthesis method that is especially efficient under hot temperatures. During drought conditions, the plant switches to a crassulacean acid metabolism (CAM) pathway to minimize water loss—the same method used by cacti and other succulents. Common purslane is also good for your health, rich in antioxidants, omega-3 fatty acids, and minerals. The next time you find purslane in your yard, try harvesting the tart, succulent greens for a nutritious and climate-conscious meal.

Origin and History

The purslane family (Portulacaceae) has over 100 species, with common purslane (*Portulaca oleracea*) most often used as a food source in the United States, although many other species are also edible. Common purslane's adaptability and ability to thrive under many conditions, including disturbance, enable it to readily spread, with or without the help of people. The geographic origins of common purslane are still being studied, with many possible sources. It is widely naturalized throughout North America. Archaeological evidence suggests an early presence of common purslane in eastern North America and Mesoamerica, where people may have cultivated and harvested it for food and medicine. Today, common purslane is cultivated in many communities and prepared in a multitude of ways. In the southwest United States and northern Mexico, Indigenous people have used its raw, young leaves as greens added to salads, soups and stews and as medicine with anti-inflammatory properties. Common purslane's ability to thrive under hot and dry conditions make it an ideal climate-smart, summer crop for the Sonoran Desert, especially as temperatures rise and rainfall becomes more variable.

Common purslane has a unique adaptation to heat and drought—it can switch between two different types of photosynthesis.

Succulent leaves and yellow flowers of common purslane (*Portulaca oleracea*).
Credit: L. Makings via SEINet



Good for Your Health

High in the essential omega-3 fatty acid alpha-linolenic acid (ALA) which reduces inflammation and cholesterol

High in antioxidants including beta carotene, and vitamin A, C, and E

Rich in dietary minerals like magnesium, calcium, phosphorous, and iron

Anti-inflammatory and antidiabetic properties may help manage type 2 diabetes

Good for The Planet

Reliable summer food source requiring low water use

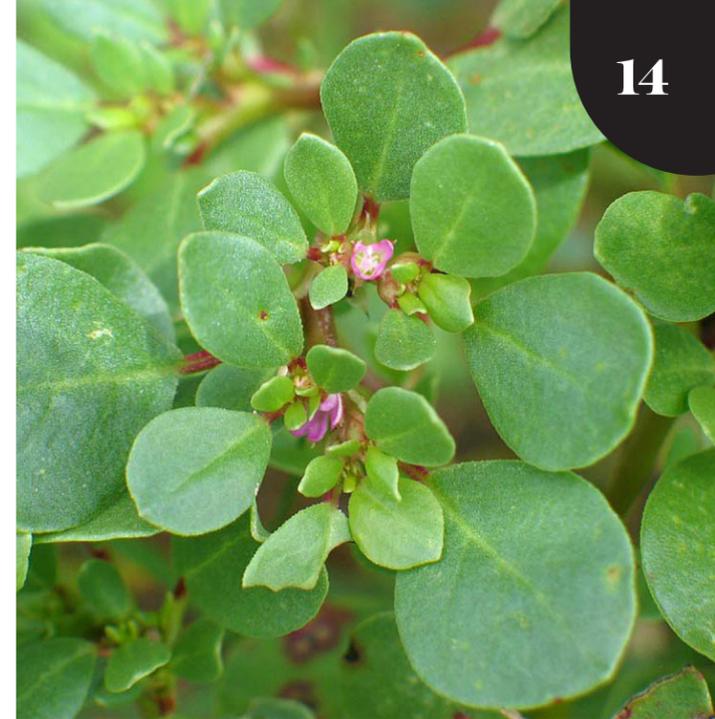
Tolerates drought, heat, and saline conditions allowing for minimal resources from planting to harvest

Flowers support native pollinators and leaves are a food source for wildlife

Can be used as ground cover and mulch

Be careful!!

Horse purslane (*Trianthema portulacastrum*) also occurs in the region and is edible but less palatable than common purslane. It is distinguished by its pink flowers and broader leaves.



The less palatable horse purslane (*Trianthema portulacastrum*) can be distinguished by its pink flowers and broader leaves.

Credit: L. Makings via SEINet

Garden to Plate

- Seeds germinate easily and plants grow well in many soil types and condition, especially disturbed areas.
- Summer rains supply enough moisture for common purslane to complete its lifecycle. Plant just before or during the monsoons for minimal water use.
- Harvest young leaves in late summer. The time of day affects flavor—if harvested in the morning, the greens will have a tart, lemony flavor.
- Stems and leaves are edible. Enjoy leaves raw, boiled, pickled, sautéed or finely ground and used in recipes like pesto. Pickle both stems and leaves to ensure the whole plant is used!
- Seeds of common purslane are also edible and high in nutrients. Grind them into a flour and add to porridges, smoothies, and other drinks.

Tepary Bean



SPANISH **frijol tépari**
 O'ODHAM **ba:wĩ** or **ba:vĩ**

Tepary beans are small beans of many colors that hold hope for a nourishing future for our bodies and everchanging climate. They are also among the most arid-adapted crops in the world, thriving in hot, dry climates. Their roots pull and retain moisture and carbon down to 6 ft deep, and nitrogen-fixing bacteria in their root nodules enrich the soil. Along with some cow peas, teparies are among the most heat tolerant bean crop in the world, bearing fruit in 110 F. When it is sunny and warm, their leaves angle perpendicular to the sun to decrease moisture loss. Additionally, their short, annual life cycle is adapted for planting with the arrival of monsoon rains and produces mature pods for harvest by the fall (60-90 days). A monsoon season can provide enough moisture for a productive harvest! If you're looking for a nutritious, low-maintenance crop, these are the beans for you. Eat teparies as you would any other bean in soups, stews, hummus, mashed, or cooked and dried for rehydration on that overnight camping or backpacking trip.

Origin and History

Over 70 species of wild beans (*Phaseolus* spp.) are native to the Americas, primarily Mesoamerica. Five of these species have been domesticated, one of which

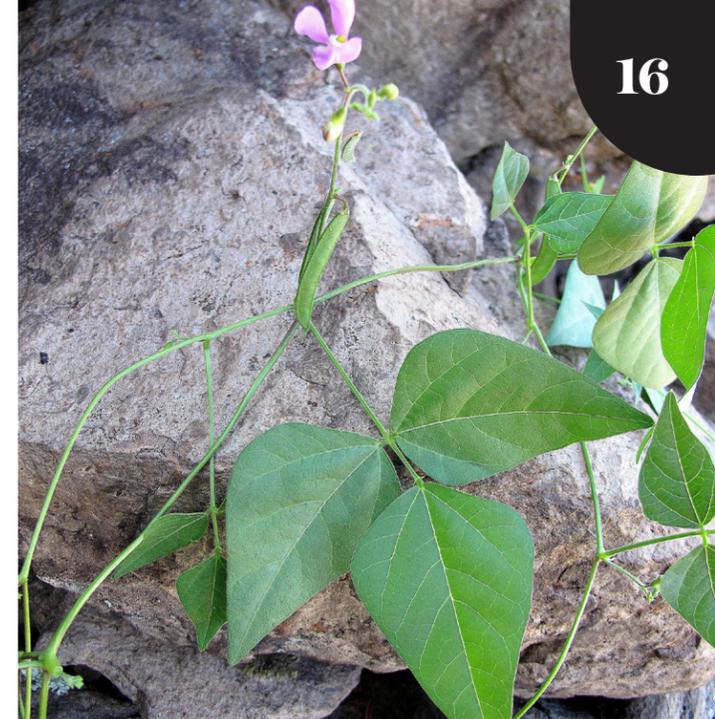
is the tepary bean. Over 40 Indigenous and immigrant cultures have grown tepary beans throughout the Southwest US and Mexico. These pulses (the dry edible seeds within legume pods) were likely first domesticated 4,000-5,000 years ago in what is now Mexico. Now, many varieties of tepary are distributed from the US Southwest to Guatemala, with their primary distribution centered in northwest Mexico. These resilient beans have since been introduced to and cultivated in arid and semiarid regions of Africa, Asia, Australia, and the Middle East as potential and sustaining crops responding to climate change.

The enduring tepary bean is an incredibly important part of many Native American and Indigenous peoples' stories. For the Akimel O'odham, the tepary bean is part of the creation story; for the Tohono O'odham it explains the presence of the Milky Way (white tepary beans dispersed across the sky) and assures their people that this food will always provide nourishment. We still see traces of 1,000-year-old tepary beans at many Hohokam sites throughout Arizona. Interestingly, some tepary bean varieties have remained relatively unchanged to change over thousands of years, a rare quality in domesticated crops.

The enduring tepary bean is an incredibly important part of many Native American and Indigenous peoples' stories.



Mature tepary beans ready for harvest.
 Credit: M.A. Burgess



Wild tepary bean plant (*Phaseolus acutifolius*) with young pod.
 Credit: F. Coburn via SEINet

Good for Your Health

Very high in protein (23-25%)

Properties to aid in the management of diabetes, such as high fiber to slow the absorption of sugars

Some varieties have over 100% of your recommended daily intake of iron in just one serving!

Significant source of calcium, potassium, magnesium, and zinc

Good for The Planet

Tolerates drought, heat, and saline conditions allowing for minimal resources from planting to harvest

Deep roots with nitrogen-fixing bacteria enrich soil and enhance moisture and carbon storage

Diversification of legume crops prevents pests, bacteria, and pathogens that affect monocultures

Be careful!!

Soak, change water and cook beans thoroughly. Unless broken down by heat through boiling, enzymes and proteins in tepary and other beans inhibit nutrient absorption in the digestive system.

Garden to Plate

- Tepary beans grow best in dry to slightly moist soil. Overwatering actually limits bean production and reduces nutritional content.
- Plant beans just after the first or second monsoon storm to ensure enough moisture for germination.
- Stop watering plants when pods begin to dry; harvest by pulling out entirely by the root or cutting it at its base.
- Allow pods to dry, agitate dried plants to loosen beans, and winnow to remove chaff and dirt.
- Presoak teparies for a few hours or overnight then drain. Add plenty of drinking water for cooking.

Prickly Pear Cactus

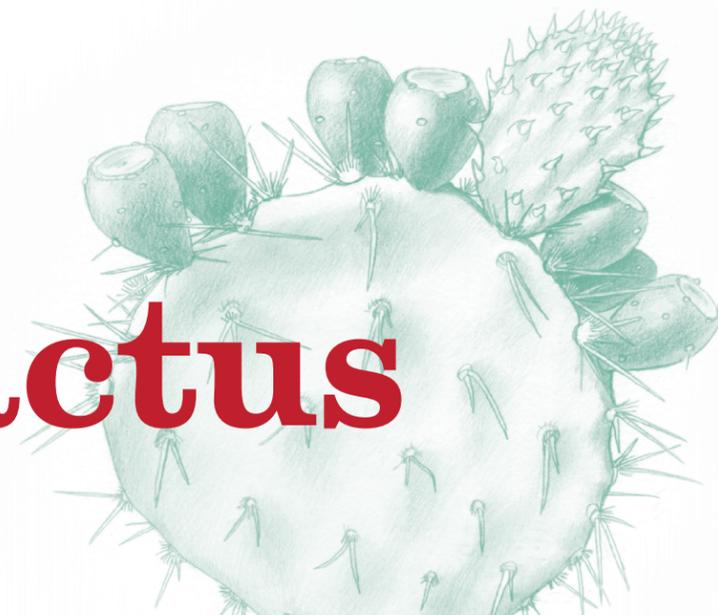
SPANISH **nopal de castilla** (pads)
tuna (fruit)

O'ODHAM **nawī na:k** or **nowī** (pads)
i:bhai (fruit)

Prickly pear cactus is a must-have for a healthy, sustainable, and climate-smart diet. These hardy plants are well-suited to hot, dry desert conditions and nutrient-poor soils. Their flattened, jointed stems (pads) store water. They are covered with spines (actually modified leaves) that help shade the plant, prevent water loss, and protect it from hungry animals. The waxy coating on the surface of the cactus pads helps seal in moisture. Along with agaves, they produce more edible biomass on less water than any other crop in the world. Prickly pear cacti are nutritious and easy to grow. A few key tips will have you enjoying these plants in your garden and on your plate—and providing food and refuge for local wildlife—all without a costly water bill.

Origin and History

Prickly pear pads were the first desert plant discovered to reduce blood sugar and cholesterol levels of diabetes sufferers and are now widely marketed through Mexico and the world for diabetes prevention and care. Desert dwellers throughout North America have long used prickly pear cacti for food and



medicine. The Sonoran Desert is home to at least 18 different species of wild prickly pear cactus. The fruits and pads of some native species, like Engelmann prickly pear (*Opuntia engelmannii*), are edible. But beware, the dense spines and higher amounts of oxalic acid in native species require extra care when preparing. Domesticated prickly pears have been cultivated specifically for edible fruits and pads and have fewer spines and low acid levels. The Indian fig cactus (*Opuntia ficus-indica*) can be found in backyards and gardens throughout Arizona and was first cultivated in Central Mexico before the arrival of Europeans.

Despite having been a staple of desert diets for centuries, today prickly pear cactus is often overlooked as a food crop, especially in the United States. Prolonged drought and recent record-breaking heat waves, however, are encouraging us to re-think food production. Rising temperatures and dwindling water resources will make growing less hardy commercial crops less and less feasible. Desert food plants like the prickly pear cactus could be the key to a more sustainable and resilient local food system.



Ripe fruit (tunas) of the native Engelmann's opuntia (*Opuntia engelmannii*) ready to harvest. Credit: M. A. Burgess

Be careful!
Cactus pads contain oxalic acid which causes digestive problems in large amounts. Cooking helps neutralize these effects. Young pads and domesticated varieties have lower acid levels. Fruits have a cooling effect. Drinking too much raw, undiluted juice can cause chills and body aches.

Good for Your Health

Pads are high in calcium, fiber, and vitamin A

Fruit are high in fiber, vitamins A and C

Fiber and complex carbohydrates (mucilage) slow sugar absorption and may aid in diabetes management

Good for The Planet

Highly heat and drought tolerant

Low water requirement reduces need for supplemental water

Roots stabilize soil, improving rainwater infiltration and soil retention

Flowers support native pollinators

Source of shade, habitat, and food for wildlife



Young cactus pad (nopal) ready for harvest. Credit: E. C. Riordan

Along with agaves, prickly pear cactus produce more edible biomass on less water than any other crop in the world.

Garden to Plate

- Find cactus pads at Mexican grocery stores or harvest from your own yard or neighborhood.
- Harvest young, bright green pads that still have their tiny, fleshy, cone-shaped leaves. Older pads--after leaves are shed-- are woody inside and not digestible.
- Harvest in the morning (when acid content is low) by cutting the young pad near its base with a sharp knife.
- Hold pads with tongs to avoid the tiny, hair-like spines called glochids, which can get stuck in hands and fingers.
- Singe off spines and glochids or remove with a knife and trim all the way around the edge of the pad.
- Slice cleaned pads according to recipe and boil, sauté, or grill. Cooking helps reduce the slime (mucilage), which some people don't enjoy, although it can benefit blood sugar levels.

- Harvest fruits in late summer (late August to mid-September.)
- Use tongs to gently pluck fruit from the nopal pad; they should come off easily when ripe.
- Rinse fruit and **blend, freeze, or boil** to process. For each method, strain juice through a pillowcase or t-shirt to remove spines.
- Blend** whole fruits into a puree then strain.
- Freeze** fruits whole then defrost in a colander over a bowl, press with a spoon to release juice, and strain.
- Place quartered fruit into a pot with water and **boil** until fruit is soft (15-25 minutes). Mash and strain.
- Store fresh juice in the refrigerator and use within several days or freeze up to one year.
- Use juice for syrups, jellies, and jams or enjoy as a beverage diluted with water—or lemonade!

Recipes



Dried chiltepins and wooden grinder.
Credit: E. C. Riordan



above
Dried mesquite pods ready for milling.



right
Dried and freshly boiled cholla buds.
Credit: M. A. Burgess

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Domesticated white tepary beans and pods.
Credit: D. E. Cowan

From
The Garden Kitchen
Del Jardín a La Cocina

thegardenkitchen.org

Wild Chile Cheese

Ingredients

- 4 cups Greek yogurt, fat-free or 2%
- 1 tablespoon salt
- 1 teaspoon chiltepin, crushed

Directions

1. Wash hands with soap and warm water.
2. Place a colander over a large bowl and line with a clean lint-free towel or a few layers of cheesecloth.
3. Pour in yogurt.
4. Sprinkle the top of the yogurt with salt and chiles.
5. Stir together the yogurt with the salt and chiles.
6. Tie top of cheesecloth together tightly and cover bowl with plastic wrap.
7. Place in refrigerator for at least 24-48 hours.
8. Unwrap bowl and untie cloth.
9. Scoop out cheese and serve with crackers or vegetables.
10. Serve immediately.

Serves 24 (2 tablespoons per serving)

Nutrition information per serving: Calories, 30; Carbohydrate, 3g; Protein, 4g; Total Fat, 0g; Saturated Fat, 0g; Trans Fat, 0g; Cholesterol, 0mg; Fiber, 0g; Total Sugars, 1g; Added Sugars, 0g; Sodium, 250mg; Calcium, 41mg; Folate, 3mcg; Iron, 0mg;

Mesquite Cornbread

Ingredients

- 3/4 cup cornmeal
- 3/4 cup all purpose flour
- 3/8 cup mesquite flour, sifted
- 2 teaspoon baking powder
- 1/2 teaspoon baking soda
- 1/2 teaspoon salt
- 1 cup nonfat plain yogurt
- 1 egg
- 3 tablespoons vegetable oil
- 1 1/2 tablespoon honey
- 1/2 tablespoon chipotle sauce (optional)
- 3/4 cup fresh or frozen corn

Directions

1. Wash hands well with soap and warm water.
2. Preheat oven to 350 F.
3. In a medium bowl, add cornmeal, all purpose flour, mesquite flour, baking powder, baking soda and salt. Mix well and set aside.
4. In a separate medium bowl, add yogurt, egg, vegetable oil, honey and chipotle sauce, if using. Mix well.
5. Add wet ingredients to dry ingredients and mix until just combined. Add corn to batter.
6. Spread mix in a greased or parchment lined 8x8 inch baking pan.
7. Bake for 18 - 23 minutes or until a toothpick inserted into the middle of the bread comes out clean.
8. Serve immediately.

Serves 10 (1/10 of loaf)

Nutrition information per serving: Calories, 150; Carbohydrate, 29g; Protein, 9g; Total Fat, 1g; Saturated Fat, 0g; Trans Fat, 0g; Cholesterol, 0mg; Fiber, 4g; Total Sugars, 1g; Added Sugars, 0g; Sodium, 160mg; Calcium, 81mg; Folate, 19mcg; Iron, 1mg;

Cholla Bud Wheat Berry Salad

Balsamic Vinaigrette

Ingredients

- 1/4 cup balsamic vinegar
- 1/2 teaspoon dried oregano and basil
- 1/4 teaspoon fresh cracked black pepper
- pinch salt
- 2 teaspoons of honey*
- 1/3 cup extra virgin olive oil
- 2 tablespoon fresh chopped parsley

Directions

1. Wash hands well with warm water and soap. Wash herbs well.
2. In a small bowl, whisk together vinegar, oregano, basil, pepper, salt and honey until blended.
3. Whisk constantly and pour olive oil in a thin stream into bowl until blended.
4. Stir in parsley.
5. Serve with Cholla Bud and Wheat Berry Salad.

* Honey should not be fed to infants less than one year of age

Serves 9 (1 tablespoon per serving)*

Nutrition: Cal: 90, Protein: 0g, Total Carb: 3g, Total Fat: 8g, Sat Fat: 1g, Trans Fat: 0g, % Fat Cal: 87%, Cholesterol: 0mg, Fiber: 0g, Sodium: 65mg, Calcium: 4mg, Folate: 1mcg, Iron: 0mg

* When eaten alone, this recipe does not meet AZNN nutritional requirements.

Pickled cholla buds and wheat berry salad.

Credit: M. A. Burgess



Ingredients

- 2 cups cooked and cooled White Sonora wheat berries
- 1/4 - 1/2 cup Balsamic Vinaigrette (see next recipe)
- 1/4 cup celery, chopped
- 1/4 - 1/2 cup colorful sweet peppers, chopped
- 1/4 cup l'itoti onion bulbs and tops or red onion, minced
- 1/2 cup cooked and cooled cholla buds, quartered
- 1/2 cup cherry tomatoes, cut in half (optional)
- Romaine lettuce leaves as bed for salad

Directions

1. Wash hands with soap and warm water. Wash produce well.
2. Marinate White Sonora wheat berries in the Balsamic Vinaigrette overnight in refrigerator, stirring once or twice.
3. Mix in all fresh chopped vegetables and cholla buds.
4. Serve on romaine lettuce.

Tip: To cook dried cholla buds, place dried cholla buds in a bowl or saucepan and cover with boiling water (at least 4 times the amount of cholla buds). Leave to cool in the refrigerator until plump.

Serves: 6 (2 lettuce leaves and 2/3 cup salad)

Nutrition information per serving: Calories, 150; Protein, 7g; Carbohydrate, 28g; Total Fat, 2.5g; Sat Fat, 0g; Trans Fat, 0g; % Fat Cal, 34%; Cholesterol, 0mg; Fiber, 2g; Sodium, 350mg; Calcium, 39mg; Folate, 81mcg; Iron, 2mg



White and brown tepary beans.

Credit: M. A. Burgess

Tepary Bean Dip

Ingredients

- 3 1/2 cups cooked Tepary beans (black, etc.)
- 1/2 cup water
- 2 fresh garlic cloves, finely chopped
- 1 small jalapeño, seeds removed and finely chopped
- 4 tablespoons fresh lime juice
- 2 teaspoons ground cumin
- 1/4 teaspoon chili powder
- 1/4 teaspoon salt
- 1/4 teaspoon ground black pepper
- 1 small yellow onion, finely chopped
- 1 cup fresh cilantro, finely chopped
- 2 tablespoons crumbled queso fresco (optional)

Directions

1. Wash hands well with soap and warm water. Wash produce well and chop as directed.
2. In a large bowl, combine beans, water, garlic, jalapeño, lime juice, cumin, chili, salt and pepper. Using a potato masher or the back of a fork, smash until well combined.
3. Stir in onion and cilantro.
4. Garnish with crumbled cheese (if using) and serve chilled. Store in refrigerator for up to three days.

Serves: 20 (1/4 cup per serving)

Nutrition information per serving: Calories, 44; Carbohydrate, 8g; Protein, 3g; Total Fat, 0g; Saturated Fat, 0g; Trans Fat, 0g; Cholesterol, 0mg; Fiber, 3g; Total Sugars, 0g; Add-ed Sugars, 0g; Sodium, 31mg; Calcium, 12mg; Folate, 47mcg; Iron, 1mg;

Purslane Tacos

Ingredients

- 3 small bunches of verdolagas or other hearty greens (i.e. spinach or kale)
- 8 corn tortillas
- 1/4 cup queso fresco (optional)
- 1 tablespoon vegetable oil

Tomatillo Sauce

- 4 tomatillos, roughly chopped
- 1 small serrano chile, seeded
- 1/4 fresh white onion, chopped
- 1 clove fresh garlic, chopped
- salt and pepper, to taste

Directions

1. Wash hands with soap and warm water. Wash produce well.
2. Chop greens to 1 inch pieces and set aside.
3. Roughly chop tomatillos, chile, onion, and garlic.
4. Combine in a blender with 1/4 cup of water and blend until smooth.
5. In a large skillet over medium heat, add tomatillo sauce and cook 10 - 15 minutes until mixture reduces by half.
6. Stir in the oil, add greens, and cook until greens are soft, about 5 - 10 minutes.
7. Serve in warm corn tortillas with a sprinkle of queso fresco.

Tip: In a pinch, canned or jar Salsa Verde can be used instead of preparing the Tomatillo Sauce.

Serves: 8 (1 taco each)

Nutrition information per serving: Calories, 81; Carbohydrate, 11g; Protein, 3g; Total Fat, 3g; Saturated Fat, 0.5g; Trans Fat, 0g; Cholesterol, 2mg; Fiber, 1g; Total Sugars, 2g; Added Sugars, 0g; Sodium, 43mg; Calcium, 67mg; Folate, 11mcg; Iron, 1mg;

Amaranth Greens Salad

Ingredients

- 2 cups dried amaranth seeds or quinoa, rinsed & drained
- 2 1/2 cups water or low sodium broth, plus more if needed
- 8 cups amaranth greens, lettuce or arugula, torn or chopped
- 1 red pepper, seeded & chopped
- 1/2 red onion, chopped
- 1 cup cucumber, seeded & chopped
- salt & pepper, to taste
- 1 1/2 cups Avocado Chiltepín Dressing (see next recipe)
- cilantro, chopped, to taste

Directions

1. Wash hands well with soap and warm water.
2. Wash produce thoroughly and chop as directed.
3. On medium heat, in a medium pot toast amaranth seeds until slightly toasted and golden brown, for about 3-5 minutes, moving them con-stantly to prevent burning.
4. Add water and simmer on medium-low heat until slightly soft and all the water has been absorbed, about 15-25 minutes.
5. Remove from heat and allow to cool. Set aside.
6. In a bowl, mix together lettuce, red pepper, onion, cucumber and amaranth greens.
7. Season the salad with salt and pepper.
8. Pour dressing over salad and toss until evenly coated.
9. Garnish with cilantro and serve at room temperature or chilled.

Avocado Wild Chile Dressing

Ingredients

- 1 large avocado, peeled & pitted
- 1/2 cup Greek yogurt
- 2 tablespoons lime juice
- 1/8 teaspoon chiltepín, ground
- 1 teaspoon garlic powder
- 1/2 teaspoon honey* (optional)
- salt & pepper, to taste

Directions

1. Wash hands well with soap and warm water.
2. Wash produce thoroughly and process as directed.
3. Add all ingredients to a blender or food processor and puree until smooth.
4. To thin dressing, add 1 tablespoon of water.
5. Serve immediately or chill for later use.

* Honey should not be fed to infants less than one year of age

Serves 12

Salad Nutrition information per 3/4 cup serving: Calories, 160; Carbohydrate, 25g; Protein, 6g; Total Fat, 4g; Saturated Fat, 0.5g; Trans Fat, 0g; Cholesterol, 0mg; Fiber, 3g; Total Sugars, 2g; Added Sugars, 0g; Sodium, 10mg; Calcium, 108mg; Folate, 61mcg; Iron, 3mg;

Dressing Nutrition information per 2 tablespoons serving: Calories, 25; Carbohydrate, 2g; Protein, 1g; Total Fat, 2g; Saturated Fat, 0g; Trans Fat, 0g; Cholesterol, 0mg; Fiber, 1g; Total Sugars, 0g; Added Sugars, 0g; Sodium, 0mg; Calcium, 12mg; Folate, 11mcg; Iron, 0mg; Note: optional ingredients are not included in nutrition information

Young, edible leaves of the native Palmer's amaranth (*Amaranthus palmeri*).

Credit: P. Alexander via SEINet.



Color and size diversity of ripe domesticated prickly pear fruit.

Credit: D. E. Cowan

Prickly Pear Popsicles

Ingredients

- Juice from 12 medium prickly pear fruit (about 3/4 cup)
- 3 tablespoons of lime juice (about 1 1/2 limes)
- zest from 1 lime
- 2 tablespoons honey*, maple syrup, or agave syrup
- 1/4 cup water

Directions

1. Wash hands with soap and warm water. Wash produce well.
2. Blend prickly pear fruit and strain juice.
3. Add all other ingredients and stir to combine
4. Pour into ice cube trays or popsicle containers
5. Freeze until solid.

Serves 6 (1/4 cup per serving)

Nutrition information per serving: Calories, 31; Carbohydrate, 8g; Protein, 0g; Total Fat, 0g; Saturated Fat, 0.5g; Trans Fat, 0g; Cholesterol, 0mg; Fiber, 1g; Total Sugars, 6g; Added Sugars, 6g; Sodium, 108mg; Calcium, 13mg; Folate, 2mcg; Iron, 0mg

Prickly Pear Salad

Ingredients

- 2 cups raw or cooked nopalitos
- 1 cup fresh tomatoes, diced
- 1/4 cup red onion, chopped
- 1 cup fresh cilantro, chopped
- juice of 2 limes
- green chile, chopped (optional)
- black pepper, to taste

Directions

1. Wash hands with soap and warm water. Wash produce well.
2. Chop ingredients as directed.
3. Mix all ingredients in bowl.
4. Serve immediately.

Serves 6 (1/2 of a cup per serving)

Nutrition information per serving: Calories, 31; Carbohydrate, 7g; Protein, 1g; Total Fat, 0.3g; Saturated Fat, 0g; Trans Fat, 0g; Cholesterol, 0mg; Fiber, 2g; Total Sugars, 1g; Added Sugars, 1g; Sodium, 6mg; Calcium, 35mg; Folate, 11mcg; Iron, 0mg;

Learn More



Cookbooks

- Desert Harvesters (2018)
Eat Mesquite and More: A Cookbook for Sonoran Desert Foods and Living. RainSource Press
- Carolyn Neithammer (2011)
Cooking the Wild Southwest: Delicious Recipes for Desert Plants. The University of Arizona Press

Extracting seeds from soaked chiltepins. Credit: L. King

Desert Food Traditions

- Tohono O'odham Community Action *TOCA* (2010)
From I'toi's Garden: Tohono O'odham Food Traditions. TOCA/Blurb, Inc. (with recipes)
- Carolyn Niethammer, Martha Ames Burgess and Amy Valdes-Schwemm
savorthesouthwest.blog (with recipes)
- Gary Paul Nabhan, Bill Steen and Wendy Hodgson (2018)
Mezcal as Food, Beverage, and Heritage (Part 1-3)
Agave Heritage Festival blogagaveheritagefestival.com/blog (with recipes)
- Wendy Hodgson (2001)
Food Plants of the Sonoran Desert. The University of Arizona Press
- Amadeo Rea (1997)
At the Desert's Green Edge: An Ethnobotany of the Gila River Pima. The University of Arizona Press
- Gary Paul Nabhan (1985)
Gathering the Desert. The University of Arizona Press
- Gary Paul Nabhan and Richard Felger (1978)
Teparies in Southwestern North America. Economic Botany
Economic Botany doi.org/10.1007/BF02906725
- Linda McKittrick (2009)
Mother Chiltepin. Seedhead News. Issue 104
nativeseeds.org/blogs/the-seedhead-news/no-104-fall-winter-2009



Agave parryi.
Credit: C. Hedgcock

From the University of Arizona Cooperative Extension

- Prickly Pear Cactus: Food of the Desert** (article no. AZ1800-2019)
extension.arizona.edu/pubs/prickly-pear-cactus-food-desert
- Ancient Rediscovering Food: Grain Amaranth** (article no. AZ1735)
extension.arizona.edu/pubs/ancient-rediscovering-food-grain-amaranth
- Mesquite: It's Food** (article no. AZ1644-2014)
extension.arizona.edu/pubs/mesquite-it-s-food
- Mesquite and Palo Verde Trees for the Urban Landscape** (article no. AZ1429-2012)
extension.arizona.edu/pubs/mesquite-palo-verde-trees-urban-landscape

Aridland Food Systems

- Erin C. Riordan (2020)
Importance of conserving of the wild chile: What can the wild chile teach us about conserving crop wild relatives?
Sustainable, Secure Food Blog, Sept. 22 2020
sustainable-secure-food-blog.com/2020/09/22/
- Gary Paul Nabhan et al. (2020)
An Aridamerican model of agriculture in a hotter, water scarce world.
Plants People Planet doi.org/10.1002/ppp3.10129
- Desert Bounty** (2009) Sonorensis. Winter Issue
desertmuseum.org/members/sonorensis/
- Desert Harvest: Heritage and Future** (2016) Sonorensis
desertmuseum.org/members/sonorensis/
- The Desert Tepary as a Food Resource** (1983) Desert Plants
(special issue) Vol. 5, No 1 repository.arizona.edu/handle/10150/552205



Opuntia bud and flower.
Credit: Borderlands Restoration Network

Visit

- Desert Laboratory on Tumamoc Hill** Tucson, AZ
tumamoc.arizona.edu
- The Garden Kitchen** Tucson, AZ
thegardenkitchen.org
- Pima County Master Gardener Demonstration Garden** Tucson, AZ
extension.arizona.edu/pima-county-master-gardener-demonstration-garden
- Mission Garden (Friends of Tucson's Birthplace)** Tucson, AZ
missiongarden.org
- Deep Dirt Farm** Patagonia, AZ
borderlandsrestoration.org/deep-dirt-institute.html
- Arizona-Sonora Desert Museum** Tucson, AZ
desertmuseum.org
- Tohono Chul Park** Tucson, AZ
tohonochul.org

Where To Buy

- Tohono O'odham Nation runs San Xavier Co-op Farm**
sanxaviercoop.org
- Native Seeds/SEARCH**
- Desert Survivors**
- Spadefoot Nursery**
- Plants for the Southwest**
plantsforthesouthwest.com
- Mission Garden (Friends of Tucson's Birthplace)**
missiongarden.org
- Baja Arizona Artisanal Food Products (2019) Tucson City of Gastronomy**
tucson.cityofgastronomy.org/publications



Wild tepary beans.
Credit: F. Coburn



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