

Mezcal as Food, Beverage & Heritage:



Reviving Agave Uses in the Tucson Basin

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Introduction

“Welcome to the Agave family!” was the way that late Arizona botanist Howard Scott Gentry used to greet aficionados of these wondrously-shaped and deliciously-tasting desert-adapted plants. Of course, many Americans are aware of the fact that *mezcal* is the popular name of a distilled alcoholic beverage from certain agaves, but how many newcomers to Southern Arizona know that it is also the common name for several kinds of native plants that are as good to eat as they are to drink?

Also known as the century plant or *maguey*, most species of this agave plant group have rosettes of sword-shaped leaves with succulent leaf bases that are edible after baking or roasting. Equally edible—once they are adequately trimmed and cooked—are the pineapple-like “hearts” below the leaf bases, the flower stalks, the floral buds and the flowers themselves. And yet, if they are so edible, why aren’t more people in Arizona prone to eat them today?

This question begs another question that we have recently heard residents of Southern Arizona ask: “How can Tucson and surrounding Sonoran Desert communities revitalize an eight millennia-old legacy of using plants such as *mezcal* both for food and for drink?”

This is not a trivial issue, given that few edible plants are more abundant in the Tucson Basin than the wild succulents called *mezcal* or *mescal* in Spanish. The various species in this region that are scientifically classified as members of the *Agave* genus are also very efficient in their water use, and can produce far more edible biomass on the same amount of moisture than corn can offer.

Archaeologists Suzanne and Paul Fish have also documented that at least one (or perhaps two) species of agave were prehistorically cultivated by the Hohokam in the Tucson Basin, and across thousands of acres of desert landscapes from central Sonora to the south and the Agua Fria drainage of central Arizona to the north. Many of these agri-cultural landscapes

still exhibit prehistorically-constructed terraces, rock alignments, rock piles, roasting pits and crescent-shaped stone agave knives associated with mescal cultivation, but remnant clones of the once-cultivated agaves persist in just a few places. These remnants were not necessarily associated with the later agricultural traditions of the Tohono O'odham and Akimel O'odham, contemporary groups who apparently defeated or expelled their Hohokam predecessors from this desert region. Curiously, there is very little evidence, if any, that landscape-level agave cultivation persisted into historic times among any Sonoran Desert cultures, even though occasional harvesting of feral stands of once-cultivated agaves may have occurred in a few areas.

The following edible agaves have been found by ethnobotanist Wendy Hodgson and other field scientists within 150 miles of Tucson, in both southern Arizona and northern Sonora.

Wild:

- Agave palmeri
- Agave chrysantha
- Agave parryi var. parryi
- Agave parryi var. huachucensis
- Agave deserti ssp. simplex
- Agave shrevei var. shrevei
- Agave toumeyana

Cultivated, Probably Domesticated:

- Agave angustifolia (some transported from further south and cultivated in Sonora)
- Agave delamateri
- Agave murpheyi
- Agave fortiflora
- Agave phillipsiana (population just northwest of Globe)
- Agave parryi var. huachucensis
- Agave spp. undescribed (one type from the San Pedro River basin,
and one from the Tortolita Mountains)

Archaeologists have uncovered cultural and culinary uses of wild agaves, prickly pears and mesquite that reach back at least 8000 years in the U.S./Mexico borderlands. Just think about that for a moment: a *nitrogen-fixing legume tree*, a *cactus* and a *succulent agave* have offered food and drink to the hungry and thirsty of our region for a duration at least 25 times longer than the U.S. has been a nation! In other words, these desert-adapted plants have long contributed to the food security of our region's many peoples, and they could potentially do so again in the future.

Let's drill down on that history a little more: Along with the consumption of the sweet flour of mesquite pods (*pechita*), prickly pear pads (*nopalitos*) and fruit (*tunas*), the healthful food and beverage uses of wild agaves (*mezcal*) are among the most anciently-used foods in this region. This trinity of wild native foods is healthful in several different ways. Like prickly pear and mesquite food products, insulin-rich agave foods and beverages have the capacity to reduce blood sugar and cholesterol levels to the degree that they can prevent or control diabetes, heart disease, and other nutrition-related diseases.

Yet, few Tucsonans today know how to sustainably harvest, prepare and eat *mezcal*. Instead, they think of these plants merely as ornamentals, or simply as the sources of industrially-distilled tequilas produced in the subtropical regions of Mexico. As such, most of the edible biomass of wild or home-grown agaves in the Tucson Basin is not eaten but ignored; in Metro Tucson alone, tens of thousands of pounds of edible agave are wasted each year.

Why? We suspect that most contemporary desert dwellers simply don't know how to process agaves for consumption, or perhaps they believe that it is too difficult and time-consuming to accomplish on their own. We hope to convince you that's not true!



Top: Cooked leaf bases
Bottom: Bacanora



Cultivated agaves for Bacanora production, Rancho Tepua, Baviacora, Sonora, Mexico

Ironically, only a small percentage of the current residents of Tucson realize that these wild plants were artisanally processed for food and beverages up through recent decades. Most have never heard of Old Pueblo pioneer Julius Goldbaum who, from 1886 to 1903, distilled, bottled and marketed local mezcals and imported tequilas in what is now downtown Tucson, at Meyer and Congress. By 1920, Prohibition had made local distillation an act of illegal bootlegging, so the tradition went “underground” to survive—which it did, especially among Mexican-Americans who had grown up with this tradition south of the border.

While locally-harvested mesquite flour and prickly pear fruit beverages have already made a commercial comeback in southern Arizona, the local harvesting and sales of value-added foods and beverages from agaves have not yet enjoyed such a revival.

With the designation of Tucson as the first UNESCO City of Gastronomy in the U.S. and the broadening of community participation in Tucson’s Agave Heritage Festival, we feel it is a fitting time to promote the cultivation, sustainable harvesting, innovative processing and

creative development of nutritious food and beverage products from local agaves.

We will emphasize the sustainable use of the agave species that are extremely common in the wild, growing on the rocky slopes of private rangelands in southern Arizona and adjacent Sonora. We encourage careful “pruning” rather than “extraction” or “destructive harvest” of an entire plant or clone.

We will also focus on using the cultivated species of agaves that are commonly found in Tucson’s house yards, highway medians, and managed landscapes in public parks, schoolyards and business centers. We will foster sustainable harvesting techniques that leave smaller vegetative offshoots to grow in the place of older mother plants. We hope to discourage destructive harvests that deplete wild populations on public lands. That is where agaves flowers are needed to provide nectar to threatened lesser long-nosed bats on their migration through southern Arizona and adjacent Sonora.



Mezcal Bacanora label, Tucson, AZ, early 1900's



Two Basic Methods of Preparing Agaves

Agaves can be pit-roasted or baked either for direct eating of its sugary pulp, or for fermentation. Most agaves are fermented with the ultimate goal of distilling a *mezcal* or tequila. In order to cook an agave, the mature mother plant must be removed from the ground, then the leaves or *pencas* removed and then cooked in a variety of different ways.

The second method—not often utilized in the desert borderlands—is one much like tapping maple “sugar bushes” for a sweet sap to be boiled down into maple syrup or granulated sugar. It is used to produce the sweet non-alcoholic *aguamiel*, which may then be further processed into either pulque or concentrated maguey sweet sap. These beverages have hardly been produced in the Sonoran Desert region, because the flow of upwelling sap is far less in the hot desert than in more temperate or semi-arid regions.

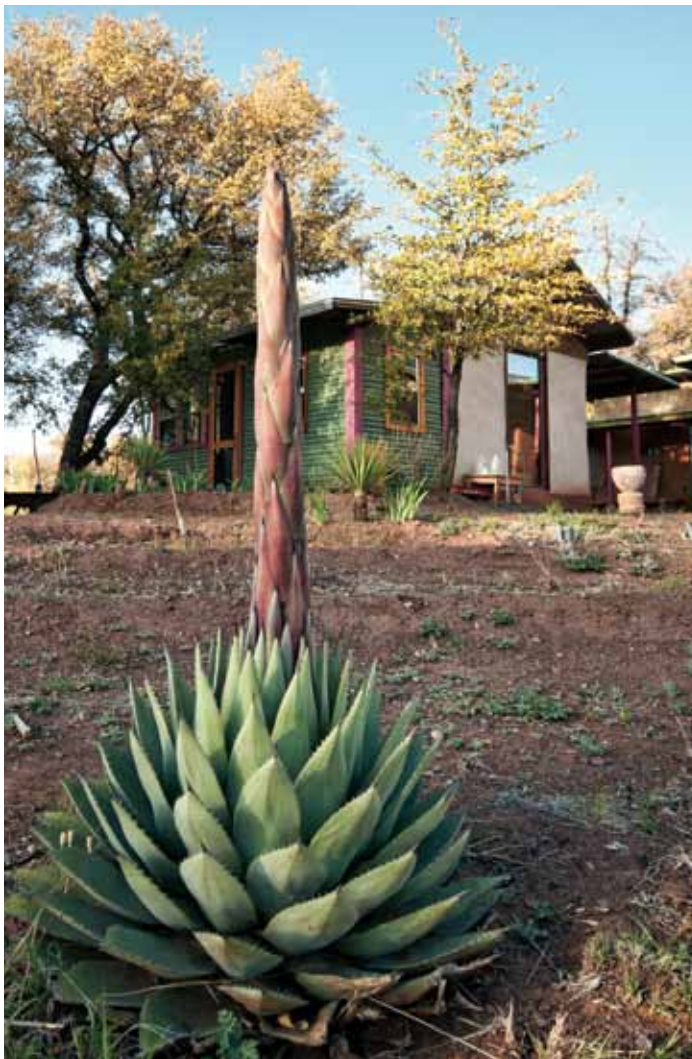
One of the most common agaves used for *aguamiel*, concentrated maguey sweet sap and pulque is the gigantic *Agave salmiana*. To extract this maguey sweet sap, the plant is left in the ground until it begins to produce a flowering stalk or quito. The stalk is removed in a manner that leaves a small hole or cavity in the center of the plant. Following a daily rhythm, the cavity fills with a liquid that is known as *aguamiel*. This liquid has been traditionally consumed in central Mexico as a beverage rich in vitamins, minerals, and steroids. When it has been yeast-fermented for short period of time, the mildly alcoholic but extremely nutritious beverage is then known as pulque. When *aguamiel* is rapidly heated and fractionated, it produces a concentrated agave nectar that has its inulins and other complex carbohydrates broken down into a high fructose and glucose syrup. When carefully and traditionally heated into a concentrated syrup called maguey sweet sap, the healthful inulins are retained and the resulting product is far less like high fructose corn syrup.

Opposite: *Harvesting agua miel for pulque*

Becoming a *Jimador* : Identifying and Selecting the Right Agaves for Use

A person skilled at tending harvesting is called a *mezcalero*, or more specifically, a *jimador*, to signify his or her facility in using a set of sharp hoe-like tools called *jimas* and *coas*.

And so, future *jimadores*, let's get started. To begin with, recognize that all agaves are not created equal. Some have inedible leaves filled with caustic juices that can form a burning rash on your skin within minutes of contact, while others are benign. When it comes to species common in southern Arizona, *Agave palmeri* is one of those with populations that have notably caustic juices that can cause skin rashes with a terrible itch. Should this happen, one remedy that gives almost immediate results is spreading wet clay as a soothing poultice over the affected skin.



Huachuca agave

Some wild species reproduce largely by seed, while many domesticated varieties cultivated in gardens and plantations reproduce more by vegetative offshoots that either emerge from the skirts of the mother plant, or form as miniature plantlets on the flowering stalks themselves. It is typically the larger agaves with tall umbellate or antler-like flowering stalks that have delicious flavors without much caustic rash-causing juices, but each species and population or stand may be slightly different in value.

In the brief list offered earlier in this publication, we have offered a preliminary inventory of the more edible common wild and cultivated kinds of agave found in southern Arizona and adjacent Sonora, Mexico.

Tucson botanist Greg Starr's book, *Agaves: Living Sculptures for Landscapes and Containers*, can help you identify most if not all agaves growing in the Tucson basin and surrounding region. All in all, there are at least a dozen highly edible agave species found in the wilds of southern Arizona and northern Sonora that have long been used for food and beverage. The two species most commercially used in Sonora today are the *bacanora*, *Agave angustifolia*, and *lechuguilla*, *Agave palmeri* and/or *A. shrevei*. The first two of these three species are frequently cultivated in Tucson's public spaces.

As noted earlier, several other species were prehistorically cultivated on thousands of acres in the Tucson Basin and beyond. Remnants of prehistorically-planted clones of at least four domesticated populations can still be found in Arizona: the Hohokam agave, *Agave murpheyi*; the Huachuca agave, *Agave parryi* var. *huachucensis*; the Tonto Basin agave, *Agave delameteri*; and the Grand Canyon agave, *Agave phillipsiana*, which grows near Globe. Two other domesticated agaves in southern Arizona are still being scientifically described. The one most commonly grown in Tucson landscapes over the last century has been the highly edible *Agave murpheyi* or Hohokam agave.



Top: Carrying trimmed agave heart with a split-leaf handle
Bottom: Trimming agave lechuguilla with sharp machete

When to Harvest, Timing is Everything

Kee in mind that each rosette of a perennial agave plant, blooms only once, then “dies.” After transplanting potted agave seedlings from a nursery out into your yard, on average you may have to wait another six to twelve years for those particular mezcal plants to be ready to offer up their harvest. Fortunately, however, there are likely to be dozens of older agaves within reach of you as well, so don’t postpone your engagement as a jimador until these youngsters mature!

When and how you harvest depends upon what part of the plant you wish to consume. The majority of agave harvests are aimed at removing the “heart” of caudex of edible carbohydrates and the leaf bases adhering to that energy-rich core just above the roots. You then cut off most of the leaf mass with a *jima* or knife-edge hoe-like tool, so that the resulting harvest looks much like a pineapple. Throughout much of Mexico and the U.S. Southwest, this pineapple-like harvest is called a *piña* or *cabeza*.

As an agave ripens to maturity, it converts most of the complex carbohydrates it has been storing for years to simpler sugars that fuel the growth of its flowering stalk or *quiote*. At this point in its life, the agave stalk can be cut –preferably when it is no more than a foot tall --to make sure that enough carbohydrates remain in the plant to allow for fermentation, distillation or pleasing consumption. Once the *quiote* has been cut, the most patient of *mezcaleros* will wait somewhere between six months to a year before harvesting the engorged mother plant.

But if you miss the optimal timing for pit-roasting the heart of the agave plant, you can also process and eat the peeled flower stalk (*quiote*), the unopened floral buds (*botones*), or the freshly-opened blossoms (*bayusas*) themselves.

Let’s walk you through the selection of a plant for pit-roasting its pineapple-like head or caudex. In the past, fully ripe agaves were selected by *jimadores* who had gained their knowledge from generations of experience. Different types of agaves will exhibit different characteristics when they are ready. For example, the leaf bases of both bacanora and lechuguilla will swell and the *pencas* or leaves will open and spread outward like a flower opening. Some agaves exhibit a change of color, with the inner leaves “blushing.”

If you have a choice, select a plant that has already generated vegetative offshoots or clonal progeny, so that harvesting or removing the mother plant will not eliminate that genetic individual. In essence, you will be non-destructively “pruning” rather than destroying that agave plant. The smaller vegetative offshoots are essentially branches of the mother plant, and genetically identical to them.



*Top: Thickened leaf bases indicates it is ready to harvest.
Bottom: Closed center leaves indicates it is not ready to harvest.*



Jimadores in Sonora, Mexico

Harvesting the Agave

Depending upon the type and size of agave, the method used for harvesting can vary. Those who have seen agaves being harvested for making tequila will have seen the *jimador* using tools called either a “*coa*” or “*jima*” which basically have shovel handles with a sharpened iron spade on the end. In Sonora and Chihuahua, machetes or hatchets are now used more frequently. The method used for uprooting the plant from the ground will also vary depending upon the plant. In Sonora, the agaves used for to make the world-renown mescal bacanora, *Agave angustifolia* are much easier to process than those of *Agave palmeri*, have a very fibrous root system. A digging bar is the common tool used for this purpose. The skill of harvesting an agave is something developed over time. In essence, let’s just say it’s not easy.



Left: Preparing cabezas for roasting
Top: Uprooted agave lechugilla
Bottom: Trimmed agave heads (cabezas or pinas)

Ideally, one would learn from someone with prior experience.

Once the plant has been removed from the ground, the next step is to trim the leaves or pencas from the central core of the plant that is known as the *cabeza*. The amount of the *penca* that is removed can vary depending upon the *jimador* or harvester. Traditional processes typically leave several inches where modern tequila production tends to shave the *pencas* very close to the core. With *Agave angustifolia*, they are very easy to remove by hacking with a machete or hatchet. Once again, the fibrous *Agave palmeri* is more difficult and requires more of a cutting or sawing motion with a very sharp machete or similar tool to remove the *pencas*. Any remaining roots from the *cabeza* must be removed before baking.

Making Your Horno or Roasting Pit

The methods used for cooking the cabezas of the agaves vary. Traditionally large rock lined pits in the ground were used both prehistorically and by small producers. Larger producers of tequila or mezcal vary in their methods which range from wood or gas fired brick ovens to autoclaves. For those wanting to bake a small amount of cabezas at home, a small wood fired, rock or firebrick lined pit, will work nicely. There is no exact formula for this size pit. For home use, the opening may vary anywhere from 4 ½ feet to 5 feet with a depth of 4 feet. Of course the size will depend upon how many cabezas are to be cooked as well as their size. The walls of the pit need to contain enough mass to retain the heat needed for cooking. One to one and a half feet in width should be sufficient. The stones used to construct the pit need to be heat resistant such as granite or dense volcanic rock. A pit typically needs to be heated with a fire burning for approximately 5 to 6 hours. Once the fire has been reduced to coals and small flames, the cabezas can be added and then the pit covered with something that won't burn and that is strong enough to support a layer of dirt on top. Corrugated metal sheets are often used. Once in place, the top of the pit is covered all the way around with dirt. The cabezas usually remain covered in the pit for two to three days depending upon how the pit performs.



Heated stone-lined baking pit ready to add the cabezas.

Now that the Cabezas are Baked, What's Next?

Once baked, the cabezas are left to cool in the open air. Their color will have been transformed from mostly white to a dark mahogany color. The leaf bases will be juicy and sweet exuding a sweet sugary syrup that should be collected and saved. What happens next will depend upon what the original purpose was in baking them. If the purpose is to consume them, the leaf bases can be removed from the central core or heart and stored in a protected location where they will keep for some time. These can be chewed to extract the juices without swallowing the fibers. The heart can be cut into smaller pieces for eating or drying. They can be rehydrated for later use. The juices along with pieces of the heart can be mixed with masa to make marvelous tortilla like cakes or eaten along with an *atole* made from corn. The fibers of the leaf bases, the mashed heart can be combined with water and left to ferment as a *tesguino*. Another traditional use was to cook diluted juices from mashed leaf bases and heart and reduce them to a syrup.

Of course the most popular use for cooked cabezas is for the distillation of a mezcakin to tequila. The distillation methods vary widely, depending upon the scale of production and the technology available. This can range from one cabeza for home use, between thirty to a hundred for a small producer in rural Sonora and much greater quantities for commercial producers.



Roasted cabezas

Using Other Parts of the Agave for Food

As hinted at earlier, it may be easier for you to start processing your own limited quantities of agaves for food with plant parts other than the hearts. Briefly, here are some ways to prepare and eat the peeled flower stalks (*quiotes*) and the flower buds known as *bayusas*.

Peeled flower stalk (*Quiote*)

Just before the flower stalk reaches its full height and opens up its multiple branches that the flowers will emerge from, cut it with a small handsaw or pruners just above the leaf level. There are several different ways that they can be prepared. The *quiotes* can be cut into several inch thick slices, peeled and boiled in water or steamed.

Traditionally, several foot long sections were thrown into a pit of coals and left to roast. These sections can also be wrapped in aluminum foil, covered with a burlap bag that has been soaked in water for about a half hour and then roasted on the coals for an hour or two, turning every half hour or so. They will change to a darker brown color. Typically, small (four to eight inch long) sections are chewed to extract the sweetness while disposing of the fiber.



Left: Slicing agave stalk (*quiote*) for cooking.
Above: Cooked *quiote* slices

Eating the Agave Flowers

The methods used for cooking the flowers of the agave to be used in a variety of dishes will vary depending upon the type of agave that is used. In central and southern Mexico these blossoms are usually referred to as *bayusas* and can be found in markets where they prepared by vendors in different ways. The method used to prepare the *bayusas* varies somewhat depending upon the type and texture of agave flowers used. For the sake of simplicity, the method listed below is one that is fairly common and should give good results.

Only the petals (actually, “*tepals*”) of the agave flower are used for cooking. The inner parts that include the stamen and pistil are discarded in that they tend to be bitter. These need to be peeled away one at a time, and this is a somewhat laborious process that requires patience. Once this process has been completed, the petals are boiled or sautéed in oil. When this process is completed, they can be combined with a sauce made with red chile or other spices. At that point, they may be added to scrambled eggs, or used in more complex dishes with meats and other vegetables.

Depending upon the height of the *quiote*, a pole saw or pruners will be needed to remove a few branches containing buds that have not yet opened. Make sure to leave enough branches with blossoms for pollination. Each branch will contain a cluster of flowers that can easily be removed from their base for peeling.

In addition to the dishes suggested above, they can also be pickled in vinegar for later use in salads or as appetizers, marinated in or dressed with the Sweet Chilpotle and Mezcal Vinaigrette described on page 22. They can be tossed in a salad bowl with other kinds of edible flowers (yucca blossoms, nasturtiums, tubal ocotillo flowers).



Above: Juan Morales sipping on agave flower nectar (*agua miel*).



Right: The edible petals (*tepals*) of the agave flowers.

Sample Recipes...To Inspire You to Formulate Your Own!

Here are some basic recipes for the agave hearts and stalk sections that you can adapt and build upon. Note that when you wish to prepare these dishes and do not have your own locally-prepared mezcal products available, you can substitute in commercially-available maguey sweet sap in half the volume called for in the original recipe. Maguey sweet sap is the consistency of black strap sorghum molasses and retains the nutritionally-important insulins that can help reduce blood sugar levels, whereas most “agave nectar” products have been processed in a manner that reduces their nutritional composition to that of high fructose corn syrup.



Hummingbirds and Long-nose bats rely on agave flower nectar



MAYAHUEL & HER FIVE SISTERS SUCCOTASH

Mayahuel is the *Nahuatl* name for the Aztec goddess of agaves. Agave products can be added to recipes for succotash to give their vegetables a rich, smoky glaze which both heightens and integrates their flavors. Instead of thinking of succotash as a dish comprised only of the “three sisters” of corn, beans and squash, we think of it as a vegetable dish comprised of “six sisters” from the Mesoamerican diet tradition: agave, beans, chiles, corn, prickly pear pads, and squash.

- 1½ cups of dried Pima mottled lima beans from the San Xavier Co-op Farm
- 1½ cups of *elote*, sweet corn or green Mexican June corn, cut fresh of the cob with a serrated knife
- 1½ cups of *calabacitas* or green summer squash, diced into ½” cubes
- 1 cup of *nopalitos* or dethorned prickly pear pads, diced into ½” cubes
- 1 cup of sweet golden, red and orange mini belle peppers, diced
- 3 cups of chicken stock
- 2 tablespoons of butter
- ¼ cup freshly roasted mezcal sugar pulp scraped off the fibers of a roasted leaf base, or, if unavailable, ⅙ cup of commercial *maguey* sweet sap or amber agave nectar ½ tablespoon of paprika or chimayo chile powder
- ½ teaspoon of salt

Prepare to mix the ingredients in the following manner, with the lima beans boiled in advance:

Thoroughly wash the lima beans, then cook in three cups of chicken stock and salt in a crock pot on high for one to two hours, until tender. Drain off half of the excess broth, then add the corn and cook for another fifteen minutes.

Meantime, place melt the butter in a frying pan and on low heat, sautee the diced peppers, squash and prickly pear for five minutes. When all are tender, add in the sugary mezcal pulp in the form of small cubed pieces of the roasted heart. Lightly toss all vegetables until glazed, then add in the lima beans and corn until they too are covered. Remove the succotash from the frying pan and place in a bowl, dust with paprika or chimayo chile powder and serve warm.



SWEET CHILPOTLE VINAIGRETTE WITH *MEZCAL TATEMADA*

AS BASTING SAUCE FOR GRILLED SEAFOOD, VEGETABLES OR COLE SLAW

- 1 cup of smoked reddish-brown striated jalapeño peppers
cured as *chilpotles* in an *adobo* sauce
- 2 tablespoons of fresh lime juice
- ¼ cup of cider vinegar or white balsamic cider
- ¼ cup freshly roasted mezcal sugar pulp in the form of small cubes from the
roasted heart, or, if unavailable, use ⅙ of a cup of commercial maguey
sweet sap or amber agave nectar
- ⅓ cup of water
- 1½ teaspoons of sea salt

Prepare the sweet salsa vinaigrette in the following manner:

In a blender, combine all the ingredients and blend them at high speed until they form a thick liquid, adding more water by the tablespoon if the mix becomes too sticky. Cool, and set aside in a glass container with a pour-out lid.

With a paint brush, baste pieces of shrimp, scallops, fish filets, or vegetables such as halved carrots, quartered zucchini or other summer squash, asparagus or eggplant. Grill over a red-hot charcoal fire, turning to the side after a minute until the seafood and vegetables are done and are slightly striped with charring.

Serve on lime juice-soaked slices of cucumber or jicama, with sections of mandarin oranges or pineapple.



SWEET & SPICY MEZCAL-FLAVORED COLE SLAW

- 1/3 cup of chilpotle-vinaigrette (as above)
- 1/2 a Napa cabbage, cored and chopped into 1/4" strips 2-3" long (makes 4-5 cups)
- 1/2 cup of jicama root, skinned, soaked in lime juice and chopped into 1/4" strips 2-3" long
- 1/3 cup of pineapple chunks
- 2/3 cup of shredded beet root or chayote squash, whichever is in season
- 1/3 cup of sesame seeds, toasted
- 1/3 cup of pecan pieces or slivered almonds, toasted
- Sea salt to taste

Prepare the cole slaw in the following manner:

In a sauce pan, boil the beets or chayote squash until tender but still firm (do not overcook!), drain, then skin and shred into a glass bowl.

Add the pineapple chunks to them. Next, toast almonds or pecans with sesame seeds for four minutes in a frying pan or on a comal, turning frequently. Set aside to cool.

Take the half of Napa cabbage, remove its core, then rough chop into strips two to three inches long and a half inch wide. Toss the five cups of cabbage strips into a glass bowl and massage the cabbage strips until they are no longer brittle.

Add the carrots and beets or chayote in with the Napa cabbage, together with a pinch of sea salt. Add the remaining ingredients, pour over the chilpotle- vinaigrette, mix well, and refrigerate an hour before serving.



PAN DE PULQUE

- 4 cups of White Sonora wheat pastry (Type 00) flour
- 7 egg whites 1 cup of maguey sweet sap or amber agave nectar
- 1 cup of pulque; if unavailable, use 1 cup of agua miel, or $\frac{3}{4}$ cup of hard apple cider with 2 teaspoons of sugar pulp in small cubes from the roasted heart of the mezcal tatemada
- $\frac{1}{4}$ kilo freshly-rendered pork lard from a Mexican carniceria
(avoid the pre-packaged hydrogenated pale blond bricks)
- 1 teaspoon of sea salt
- 1 package of baker's yeast
- $\frac{1}{2}$ stick of butter
- $\frac{1}{4}$ cup of toasted sesame seeds

Prepare the dough in the following manner:

In a glass mixing bowl, combine the pastry flour, the salt, and the yeast, mixing thoroughly. In a separate bowl, beat the fresh lard five to eight minutes until it is whipped and frothy. In another small bowl, crack the egg shells, remove the yolks and separate the egg whites out for keeping. Add the pulque or its substitutes to the yolks and beat for three to five minutes.

Next, mix into the larger bowl of flour little by little the whipped lard, the maguey sweet sap or amber agave nectar, and the yolks beaten with the pulque, kneading the dough until it is soft.

Let rise, punch down, and then cut the dough into four balls. Partially flatten them into four roundish cushion-like loaves or keep as a single quadrangular loaf. Place the loaves on a greased, flour-dusted baking pan, and pre-heat the oven to 220 degrees.

Meantime, slowly heat the stick of butter, and then brush the melted butter onto the top of the loaves, sprinkling them with toasted sesame seeds. Put the baking pan in the oven and bake the loaves for 25 to 30 minutes, or until golden brown. Serve warm.



BIOSPHERE TWO CULINARY COCKTAIL

Prepare the two mixed drinks in the two bulbs of a quaffer shot glass in the following manner:

For the top bulb layer

- 2 ounces of mesquite-smoked Whiskey del Bac
- 1 ounce of cubes from roasted mezcal heart infused in Mexican lime juice for two hours, then strained free of solids
- 5 dashes of Fee Brothers Aztec chocolate bitters (from cacao beans, chiles and other spices) or 5 dashes of chiltepin water with ¼ t of Mexican chocolate powder mixed in
- 2 sun-dried Mission figs, one rehydrated/infused in the whiskey, then super-finely chopped; the other rehydrated in warm water and kept whole as a “plug” between the two bulbs of the Quaffer. Dusted with fire-roasted mesquite pod flour

For the bottom bulb layer

- 2 ounces of uvalama-infused mezcal bacanora
- ½ ounce of pomegranate syrup or pomegranate shrub
- ½ ounce of fresh finely-grated and de-seeded limequats or kumquats
- ½ ounce of prickly pear cactus fruit juice or ½ ounce of prickly pear syrup, or if unavailable, ¼ ounce of grenadine syrup
- ¼ ounce of the expressed liquid from roasted mezcal heart infused in Mexican lime juice for two hours, then strained free of solids

This culinary cocktail is dedicated to Dr. Joaquin Ruiz for his work advancing Biosphere Two, and features two distilled treasures of the Sonoran Desert. The first is Mesquite-smoked Whiskey del Bac from Stephen Paul at Hamilton Distillers in Tucson, Arizona, and the second is Rancho Tepua Bacanora, by Roberto Sr. and Jr. Contreras Mayoral of Baviacora, Sonora.

They are served juxtaposed in a double-bulbed glass called a Quaffer, which allows you to serve a layered drink, each layer with its own memorable colors, as Culinary Cocktail expert Matthew Biancaniello first explored with his after dinner drink, The Antidote. (Double-bulbed Quaffer shot glasses can be order from www.quaffer.com.)

For the bottom layer, place into a stainless steel cocktail shaker the mezcal bacanora, the shredded kumquats or limequats, the prickly pear syrup or juice, and the expressed liquid from roasted infused in lime juice. Shake, then strain into the bottom section of the Quaffer. For the top layer, plug the hole between the two bulbs with the whole, rehydrated Mission fig. Next, pour the fine-chopped fig pulp infused in mesquite-smoked whiskey, the expressed liquid from roasted mezcal infused in lime juice, and the Aztec chocolate bitters or chiltepin water into a mixing glass with ice chips and stir until there is frost on the glass. Pour into the top section of the Quaffer, then dust with fire-roasted mesquite flour.

Bañuelos Flores, Noemí; Salido Araiza, Patricia L. (2012) *El mezcal en Sonora, México, más que una bebida espirituosa. Etnobotánica de Agave angustifolia* Haw. CIAD, Hermosillo, Sonora. Estudios Sociales, Número 2, Marzo, 2012, pp. 173-197.

Biancaniello, Matthew (2015) *Eat Your Drink: Culinary Cocktails*. Dey Street Books, San Francisco.

Fish, Suzanne K., Paul R. Fish, and John H. Madsen (). Evidence for Large-scale Agave Cultivation in the Marana Community. Chapter Seven in *The Marana Community in the Hohokam World*. University of Arizona Press Anthropological Paper 56, Tucson, Arizona.

Gentry, Howard Scott. 2004. *Agaves of Continental North America*. Second edition. University of Arizona Press, Tucson Arizona.

Hodgson, Wendy. (2001). *Food Plants of the Sonoran Desert*. University of Arizona Press, Tucson, Arizona.

Rivas Vega, Josefina, Yolanda Solís Arellano and Alfonso Flores Domené (2004) *Recetario Tepehuano de Chihuahua y Durango*. CONACULTA / Dirección General de Publicaciones / Dirección General de Culturas, Mexico City.

Starr, Greg. (2012). *Agaves: Living Sculptures for Landscapes and Containers*. Timber Press, Portland, Oregon..

Irish, Mary and Gary Irish (2000). *Agaves, Yuccas, and Related Plants: A Gardener's Guide*. Timber Press, Portland, Oregon.

Valenzuela-Zapata, Ana Guadalupe and Gary Paul Nabhan. 2004. *Tequila: A Natural and Cultural History*. University of Arizona Press, Tucson, Arizona.

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