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Archaeological Evidence of the Cultural Importance of *Agave spp.* in Pre-Hispanic Colima, Mexico¹

DANIEL ZIZUMBO-VILLARREAL², FERNANDO GONZÁLEZ-ZOZAYA³,
ANGELES OLAY-BARRIENTOS³, RAFAEL PLATAS-RUIZ³, MARIZA CUEVAS-SAGARDÍ³,
LAURA ALMENDROS-LÓPEZ³, AND PATRICIA COLUNGA-GARCÍA MARÍN^{*,2}

²Unidad de Recursos Naturales, Centro de Investigación Científica de Yucatán, Mérida, Yucatán, México

³Instituto Nacional de Antropología e Historia, Centro INAH Colima, Colima, México

*Corresponding author; e-mail: patricia.colunga@gmail.com; pcolunga@cicy.mx

Archaeological Evidence of the Cultural Importance of *Agave spp.* in Pre-Hispanic Colima, Mexico. Production of agave-based food and fermented alcoholic beverages was highly relevant culturally and socially in pre-European contact western Mesoamerica. It has been hypothesized that agave distillation in western Mexico began in Colima in the early Colonial Era through adaptation of introduced Filipino techniques. Archaeological evidence is presented confirming the cultural and social significance of agave in Colima before contact, one of the fundamental conditions supporting this hypothesis. An analysis of circular subterranean stone structures in residential and ceremonial contexts (Classic and Postclassic periods: 200–1500 common era [CE]), and a comparison with stone ovens currently used to cook agave for the creation of spirits, indicate these structures were probably used for preparing food, including agave. Analysis of funerary ceramic vessel offerings with agave images (Colima phase: 400–600 CE) are reported for the first time. Their characteristics, and those of the associated burials and tombs, suggest those buried were agave growers or alcoholic beverage producers who fulfilled relevant roles in the society. Most of the agave images probably represent *Agave angustifolia* Lem and its cultivation. During the Colonial Era, the cultural and social relevance of agaves almost disappeared in Colima, possibly due to drastic reductions in the native human population, changing land use practices, and prohibitions against the production and sale of native alcoholic beverages.

Evidencias Arqueológicas de la Importancia Cultural de *Agave spp.* en la Colima Pre-Hispánica, México. En el occidente de la Mesoamérica prehispánica, se elaboraban alimentos y bebidas alcohólicas fermentadas de agave con alta relevancia cultural y social. Se ha hipotetizado que en el occidente de México la destilación de agave se originó en Colima en la época Colonial temprana a través de la adaptación de las técnicas introducidas de Filipinas. Se presentan evidencias arqueológicas que confirman la importancia cultural y social de los agaves en Colima en la época precolombina, uno de los fundamentos de esta hipótesis. El análisis de estructuras circulares de piedra en contextos residenciales y ceremoniales (Clásico y Post-clásico: 200-1500 d.C.) y su comparación con hornos de piedra actualmente usados para cocer agaves para elaborar bebidas destiladas, indica que estas estructuras fueron probablemente usadas para preparar alimentos, incluyendo agaves. Se reportan por primera vez ofrendas funerarias de vasijas de cerámica con representaciones de agaves (Fase Colima: 400–600 d.C.). Sus características, y las de los entierros y tumbas asociados, sugieren que los personajes enterrados eran probablemente productores de agaves o de bebidas alcohólicas que tenían un papel relevante en la sociedad. La mayoría de las imágenes de agave son probablemente representaciones de *Agave angustifolia* Lem. y su cultivo. La relevancia cul-

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Dedicated to Isabel Kelly in honor of her contributions to the understanding of cultural development in western Mexico and Colima in particular.

tural y social de los agaves en Colima decreció en la época Colonial hasta casi desaparecer, debido posiblemente al severo decremento de la población nativa, los cambios en las prácticas agrícolas, y las prohibiciones de elaborar y comercializar las bebidas alcohólicas nativas.

Key Words: Agave; alcoholic beverages; archaeobotany; Mesoamerica; pottery; funerary offerings; Colima; Mexico.

Introduction

Before corn was ever cultivated or domesticated, agaves were one of the main carbohydrate sources for human populations in what is today western and northern Mexico and southwestern United States. Agave stems and leaf bases (jointly known as “heads”), and the floral peduncles, have been roasted or pit-cooked for use as food probably since 7000 BCE (Callen 1965; Hodgson 2001; Smith 1965). Since at least this time, the long fibers in the leaves have been another staple product used for making utensils, and later for cloth (Gentry 1982). By the time of European contact, two kinds of fermented agave beverages were culturally significant within Mesoamerica: One made with inflorescence sap and the other using juices from pit-cooked heads. The former was characteristic of what is now central Mexico and the latter of western Mexico (Bruman 1940, 2000; Gentry 1982; Parsons and Darling 2000).

Spanish colonial-era sources, written between 1550 and 1580, include references to the natives in the area around the Colima volcanoes (central-western Mexico) using agaves to produce wine, vinegar, syrup, rope, clothing, wood for housing, needles, nails, thread, and balsam for treating injuries (Alcade-de Rueda 1580:158; Dávila-Quíñonez 1580:141; de Agüero 1579:69). It is unclear if the word “wine” (*vino*) is used to refer to a fermented or a distilled beverage, because the term “wine-mezcal” (*vino-mezcal*) has been widely used for distilled agave beverages in central-western Mexico since at least the early seventeenth century (de Arregui 1621). No documentation exists of agave spirits production before European contact, but evidence indicates that the traditional distillation process in use in central-western Mexico since at least the early seventeenth century was probably first developed in Colima, in the lower Ayuquila-Tuxcacueco-Armería (ATA) and Tuxpan-Naranjo-Coahuayana (TNC) river basins using *Agave angustifolia* Haw. and through adaptation of the Philippine coconut

spirits distillation technique (Zizumbo-Villarreal and Colunga-GarcíaMarín 2008). This method was introduced by the Filipinos brought to Colima by the Spanish to plant coconut plantations and work them (Bruman 1945; Zizumbo-Villarreal 1996). By the eighteenth century, agave spirit production had become quite important in areas of Colima where wild agave populations were abundant (Morales 1778).

The importance of agave spirits in Colima by the eighteenth century and the developmental trajectory that led to this significance were most probably rooted in a pre-Contact culture of fermented beverage production and consumption that formed part of a broad agave culture that included other uses such as food, fiber, fuel, construction, and others. However, recent ethnobotanical research indicates that natural agave populations are scarce in Colima and agaves are not culturally prominent (Zizumbo-Villarreal and Colunga-GarcíaMarín 2008). The present study’s aim is to provide and discuss archaeological evidence of agave’s cultural importance in Colima before European contact in support of the hypothesis that agave distillation in central-western Mexico began in Colima. We also discuss the possible causes for the decreased cultural and social relevance of agaves in Colima, and the present scarcity of the wild populations.

Archaeological evidence of pre-European contact cultures in Colima is characterized by a shaft-tomb mortuary tradition. This cultural tradition is recognizable in western Mesoamerica beginning in the early Formative period (1500–1000 BCE) and lasted through the late Postclassic period (1500 CE). It included the building of residential, mortuary and ceremonial complexes. Burial offerings were often valuable objects including sumptuary ceramics (Beekman 2006; López-Mestas and Ramos-de la Vega 2006). The ceramic corpus described for Colima has been divided in seven phases in terms of time period, location, and physical characteristics (Kelly 1980).

The data used in the present study include stone structures in residential and ceremonial contexts as well as ceramic funerary offerings and the characteristics of the associated burials and tombs. The stone structures are putative stone ovens used to pit-cook agave, and are compared with ovens currently used for this purpose. Both types of archaeological evidence indicate a high cultural and social significance for agaves in Colima before European contact.

Methodology

STUDY AREA

Between 2004 and 2007, archaeological explorations were made in the Colima Valley and the

southern foothills of the Fuego Volcano, between the ATA and TNC rivers (Fig. 1). The study area (19.27 – 19.31 N; 103.71 – 103.75 W) is between 500 and 600 masl. It consists of a terrace with a slight north-south slope formed of superimposed volcanic material flows produced by the Colima volcanoes (Fuego and Nevado) in approximately 16500–2300 BCE, as well as later volcanic ash deposits (Capra and Macías 2002; Luhr and Prestegard 1988). Soils are young and well drained (eutric cambisols) due to the permanent streams descending the flanks of the Colima volcanoes (INEGI 1998). The regional climate is warm sub-humid with an average annual temperature of 24.6° Centigrade (C), an average annual

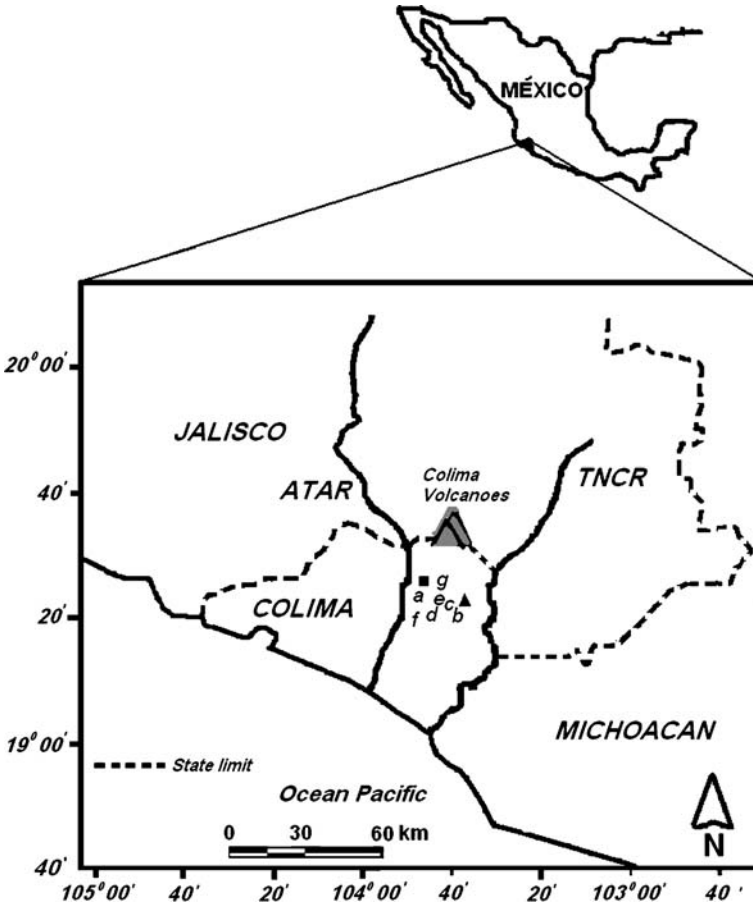


Fig. 1. Archaeological sites studied: (a) *Lagunas Cuatas*; (b) *Tabachines*; (c) *Potrero de Arriba*; (d) *Avenida Constitución*; (e) *Santa Bárbara*; (f) *La Campana*, ceremonial center; (g) *El Chanal*, ceremonial center. Reference locations: (■) *Comala*, (▲) *Hacienda La Capacha*, ATAR = Armería-Ayuquila-Tuxcacueco river, TNCR = Tuxpan-Naranja-Coahuayana river.

rainfall of 960 mm, summer rains, a dry spring, and a short interseasonal dry period in August (García 1990). Natural vegetation between the rivers consists of a deciduous tropical forest in which *A. angustifolia* is currently a rare natural component and the only agave species. Some semi-evergreen tropical forest species occur in the drainages (Rzedowski and McVaugh 1966). Both vegetation communities have experienced human disturbance.

STUDY SITES

Circular stone structures in residential and ceremonial contexts, and ceramics in a funerary context were studied in five previously unexplored archaeological sites and two excavated sites (Fig. 1; Table 1). All are near the archaeological settlements studied by Kelly (1980) in the surroundings of La Capacha hacienda and the town of Comala.

The unexplored sites had intact contexts despite recent modifications and repeated looting. Controlled excavations were done at each site as well as analyses of well-preserved human remains found in tombs at one of the sites (Flores-Hernández 2007). Archaeological materials as well as human remains and associated artifacts were processed and are stored at the Colima Delegation of the National Institute of Anthropology and History (INAH-Col). The sites consisted of four residential settlements: (a) *Lagunas Cuatas* (19.293 lat. N; 103.726 long. W), excavated in November-December 2004 and March 2006; (b) *Tabachines* (19.268 lat. N; 103.686 long. W), excavated in March 2006; (c) *Potrero de Arriba* (19.282 lat. N; 103.710 long. W), excavated in August and September 2006; (d) *Avenida Constitución* (19.271 lat. N; 103.706 long. W), excavated in March 2006; and (e) *Santa Bárbara* (19.276 lat. N; 103.709 long. W), a funerary complex excavated in March and August-September 2006. Twenty-two ceramic offerings documented at Santa Bárbara are described here. The two previously excavated sites are ceremonial complexes: (f) *La Campana* (19.267 lat. N; 103.730 long. W) (López-Loera et al. 2000) and (g) *El Chanal* (19.293 lat. N; 103.705 long. W) (Olay-Barrientos and Mata 2007).

CIRCULAR STONE STRUCTURES AND COMPARISON WITH CURRENT STONE OVENS

Six putative stone ovens were identified in residential contexts and nine in ceremonial contexts. The diameter, depth, and the number of

rows in the stone lining were documented and these data were compared to 38 stone ovens currently used to pit-cook agaves for spirits production (Zizumbo-Villarreal and Colunga-GarcíaMarín 2008). The current ovens are grouped into three categories by the type of associated traditional distillery: Single-family (8); Group (23); and Semi-industrial group (7). Statistical comparisons were done with the SAS (1992) software using a one-way analysis of variance (ANOVA) and a generalized linear model (GLM) for unbalanced samples. A Tukey test was applied for comparison of the means ($\alpha=0.05$).

Results

CIRCULAR STONE STRUCTURES IN PRE-EUROPEAN CONTACT RESIDENTIAL CONTEXTS

Lagunas Cuatas (Site a). Two circular stone structures were found. One was well-preserved: It measured 1.5 m diameter \times 1.0 m deep, was lined with five rows of stones, and had a stone in the center (Fig. 2a). The second was partially destroyed: It measured 1.5 m diameter \times 0.4 m deep, and still had two rows of stones in the lining. Both had burnt clay on their walls and ash in the bottom. The associated residential terraces contained artifacts dating to the Armería phase (500–1000 CE).

Tabachines (Site b). A single circular stone structure was identified, measuring 1.60 m diameter \times 0.9 m deep and consisting of stones arranged in a circle with small carbonized rocks in the center. The associated household unit was dated to the Chanal phase (600–1500 CE).

Potrero de Arriba (Site c). Two circular stone structures were unearthed. The first measured 1.0 m diameter \times 0.4 m deep and consisted of talud walls with a rock set in the center; dark soil, ash, and some ceramic fragments were found in the bottom. The associated residential unit and two funerary cists date to the Colima phase (400–600 CE). The second structure measured 1.40 m diameter \times 0.8 m deep, and consisted of a talud wall with five rows and a stone in the center and carbon in the bottom (Fig. 2b). The associated household unit was dated to the Armería phase (500–1000 CE).

Avenida Constitución (Site d). One semicircular stone structure was discovered. It measured 1.2 m diameter \times 0.6 m deep and consisted of 10 stones facing inwards, without mortar. The arrangement of the stones suggests use as an oven, although no carbon was found in the bottom due to heavy disturbance. The associated household could not be dated.

TABLE I. ARCHAEOLOGICAL FINDINGS, STUDY SITE WHERE FOUND, TYPE OF CONTEXT, AND ASSOCIATED CERAMIC PHASE AS DESCRIBED BY I. KELLY (1980) FOR COLIMA.

<TH>15	1400	1300	1200	1100	1000	900	800	700	600	500	400	300	200	100	1	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500
<TB>PRECLASSIC																CLASSIC						POST CLASSIC								
EARLY		MIDDLE					LATE					EARLY ^f			LATE ^f			EARLY			LATE									
♦ Capacha (1500–1000 BCE)																♦ Comala ^e (100–700 CE)														
												♦ Ortices ^e (500 BCE–500 CE)						♦ Chanal ^{b,g} (600–1500 CE)												
																		♦ Armeria ^{a,c} (500–1000 CE)			♦ Periquillos (1000–1500 CE)									
																		♦ Colima ^{c,e} (400–600CE)												
Study site	Findings															Context	♦ Ceramic phase													
a. Lagunas Cuatas	Two circular stone structures															Residential														
b. Tabachines	One circular stone structure															Residential														
c. Potrero de arriba	Two circular stone structures															Residential														
d. Avenida Constitución	One semi-circular stone structure															Residential														
e. Santa Bárbara	22 ceramic offerings in tombs															Ritual mortuary														
	5% Ortices phase, 23% Comala phase, 72% Colima phase																													
f. La Campana	Five circular stone structures															Ceremonial														
g. El Chanal	Four circular stone structures															Ceremonial														

CIRCULAR STONE STRUCTURES
IN PRE-EUROPEAN CONTACT CEREMONIAL
CONTEXTS

La Campana (Site f). Five circular stone structures are described within the rectangular area atop Building 2 (named by López-Loera et al. 2000), in the southern portion of the central plaza (Figure 2c and d). These are lined with two

to thirteen rows of stones, and have diameters between 1.5 to 3.5 m and depths between 0.5 to 3.5 m. The base of Building 2 measures 52×36 m and consists of superimposed scaled platforms unified by a central staircase. It was a public building probably used for ritual functions during the early Classic (200–650 CE) and Epiclassic (650–800 CE) periods (Jarquín and Martínez-Vargas 2004).



Fig. 2. Archaeological circular stone structures: (a) Residential context (Armería phase 500–1000 CE) in *Lagunas Cuatas*; (b) Residential context (Cerro de la Cruz phase 400–600 CE) in *Potrero de Arriba*; (c) Ceremonial context (from Classic 200–800 CE to early Epiclassic 900–1100 CE periods). Current stone ovens used to pit-cook agaves for spirits production: (d) Single-family oven near Armería river; (e) Group oven at Zapotitlán, Jalisco; (f) Semi-industrial oven at Comala, Colima.

El Chanal (Site g). Four circular stone structures were discovered in this Chanal phase (600–1500 CE) ceremonial center. These structures are associated with a large residential unit that is next to a plaza. They are lined with three to six rows of stones and have diameters between 2.3 and 1.3 m and depths between 0.7 and 1.1 m. Burnt soil, but no carbon, was found on the walls and in the bottom of these structures (Olay-Barrientos 2004; Olay-Barrientos and Mata 2007).

CERAMIC OFFERINGS IN A MORTUARY CONTEXT

Santa Bárbara (Site e). This funerary complex is associated with a residential group located between the Colima River and Campos Creek (Fig. 3). Ceramic sherds found on site suggest it was occupied from the late Formative period (Ortices phase, 500 BCE–500 CE) to the early



Fig. 3. *Santa Bárbara* funerary complex (Formative period, Ortimes phase 500 BCE–500 CE to early Classic period, Colima phase 400–600 CE): (a) Circular tomb; (b) Rectangular tomb.

Classic period (Colima phase, 400–600 CE). The complex consists of 34 well tombs although only 33 burials were found since one tomb contained only offerings. Eighteen (58%) of the tombs contained ceramic burial-associated offerings, and one contained a green stone (possibly jadeite) zoomorph figure of a frog. All burials and offerings were found deposited on a consolidated substrate between 1.5 and 2.0 m below current ground surface.

Tombs and Burials—Tombs were of three types: Eight circular (Fig. 3a); 24 rectangular (Fig. 3b); and two of irregular shape. Four of the eight circular tombs had a row of stones lining the burial, although not in an anatomical arrangement. The remaining four had no stone lining: In two, the burials were in a right lateral flexed decubitus or flexed seated position; in the third the burial was not anatomically arranged; no burial was present in the fourth. Burials were female in three cases, male in two, and unidentifiable in three. Of the 24 rectangular tombs, 11 had stone walls of three to six rows lining the burials on one side. Nine of these eleven burials were in an extended position, three in ventral decubitus, two in right lateral decubitus, one in left lateral decubitus, two in supine decubitus, and one in an undefined position. Burials were male in five cases, female in four, and unidentifiable in one. The remaining 13 of the 24 rectangular tombs had no stone walls. In these tombs, seven burials were in extended ventral decubitus (face down), one in extended left lateral

decubitus, one in extended right lateral decubitus, one in extended dorsal (face up), one in extended dorsal (face down), and two in an undefined position. Nine of the burials were female and four were male. One of the two irregularly shaped tombs had no stone lining and contained a female burial in a flexed sitting position, while the other, which also had no stone lining, contained a burial of unidentifiable sex and undefined position (due to deteriorated condition). In summary, of the thirty-three burials, eighteen were female, eleven male, and four were unidentified individuals. The age range was 20 to 40 years with an average age of 31 years. No child remains were found.

Ceramic Offerings—Ceramic offerings were found in all four circular tombs without a stone lining and in two of those with a lining. Of the thirteen rectangular tombs without a stone wall, five contained offerings and eight did not. In the eleven rectangular tombs with a stone wall, nine contained offerings and two did not. Offerings were found in one of the irregularly shaped tombs and no offering was found in the other.

A total of 22 ceramic pieces were recovered: Three complete pots, three incomplete pots, 15 complete vases, and one square container. One (5%) piece had characteristics diagnostic of the Ortimes phase (500 BCE–500 CE); five (23%) corresponded to the Comala phase (100–700 CE); and sixteen (72%) to the Colima phase (400–600 CE). Among these pieces was an anthropomorph vase representing a woman, a fragment of a phytomorph vase representing a

squash fruit, and a zoomorph vase in the form of a dog. Seven of the vases, belonging to seven different burials, were decorated with drawings that we interpret as representations of agave plants, belonging to the *Rigidae* Group (sensu Gentry 1982) based on their rosette form and ensiform leaves, patulous with straight margins. All seven of these vases are Colima phase (400–600 CE) and were found at different depths in relation to the burials. None had macro-remains making further micro-content analysis necessary.

CERAMIC OFFERINGS WITH AGAVE PLANT REPRESENTATIONS

The seven vases with agave images exhibited characteristics indicating they functioned as containers for liquids on a daily basis (photographs of five are shown). Five are the “red on cream” type that is typical of the Colima phase (400–600 CE), and two have the paste and tone of surface finishings that suggest they were made in the beginning of this phase (Fig. 4). Six vases show complete plants (Figs. 4, 5, 6 and 7) and one shows only individual leaves (Fig. 8). Two vases had a composite silhouette (Figs. 4 and 6) and five were globular. All had a slightly diverging continuous, short neck, as well as a rounded lip and bottom.

All the vases had signs of wear on the exterior surface of the vessel bottom, with extraordinary wear on two; the plant silhouettes are almost indistinguishable on the second. This suggests they were liquid containers used on a daily basis before placement in the burial. Two had been deliberately punctured to make them dysfunctional as containers and prepare them for ritual use (Figs. 6 and 8), and another was probably made dysfunctional due to a firing defect (Fig. 5).

The seven vases had an average mouth diameter of 9.5 cm (coefficient of variation [CV] <10%), suggesting the use of same-size tops to prevent dust and insects from entering the container. Paste granulometry varied between vases in terms of sand and mica temper components, although all manifested signs of complete firing in an open oven. Using Munsell’s soil color scale, paste color varied from red to dark red (2.5YR 4/8 and 3/6) (Munsell 1975), with smooth exterior and interior finishings. Exterior finishes had a creamy white to rose and orange to red base (5YR 8/2, 5YR 7/3, 2.5YR 8/2, and 2.5 8/3), with designs applied on this base in red and dark red (2.5YR 4/6, 2.5YR 3/3).

The design elements were similar on all the vases and were characterized by two illustration patterns: An upper and a lower. These were inverted in relation to each other and separated by two red lines



Fig. 4. Composite vessel with double inverted illustration (Colima phase 400–600 CE): (a) Upper portion with thin lines, straight, wavy, triangular and Greek forms; (b) Lower portion with agave representations suggest edge and row pattern of agricultural field. Site: *Santa Bárbara* funerary complex (Formative period, Ortices phase 500 BCE–500 CE to early Classic period, Colima phase 400–600 CE), grid 1, squares 5A and 6B, stratum IV, offering 25, element 1, tomb 30.



Fig. 5. Globular vessel with double inverted illustration (Colima phase 400–600 CE): (a) Upper portion with triangular lines; (b) Lower portion with agave plant images similar to *A. angustifolia* and suggestive of row cultivation pattern. Site: *Santa Bárbara* funerary complex (Formative period, Orlices phase 500 BCE–500 CE to early Classic period, Colima phase 400–600 CE), grid 1, squares 7A and 7B, stratum IV, offering, element 1, tomb 25.

in the middle portion of the vessel. In the upper part, the images were made using thin lines, straight, wavy, triangular, and Greek forms alternating around the vessel neck. In the lower portion, the images are of four, nine, eleven or nineteen agave plants.

Of the seven burials containing offerings representing agave plants, two could not be analyzed due to their highly deteriorated condition. The five analyzed burials were associated with rectangular tombs with a retaining wall and an extended burial:

two in right lateral decubitus, one in left lateral decubitus, two in ventral decubitus (face up), and one in ventral decubitus (face down). All burials exhibited erect tubular cranial deformation, and signs of generally good health conditions with balanced nutrition and high protein intake. Three had notable abrasion of dentition, two showed normal abrasion, while four had localized periodontitis and one had localized osteomyelitis (Flores-Hernández 2007).

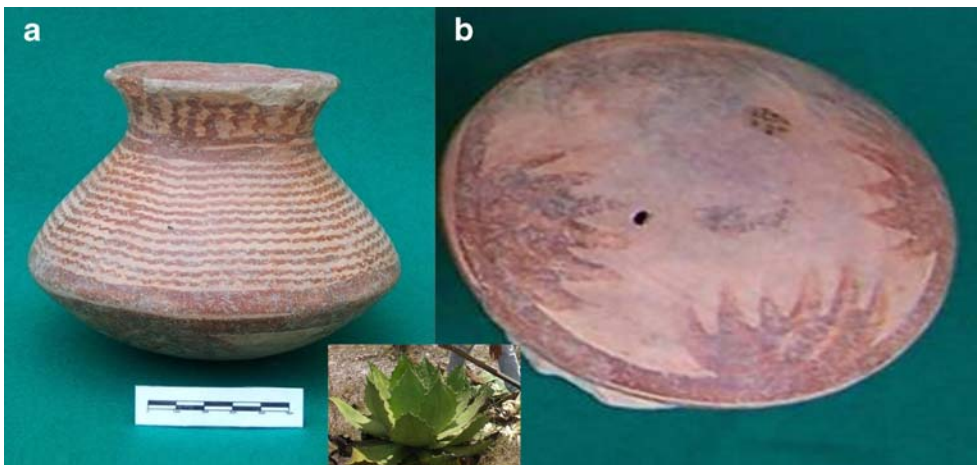


Fig. 6. Composite vessel with double inverted illustration and deliberate modification to prevent use as container (Colima phase 400–600 CE): (a) Upper portion with thin undulating lines; (b) Lower portion with agave plant images similar to *A. maximiliana* and suggestive of cultivation on edge of fields. Site: *Santa Bárbara* funerary complex (Formative period, Orlices phase 500 BCE–500 CE to early Classic period, Colima phase 400–600 CE), grid 1, squares 6E and 6F, stratum IV, offering 10, element 1, tomb 34.



Fig. 7. Globular vessel with double inverted illustration (Colima phase 400–600 CE): (a) Upper portion with triangular figures and thin lines; (b) Lower portion with agave plant images suggestive of edge and triangular cultivation pattern. Site: *Santa Bárbara* funerary complex (Formative period, Orices phase 500 BCE–500 CE to early Classic period, Colima phase 400–600 CE), grid 1, squares 6B and 6C, stratum IV, offering 16, element 1, tomb 19.

COMPARISON OF CIRCULAR STONE STRUCTURES WITH CURRENT STONE OVENS

The circular stone structures in archaeological residential contexts were smaller in diameter and depth than those in ceremonial contexts. In the three evaluated dimensions, they were similar to current stone ovens associated with traditional single-family distilleries; smaller in terms of deep and number of stone rows than current stone

ovens associated with traditional group distilleries; and smaller in all three dimensions than current stone ovens associated with traditional semi-industrial distilleries (Table 2).

The circular stone structures in archaeological ceremonial contexts were larger in diameter and number of stone rows than current stone ovens associated with traditional single-family distilleries; equal in all three dimensions to current stone ovens associated with traditional group



Fig. 8. Globular vessel with double inverted illustration and deliberate modification to prevent use as container (Colima phase 400–600 CE): (a) Upper portion with thin undulating lines; (b) Lower portion with agave leaf images. Site: *Santa Bárbara* funerary complex (Formative period, Orices phase 500 BCE–500 CE to early Classic period, Colima phase 400–600 CE), grid 1, square 5C, stratum IV, offering 19, element 1, tomb 20.

distilleries; and smaller in all three dimensions than current stone ovens associated with traditional semi-industrial distilleries (Table 2).

Discussion

CIRCULAR STONE STRUCTURES: STONE OVENS FOR COOKING AGAVE?

The presence of ash and carbon in the bottom of six of the circular stone structures found in residential contexts suggest they were stone ovens for the cooking of food and/or ceramics; in fact, ceramic remains were found in one of them. The lack of ash in two of these structures may have been due to their degraded context, bad organic material preservation, or, given the possibility of multiple uses, they had been cleaned. Placement of a stone in the middle of four of these ovens indicates use of a central stone was common, possibly for placement of food or to facilitate uniform cooking.

Even though their use for cooking of agave cannot be demonstrated irrefutably, their design, building materials, size and shape are appropriate for cooking this raw material and they are very similar to ovens still in use for agave spirits production in areas contiguous to the Colima valley (Colunga-GarcíaMarín and Zizumbo-Villarreal 2007). Stone ovens currently in use consist of a pit in the ground and stone lining on the walls (this is not universal), and they are used by burning wood in the bottom to heat rocks placed higher up. When the rocks are warm enough, the agave heads are placed over them, covered with the debris of already baked and mashed agaves, and agave fiber sacks, and finally topped with earth (Fig. 2e, f).

The putative stone ovens in archaeological residential contexts have dimensions (diameter,

depth, and number of stone rows) equal to the current stone ovens associated with single-family distilleries, supporting the hypothesis that they were both used for cooking, be it agave and/or other foods. The putative stone ovens in archaeological ceremonial contexts were larger in diameter and depth than the stone ovens in residential contexts, and equal in all three dimensions to current stone ovens associated with traditional group distilleries. These similarities and their placement on the upper part of a public building suggest their use for baking agave in ceremonial contexts like those proposed by Jarquín and Martínez-Vargas (2004) for the late Classic (150–650 CE) and Epiclassic (650–1000 CE) periods.

CERAMIC OFFERINGS: CULTIVATION OF AGAVE ANGUSTIFOLIA PLANTS?

In this society, all the analyzed tombs contained ceramic offerings, indicating generalized ceramic use—a common cultural feature in the Colima region beginning in the early Formative period (Kelly 1980). Their traits indicate the ceramics were produced during the Comala phase (100–700 CE). All the burials were adult, suggesting that the Santa Bárbara mortuary complex was restricted in its use. The relatively few objects found in association with the burials and the absence of shaft tombs, commonly used for persons of high social rank during this period, indicate this complex was used for people involved in common domestic and agricultural activities. Ceramic offerings were more frequent in the more elaborate tombs, suggesting that they served as a means of social differentiation.

Seven (33%) of the 21 pots and vessels documented as offerings had illustrations of agave

TABLE 2. DIAMETER, DEPTH, AND NUMBER OF STONE ROWS OF THE ARCHAEOLOGICAL CIRCULAR STONE STRUCTURES ANALYZED IN THIS STUDY: (I) RESIDENTIAL CONTEXT, (II) CEREMONIAL CONTEXT; AND OF THE STONE OVENS CURRENTLY USED TO PIT-COOK AGAVES FOR SPIRIT PRODUCTION REPORTED BY ZIZUMBO-VILLARREAL AND COLUNGA-GARCÍA-MARÍN (2008): (III) SINGLE-FAMILY, (IV) GROUP, AND (V) SEMI-INDUSTRIAL GROUP.

Type of structure	N	Diameter (m)			Depth (m)			No. of stone rows		
		MEAN	SE	P	MEAN	SE	P	MEAN	SE	P
I	6	1.37	0.01	C	0.7	0.1	C	3.7	0.61	CB
II	13	2.3	0.26	B	1.43	0.33	AB	6.2	1.3	AB
III	23	1.69	0.05	C	0.86	0.1	BC	3.39	0.24	C
IV	8	1.82	0.06	CB	1.5	0.2	AB	6.25	0.25	AB
V	7	3.6	0.08	A	2	0.12	A	8	0.48	A

P Tukey's means comparison test. Different letter means significantly different $P < 0.05$

plants. They were found in the tombs of men and women for whom the plant may have played a relevant role in their lives and deaths. They may have been agave growers or fermented beverage producers who, according to the regional cosmology, would continue these activities in the afterlife. The fact that all the burials containing ceramics offerings with agave representations exhibited erect tubular cranial deformation suggests that individuals involved with agave played a relevant role in the society.

All the vessels found with agave representations had opposing upper and lower images, suggesting double use. The upper image is vertical and may allude to everyday use in the observable world; in other words, as a recipient or container for liquids. This is supported by wear apparent on the lower surface of the vessels. The lower image may refer to use of the plant in the afterlife, as supported by the inverted arrangement of the images in relation to the soil surface (the lines across the middle of the vessel) and deliberate modification of the vessels to prevent their later use as a container.

The vessels were found in an inverted position or laying down, with the agave images visible. Neither the inverted image pattern nor the inverted vessel position in the burial have been reported for earlier cultural periods (Kelly 1945, 1949, 1980). This suggests cultural change between the Formative and Classic periods in terms of mortuary rites and increasing cultural relevance for agave in the Classic period. In this region, the vessel-burial association has been shown to be an indicator of cultural complexity since the early Formative period (1500 BCE) (Kelly 1980; Schöndube 1973–1974). The evolution found in the Colima Valley of ritual and social complexity linked to the use of agaves is similar to that found in the Mitla Valley, Oaxaca, during the Monte Alban IIIb phase (600–1000 CE), where increased agave (presumably *A. potatorum* Zucc.) collection and preparation for food in ovens was associated with greater ritual complexity (Marcus and Flannery 2004; Perry and Flannery 2007).

The arrangement of the agave images along the lower edge of one vessel suggests the edge of a parcel (Fig. 6), while their arrangement in edges, rows, and triangles (Figs. 4, 5, 7) suggests agricultural intensification in unirrigated areas near the valley and the use of agave as a perennial crop between which annual multi-cropping of

corn, beans, and squash could have occurred, just as it is cultivated currently in areas near the Colima Valley (Colunga-GarcíaMarín and Zizumbo-Villarreal 2007). Use of agave to aid in rainwater catchment, erosion control, and soil loss, as well as to increase soil moisture content in parcels, could have facilitated agricultural intensification in the foothills. This has been reported among Mesoamerican farmers and in arid regions like southwestern United States (Anderies et al. 2008; Evans 1992; Fisher et al. 1999; Parker et al. 2007; Trombold and Israde-Alcántara 2005).

The seven offerings were from the Colima phase (400–600 CE) of the Classic period, suggesting increased cultivation of and a greater cultural significance for agave in this time period, possibly associated with the production of alcoholic beverages for ritual use. There are no previous studies containing references to this vessel type with representations of agave. Other types of agave-related ceramic funeral offerings found in Colima are reported by Schöndube (1998:214) and Vela (2005:50), and show clear references to the offering of baked agave leaf bases and a beverage. Two others reported by Vela (2005: 80) and Butterwick (1998:107) show two men carrying a harvested agave head. All four of these offerings were found in early Classic period (Comala phase 100–500 CE) contexts, coinciding with and reinforcing the suggestion of a significant role for agave beverages in this period based on the seven vessels described here.

The agave representations on most of the vessels are very similar to *A. angustifolia* (Fig. 5). This species and *A. colimana* Gentry are the only two agave species that grow in the tropical deciduous forest of Colima, and *A. angustifolia* is the only one with rigid leaves, linear to lanceolate, with straight margins, like those shown in most of the vessel representations. *Agave colimana* has thin leaves with filiferating margins and fine, long threads—nothing like any of the images in the representations. This species grows in relatively inaccessible areas, scattered along rocky heights. Other species that grow in Colima, but not in the tropical deciduous forest, are *A. attenuata* Salm (soft arched leaves, grows on high rocky outcrops in pine forest); *A. gypsophylla* Gentry (soft arched leaves, grows in thorn forest on gypsoferous substrate); and *A. maximiliana* Baker (undulate repand margins, grows in oak and pine forest). This species is similar to the representation on Fig. 6 and it is also used at present for creating traditional agave spirits in Jalisco.

The use of ceramic vessels for fermentation of agave beverages in the Colima Valley is referred to in early Colonial-era ethnohistoric sources when authorities reported consumption of alcoholic agave beverages and destruction of the clay pots used as containers and fermenters (de Vera 1612 in Sevilla-del Río 1977:60).

Conclusions

The archaeological evidence presented indicates the high cultural and social significance of agaves in Colima before European contact: The presence of putative stone ovens in archaeological residential and ceremonial contexts (200–1500 CE) that could be used to pit-cook agaves as well as the presence of funerary ceramic offerings (400–600 CE) with representations of agaves and its possible cultivation. These funerary offerings were present in tombs whose burials suggest that in that time there were agave growers or alcoholic beverages producers who fulfilled relevant roles in the society.

The causes for the decrease in and eventual disappearance of agave cultivation and the decline in wild populations is still unknown. One important factor may have been the drastic decrease in the native population of Colima: More than 80% of the population died within 20 years of European contact and most of the survivors would have emigrated to the mountains (Sauer 1948:50). The Spanish colonists took over the fertile, irrigated bottomlands that had been used for intensive cultivation of cacao (*Theobroma cacao* L.) during the first half of the sixteenth century, completely replacing it with coconut between 1580 and 1610 (Zizumbo-Villarreal 1996). The foothills, where seasonal agriculture would have been done and where agave would have been cultivated, were given over to cattle ranching and sugar cane (*Saccharum officinarum* L.). The disappearance of agave cultivation and wild agave populations from the Colima landscape would have occurred in much the same way as it did for cacao. Continual prohibitions by the Spanish Crown against the production and sale of native fermented and distilled beverages eventually even led to disappearance of coconut liquor (Sevilla-del Río 1977; Zizumbo-Villarreal 1996). The cultivation of agave exposed farmers to severe punishment by colonial authorities, as recorded in the early seventeenth century (Sevilla-del Río 1977; Zizumbo-Villarreal and Colunga-García Marín 2008). An alternative explanation is that

clandestine harvesting of wild populations for spirits production to meet the high demand in mining regions during the seventeenth and eighteenth centuries could have led to over-exploitation and exhaustion of the resource.

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