



Glyph Dwellers

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Agave Leaves as a Vessel Cover Depicted on Maya Vase K1092

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The term "maguey" refers to a group of xerophytic succulents (*Agave* spp.) native to the Americas, from which a subset of species is exploited for their sap.¹ The liquid is suctioned from plants that have been cored and scraped after reaching maturity. Consumed fresh, the maguey sap is called *aguamiel*. Fermented into a low-alcohol beverage (ca. 2% alcohol content), it is termed *pulque*. Because of the rapid perishability of these liquids (the term 'pulque' probably derives from Nahuatl *polihqui* "spoiled" or *polihquioctli* "spoiled wine"), the juice can be boiled down into a syrup and stored for longer periods. It was probably in this form that maguey liquid was transported from producing to consuming regions in Postclassic Mesoamerica, as attested in the tribute section of the Codex Mendoza (Berdan and Anawalt 1997:Folio 27r, 29r; Parsons and Parsons 1990:353).

The earliest images of maguey plants and pulque-related rituals and deities in Mesoamerica appear in the art of Teotihuacan in the Late Formative to Early Classic periods, and ceramics from this central Mexican city have been interpreted as vessels for storing aguamiel and/or pulque (Aguilera and Cabrera Castro 1999; Angulo Villaseñor 1996:125–129; Correa-Ascencio et al. 2014; Helmke and Nielsen 2016; Luna 1996:378–379; Rivas Castro 2001; Robertson and Cabrera Cortés 2017). Stone tools for harvesting pulque have been reported for the Teotihuacan region (Sanders, Parsons, and Santley 1979:347; Sanders 1994:63). Images of *Agave* plants also appear in the ceramic art of ancient Colima during the Early Classic

¹ These species are mainly *A. salmiana* var. *salmiana* (green or meek agave), *A. atrovirens* (white agave), and *A. mapisaga* (Mexican or long hand agave), and in lower proportion from *A. lehmannii* and *A. altissima* (Alfaro Rojas, Legaria Solano, and Rodríguez Pérez 2007; García-Mendoza 1995; 1998; Loyola Montemayor 1956; Mora-López et al. 2011).



period (Zizumbo-Villarreal et al. 2009). In Tlaxcala during the mid-late Formative (400 BCE-200 CE) and Epiclassic (650-950 CE) periods, archaeologists found earthen and stone ovens adjacent to houses, which were used for cooking maguey, possibly in order to make mezcal (distilled spirits) (Serra Puche and Lazcano Arce 2020). The consumption of pulque among the Aztecs and other central Mexican groups during the Postclassic and early colonial periods has been extensively studied, and during the early colonial period pulque production was encouraged in these areas as a way of controlling Indigenous and enslaved African populations and extracting wealth in the form of taxes (Escalante, Giles-Gómez, Esquivel Flores, et al. 2012:692). By the seventeenth century, however, pulque production and consumption was forbidden, as it was blamed for causing social and health problems among the Native population (Escalante et al. 2016:2–3). At the same time, however, sugarcane beer and liquor were introduced in the Maya area as part of the system of debt peonage that obviously benefitted the non-Indigenous producers, merchants, and landholders (Maffi 1996:36–37; Navarrete Pellicier 1988). Finally, during the independence era, the pulque industry was revitalized in central and western Mexico, mainly on an artisanal scale (Valadez-Blanco et al. 2012).

At present, the consumption of pulque is virtually absent in the Maya area, and for this reason, as well as for its generally tropical and humid climate, this zone is traditionally thought to be outside of the typically temperate Mesoamerican "pulque region," i.e., exclusively west of the Isthmus of Tehuantepec (see Bruman 2000:62, Map 9). Nevertheless, various sources indicate that pulque was also produced in the Maya area, including colonial-period linguistic evidence from groups like the Chontal, Tzeltal, Q'eqchi', and Poqomchi', as well as the Yukatek (Barrera Vasquez 1941). Fray Dionysio de Zuñiga's Poqomchi' dictionary of ca. 1608 states that the pulque was derived from the leaves (*pencas*) of the plant, and Martín de Palomar's *Relación de Mérida* of 1579 states that the beverage was made from its roots (Barrera Vásquez 1941:8, 9). However, by the nineteenth century, documentation of pulque production among the Maya is scarce. For example, the French naturalist Arthur Morelet (1871 [1857]:404), states:

I did not find, in Guatemala, any important plantations of the *agave americana*, from which, in Mexico, the natives procure the intoxicating drink known as *pulque*. Formerly, the Indians of Almolonga and San Gaspar had the privilege of supplying the capital with this liquor; but drunkenness became, in consequence, so general that one of the bishops was obliged to interdict its manufacture, under penalty of excommunication. Since then its production has entirely disappeared from the country.

Instead, the various *Agave* species that are cultivated nowadays in the Maya region are mainly used to produce bast fibers for making rope and textiles. These include especially *A. fourcroydes* (*henequén*) and *A. sisalana* (*sisal*), which constituted a major cash crop in the Yucatan starting in the late nineteenth century (Camposeco M. 1994; Pérez de Sarmiento and Savarino Roggero 2001).

Although it is rare in the Maya area today, the consumption of pulque is well-represented in ancient Maya art and texts during the Late Classic period (Carter and Matsumoto 2020; Henderson 2008; Loughmiller-Cardinal 2012:121–125; Tokovinine 2016). The beverage was served in bulbous, constricted-neck vessels, sometimes glyphically labeled **chi** or **chi-hi** for *chih* "pulque," and was either drunk using a bowl or vase or consumed as an enema (e.g. K717, 732, 1453, 4481, 8764; John Justeson, cited in de Smet 1985:61–65). In at least one case, a stucco-covered lid was designated for use on a pulque vessel (Tikal Miscellaneous Text 219; Stuart 2005:145). At La Corona, a stairway block refers to the ruler drinking and offering pulque, which likely corresponds to material remains of liquid-holding jars found in association with the temples for local patron gods, indicating elite-sponsored community feasting (Baron 2016:147, 158–159).



In Maya art, constricted-neck pulque vessels are usually shown without a lid or stopper, in a few cases, maguey leaves, with their distinctive black tips and dots, appear to emerge from the mouth of the vessel (Houston, Stuart, and Taube 2006:116, fig. 3.11). On K1775 and K1599, the leaves are short, while on K1092 the three maguey leaves are unusually long (Fig. 1).² The presence of the leaves from an identified plant genus seems to support the interpretation that these vessels did not only hold a "sweet" (also *chih*) beverage, but specifically a drink derived from maguey.



Fig. 1a. Vase, Museum of Fine Arts, Boston 2003.775 (K1092). Rollout photo by Justin Kerr.



Fig. 1b. Detail of vase, Museum of Fine Arts, Boston 2003.775 (K1092) showing pulque vessel. Photo by Matthew Looper.

² K1092 is painted in the Hixwitz style, associated with La Joyanca, Pajamal, and Zapote Bobal (see Stuart 2003). The complex scene, a drunken revel by young males, as well as its use of quoted speech (with speech scrolls), suggests a date very late in the Late Classic period, ca. 750-800 CE. The captions are not fully understood but include possible references to the clamor of the scene (see Houston 2017). Both constricted-neck vessels carried on the head of one youth and on the ground between two others in this scene are labeled with the glyphic caption **chi**, signifying *chih* 'pulque' (Montúfar López and Anzures Jaimes 2014:19; Reents-Budet 2019:37). Not all constricted-neck vessels in Maya art are clearly plugged with maguey leaves, such as K1453, which shows rounded, striated forms, possibly depicting some other vegetal material emerging from the jars' mouths. The same vase also shows a large gourd with its stopper in the form of the fruit's stem, placed to the side. A vase excavated at Tamarindito (cat. no. 206002) shows a related scene of pulque-drinking with a large gourd with a stem lid in the foreground (Foias and Bishop 2013:fig. C20).

While it is possible that the maguey leaves in these images serve as a quasi-glyphic tag or ideograph referring to the contents of the vessel, they may also depict actual maguey leaves employed as a vessel lid or plug. Indeed, in central and western Mexico, where pulque is widely produced today, the extremities of maguey leaves are used as a covering for pulque jars (**Fig. 2**). The following statements reflect experiences of the second author (Rehg):

Born in Guadalajara, Jalisco, as a child, I remember going to the market with my mom or grandmother and seeing the pulque vendors. I also remember seeing pulque sellers in many villages around Jalisco. They had *ollas de barro* (ceramic pots) filled with pulque and used the maguey leaves as lids. I remember also seeing people using the maguey leaves to cover tamales and *birría*. My mother also has memories of seeing the pulque vendors when she was a child. She was born in Toluquilla, Jalisco in 1937 and remembers all her childhood seeing pulque vendors with donkeys carrying *cántaros de barro* (ceramic jugs) or *bules* (calabash bottles) and the maguey leaves as lids. Her cousin lived in Mexico City, and next to her house was a pulquería where she remembers seeing *cántaros de barro* with pulque, placed on ice, and using agave leaves as lids.



Fig. 2. Pulque jars capped by maguey leaves. Credit: "Stand with different kinds of Curado de Pulque a flavored alcoholic drink made with maguey (cacti), spotted at the XXXVIII Gastronomical fair of Santiago de Anaya, in the state of Hidalgo, Mexico. Puesto con diferentes tipos de Curado de Pulque, una bebida alcohólica hecha a base de Maguey (tipo de cactus), encontrado en la XXXVIII Muestra Gastronomía de Santiago da Anaya, en estado de Hidalgo, México." Photo by MCGau, 2018. Wikimedia Creative Commons Attribution-Share Alike 4.0 International license: <https://creativecommons.org/licenses/by-sa/4.0/deed.en>

Fresh or dried maguey leaves are also used in Mexico as receptacles for corn dough (*masa*) or other foods, as basket covers, brooms, scouring pads, construction material, and even as cribs for babies (Bravo Vargas 2015:57; Guerrero y Visiera 1874:52; Museo Nacional de Culturas Populares 1988:37). Folded or rolled leaves are used as plugs for pulque barrels, and, bent into a bowl-like shape, the *xoma* (derived from Nahuatl *xomatli* 'cuchara de barro' (clay spoon)); (Molina 1880:161) can be used as a drinking bowl for aguamiel or pulque (Museo Nacional de Culturas Populares 1988:81, 82, 130; **Figs. 3, 4**).



Fig. 3 (left). Folded maguey leaves as plugs for pulque barrels. Credit: "Nanacamilpa Tlaxcala pulque santuario luciérnagas México." Photo by CorreoGSK, 2011. Wikimedia Creative Commons Attribution-Share Alike 4.0 International license: <https://creativecommons.org/licenses/by-sa/4.0/deed.en>

Fig. 4 (right). Xoma used to drink pulque. Credit: "La Xoma es un trozo de penca de maguey que sirve de recipiente para contener el pulque, bebida fermentada, hecha a base de esta misma planta." Photo by Ana Brisa Hernández Salinas, 2019. Wikimedia Creative Commons Attribution-Share Alike 4.0 International license: <https://creativecommons.org/licenses/by-sa/4.0/deed.en>

It is therefore conceivable that the images in Maya art that show maguey leaves "emerging" from pulque vessels—in particular K1092—are representations of actual leaves used as coverings or plugs for the jars. Such loosely-fitting lids would provide an important means for relieving the buildup of gases during fermentation, which would have been very rapid in the hot environment typical of the Maya lowlands. Because the artist of the vase K1092 probably did not have access to non-local maguey leaves, the vase seems to suggest local production of maguey and therefore pulque. Indeed, excavations at Cerén, El Salvador, demonstrate that *Agave americana* plants were cultivated in Central America in the Classic period, at least at this elevation, approximately 450 masl (Sheets 2002:34, 38, 79, 186–188). The black or darkened patches of the leaf tips of maguey represented in Maya art and writing probably indicate the

frequently brownish or blackish colors of the tips of leaves of *Agave americana* and other species (**Fig. 5a, b**). In Maya ceramic painting, artists working in various styles often represented maguey plants naturalistically, further suggesting direct familiarity with the growing plants (**Fig. 6**). It is possible that the ancient Maya exploited different *Agave* species than those typically used to make pulque in central Mexico and, consequently, may not have used the same coring and scraping process to extract the sap.



Fig. 5a. /chi/ grapheme (SC9) from a Calakmul vase. Drawing by Dana Moot II; **b.** *Agave americana* plant showing darkened tips of leaves. Photo by Matthew Looper.



Fig. 6. Agave plant depicted on polychrome vessel (MS0066). Photo by Ronald L. Bishop, courtesy Maya Ceramics Project.

In conclusion, we propose that K1092, and possibly other vessels with similar iconography, depict actual maguey leaf covers or plugs for pulque jars, analogous to contemporary practice elsewhere in Mesoamerica. This imagery signifies the local production of pulque from fresh plant material, rather than (or in addition to) its fermentation from imported syrup. The sap may have been derived from either leaves or the roots of the maguey, as described in colonial-period sources from the Maya area, or by baking maguey cores, as attested in excavations in central Mexico.

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References

- Aguilera, C., and R. Cabrera Castro
1999 Figura Pintada Sobre Piso En La Ventilla, Teotihuacan. *Arqueología* 22: 3–15.
- Alfaro Rojas, Guillermo, Juan Porfirio Legaria Solano, and Juan Enrique Rodríguez Pérez
2007 Diversidad Genética En Poblaciones de Agaves Pulqueros (Agave Spp.) Del Nororiente Del Estado de México. *Rev. Fitotec. Mex.* 30: 1–12.
- Angulo Villaseñor, Jorge
1996 Teotihuacan: Aspectos de La Cultura a Través de Su Expresión Pictórica. In *La Pintura Mural Prehispánica En México: Teotihuacan*, Vol. 2: Estudios. Beatriz De la Fuente, ed. Pp. 65–186. Mexico, D.F.: Universidad Nacional Autónoma de México: Instituto de Investigaciones Estéticas.
- Baron, Joanne
2016 *Patron Gods and Patron Lords: The Semiotics of Classic Maya Community Cults*. Boulder, Colorado: University Press of Colorado.
- Barrera Vásquez, Alfredo
1941 El Pulque Entre Los Mayas. *Cuadernos Mayas*, 3. Mérida, Yucatán.
- Berdan, Frances, and Patricia Rieff Anawalt
1997 *The Essential Codex Mendoza*. Berkeley: University of California Press.
- Bravo Vargas, Gerardo
2015 *Vocabulario náhuatl del maguey y el pulque*. Tepeyahualco, Zempoala, Hgo.: Gerardo Bravo Vargas.
- Camposeco M., José Balbino
1994 *An ch'ech, sajchi' o ki' = El maguey y sus usos en Guatemala*. 1. ed. Ranchos Palos Verdes, CA: Ediciones Yax Te'.
- Carter, Nicholas, and Mallory Matsumoto
2020 The Epigraphy of Ancient Maya Food and Drink. In *Her Cup for Sweet Cacao: Food in Ancient Maya Society*. Traci Ardren, ed. Pp. 87–123. Austin, Tex.: University of Texas Press.
- Correa-Ascencio, Marisol, Ian G. Robertson, Oralía Cabrera-Cortés, Rubén Cabrera-Castro, and Richard P. Evershed
2014 Pulque Production from Fermented Agave Sap as a Dietary Supplement in Prehispanic Mesoamerica. *Proceedings of the National Academy of Sciences* 111(39): 14223–14228.
- Escalante, Adelfo, Martha Giles-Gómez, Guadalupe Esquivel Flores, et al.
2012 Pulque Fermentation. In *Handbook of Fermented Food and Beverage Technology*. Y. H. Hui, ed. Pp. 691–706. Boca Raton: Chapman and Hall/CRC.



Escalante, Adelfo, David R. López Soto, Judith E. Velázquez Gutiérrez, et al.

2016 Pulque, a Traditional Mexican Alcoholic Fermented Beverage: Historical, Microbiological, and Technical Aspects. *Frontiers in Microbiology* 7.

<http://journal.frontiersin.org/Article/10.3389/fmicb.2016.01026/abstract>, accessed December 15, 2022.

Foias, Antonia E., and Ronald L. Bishop

2013 *Ceramics, Production, and Exchange in the Petexbatun Region: The Economic Parameters of the Classic Maya Collapse*. Vanderbilt Institute of Mesoamerican Archaeology (Series). Nashville: Vanderbilt University Press.

García-Mendoza, Abisaí

1995 El Maguey: Una Planta Maravillosa. In *Cofradía En Apoyo de La Mayora Mexicana A C: En Torno al Pulque y al Maguey*. Mexico, D.F.: Grupo Editorial Siquisiri.

1998 *Con sabor a maguey: guía de la colección nacional de agaváceas y nolináceas del Jardín Botánico, Instituto de Biología-UNAM*. México, D.F.: Jardín Botánico, Instituto de Biología, Universidad Nacional Autónoma de México.

Guerrero y Visiera, Francisco

1874 *El vino de Maguey: tesis para el examen profesional de medicina, cirugía y obstetricia*. México: Imprenta de Diaz de Leon y White.

Helmke, Christophe, and Jesper Nielsen

2016 Los Bebedores de Tetitla: Representaciones Del Consumo Ritual de Pulque En Los Murales de Teotihuacan. In *Las Pinturas Realistas de Tetitla, Teotihuacan: Estudios a Través de La Obra de Agustín Villagra Caletí*. Leticia Staines Cicero and Christophe Helmke, eds. Pp. 135–163. Colección Científica (Instituto Nacional de Antropología e Historia (Mexico)). México, D.F.: Secretaría de Cultura, Instituto Nacional de Antropología e Historia : Universidad Nacional Autónoma de México, Instituto de Investigaciones Estéticas.

Henderson, Lucia R.

2008 Blood, Water, Vomit, and Wine: Pulque in Maya and Aztec Belief. In *Art, Writing, and Archaeology of Middle America*. Joel W. Palka, ed. Pp. 53–76. Mesoamerican Voices, 3. Chicago, Il.: Beaker Press.

Houston, Stephen D.

2017 Puzzle Writing. Maya Decipherment: Ideas on Ancient Maya Writing and Iconography: Posted February 13, 2017. <https://mayadecipherment.com/2017/02/13/puzzle-writing/>.

Houston, Stephen D., David Stuart, and Karl A. Taube

2006 *The Memory of Bones: Body, Being, and Experience among the Classic Maya*. Austin: University of Texas Press.

Loughmiller-Cardinal, Jennifer A.

2012 The Analytic Reconciliation of Classic Mayan Elite Pottery: Squaring Pottery Function with Form, Adornment, and Residual Contents. Ph.D. dissertation, State University of New York, Albany.

Loyola Montemayor, Elías



1956 *La Industria Del Pulque*. Mexico, D.F.: Departamento de investigaciones industriales. Banco de México SA.

Luna, S. A.

1996 La Flora Representada En La Iconografía Pictórica. In *La Pintura Mural Prehispánica En México: Teotihuacan*, Vol. 2: Estudios. Beatriz De la Fuente, ed. Pp. 169–189. Mexico, D.F.: Universidad Nacional Autónoma de México: Instituto de Investigaciones Estéticas.

Maffi, Luisa

1996 Liquor and Medicine: A Mayan Case Study in Diachronic Semantics. *Journal of Linguistic Anthropology* 6(1): 27–46.

Molina, Alonso de

1880 *Vocabulario de la lengua mexicana*. Edición facsimilar. Mexicano y Castellano. Castellano y Mexicano. Leipzig: B. G. Teubner.

Montúfar López, Aurora, and Norma Anzures Jaimes

2014 El Registro Arqueológico e Histórico Del Maguey. *Arqueología Mexicana* 57: 12–25.

Mora-López, J. Luis, J. Antonio Reyes-Agüero, J. Luis Flores-Flores, C. Beatriz Peña-Valdivia, and J. Rogelio Aguirre-Rivera

2011 Variación Morfológica y Humanización de La Sección Salmianae Del Género Agave. *Agrociencia* 45: 465–477.

Morelet, Arthur

1871 *Travels in Central America: Including Accounts of Some Regions Unexplored Since the Conquest*. Mrs. M. F. Squier, tran. New York: Leypoldt, Holt, and Williams.

Museo Nacional de Culturas Populares

1988 *El Maguey, árbol de las maravillas*. México, D.F.: Gobierno del Estado de Hidalgo; Museo Nacional de Culturas Populares.

Navarrete Pellicier, Sergio

1988 *La Flor Del Aguardiente*. Colección Regiones de México. Mexico City: Instituto Nacional de Antropología e Historia.

Parsons, J. R., and M. H. Parsons

1990 *Maguey Utilization in Highland Central Mexico: An Archaeological Ethnography*. Anthropological Papers, 82. Ann Arbor: Museum of Anthropology, University of Michigan.

Pérez de Sarmiento, Marisa, and Franco Savarino Roggero

2001 *El Cultivo de Las Élités: Grupos Económicos y Políticos En Yucatán En Los Siglos XIX y XX*. Mexico, D.F.: Consejo Nacional para la Cultura y las Artes.

Reents-Budet, Dorie

2019 *Arts of the Ancient Americas*. Gerald W. R. Ward and Jennifer Snodgrass, eds. First edition. MFA Highlights. Boston, Massachusetts: MFA Publications, Museum of Fine Arts, Boston.



- Rivas Castro, F.
2001 El Maguey y El Pulque En Teotihuacan: Representación y Simbolismo. *Arqueología* 25: 47–62.
- Robertson, Ian G., and M. Oralia Cabrera Cortés
2017 Teotihuacan Pottery as Evidence for Subsistence Practices Involving Maguey Sap. *Archaeological and Anthropological Sciences* 9: 11–27.
- Sanders, William T., ed.
1994 *Teotihuacan Valley Project Final Report, Vol. 3: The Teotihuacan Period Occupation of the Valley, Part 1: Excavations*. Occasional Papers in Anthropology, 19. University Park: Pennsylvania State University.
- Sanders, William T., Jeffrey R. Parsons, and Robert S. Santley
1979 *The Basin of Mexico: Ecological Processes in the Evolution of a Civilization*. New York: Academic Press.
- Serra Puche, Mari Carmen, and Carlos Lazcano Arce
2020 El Mezcal: Patrimonio Cultural de Mexico. In *Paisajes Sensoriales: Un Patrimonio Cultural de Los Sentidos: México-Uruguay*. Amalia Lejavitzer and Mario Humberto Ruz, eds. Pp. 213–231. Montevideo and Mexico, D.F.: Universidad Católica de Uruguay and UNAM.
- Sheets, Payson D.
2002 *The Ceren Site: A Prehistoric Village Buried by Volcanic Ash in Central America*. Case Studies in Archaeology Series. Belmont, CA: Wadsworth/Thomson Learning.
- Smet, Peter A. G. M. de
1985 Ritual Enemas and Snuffs in the Americas. Ph.D. dissertation, Foris; Centrum voor studie en documentatie van Latijns Amerika.
- Stuart, David
2003 La Identificación de Hixwitz. Paper presented at XV Simposio de Investigaciones Arqueológicas en Guatemala. Guatemala City.
2005 *Sourcebook for the 29th Maya Hieroglyph Forum, March 11–16, 2005*. Austin: University of Texas at Austin, Department of Art and Art History.
- Tokovinine, Alexandre
2016 “It Is His Image with Pulque”: Drinks, Gifts, and Political Networking in Classic Maya Texts and Images. *Ancient Mesoamerica* 27: 13–29.
- Valadez-Blanco, Rogelio, Griselda Bravo-Villa, Norma F. Santos-Sánchez, Sandra I. Velasco-Almendarez, and Thomas J. Montville
2012 The Artisanal Production of Pulque, a Traditional Beverage of the Mexican Highlands. *Probiotics and Antimicrobial Proteins* 4(2): 140–144.
- Zizumbo-Villarreal, Daniel, Fernando González-Zozaya, Angeles Olay-Barrientos, et al.



2009 Archaeological Evidence of the Cultural Importance of Agave Spp. in Pre-Hispanic Colima, Mexico. *Economic Botany* 63(3): 288–302.

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