MOLLE BEER PRODUCTION IN A PERUVIAN CENTRAL HIGHLAND VALLEY

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KEY WORDS: Fermented beverages, Central Andes, *Schinus molle,* Molle beer, Indigenous peoples, Ethnography, Archaeology

Early accounts left by the Spaniards acknowledge that fermented beverages produced from a variety of products were consumed at the time the Inka Empire flourished in the Andean region. One of these beverages, called molle aqa *(molle beer), was made from the berries of the molle tree. However, molle beer is seldom included in scholarly discussions concerning the production and consumption of fermented beverages. In contrast to the attention given to maize beer production, there are no substantial ethnographic accounts reporting the processes that involve the making of molle beer. Likewise, archaeologically, it is uncertain how far back in time this beverage was produced and consumed, although it is frequently asserted that maize beer consumption predated the Inka Empire. Here I report on the production of molle beer in the Peruvian central highlands valley of Ayacucho and discuss the implications for the identification of molle beer production in archaeological contexts. This analysis illustrates that the archaeological signature of molle beer production overlaps significantly with that of maize beer, a situation that has likely prevented the identification of molle beer in archaeological contexts. A detailed description of the process of molle beer making has the potential to provide scholars with the necessary tools to identify fermented beverages other than maize beer.*

FERMENTED BEVERAGES, PRODUCED FROM A VARIETY OF CROPS, are one of the most widely accepted drugs around the world. Indeed, fermented beverages are not only as old as the earliest civilizations but also legally consumed in most cultures (Dietler 1990, 2006; Heath 1987, 2000; Jennings et al. 2005). The Central Andes of South America is one of the regions where fermented beverages, commonly known as *chicha*,[1] were produced and consumed (see Bray 2003; Morris 1979; Rowe 1946). Early accounts left by the Spaniards, such as Cieza de León (1962 [1552]), Father Bernabé Cobo (1956 [1653], 1990), and Sarmiento de Gamboa (1999 [1572]:30), for example, indicate that during the time the Inka state flourished, fermented beverages were widely consumed across Tawantinsuyo, as the Inka Empire was called (Murra 1962, 1983; Rowe 1946). The most frequently mentioned beverage is made of maize, called maize beer or *qora aqa* (Camino 1987; D'Altroy 2003:201; Malpass 2009:76; Morris 1979:22).[2]

Archaeological research has confirmed that maize beer was indeed produced and consumed at the time the Inka state exercised political power over most of the

Journal of Anthropological Research, vol. 68, 2012

Andean region (Hastorf 1991; Morris 1979; Rowe 1946). The Inka administration was apparently directly involved in the production of maize beer; the task itself was the responsibility of particular women, or *aqllas* (Cobo 1956 [1653]:232; Rowe 1946:269; Silverblatt 1987:99). Archaeological studies demonstrate that the production and consumption of maize beer in the Central Andes predates the Inka state (Gero 1990; Moore 1989; Shimada 1994; Valdez 2002, 2006). Various kinds of archaeological remains are interpreted as being tangible evidence for the production and consumption of maize beer, including large ceramic vessels and drinking cups or *keros,* in addition to other equipment used by ancient brewers (Hayashida 2008:162; Moore 1989:686; Morris 1979:27). Furthermore, isotopic analysis of human skeletal remains shows a considerable increase of maize consumption during the hegemony of the Inka state, which has been interpreted as indicative of maize beer consumption (Hastorf 1991:150), particularly among the men.

At the same time, it is well known that maize beer was not the only fermented beverage consumed in the Andean region. Indeed, Cieza de León (1962 [1552]) and Father Cobo (1956 [1653]:162, 1979 [1653]:28) were among the first to mention the existence of other fermented beverages, including one made from the berries of the molle tree (*Schinus molle* L. Anacardiaceae) (Cuya and Lombardi 1991; Materechera and Hae 2008:99); this beverage is called *molle aqa* (molle beer). Cieza de León (1959 [1540]:115, 1962 [1552]:275) also acknowledged the beverage as being "very good," while Father Cobo (1956 [1653]:267) assessed it as being even "stronger than maize beer." Likewise, Garcilaso de la Vega (1966 [1688]:504) described the beverage as "delightful" and "full of flavour." Garcilaso de la Vega further notes that the "valley of Cuzco used to be adorned with innumerable trees of this valuable variety." In *Nueva Coronica y Buen Gobierno*, Guamán Poma de Ayala (1980 [1613]:189) emphasizes the medicinal properties of the beverage (see also Vázquez de Espinosa 1969 [1628]:294). Cuttler and Cárdenas (1947:39) provide a brief reference to this beverage, while Steward and Faron (1959:142) mention that, in addition to maize beer, fermented beverages "could be made of practically any vegetable or fruit" (see also Nuñez del Prado 1973:26).

Despite the early references (see Cooper 1949:542; Rowe 1946:292), molle beer is seldom mentioned in the specialized academic literature, with some notable exceptions (Flannery et al. 2009:105; Goldstein and Coleman 2004; Goldstein et al. 2009; Horkheimer 1973:101; Mitchell 2006:234; Valdez 1997:69). Instead, the majority of Andean ethnographies highlight the particular importance of maize beer or of cane alcohol (Abercrombie 1998; Allen 1988; Arnold 1993:120; Isbell 1985; Meyerson 1990). Owing to the increased importance of ethnographic data for the interpretation of archaeological findings, archaeologists have recently shown an increasing interest in understanding the processes of maize beer production (Bray 2003; Hayashida 2008, 2009; Jennings 2005; Jennings and Bowser, eds. 2009).

The absence of detailed information about the operational chain of other fermented beverages, such as molle beer, may leave the impression that maize beer is the most important indigenous beverage of the region. In fact, many make a bold equivalency of fermented beverage with maize beer (see Skar 1982:143;

Urton 1981:19). However, according to the same ethnographic sources, maize beer "is made only for special occasions" (Allen 1988:140), such as "religious rituals" (Arnold 1993:120; see also Abercrombie 1998:362; Meyerson 1990:49–50), or is in fact "rarely produced" (Allen 2009:28). In contrast, the most frequently consumed drink is cane alcohol (Abercrombie 1998; Allen 1988, 2009; Isbell 1985:6; Skar 1982:126). In addition, most of the frequently cited ethnographies deal with potato-growing communities of higher elevations, known as *sallqa* or Puna, located more than 3,300 m above sea level. But Andean communities are also located at lower elevations, such as the Ayacucho Valley, where molle beer—not maize beer—is the most important type of fermented beverage.

I argue that the general notion that maize beer was (and is) the most important indigenous fermented beverage of the region is to a large extent the by-product of our poor understanding of the processes that involve the production of other—perhaps equally important—fermented beverages, such as molle beer. Both ethnohistorical and ethnographic sources provide valuable information regarding the operational chain of maize beer making, a process that requires the use of several types of ceramic vessels. Whenever similar ceramic vessels are found in archaeological contexts, often it is assumed that maize beer was produced and consumed. In contrast, there is no record to enable scholars to consider the possibility that other fermented beverages may also have been produced and consumed in the distant past. I argue that this emphasis on maize beer and the frequent association of large fermenting ceramic vessels with maize beer are the central reasons that other fermented beverages remain unrecognized in the archaeological record.

If scholars are seriously interested in identifying other fermented beverages from the analysis of archaeological material remains, such as molle beer, it is critical to have an understanding of the operational chain of molle beer production.[3] Therefore, my aim here is to provide a descriptive account of molle beer production in order to improve our ability to detect the production and consumption of molle beer in archaeological contexts. This paper is based on experience gained as I was growing up in the Ayacucho Valley of the Peruvian central highlands (Figure 1). In this region the production of molle beer is widespread; consequently, every local individual not only observes the process from a very early age but, more importantly, participates in the activity over the years. Indeed, this is one of the many obligations that one learns early in life. What follows is an insider's account (Smith 1999:137).

In the following discussion, first I locate the molle tree in its ecological context, continuing with a description of how molle berries are harvested. In the next section, the process of molle beer making is described, paying close attention to the equipment required for the task. Finally, the archaeological implications of molle beer making are discussed by comparing and contrasting the vessel types used in maize beer and molle beer production to assess whether the two beverages can be distinguished using material remains. However, I do not imply that this discussion exhausts the issue of molle beer production in the entire Central Andes, since such production may vary from region to region.

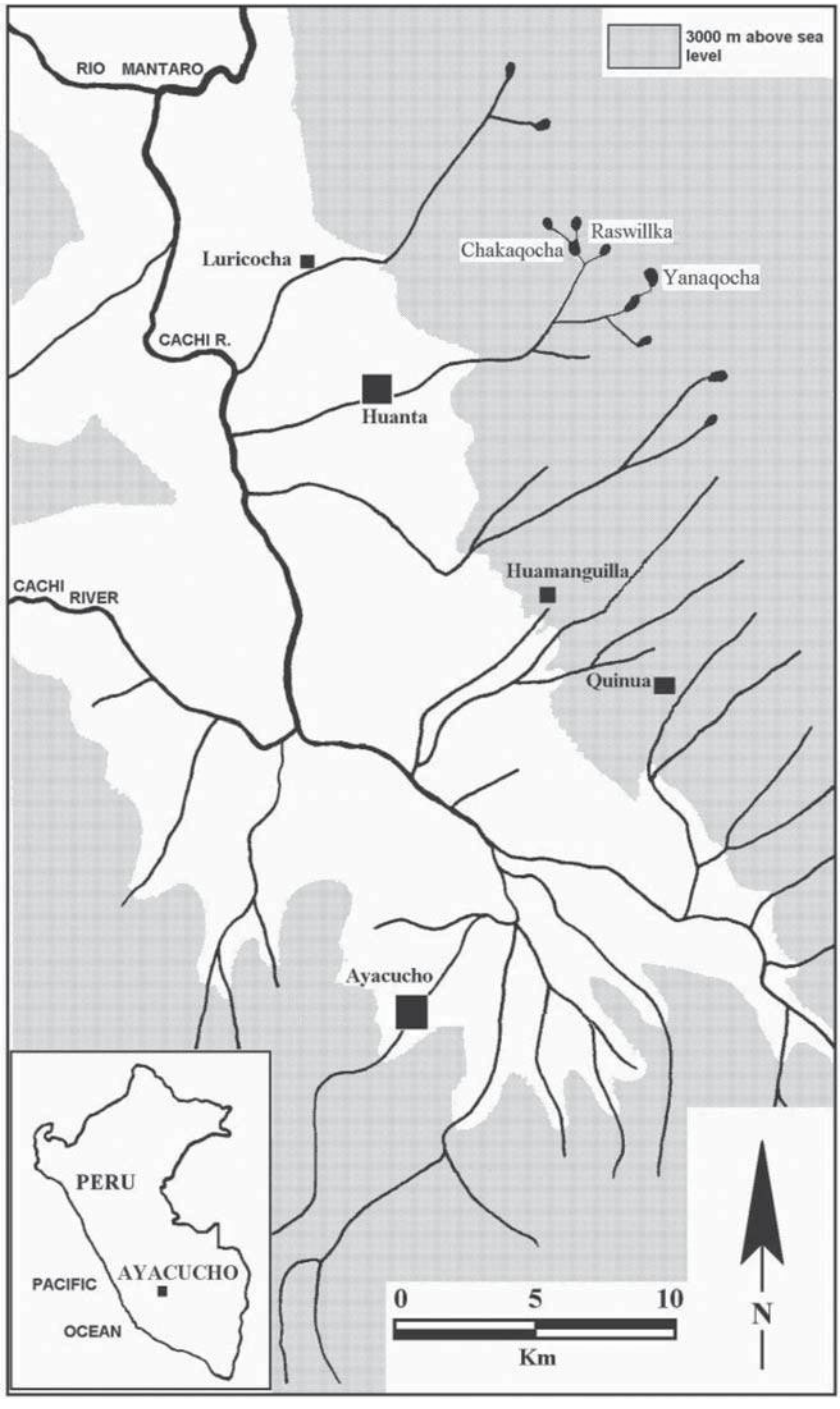

Figure 1. Map of the Ayacucho Valley in central Peru.

THE MOLLE TREE IN THE AYACUCHO VALLEY

The Ayacucho Valley of central Peru—in particular, its northern section (Huanta)—is an ecologically diverse region (see Arnold 1975, 1993; Mitchell 1976, 1991; Valdez 1997). From the bottom of the valley at 2450 m asl, known for its warm temperatures especially during the day, the climate, humidity, flora, and fauna change drastically as elevation increases to 5050 m (Valdez 1997:67). In the lower part of the valley are the Cachi River and its various small tributaries, among them the Totora and Pongora rivers. The western side of the Cachi River is drier and has limited vegetation; in contrast, the eastern side is more humid because it is irrigated by a series of small streams that descend from the sallqa zone. The sources of these streams are the glacial lakes found at higher elevations, particularly in Rassuwillka, the highest mountain chain in the entire region and recognized as the sacred Wamani. The most arable land in the valley is also located in the section that is irrigated by the small streams (Figure 1).

The area recognized as the most fertile is also the most heavily forested section of the valley. The vegetation consists of a variety of fruit-bearing domestic plants (Valdez 1997:67) as well as molle trees (Gade 1999:43; Kramer 1957; Lanning 1967:16). Indeed, almost every agricultural plot is surrounded by a "living fence" of molle trees. As pointed out by Materechera and Hae (2008:99; see also Goldstein and Coleman 2004:523), the molle is a fast-growing, heat- and drought-resistant evergreen tree that can easily reach heights of 18 to 20 m (Figure 2). It is also one of the longest-lived trees of the region, next to the tara tree (*Caesalpinia spinosa* [Molina] Kuntze) and the lúcuma fruit tree (*Pouteria lucuma*). The tree produces many branches and thus is highly valued for the shade it creates. However, because the branches are not straight, the tree is not regarded as good construction material; instead, it is recognized as one of the best sources of fuel.

As do many other indigenous trees of the region, molle keep their leaves all year. Thus, molle provides not only shade and soil moisture, but a microclimate that is inhabited by microorganisms. Fallen molle leaves create a carpet beneath the tree, maintaining humidity and increasing soil humus, and contributing nutrients as they decompose (Dikshit and Naqvi 1986).[4] As a result, crops such as maize, beans, and squash develop well under the shade of molle trees. Indeed, it is common to see squash plants climbing up the trees.

At the beginning of the rainy season (October–November), known as *poqoy*, the molle tree flowers in panicles, and each flower evolves into a small fruit. The young fruits are bright green, but as the rainy season ends the berries become bright red as they mature (Figure 3). The ripe berries have a sweet covering, so it is common for children to suck on them (Garcilaso de la Vega 1966:504). At the beginning of the dry season (May–June), called *chiraw* (Arnold 1975), the berries are fully mature and ready for harvesting. Because this is also the period for harvesting other crops, particularly maize, beans, and other grains, the molle harvest must wait until all the other crops are harvested and stored.

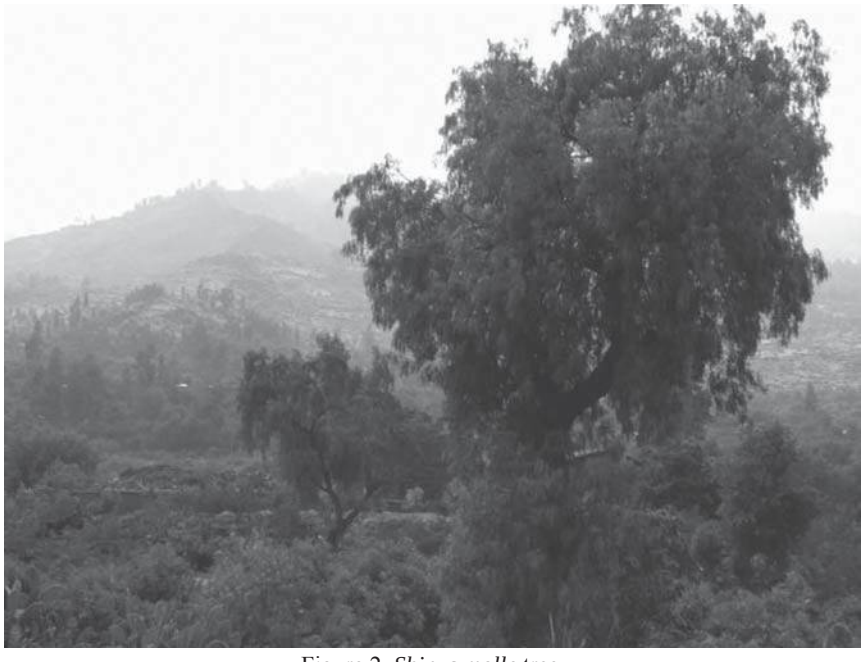

Figure 2. *Shinus molle* tree

Figure 3. Mature molle berries

MOLLE BERRY HARVEST

In the Ayacucho Valley, molle trees produce berries once a year. However, the harvest of molle berries, locally known as *molle pallay*, is not carried out every year. Instead, social and economic factors determine not only whether molle berries should be harvested, but also how much should be harvested. One example of an economic factor is that molle trees often produce in abundance during years of poor maize harvest.[5] Maize is extensively bartered for other crops from the residents of higher ecological zones (Valdez 1997), but poor maize harvests prevent, or limit, the use of maize in such transactions. Because molle berries are highly valued commodities, they can also be bartered with the residents of higher zones (Isbell 1974:121), where the trees do not grow (Flannery et al. 2009:105). Thus, molle berries become substitutes for the purposes of bartering.

In addition, community obligations, such as the cargo system (see Abercrombie 1998:86, 90; Allen 1988:115; Escobar 1976:64; Meyerson 1990:40–51; Mitchell 1991:137), and other ritual activities, such as weddings and construction of new houses, are stimuli for harvesting molle berries (Flannery et al. 2009:143–44). The cargo system, in which every (married) adult must participate by becoming an authority as well as sponsoring communal rituals (Isbell 1985:168), brings together community members who must be provided with food and fermented beverages (Skar 1982:143). Consequently, those sponsoring communal rituals (*carguyoq*) not only harvest their own molle berries but also request their kin and neighbors to harvest theirs.

When the harvest is carried out to fulfill a major communal ritual, all kin and immediate neighbors are expected to assist. This process is part of the ancient reciprocal tradition known as *ayni* (Escobar 1976:71; Mitchell 1991:64, 2006:233; Rowe 1946:212), a system of mutual cooperation without expectation of immediate return or payment. In any community there are always occasions for providing labor to neighbors or receiving help from neighbors as part of the ayni system (Alberti and Mayer 1974).[6] A considerable number of people, of both sexes and all ages, is needed for the harvest. As is often the case, kin and neighbors provide the most assistance, but other community members are equally welcomed. A large number of blankets is borrowed from kin and neighbors for the harvest, also under the ayni system.

Work begins early in the morning with the chewing of coca leaves, and all participants understand their obligations. One participant, often a male, will climb the trees. This individual is recognized as the *waqtaq;* the rest of the workers are the *mastaqkuna*. The waqtaq climbs the tree carrying a long (about 4 m) stick made from a branch of a tara tree (*Caesalpinia spinosa* [Molina] Kuntze) and with a hook at one end. The people lay large blankets on the ground underneath the branch to be harvested. As soon as the blankets are in place, the waqtaq begins hitting branch by branch with a long stick, creating a shower of molle berries that land on the blankets. Once a branch is finished, the waqtaq and mastaqkuna repeat the same actions for the other branches until the whole tree is harvested. A harvested molle tree is easy to recognize because during the process the tree

loses most of its smaller branches and consequently its leaves; in other words, the whole tree undergoes a pruning process.

The work progresses quickly, and everyone is active and alert. Not only must the blankets be moved from one location to another, but the molle berries must be collected for further processing. Indeed, as the work progresses and several trees are harvested, the berries also begin accumulating fast. The harvested berries need to be separated from small branches, leaves, and panicles. Further processing involves stepping on the berries to separate them from their papery cover (exocarp). After midday, the wind often increases and can be used for winnowing. This task often continues for days after the harvest has been completed. All of these activities take place in the fields, near the molle trees. Once the winnowing process is completed, the berries are stored in large baskets (*tunko*) that are placed indoors (Figure 4), on dry floors, and their openings are covered with blankets to keep out dust or anything that might spoil the berries. Berries stored for more than a year are regarded as no longer good for making beverages. The old berries are discarded in the fields, away from the settlements.

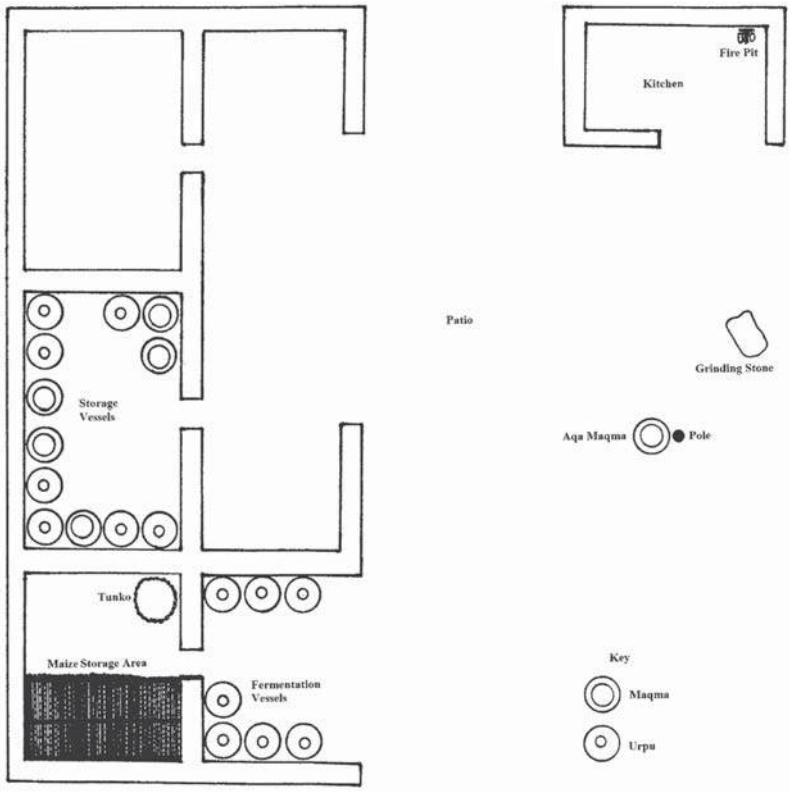

Figure 4. Plan of a typical house in the Ayacucho Valley; note the location of the *tunko*, the narrow-necked vessels used for molle beer fermentation, the platform used for maize storage, other large vessels (maqma and urpu) used for storing grains and processed Andean tubers, and finally the location of the aqa maqma in the patio, next to a pole.

MOLLE BEER MAKING PROCESS

Community obligations, such as those noted above, and others linked to household activities, including planting (*tarpuy*), banking (*hallmay*) (Skar 1982:140), and harvesting (*pallay*), are occasions that call for the preparation of molle beer because drinking is a central aspect of every activity (Flannery et al. 2009:154). As during Inka times, offering water rather than beer to working parties continues to be a serious offense with possible negative consequences, such as difficulty in recruiting necessary labor in the near future (Isbell 1985:177). For the inhabitants of the valley who own molle trees, the preparation of molle beer is the easiest way to provide visitors, guests, and work parties with the anticipated fermented beverage. Above all, the preparation of the beverage is less demanding than making maize beer, as discussed below. The process is called *molle aqa ruway* and involves the use of several ceramic vessels of different sizes and shapes.

The central role that molle beer plays in the day-to-day household activities in this valley is best illustrated in the availability in every household of the necessary equipment to prepare this beverage. The most important is a large, open-mouthed vessel locally known as *aqa maqma*. This vessel is about 80 cm tall and 70 cm wide, with a globular body, flat base, and two horizontal strap handles placed symmetrically on the sides. The aqa maqma is manufactured exclusively for the purposes of molle beer making. The aqa maqma is distinguishable from vessels of similar shape and size called *maqma*, which are used for grain storage and sometimes for fermenting maize beer (Arnold 1985:150, 1993:82, 120; Valdez 2006:59), by a small hole found in the lower section of the vessel (Figure 5A), about 6 cm from the base (see also León 208:120–21). Because of this small hole, the vessel is often regarded as a female; the hole is used to drain the sweetened water. This vessel type is significantly different from small vessels with several holes in their base, identified as strainers and used in the preparation of maize beer. If a household does not own a vessel of this type, it can be borrowed from kin or a neighboring household, again following the ayni system of reciprocity.

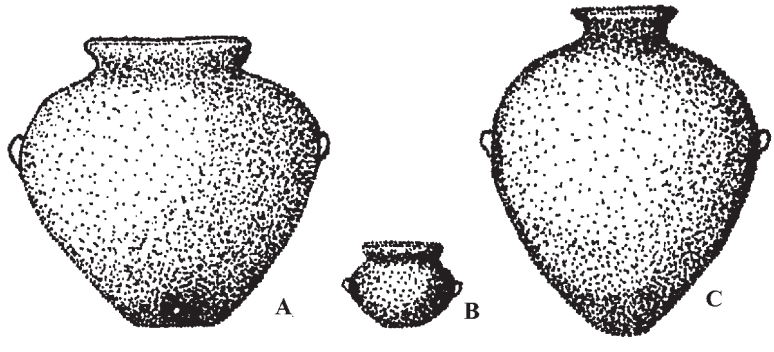

Figure 5. The three vessel types (A: aqa maqma, B: tinaja, and C: urpu) used in molle beer production.

The next step is to place the vessel securely on an elevated platform, about 30–40 cm above the ground, with the hole facing to the front. Between the platform and the base of the vessel, right below the vessel's hole, is placed a leaf of *paqpa* (*Agave americana*) that functions as a canal and allows the sweetened water to run from the aqa maqma into a smaller open-mouthed vessel called a *tinaja* (Arnold 1993:120). To ensure the stability of the aqa maqma, the platform is prepared next to a securely planted pole or next to a tree, to which the vessel is securely tied. As indicated in Figure 4, molle beer making takes place in the courtyard (patio).

Once the aqa maqma is in position, the vessel's hole is securely closed from the exterior with a corncob; the vessel is filled halfway with molle berries and then with water all the way to the top. Regardless of age or sex, each household member participates in this process; the younger ones are responsible for fetching the water. In the aqa maqma the molle berries soak for about two hours to release the sugars (see also Kramer 1957:322; León 2008:121). Then the sweetened water is drained into a tinaja (Figure 5B). To ensure that the seeds remain in the vessel, a thin stick is placed sideways into the hole as soon as the corncob is removed. Often two tinajas are used: when one is filled, it is replaced with another. If the molle berries were harvested recently, they may be soaked again. If not, depending on the activity for which the drink is made and how much of it is needed, the vessel will be emptied and refilled with new molle berries.

The sweetened water, *molle upi*, is poured into larger, narrow-necked jars called *urpu* (Arnold 1993:120) and into other, smaller vessels for fermentation (Figure 5C). Following the Andean concept of duality, these narrow-necked vessels are considered male jars. These vessels, also known as *sinka* or drunken jars, are used only for fermenting molle beer. Once a jar has been used, the drink leaves a strong flavor in the vessel, making it undesirable for other uses, such as the storage of grains or even fermenting other types of beer. Also, because of their size and narrow necks, it is difficult to wash them.

As illustrated in Figure 4, the fermenting jars are securely seated indoors, over a dry floor, and often near walls for support. The fermentation process takes only a couple of days, especially in jars that have been previously used for fermentation. In order to ensure fermentation, it is customary to add a few cups of old molle beer (*qonchu*) into the new jars (Meyerson 1990:50). Or, upi initially poured into a sinka jar that has already been used may be transferred after a few hours into the new jar. The presence of white foam at the mouth of the fermenting jar indicates that the molle beer has fermented; literally, it is said that the vessel is "drunk" because the foam will continue to fill the mouth of the vessel. As discussed below, identical vessels are also used for fermenting maize beer and for storing grains.

A well-fermented molle beer is refreshing and pleasant (Arnold 1985:150; Kramer 1957:322). The quality of the drink is heavily influenced by the freshness of the berries; recently harvested berries will result in a better drink than berries kept stored for longer periods. When the beverage is poured into a cup, white foam covers the top. The drink is somewhat bitter, and each day it becomes more bitter, stronger, and eventually undrinkable. When too sweet, it can produce

strong headaches. Therefore, molle beer must be prepared within a specific time frame. In contrast to maize beer (Morris 1979; Valdez 2006), molle beer does not require boiling (Cook and Glowacki 2003:180; Kramer 1957: 322; León 2008:121; Valdez et al. 2010a:31).

The seeds removed from the aqa maqma are dried and kept near the kitchen. The dried seeds, called *molle ruru*, are used to supplement firewood while cooking, especially during the rainy season when firewood is often damp. It is a common practice to keep molle ruru in a small basket near the cooking area, and from time to time some of it is thrown into the fire. Andean women consider molle ruru to be an excellent fuel; the oily seeds are like firecrackers and burn almost instantly. Thus, the used molle seeds are not simply discarded. In fact, when a neighbor or kin is preparing a considerable amount of molle beer, those assisting in this or other tasks often make a special request for the molle ruru. Consequently, the presence of molle seeds near the cooking area does not necessarily mean that molle aqa was prepared at that particular household.

Molle beer continues to be produced all over the Ayacucho Valley for various purposes. First, activities related to agriculture, including the annual cleaning and repairing of irrigation canals, called *yarqa aspiy* (Isbell 1974, 1985:92; Mitchell 1976:39; Valdez 1997:71) and carried out just prior to the planting season, require molle beer as a work incentive. Other agriculturally related activities, such as planting, banking of fields, and harvesting, all require the distribution of molle beer. Second, festivities such as Carnival and animal rituals, known as *herranza* (Flannery et al. 2009; Isbell 1985:155; Valdez 1997:68), equally demand the distribution of molle beer. During Carnival celebrations, groups of women and men numbering between 20 to 30 individuals go from house to house, singing and dancing. When the group enters a house, it is customary to provide the visitors with plenty of molle beer. A lack or shortage of molle beer can easily result in open insults from the visitors. Because each household is frequently visited by several groups, Carnival celebrations often require large amounts of molle beer.

Third, activities related to the cargo system, often carried out during the dry season, require the preparation and distribution of molle beer in considerable amounts. For this reason, new fermenting vessels are specially acquired from a nearby ceramic-making community (Valdez 1997:69). In the Ayacucho Valley, a household prepares molle beer several times per year, and the consumption rate of this beverage is undoubtedly higher than that of maize beer (León 2008:120). Nevertheless, maize beer is certainly consumed (Cavero Carrasco 1986) and is often prepared for the rituals of the animals (herranza), which take place from July 25 to the end of August (Valdez 1997:68). Molle beer is also produced for these occasions. The greater consumption of molle beer, in contrast to maize beer, has nothing to do with the availability of maize, which is the main crop produced in the valley. Instead, the preference toward molle beer is because its production is definitely less labor-intensive.

As elsewhere in the Central Andes, in the Ayacucho Valley specific households are dedicated to the production of molle beer on a weekly basis. Known as *aqa wasi* or chicherías (Cuttler and Cárdenas 1947:53; Hayashida 2008:162–63;

Jennings 2005:244; Perlov 2009), they make the beverage to earn income, and occasionally also to barter the beverage for agricultural produce. Chicherías are often found just outside the main towns, although their presence in the towns themselves is not unusual. In either case, chicherías prepare the drink for market days, often during the weekends (Sunday). A long stick with a bunch of molle leaves tied at the top and placed at the entrance of the house is an unmistakable sign advertising the availability of molle beer. A piece of cloth placed in same manner (as a flag) signals the availability of maize beer (*qora aqa;* see Cuttler and Cárdenas 1947:52).

ARCHAEOLOGICAL IMPLICATIONS

According to early Spanish records (Cobo 1956 [1653]:232), the Inka administration was directly involved in the production of maize beer; the task itself was the responsibility of women known as *aqllas* (Rowe 1946:269; Silverblatt 1987:99), who brewed the beverage at the main state facilities across the empire (Bray 2003:97–98; Hastorf 1991:50; Malpass 2009:48; McEwan 2006:106; Rowe 1946:292). For this reason, scholarly research pays particular attention to the use of maize beer (Hayashida 2008; Jennings 2005; Jennings et al. 2009; Moore 1989), an emphasis that perhaps unintentionally has overshadowed the role of other fermented beverages. This approach follows the classification established by some of the Spaniards (Sarmiento de Gamboa (1999 [1572]:30; Betanzos 1924 [1551]:199–200), who labeled all types of Andean fermented beverages under a single name: *chicha*.

In contrast, the previous section shows that the more ubiquitous beverage is actually molle beer, at least in the Ayacucho Valley (see also León 2008). The main reasons for the more frequent production and consumption of molle beer in this valley are the availability of the raw material and the fact that molle beer making is less demanding than maize beer. In fact, from the moment the berries are harvested to the time the drink is ready for consumption, molle beer production can take at most four days. The operational sequence of maize beer making is not only longer (Cuttler and Cárdenas 1947:35; Jennings 2005:250–51; Jennings et al. 2005:278), it also requires hard labor (Allen 2009:32; Hayashida 2008:163–65; Jennings 2005:244; Skar 1982:143–44). From the moment maize grains are selected to the time maize beer is ready for consumption—under exceptional conditions (i.e., good weather and labor availability)—it will take a minimum of 18 days. Additional costs include labor for grinding the malted corn (Jennings 2005:150) and the amount of firewood needed for boiling (Hayashida 2008:169).

If indeed maize beer was the most important beverage at the time the Inka Empire flourished, the likely reason for the seemingly secondary role of molle beer was perhaps the geographical distribution of the molle tree, which is mainly found in highland valleys with warm temperatures, at elevations below 3300 m (Gade 1999:43). The prehispanic distribution of the molle tree is unknown because its occurrence at archaeological sites continues to be poorly reported. Nonetheless, Early Intermediate Period (ca. 50 BC – AD 600) contexts in the Peruvian South

Coast region, for example, lack evidence of the molle tree (Piacenza 2002; Valdez 2009:264). Its current presence in the valleys of the South Coast is indicative of subsequent introduction.

Alternatively, the likely secondary role of molle beer during Inka times could be just due to our inability to distinguish the material remains associated with the production of these two beverages, or the fact that molle beer is not even considered as a possibility. Our inability to distinguish vessels associated with maize beer production from vessels associated with molle beer production is precisely because there is a huge overlap in the ceramic vessel types used in such processes.

As listed in Table 1, large, open-mouthed vessels (maqma) (Arnold 1993:82) are used for soaking maize grains and for cooling (Arnold 1985:150). The aqa maqma (Figure 5A), identical to the maqma except for its small hole, is used for soaking the molle berries. Smaller versions of maqma, called tinaja (Arnold 1993:120), are used for straining maize beer; this process can also be done using a piece of cloth (Hayashida 2008:167). Tinajas are also used for draining molle beer (Figure 5B). Large, narrow-necked vessels (urpu; Figure 5C; Arnold 1993:83) are used for fermenting both maize and molle beer. Other, smaller versions of urpu, such as *tumin*, *puyñu,* and *qipiris* (Arnold 1993:82, 83; Valdez 1997:72), are also used for fermenting both beverages. In addition, both drinks are transported in qipiris. Finally, keros are used for drinking both maize and molle beer.

Further complicating this overlap, as illustrated in Figure 4, the two main types of vessels associated with the production of maize and molle beer, maqmas and urpus, are also used for storing grains and dehydrated Andean tubers (Valdez 1997:68), such as *chuño*, *muray*, and *kaya* (see Flannery et al. 2009: Figs. 2.5, 2.6). In contrast, maize is seldom stored in ceramic vessels; instead, it is stored over a platform made of cane (*Arundo donax*).

From this comparative review, it is evident that identical vessel types are used not only in the preparation of both fermented beverages, but also for the purposes

Table 1. Processes, vessels, and materials used in maize beer and molle beer production

Maize Beer			Molle Beer		
Other Materials	Process	Associated Vessel Types	Associated Vessel Types	Process	Other Materials
Maize kernels	Soaking	Maqma	Aqa maqma	Soaking	Molle berries
	Malting			|	
	Drying			|	
Grinding stones	Grinding			|	
Firewood	Boiling	Manka		|	
	Straining	Strainer	Tinaja	Draining	
	Cooling	Maqma		|	
	Fermenting	Urpu	Urpu	Fermenting	
	Drinking	Kero	Kero	Drinking	

of storage. The only vessels that can be differentiated from the other types are the aqa maqma, distinguishable by its small single hole (León 2008:121), and the strainers with several, smaller holes. However, identifying these signatures in broken vessels would be challenging. Since researchers were unaware of such small details, it becomes even more difficult to identify such vessel types based on archaeological reports. It remains to be seen whether it is possible to identify the production of molle beer solely using archaeological remains, or to distinguish molle beer production from maize beer production.

Goldstein, Coleman, and Williams (2009:148) have identified three stages of molle beer production: harvesting, winnowing (or processing), and boiling. They assert that these three stages of molle beer production have archaeological signatures, such as "archaeobotanical remains, fermenting jars, serving vessels, and large dedicated firing areas."[7] Based on their identification of these archaeological signatures at the Middle Horizon Wari site of Cerro Baúl, these authors (see also Goldstein and Coleman 2004) have concluded that molle beer was produced and consumed at that site. This is one of the first attempts to identify molle beer using archaeological remains.

However, it would be extremely difficult to distinguish with certainty the fermenting jars and serving vessels used in molle beer production and consumption from those used in maize beer production and consumption. Furthermore, as shown above, firing areas are not necessarily associated with molle beer making because the process does not require boiling (Cook and Glowacki 2003:180; Valdez 2006:75; Valdez et al. 2010a:30; see also León 2008). The concept that molle beer making at Cerro Baúl required boiling, as noted by Goldstein, Coleman and Williams (2009), is largely based in the finding of molle berries near firing areas, which is supplemented by the account of one informant from the Moquegua Valley, "who remembered making the drink as a boy" (Goldstein and Coleman 2004:526).

More recently, archaeological studies carried out at the Wari sites of Beringa in the Majes Valley (Tung 2007) and Millo II in the Vitor Valley (Hackner et al. 2011), both in southern Peru, have uncovered molle seeds in almost every context. This is different from Cerro Baúl, where such remains are not present all over the site. In the case of Beringa, molle seeds occur in conjunction with large ceramic vessels, suggesting that molle beer may have been produced at the site (Tung 2007:260). A similar interpretation is given for the other Wari site, Millo II (Hackner et al. 2011). In neither case is there a reference to associated cooking areas, leaving open the possibility that molle beer production at those sites did not involve boiling.

In the case of Cerro Baúl, to confirm that the large ceramic vessels were actually used for fermenting molle—and not maize—beer, additional data must be provided. Moseley and colleagues (2005:17267) have argued that it was "unclear" whether maize or molle beer was produced at the site, although they favored maize beer.[8] One of their reasons is the presence of milling stones at the site. Likewise, in a more recent review of beer making at Cerro Baúl, Marcus (2009:311–12) highlights not only the boiling area but also the grinding area and the fermentation

area as she mentions that maize (not molle) beer was produced at the site. Maize beer production requires the crushing of malted maize with milling stones (Hayashida 2008:168; Morris 1979; Valdez 2006; Valdez et al. 2010b). Thus, the milling stones from Cerro Baúl constitute a significant finding and deserve to be assessed in relation to remains such as the large vessels and the firing areas.

Thus, the archaeobotanical remains constitute the only strong evidence for the production of molle beer at Cerro Baúl. According to Goldstein, Coleman, and Williams (2009:152), molle berries are "uniformly associated with kitchen contexts," which is reminiscent of the use of molle ruru as fuel. If the evidence from the Ayacucho Valley has any relevance for identification of molle beer production in archaeological contexts, the finding of molle berries near kitchen contexts may be an indication that molle beer was produced somewhere at the site or near the site, but it does not necessarily demonstrate that such a process included boiling. Likewise, such an association does not prove that molle beer was produced at that particular location. As already point out, reports from other Wari sites adjacent to Cerro Baúl do not mention kitchen contexts. Nonetheless, the finding of molle berries in Cerro Baúl, Beringa, and Millo II opens up the possibility that molle beer may have been produced and consumed during the time the Wari State exercised political power in the Central Andes. If so, it is also possible that the Wari State may have been behind the spread of the molle tree over most of this region. Indeed, the molle tree is found at almost every Wari site in the highlands.

Of course, there may be variations in the way molle beer is prepared across the Andes, both present and past. If making molle beer requires boiling, as argued by Goldstein and Coleman (2004; Goldstein et al. 2009), the identification of molle beer production using archaeological remains appears to be even more challenging since maize beer production also requires boiling. In any attempt to identify the material remains of these two fermented beverages, several lines of evidence must be considered. Thus, in addition to other variables, the identification of aqa maqma in archaeological contexts certainly would allow us to identify molle beer, while the presence of strainers would allow us to recognize the production of maize beer—if there is continuity between the past and the present. Thus, vessels alone constitute poor proof for the production of specific types of fermented beverages, unless otherwise demonstrated.

CONCLUDING COMMENTS

> Water is their worst enemy; they never drink it pure unless they are unable to obtain their beverages, and there is no worse torment for them than being compelled to drink water (Cobo 1979 [1653]:27).

Our current understanding of the production and consumption of fermented beverages in the Central Andes is profoundly shaped by the ethnographic present, to the point that any reference to fermented beverages, or *chicha*, is commonly understood to be maize beer. Most of the influential Andean ethnographies are

about communities found at higher elevations where maize beer is consumed during "special occasions."[9] Such studies have been complemented by the committed efforts of other researchers who have recorded the processes of maize beer production and consumption (Camino 1987; Cavero Carrasco 1986; Hayashida 2008, 2009; Jennings 2005; Jennings et al. 2005). These studies not only highlight the important role played by the distribution and consumption of fermented beverages, they also provide useful details about the operational chain of their production. The combined effort of these studies has given scholars a good perspective on the equipment used in such a process. Thus, it is generally understood that maize beer production and consumption implies the use of several types of ceramic vessels.

The above view, supplemented by the notion that maize beer played a critical role in almost every aspect of the Inka State, has had a tremendous influence on the way scholars interpret archaeological material remains associated with the production of fermented beverages. The broken and abandoned equipment used by ancient brewers, as noted by the late Craig Morris (1979:27), often constitutes the primary archaeological evidence for the production of fermented beverages. These materials are often ceramic vessels that based on the ethnographic present are interpreted as being associated with maize beer production. For instance, oversized vessels and drinking cups found in Wari contexts have been often interpreted as evidence for maize beer consumption (Anders 1991:187, 190–91; Cook 2004:156; Cook and Glowacki 2003; Glowacki 2002:276, 279; Isbell and Cook 1987:28, 2002:277; Isbell et al. 1991:43–44; Knobloch 2000:398; Ochatoma and Cabrera 2002:236)

However, the available ethnographic sources do not represent all Andean communities. Indeed, the emphasis on communities of higher elevations has ignored other highland Andean communities found at lower elevations, as in the case of the Ayacucho Valley. This is a maize-growing valley (Arnold 1975; Valdez 1997), but as discussed throughout this paper, molle beer is the most frequently produced and consumed fermented beverage (León 2008). The reasons for the predominance of molle beer include the availability of molle berries and the fact that its production is less labor-intensive than maize beer production. Moreover, and in contrast to high-altitude Andean communities, communities such as those of the Ayacucho Valley have more choices for making fermented beverages from raw materials other than maize because those resources are locally available.

An interesting aspect of molle beer production in the Ayacucho Valley is that the ceramic vessels used in the process overlap with those used in the production of maize beer. As noted, the minimal differences may not be easily recognizable in broken vessels. Because of this similarity, and without consideration of other lines of evidence, ceramic vessels associated with the making of molle beer could be misidentified as being evidence for maize beer production. To overcome this difficulty and in order to make a more careful assessment of archaeological remains associated with the production of fermented beverages, it is vital to have a good understanding not only of the processes that involve molle beer making, but also of the equipment used in such production.

From this discussion, it is apparent that ceramic vessels useful for the production of fermented beverages more likely signal molle beer rather than maize beer. Such a possibility can be confirmed with the presence of molle berries and the identification of aqa maqma. Evidence of molle storage would certainly add valuable data for determining that the vessels found at a site may be indeed associated with molle beer. On the other hand, the presence of ceramic vessels useful for the production of fermented beverages, in addition to grinding stones and extended kitchen areas, more likely signals maize beer than molle beer. However, if indeed there is regional variation in the way molle beer is produced, and in some instances it also involves boiling (Goldstein and Coleman 2004), the identification of molle beer production and consumption on the basis of material remains from archaeological contexts may be more challenging because the material remains left by the production of these two fermented beverages would be the same.

It is evident from this discussion that our ability to distinguish the various types of fermented beverages from the material remains found in archaeological contexts will definitely benefit from ethnographic and ethnoarchaeological studies aimed at recording the production and consumption of fermented beverages other than maize beer. Indeed, it is surprising how little is known about the operational chain of fermented beverages other than maize beer, even though they were also mentioned in the writings of the Spaniards (Cieza de León 1962; Cobo 1956). For the case discussed here, a good understanding of the process of molle beer making and in particular of the equipment associated with such production will improve our ability to identify molle beer in archaeological contexts. This must be supplemented with residue analysis of the vessels from archaeological contexts and isotope analysis (Hastorf and Johannessen 1993), which will enable us to know, independent of the ethnohistorical records, which fermented beverages were consumed in the distant past.

Until such efforts are achieved, any attempt to distinguish fermented beverages from archaeological material remains will remain incomplete, especially if ceramic vessels are the only evidence considered. Therefore, the aim of this contribution is to provide the scientific community with an account that will be useful for the evaluation of archaeological remains linked to the production of fermented beverages. I encourage other researchers to provide similar accounts for other regions that will enable us to compare and contrast the operational sequence of molle beer production from one region to other. Ultimately, I encourage researchers to produce similar accounts for other types of fermented beverages that are rarely if ever mentioned in the specialized literature but nonetheless deserve scholarly attention.

NOTES

I was only two years old when my mother passed away; my paternal grandparents took care of me until I became an undergraduate at a colonial university in Huamanga, in central Peru. For as long as I can recall, my grandparents taught me about many basic activities to ensure that, once they were no longer here, I would be able to carry out those tasks. One such

activity was molle beer making, including the molle harvest. Now, as I write these lines, I have fresh memories of the time I spent with my grandparents and, more importantly, their teachings. Here I pay tribute to Nieves Romero Valdivia and Pablo Valdez Mendoza, my grandparents, who not only showed me how to make molle beer, but who considered it critical to pass on their knowledge. Here I leave that knowledge for the later generations, although I am sure that my grandparents did not imagine that one day their teachings would appear in print. They never went to school, and I doubt they imagined that I would be doing this. I would also like to thank my wife, Katrina Bettcher, for reading previous drafts of this paper and for providing her comments and observations to ensure that my writing is understandable. Likewise, I thank the editor and three anonymous *JAR* reviewers for their valuable comments and suggestions to improve the paper. Any shortcomings, of course, are mine. Finally, to my children, Kai and Kía, with the hope that by reading this they too can learn one aspect of Andean life and understand what it means, and what it takes, to grow up high in the Andes.

1. Goldstein, Coleman and Williams (2009:136) assert that "Indigenous peoples today . . . use the term *chicha* for beers made from both grains and fruits." In the Ayacucho Valley, the term used by the indigenous people is *aqa*. It is among the mestizos (mixed bloods) that the term *chicha* is favored.

2. Throughout this paper I use the spelling of the Quechua language spoken in the Ayacucho Valley and adjacent regions, which is the Ayacucho-Chanka Quechua (Soto Ruiz 1979).

3. Projecting contemporary modes of molle aqa production into the past assumes both cultural and technological continuities, which can be dangerous. Therefore, ethnographic examples need to be used as aids and not necessarily as recipes for discussing the production of fermented beverages in the past.

4. The leaves of molle trees are unlike eucalyptus leaves, which "are slow to rot and suffocate plant growth around them" (Radkau 2008:22).

5. Local inhabitants have learned that when molle trees produce abundantly, the maize harvest will be poor.

6. Contrary to the suggestions of some scholars (e.g., Jennings and Bowser 2009:5), *ayni* and *mita* are not the same.

7. It is surprising that boiling vessels are not included as additional archaeological evidence, particularly because such vessels (*mankas*) are morphologically different from *maqmas* and *urpus*.

8. However, Goldstein et al. (2009:158) state that "the *Schinus molle* and other plant remains recovered from Cerro Baúl area point to a tradition of fermenting beverage production from *S. molle* fruits rather than corn."

9. Yet even the most commonly cited ethnographies recognize that maize beer is produced only for special occasions; cane alcohol (or *trago*) is consumed more often (Allen 1988:141, 2009; Isbell 1985:8–9). One wonders which indigenous beverage has been replaced by cane alcohol.

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