A History of Vinegar

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Introduction

Our word vinegar comes from the French, vin aigre, sour wine [1]. While it was the medieval French who industrialized vinegar in the Western world, the existence of vinegar stretches far back into pre-history. The production of vinegar is a natural, biological process. Ripe fruit falls to the ground and wild yeasts convert the fruit sugars into alcohol. In turn, the alcohol is converted into vinegar by wild aceto-bacteria [2]. Vinegar has become part of the story of humanity, and serves it as food, beverage, preservative, and cleaner.

Early History

Vinegar dates back to pre-historic times and is at least as old as brewing, as the two processes are related. It is unlikely that we will learn where and when it was discovered. We know that the

Babylonians used vinegar as a cleaning agent as early as ~5000 BC [3]. Ancient Egypt has evidence of vinegar as early as ~3000 BC. Ancient China has evidence of vinegar as early as ~1200 BC [4].

An ancient Babylonian proverb suggests that ancient cultures understood the versatility of vinegar: "Vinegar is beer that went sour and wandered into the kitchen." Vinegar finds its way into sauces, drinks, and pickling solutions. Ancient cultures also understood that any alcoholic beverage can become vinegar. Their beer (more than likely a weak barley wine), raisin wines, date wines, rice wines, and even traditional grape wines all turn to vinegar fairly easily. [5]

Pottery shards—ostraca-- suggest that vinegar was sometimes used a form for payment. One such ostracon from Egypt states, "[Payment for] a mat: 15 mnt-jars of vinegar, to Kata." [6] Vinegar is seen to have been offered and accepted as payment for goods and services, which indicates to us that vinegar has both value and regular use.

Vinegar is also seen used for early medicinal purposes. Both Assyria and Egypt document medicinal uses for vinegar. In Assyria, vinegar was used for treating chronic middle-ear diseases [7]. In Egypt, the Memphis Stone tells us that vinegar was used as a numbing agent for wounds and lancing [8].

Classical History

From its early beginning as an accidental product, and later as a home-made product, vinegar comes to be semi-industrialized. In Classical times, we get our best examples of the widespread making and use of vinegar.

Jewish texts and the Bible contain many references to vinegar. Most famously, Jesus is offered a sponge with vinegar while on the Cross. The Book of Ruth contains a reference to vinegar as a drink. Several Proverbs and Psalms make references to vinegar, to pickles, and medicinal uses of vinegar. Vinegar was used to combat dandruff, toothaches, and to sanitize wound dressings [9].

The Hellenistic Greeks had several uses for vinegar. Oxymel, a drink made with vinegar and honey, was drunk recreationally and also medicinally, as a cure for digestive aliments. Spartans were known to favor a black broth made from vinegar, pork stock, and salt. Hippocrates writes of vinegar in *On Regimen in Acute Diseases* as a curative for respiratory ailments. He recommends vinegar in *On Ulcers* to clean wounds and treat ulcers. Vinegar finds uses in art as the means to make several metal acetates used in pigments [10].

Pliny tells us "there are considerable virtues [to vinegar] and without which we should miss many the comforts of civilized life [8]." The Romans used vinegar just as the Greeks did, but also developed their own version of vinegar drink, *posca*. *Posca* is a mixture of water and vinegar that would help keep water potable [11]. Vinegar was also used to make sapa, reduced grape must with vinegar added. Ancient Roman *sapa* was particularly sweet as the vinegar reacted with the lead pots to make lead acetate. Lead acetate is sweet in flavor but also causes neurological damage.

Columella [12] gives us several methods that could have been used to produce vinegar in Rome. Wine vinegars and fig vinegars are both mentioned. Strabo [13] tells us of the Iberians and their *zythos*, an

early hard cider that would have easily turned to vinegar. Livy [14] relates the story of how Hannibal heated the rocks of the Alps with brushfires and then dosed them with vinegar to shatter them. This is reminiscent of Alexander's destruction of Persepolis with heat and wine. Pliny [15] tells us the story of how Cleopatra drank a fortune by dissolving a rare pearl in vinegar. Galen and Apicius both frequently reference vinegar.

It is therefore believed that Roman civilization has the first industrialized vinegar production in the West. Agricultural manuals give instructions on how to make vinegar; fables hint at vast quantities of it; the legions marched dependent on it, and large-scale trade networks existed to move different vinegars from Britannia to Syria.

Eastern History

Vinegar was equally important in China, Japan, and Korea. The primary difference seen is in the base that is used to convert to vinegar. This process is mostly solid-state as opposed to liquid. Specific mold spores are used to convert moist rice starch to sugar; then yeasts convert the sugar to alcohol in order for the bacteria to convert the alcohol to acid. China had large-scale vinegar production by 479 BC that continued virtually uninterrupted to the modern day [16].

Medieval European History

Islamic Vinegar

Knowledge about how to make vinegar on a large scale dwindled, as history moved out of the Classical era; but as is seen with much Classical knowledge, the Muslims preserved what the Romans knew. The Prophet states in the Hadith, "The best of condiments is vinegar" and "God has put blessing in vinegar, for truly it was the seasoning used by the Prophets before me [17]." Due to a prohibition on adding vinegar to wine for production, Islamic cultures primarily practiced a double-fermentation process. This is a process where a diluted syrup is made into alcohol by wild fermentation and that alcohol is then colonized by wild bacteria to make vinegar. Muslim alchemists gave us the understanding that the active ingredient of vinegar is acetic acid [18].

Ibn Hayyan, also known as Geber, is the first person known to distill acetic acid from vinegar [19], in the 8th century CE in Persia. He distilled vinegar and his resulting distillate would be of greater strength than the standard 5 to 8% of a wine vinegar. As of this writing, I have not found copies of his work nor more information as to the purity of the distillate. Secondary and tertiary sources do comment that it was not pure. As Geber's writings served as the basis for later European alchemy, acetic acid of strength of 10% or more is believed to have been not only possible but likely. Later methods for making acetic acid from metal acetates would be developed, but these would not be considered to be "vinegar" and were likely labeled acetic acid.

European Vinegar

Post-Rome Europe returned to earlier home-based methods of vinegar productions as large agricultural cooperatives were not yet sustainable. Larger-scale production returned over time. 14th century Burgundy saw the production of wine, vinegar, and mustard grow into an industrial powerhouse.

Vinegar Production in Europe

Orleans Method

Around 1350, vinegar production becomes industrialized in France using the Orleans method. A wine cask was laid on its side, air holes were drilled into it, and wine was added to the cask up to just below the airholes. A mother of vinegar could have been added at this point, but it would not be necessary as wild bacteria would enter the cask with the air. The airholes were stopped with cloth to permit the passage of air but not insects or vermin. After several months, the wine would have turned to vinegar, and about 80% of the cask would be drained to use or sell right away, or removed to a different cask to age further. More wine was added to top off original cask with its 20% vinegar; and the vinegar-making process would continue. Acidity of up to 10% can achieved via this method [20].

By 1394, vinaigriers were numerous enough to form a corporation or guild. Vinegar prices were set by the guild, which also trained tradesmen. Other products reliant on vinegar were also part of this guild, including apothecaries, moutardiers (mustard makers), and sauciers. Not until 1580 was the guild primarily composed of vinegar makers [21].

Balsamic Vinegar

Balsamic vinegar is one of the most famous vinegars of the world, and true balsamic vinegar is a protected designation of origin product (DOP) of the Modena region of Italy. It is made exclusively from a reduction of pressed Trebbiano and Lambrusco grapes, aged for at least 12 years in a series of specific wooden casks, ideally in a specific series of caves in Northern Italy [22].

The word “balsamic” does not appear in the historical record until 1747 AD as part of the Duke of Modena’s inventory. However, vinegar from the Modena region is seen in records going back to 1046. Monk Donizone in the Vita Mathildis mentions a barrel of vinegar from this region being given to Holy Roman Emperor Henry II [23]. Modena vinegar was given to the Emperor by Bonifacio, Matilda of Tuscany’s father. Circa 1228 through 1598, particular mention is made of barrels of special vinegar, sometimes called the Duke’s vinegar in inventory lists and ducal writings. Even though the word “balsamic” is not used at this time in history, authors believe that this highly-valued Modena vinegar was either the same vinegar that we know as balsamic or a similarly-produced predecessor, worthy enough to become an imperial gift. [24].

Traditional balsamic vinegar is made by taking the fresh juice of Trebbiano and/or Lambrusco grapes, and making a mosto cotto with it that is then fermenting that into a wine. Vinegar is made from that

wine, and then aged for 10 to 25 years in a series of wooden casks. The modern method of making balsamic vinegar uses casks starting at 50L; the 50L of vinegar is reduced by evaporation to 15L, and the cask size is decreased accordingly.

How was vinegar sold in period?

Vinegar was a significant trade product and industrially produced, but physical evidence on how it was sold seems to be lacking. Once genre-subject painting became popular during the late 16th (and persisting through the 17th and into the 18th century), scenes of everyday life featuring vinegar begin to appear:

Marchard de vinaigre Carrache 1560-1609

Various merchants, during Reign of Louis XIII 1601-1643

Brebiette ~1630

The Vinegar Merchant, Bosse mid 17th c.

1688 from Cries of London

Bon-vinegar-merchant-1774

Given these illustrations, what can be determined about how vinegar was sold in the late Medieval period? These illustrations are largely French. Orleans was the center of the vinegar trade since industrialization in the 14th century [21]. France also saw an earlier influence by the Dutch masters who used everyday people as artistic expression, at least a century before English artists followed suit.

Therefore, these French illustrations and what they depict are all that we have to consider when making determinations as to whether what we see is typical to all medieval vinegar salesmen; or whether these scenes are unique to the terrain and cultures where they were created.

From the illustrations, there are three major ways to transport and distribute vinegar. All involve casks, whether transported on the merchant's back, beast, or barrow. Wheelbarrows are very common in these depictions, and can be reasonably be speculated to have been in general use. From these illustrations, these casks appear to be roughly in the 10L to 20L range, based on a size comparison between them and modern casks, as well as background elements in the illustrations. Filled with vinegar, each cask would weigh from 20 to 40 pounds, which would be a carriable weight for a merchant, but one that would be awkward and quickly prove burdensome.

Wheelbarrows make sense, being relatively cheap and mobile compared to beasts and wagons; and they are easier to stop and keep still for the dispensing of product. While we do not know precisely what the English used to distribute vinegar in period, the long reach of the Burgundian trade routes permits us to speculate that the English would have used a similar means of transport.

How much did vinegar cost?

The 1688 Cries of London illustration shown above gives us a price for vinegar of 3 pence per quart. Assuming these units were similar to modern quarts, that would be 1.5 pence per pint.

According to The National Trust of the UK, in the Tudor era, Gascon wine sold for 3 pounds per tun barrel. Vinegar was "a bit cheaper" [25]. Using 3 pounds per tun, 252 gallons per tun, 240 pence per pound, and modern equivalents, an ounce of imported vinegar would run about a 0.022 pence per ounce. Or 0.35 pence per pint. A cry of a "ha'penny per pint" is in line with a merchant's modest mark up.

After Period

Vinegar production takes off shortly after period. In 1670, the French began to stuff grape stalks and vine twigs into vinegar barrels. Such an increase in nucleation sites for bacteria greatly speeds up the production of vinegar [26].

Improved knowledge of aeration and its relationship to aceto-bacteria resulted in faster generation of vinegar from ever-cheaper alcohol sources, which developed into modern methods.

Experimentation

Most of my research is my own experimentation with creating vinegars through surface methods (similar to what would be done in households and Classical times), through the later Orleans method, up to barrel aging methods.

I have made many gallons of vinegar via these various methods since June 2016. I started out with 4 red wine vinegars and 4 white wine vinegars to determine which ones I liked best; and have since made vinegar from all sorts of wines, beers, ciders, meads, sakes, rice wines, and even spirits. I have also made my own ciders, meads, and wines to turn into vinegar, including a wine I created from coconut water to make into a coconut vinegar. I have four 20L barrels, three 10L barrels, and about a score of 2L barrels, full of vinegar. Thus far, the only alcohol I haven't successfully turned into vinegar has been Malort, likely due to its containing the antimicrobial wormwood.

Via the solera method, I have made two kinds of sherry vinegar and have started a four-year project to make balsamic vinegar. There are 3 Orleans process vinegars running right now.

I have also pressed apples to make my own cider to make into vinegar.

During the course of my experimentation, I have harvested dozens of mothers, killed hundred of fruit flies, and have had several batches fail for a variety of reasons.

My next plan is to try to make oriental vinegars soon.

Photos of my vinegar room in my house.


FRAGILE
UPWARD

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