

# Vinegar



Vinegar is sometimes [infused](#) with spices or herbs—as here, with [oregano](#).

**Vinegar** is a liquid produced from the [fermentation](#) of [ethanol](#) in a process that yields its key ingredient, [acetic acid](#). The acetic acid concentration ranges typically from 4 to 8 percent by volume for table vinegar (typically 5%) and higher concentrations for pickling (up to 18%) although in some countries the minimum strength may be less. Natural vinegars also contain smaller amounts of [tartaric acid](#), [citric acid](#), and other acids. It has been used since ancient times, and is an important element in [Western](#) and [European](#), [Asian](#), and other traditional cuisines of the world.

The word "vinegar" derives from the [Old French](#) *vin aigre*, meaning "sour wine." [Louis Pasteur](#) showed in 1864 that vinegar results from a natural [fermentation](#) process.

## Chemical Properties

### pH Value

The [pH](#) of vinegar is typically in the range of 2 to 3.5, depending on the concentration of acetic acid. Commercially available vinegar usually has a pH of about 2.4<sup>[\[citation needed\]](#)</sup>.

### Density

Vinegar has a density of approximately 0.96 [g/mL](#). The density level depends on the acidity of the vinegar.

# History

Vinegar has been made and used by people for thousands of years. Traces of it have been found in Egyptian urns from around 3000 [BC](#).<sup>[4]</sup>

In the [Bible](#), it is mentioned as something not very pleasant ([Ps.](#) 69:21, [Prov.](#) 25:20), but [Boaz](#) allows Ruth to "dip her piece of bread in the vinegar" ([Ruth](#) 2:14). [Nazirites](#), on the other hand, were not allowed to drink either wine vinegar or malt vinegar. [Jesus](#) was offered vinegar while on the cross according to the King James version of the Bible, yet actually it was sour wine or wine that was turning which was given out by women of charity to comfort people dying on the cross as this was a common daily occurrence as a Roman punishment of the time.

## Production

Vinegar is made from the [oxidation](#) of [ethanol](#) in [wine](#), [cider](#), [beer](#), fermented [fruit juice](#), or nearly any other liquid containing alcohol. Commercial vinegar is produced either by fast or slow [fermentation](#) processes. Slow methods are generally used with traditional vinegars and fermentation proceeds slowly over the course of weeks or months. The longer fermentation period allows for the accumulation of a nontoxic slime composed of [acetic acid bacteria](#) and soluble [cellulose](#), known as the [mother of vinegar](#). Fast methods add mother of vinegar (i.e. bacterial culture) to the source liquid and then add air using a [venturi pump](#) system or a [turbine](#) to promote oxygenisation to give the fastest fermentation. In fast production processes, vinegar may be produced in a period ranging between 20 hours and three days.

[Vinegar eels](#) (*Turbatrix aceti*), a form of [nematode](#), may occur in some forms of vinegar. These feed on the mother and occur in naturally fermenting vinegar. Most manufacturers [filter](#) and [pasteurize](#) their product before bottling to eliminate any potential adulteration.

## Types of vinegar

### White

So-called "white vinegar" (actually transparent in appearance), or sometimes referred to as spirit vinegar, can be made by oxidizing a [distilled alcohol](#).

Alternatively, it may be nothing more than a solution of [acetic acid](#) in water. Most commercial white vinegars are 5% acetic acid solutions, although some US states such as [Virginia](#) have laws prohibiting the sale of any product not made from acetous fermentation of alcohol as vinegar. They are made from [grain](#) (often [maize](#)) and water.

White vinegar is typically stronger and sharper than other vinegars, and as such is used in [pickling](#) recipes. It is also used for cleaning purposes.

## Malt

Malt vinegar is made by [malting barley](#), causing the [starch](#) in the grain to turn to [maltose](#). An [ale](#) is then [brewed](#) from the maltose and allowed to turn into vinegar, which is then aged. It is typically light brown in color.

A cheaper alternative, called "non-brewed condiment," is a solution of 4-8% acetic acid [colored](#) with [caramel](#) (usually [E150](#)). There is also around 1-3% citric acid present. Non-brewed condiment is more popular in the North of England, and gained popularity with the rise of the [Temperance movement](#) <sup>[\[citation needed\]](#)</sup>.

## Wine

[Wine](#) vinegar is made from red or white wine, and is the most commonly used vinegar in [Mediterranean](#) countries and [Central Europe](#). As with wine, there is a considerable range in quality. Better quality wine vinegars are matured in wood for up to two years and exhibit a complex, mellow flavor. Wine vinegar tends to have a less acidity than that of white or cider vinegars. There are more expensive wine vinegars made from individual varieties of wine, such as [Champagne](#), [Sherry](#), or [pinot grigio](#).

## Apple cider

Apple cider vinegar, otherwise known simply as cider vinegar, is made from [cider](#) or [apple must](#), and is often sold unfiltered, with a brownish-yellow color; it often contains [mother of vinegar](#). It is currently very popular, partly due to its alleged beneficial health and beauty properties (see below). Due to its acidity, apple cider vinegar can be very caustic, even burning the throat. If taken straight (as opposed to usage in cooking), it should be diluted (e.g. with fruit juice) before drinking. Others dilute it with warm water and some add honey. There have been reports of acid chemical burns of the throat in using the pill form.

## Fruit

Fruit vinegars are made from [fruit wines](#) usually without any additional flavouring. Common flavors of fruit vinegar include [apple](#), [black currant](#), [raspberry](#), [quince](#), and [tomato](#). Typically, the flavors of the original fruits remain tasteable in the final vinegar.

Most such vinegars are produced in Europe, where there is a growing market for high price vinegars made solely from specific fruits (as opposed to non-fruit vinegars which are infused with fruits or fruit flavors). [Persimmon](#) vinegar is popular in [South Korea](#), and [jujube](#) vinegar is produced in China. [Umeboshi](#) vinegar, a salty, sour liquid that is a by-product of *umeboshi* (pickled [ume](#)) production, is produced in Japan but is technically not a true vinegar.

## Balsamic

*Main article: [Balsamic vinegar](#)*

Balsamic vinegar is an aromatic, aged type of vinegar traditionally manufactured in [Modena, Italy](#), from the concentrated juice, or [must](#), of white grapes (typically of the [Trebiano](#) variety). It is very dark brown in color and its flavor is rich, sweet, and complex, with the finest grades being the end product of years of aging in a successive number of casks made of various types of wood (including oak, mulberry, chestnut, cherry, juniper, ash, and acacia). Originally an artisanal product available only to the Italian upper classes, balsamic vinegar became widely known and available around the world in the late 20th century. True balsamic is aged between 3 - 12 years. One can sometimes even find balsamics that have been aged for up to 100 years, though they are very expensive. The commercial balsamic sold in supermarkets is typically made with red wine vinegar or concentrated grape juice mixed with a strong vinegar which is laced with caramel and sugar. However produced, balsamic needs to be made from a grape product.

Balsamic has a high acid level, but the sweetness covers the tart flavor, making it very mellow.

## Rice

*Main article: [Rice vinegar](#)*

Rice vinegar is most popular in the cuisines of East and Southeast Asia. It is available in white (actually light yellow), red, and black variants. The [Japanese](#) prefer a light and more delicate rice vinegar for the preparation of [sushi](#) rice and salad dressings. Red rice vinegar is traditionally colored with [red yeast rice](#), although some Chinese brands use artificial [food coloring](#) instead. Black rice vinegar (made with black glutinous rice) is most popular in [China](#), although it is also produced in Japan (see [East Asian black](#), below). It may be used as a substitute for balsamic vinegar, although its dark color and the fact that it is aged may be the only similarity between the two products.

Some varieties of rice vinegar are sweetened or otherwise seasoned with spices or other added flavorings.

## Coconut

Coconut vinegar, made from the sap, or "[toddy](#)," of the [coconut palm](#), is used extensively in Southeast Asian cuisine (particularly in the Philippines, a major producer of the product), as well as in some cuisines of India. A cloudy white liquid, it has a particularly sharp, acidic taste with a slightly yeasty note.

## Cane

Cane vinegar, made from [sugar cane](#) juice, is most popular in the [Ilocos Region](#) of the northern Philippines (where it is called *sukang iloko*), although it is also produced in

France and the United States. It ranges from dark yellow to golden brown in color and has a mellow flavor, similar in some respects to rice vinegar, though with a somewhat "fresher" taste. Contrary to expectation, it is not sweeter than other vinegars, containing no residual sugar. In the Philippines, it is often labeled as *sukang maasim*, although this is simply a generic term meaning "sour vinegar."

## Raisin

Vinegar made from [raisins](#) is used in cuisines of the Middle East, and is produced in Turkey. It is cloudy and medium brown in color, with a mild flavor.<sup>[10][11]</sup>

## Date

Vinegar made from [dates](#) is a traditional product of the Middle East.

## Beer

Vinegar made from [beer](#) is produced in Germany, Austria, and the Netherlands. Although its flavor depends on the particular type of beer from which it is made, it is often described as having a malty taste. That produced in [Bavaria](#) is a light golden color, with a very sharp and not overly complex flavor.<sup>[13]</sup>

## Honey

Vinegar made from [honey](#) is rare, though commercially available honey vinegars are produced in [Italy](#) and [France](#).

## East Asian black

Chinese [black vinegar](#) is an aged product made from [rice](#), [wheat](#), [millet](#), or [sorghum](#), or a combination thereof. It has an inky black color and a complex, malty flavor. There is no fixed recipe and thus some Chinese black vinegars may contain added sugar, spices, or caramel color. The most popular variety, Chinkiang vinegar, originated in the city of [Zhenjiang](#), in the eastern coastal province of [Jiangsu](#), China, and is also produced in [Tianjin](#) and [Hong Kong](#).

A somewhat lighter form of black vinegar, made from rice, is also produced in Japan, where it is called *kurozu*. Since 2004 it has been marketed as a healthful drink; its manufacturers claim that it contains high concentrations of [amino acids](#).



[Cantonese](#) red vinegar

## Flavored vinegars

Popular *fruit-flavored vinegars* include those infused with whole [raspberries](#), [blueberries](#), or [figs](#) (or else from flavorings derived from these fruits). Some of the more exotic fruit-flavored vinegars include [blood orange](#) and [pear](#).

*Herb vinegars* are flavored with [herbs](#), most commonly [Mediterranean](#) herbs such as [thyme](#) or [oregano](#). Such vinegars can be prepared at home by adding sprigs of fresh or dried herbs to store-bought vinegar; generally a light-colored, mild tasting vinegar such as that made from white wine is used for this purpose.

*Red vinegar* is of [Cantonese](#) origin and is made from rice wine, sugar and herbs including ginger, cloves and other spices.

*Spiced vinegar*, from the Philippines (labeled as spiced *sukang maasim*), is flavored with chili peppers, onions, and garlic.

## Kombucha

Kombucha vinegar, also referred to as probiotic vinegar,<sup>[[citation needed](#)]</sup> is made from [kombucha](#), a symbiotic culture of yeast and bacteria. The bacteria produce a complex array of [nutrients](#) and populate the vinegar with symbiotic bacteria which some claim promote a healthy digestive tract, though no scientific studies have shown this to date. Kombucha vinegar is primarily used to make a [vinaigrette](#) and flavored by adding strawberries, blackberries, mint, or blueberries at the beginning of fermentation.

## Culinary uses

Vinegar is commonly used in [food](#) preparation, particularly in [pickling](#) processes, [vinaigrettes](#), and other [salad dressings](#). It is an ingredient in sauces such as [mustard](#), [ketchup](#), and [mayonnaise](#). Vinegar is an essential component of [chutneys](#). It is often used as a [condiment](#). [Marinades](#) often contain vinegar.

- Condiment for [fish and chips](#) - [Britons](#) commonly use *malt vinegar* (or non-brewed condiment) on [chips](#); it may be used in other territories where [British](#)-style fish and chips are served.
- Flavouring for [potato chips](#) - In the case of American-style chips or crisps, many manufacturers of pre-packaged potato chips/crisps feature a variety flavored with vinegar and salt.
- Condiment for French Fries, particularly in the [Northeastern United States](#) and Canada.
- [Vinegar pie](#) - is a North American [dessert](#) made with a vinegar to one's taste.
- Pickling - any vinegar can be used to [pickle](#) foods.
- Cider vinegar and sauces - *cider vinegar* is not usually suitable for use in delicate sauces.
- Substitute for lemon juice - *cider vinegar* can usually be substituted for lemon juice in recipes and obtain a pleasing effect.
- Saucing roast lamb - pouring *cider vinegar* over the meat when roasting lamb, especially when combined with honey or when sliced onions have been added to the roasting pan, produces a tasty sauce.
- Sweetened vinegar (see *Flavored vinegars* above) is used in the dish of Pork Knuckles and Ginger Stew which is made among Chinese people of Cantonese backgrounds to celebrate the arrival of a new child.
- [Sushi](#) rice - Japanese use *rice vinegar* as an essential ingredient for sushi rice.
- Red vinegar - Sometimes used in Chinese soups

## Medicinal uses

Many remedies and treatments have been ascribed to vinegar over millennia in many different cultures. However, few have been verifiable using controlled medical trials and several that are effective to some extent have significant risks and side effects.

### Cholesterol

A scientific study published in 2006 concluded that a test group of rats fed with [acetic acid](#) (the main component of vinegar) had "significantly lower values for serum total cholesterol and triacylglycerols", among other health benefits.

### Blood glucose control and diabetic management



Small amounts of vinegar (approx. 20 mls or two tablespoons of domestic vinegar) added to food, or taken along with a meal, have been shown by a number of medical trials to reduce the [glycemic index](#) of carbohydrate food for people with and without diabetes. This has also been expressed as lower glycemic index ratings in the region of 30%.

## Diet control

Multiple trials indicate that taking vinegar with food increases satiety (the feeling of fullness) and so reduces the amount of food consumed. It has been proposed that a single application of vinegar can lead to reduced food intake for a whole day. One study suggested that overweight patients would likely be reluctant to use sufficient vinegar on a daily basis: "The findings of this group suggest that compliance with ingesting a high-dose vinegar beverage is challenging, even when it is derived from a fruit vinegar, and that weight/fat loss remains to be confirmed.

## Treatment for jellyfish stings

Applying vinegar to [jellyfish](#) stings deactivates the [nematocysts](#). However, placing the affected areas into hot-water is a more effective treatment because the venom is deactivated by heat. The latter requires immersion in 45 degrees celsius (113 F) water for at least four minutes for the pain to be reduced to less than that of vinegar. However, vinegar should not be applied to [portuguese man o' war](#) stings, since their venom is different and vinegar can actually cause the [nematocysts](#) from their venom to discharge, making the pain worse. The hot water immersion or cold ice pack treatments have been shown to be the best for treatment of [portuguese man o' war](#) stings.

## Traditional and anecdotal treatments

- [Hippocrates](#) prescribed vinegar for many ailments, from [skin rash](#) to [ear infection](#).
- Vinegar is a [folk medicine](#) used in [China](#) to prevent the spread of [virus](#) such as SARS ([Severe Acute Respiratory Syndrome](#)) and other [pneumonia](#) outbreaks:
- In February 2003, an outbreak in China's [Guangdong](#) province of an atypical pneumonia caused massive demand and soaring prices for vinegar, [isatis](#) root, and other [medicines](#) believed to be useful in killing the infectious agent.<sup>[36]</sup>
- The therapeutic use of vinegar is recorded in the second verse of the nursery rhyme "[Jack and Jill](#)": "Went to bed and bound his head / With vinegar and brown paper." As with some nursery rhymes, there is truth in the story. The vinegar used would likely have been cider vinegar.
- Apple cider vinegar is a much more useful [astringent](#) than ice and will reduce inflammation, bruising and swelling in approximately a third of the time that ice will take. Application is directly onto the skin with a flannel, and left on for an hour or so.<sup>[citation needed]</sup>



- Apple cider vinegar in particular is often touted as a medical aid, from cancer prevention to alleviation of joint pain to weight loss. Claims of its benefits go back at least to [Hippocrates](#). In 1958, Dr. D. C. Jarvis made the remedy popular with a book that sold 500,000 copies.
- Claims that cider vinegar can be used as a beauty aid also persist, it is touted as a remedy for Acne skin conditions when diluted 50:50 with water and used as a toner, despite the fact that apple cider vinegar can sometimes be very dangerous to the eyes. The acid will burn and the eyes will become red, but no damage to the eyes has ever been described. If the vinegar contains mother of vinegar the slime bacteria of the mother can cause [Ophthalmia neonatorum](#).<sup>[[citation needed](#)]</sup>
- Many believe that vinegar is also a cure to mild to moderate sunburn when soaked on the area with a towel or in a bath.<sup>[[citation needed](#)]</sup>
- Cider vinegar is also claimed to be a solution to [dandruff](#), in that the acid in the vinegar kills the fungus *Malassezia furfur* (formerly known as *Pityrosporum ovale*) and restores the chemical balance of the skin.<sup>[[citation needed](#)]</sup>
- Cider vinegar is a natural remedy for [yeast infections](#), when diluted with water and used as a douche.<sup>[[39](#)]</sup>

## Veterinary treatment

Vinegar along with [hydrogen peroxide](#) (H<sub>2</sub>O<sub>2</sub>) is used in the [livestock](#) industry to kill [bacteria](#) and viruses before refrigeration storage. A chemical mixture of [peracetic acid](#) is formed when [acetic acid](#) is mixed with hydrogen peroxide. It is being used in some [Asian](#) countries by [aerosol sprays](#) for control of [pneumonia](#). A mixture of five-percent acetic acid and three-percent hydrogen peroxide is commonly used.<sup>[[citation needed](#)]</sup>

Apple cider vinegar can be used to prevent some problems in the digestive systems of dogs, such as E. Coli. The vinegar is acidic until it enters the dog's body, and it lines its intestines. E. coli cannot attach to an alkaline vinegar-coated intestine.<sup>[[citation needed](#)]</sup>

## Cleaning uses

White vinegar is often used as a natural household cleaning agent. With most such purposes dilution with water is recommended for safety, reduced risk of damaging certain surfaces, and budgetary reasons. It is especially useful for cleaning mineral deposits on glass, inside a [coffee maker](#), or other smooth surfaces. Care should be taken to not allow contact with eyes (if such contact occurs, the eyes should be flushed immediately and persistently with warm water) or skin (the affected skin area should be washed thoroughly after use). See [Household chemicals](#).

## Agricultural and horticultural uses

### As a herbicide

Vinegar can be used as a [herbicide](#) as shown by scientific trials reported by the US Dept of Agriculture in 2002. Vinegar made from natural products classified as [organic](#) and so there is interest in it being used on farms/orchards/gardens certified as organic. The trials showed that a number of common weeds could be effectively controlled using vinegar with 5% to 20% [acetic acid](#). The lower concentration is less effective. A crop of [corn](#) can be sprayed with vinegar at 20% strength without causing harm to that crop and so it can be used to help keep a corn crop clear of weeds.

Acetic acid is not absorbed into root systems and so vinegar will kill top growth but [perennial plants](#) will reshoot.

Commercial vinegar available to consumers for household use does not exceed 5% and solutions above 10% need careful handling since they are corrosive and damaging to skin. Stronger solutions (i.e. greater than 5%) that are labeled for use as herbicides are available from some retailers.<sup>[42]</sup>

## Miscellaneous

- When a bottle of vinegar is opened, [mother of vinegar](#) may develop. It is considered harmless and can be removed by filtering.
- When vinegar is added to [sodium bicarbonate](#) (baking soda), it produces a volatile mixture of [carbonic acid](#) rapidly decomposing into water and carbon dioxide bubbles, making the reaction "fizz". It is exemplified as the typical acid-base reaction in school science experiments. The salt that is formed is [sodium acetate](#).
- Vinegar is a very effective way to remove [rust](#) from metals.
- Vinegar neutralizes [lye](#), a strong [base](#).
- Some countries, Canada as an example, prohibit the selling of vinegar over a certain percentage acidity.
- According to the Prophet Muhammed, vinegar is one of the best condiments (Ref. [Sahih Muslim](#) Book 023, Number 5091).
- [Lord Byron](#) would consume vast quantities of white vinegar in an attempt to keep his complexion pale. <sup>[citation needed]</sup>
- Some people also believe that vinegar can be used as a [detoxification](#) agent for [marijuana](#), but this is a myth.<sup>[44][45][46][47]>[48]</sup>

- [Posca](#), a Roman legionaries' basic drink was vinegar mixed with water and optional honey.<sup>[\[49\]](#)</sup>