

## Fermentation in Food and Wine

Written by Friends' Contribution

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**Fermentation** in [food processing](#) typically is the conversion of [carbohydrates](#) to [alcohols](#) and carbon dioxide or organic acids using

[yeasts](#)

,  
[bacteria](#)

, or a combination thereof, under

[anaerobic](#)

conditions. A more restricted definition of fermentation is the chemical conversion of

[sugars](#)

into

[ethanol](#)

. The science of fermentation is known as

[zymurgy](#)

.

Fermentation usually implies that the action of [microorganisms](#) is desirable, and the process is used to produce alcoholic beverages such as

[wine](#)

,  
[beer](#)

, and

[cider](#)

. Fermentation is also employed in the

[leavening](#)

of

[bread](#)

, and for preservation techniques to create

[lactic acid](#)

in sour foods such as

[sauerkraut](#)

,  
[dry sausages](#)

,  
[kimchi](#)

and

[yogurt](#)

, or vinegar (

[acetic acid](#)

) for use in

[pickling](#)

foods.

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The primary benefit of fermentation is the conversion of sugars and other [carbohydrates](#) , e.g.,  
converting  
[juice](#)  
into  
[wine](#)  
, grains into  
[beer](#)  
, carbohydrates into  
[carbon dioxide](#)  
to  
[leaven](#)  
bread, and sugars in vegetables into preservative  
[organic acids](#)  
.

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The process of [fermentation](#) in [wine](#) is the [catalyst](#) function that turns [grape juice](#) into an  
[alcoholic beverage](#)  
. During fermentation  
[yeast](#)  
interact with  
[sugars](#)  
in the juice to create  
[ethanol](#)  
, commonly known as ethyl alcohol, and  
[carbon dioxide](#)  
(as a  
[by-product](#)  
). In  
[winemaking](#)  
the  
[temperature](#)  
and speed of fermentation is an important consideration as well as the levels of  
[oxygen](#)  
present in the  
[must](#)  
at the start of the fermentation. The risk of  
[stuck fermentation](#)  
and the development of several  
[wine faults](#)  
can also occur during this stage, which can last anywhere from 5 to 14 days for

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*primary fermentation*

and potentially another 5 to 10 days for a

[secondary fermentation](#)

. Fermentation may be done in stainless steel tanks, which is common with many white wines like

[Riesling](#)

, in an open wooden vat, inside a

[wine barrel](#)

and inside the

[wine bottle](#)

itself as in

[the production](#)

of many

[sparkling wines](#)

.

During fermentation there are several factors that winemakers take into consideration. The most notable is that of the internal temperature of the must. The biochemical process of fermentation itself creates a lot of residual [heat](#) which can take the must out of the ideal temperature range for the wine. Typically white wine is fermented between 64-68

[°F](#)

(18-20

[°C](#)

) though a wine maker may choose to use a higher temperature to bring out some of the complexity of the wine. Red wine is typically fermented at higher temperatures up to 85

[°F](#)

(29 °C). Fermentation at higher temperatures may have adverse effect on the wine in stunning the yeast to inactivity and even "boiling off" some of the flavors of the wines. Some winemakers may ferment their red wines at cooler temperatures more typical of white wines in order to bring out more fruit flavors.

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To control the heat generated during fermentation the winemaker has to choose a suitable vessel size or to use cooling devices of various sorts from the ancient [Bordeaux](#) traditions of placing the fermentation vat on top of blocks of ice to today's modern use of sophisticated fermentation tanks with built in cooling rings.

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A risk factor involved with fermentation is the development of chemical residue and spoilage which can be corrected with the addition of [sulfur dioxide](#) (SO<sub>2</sub>), although excess SO<sub>2</sub> can lead to a wine fault. A winemaker who wishes to make a wine with high levels of

[residual sugar](#)

(like a

[dessert wine](#)

) may stop fermentation early either by dropping the temperature of the must to stun the yeast or by adding a high level of alcohol (like

[brandy](#)

) to the must to kill off the yeast and create a

[fortified wine](#)

.

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