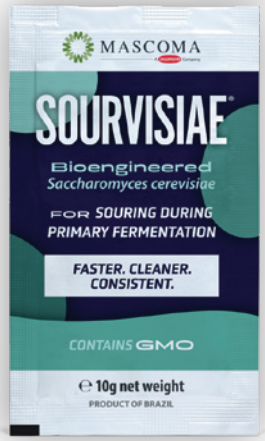
MASCOMA
A LALLEMAND Company

SOURVISIAE®

FASTER, CLEANER, MORE CONSISTENT SOUR BEERS

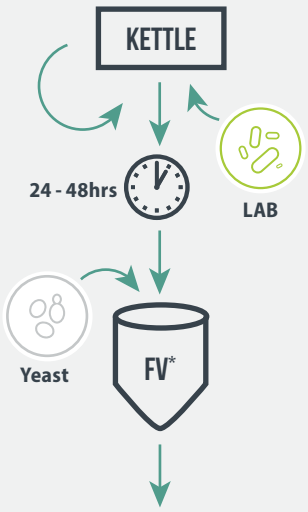
Traditional methods for brewing sour beers involve fermentation with lactic acid bacteria and yeast. The most common approach in recent years has been using the kettle souring method to pre-sour the wort prior to fermentation. In this method, sterile unhopped wort is inoculated with bacteria, which is held at a precise temperature for 24-48 hours, to allow the development of lactic acid. The wort is then boiled (with hops as desired) and then transferred to a fermenter and inoculated with a brewing yeast strain



Mascoma Sourvisiae® is a modern fermentation solution that produces sour beers through one simple fermentation step. There is no need to pre-sour the wort, so the production process is fast, simple, and consistent (Figure 1).

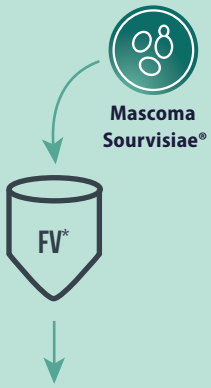
This document describes in detail how to use Sourvisiae® to create a variety of sour beer styles with differing levels of acidity. With consistent levels of lactic acid and neutral flavor, Sourvisiae® is ideal for traditional and modern sour beer styles as well as providing an excellent base for fruited sours.

TRADITIONAL KETTLE SOUR



1. Boil wort 2-5 min (no hops)
2. Cool wort to bacteria fermentation temperature and return to kette.
3. Inoculate bacteria and incubate for 24-48 hrs.
4. Boil 60 min (with hops)
5. Cool wort to yeast fermentation temperature while transferring to FV.
6. Pitch yeast
7. Ferment to full attenuation.

SOURVISIAE® FERMENTION



1. Brew as normal (hopped wort).
2. Pitch Sourvisiae® yeast.
3. Ferment to full attenuation.

*FV = Fermentation Vessel

FIG. 1: Traditional kettle sour vs Sourvisiae® fermention for producing sour beers.

BENEFITS

- › Sour and ferment in one simple step
- › Clean and neutral flavor
- › Consistent performance
- › Shorter process time
- › Low cross-contamination risk
- › Hop tolerant

For more information, you can reach us via email at
brewing@lallemand.com

LALLEMAND

Mascoma Sourvisiae® is a bioengineered (GMO) strain of *Saccharomyces cerevisiae*.

Sourvisiae® contains a single genetic modification, a lactate dehydrogenase gene from a food microorganism, which was incorporated into the genome through the process of homologous recombination (Figure 2). By expressing this gene, Sourvisiae® can produce both ethanol and lactic acid during fermentation (Figure 3). This allows the brewer to ferment and sour the beer in one simple step.

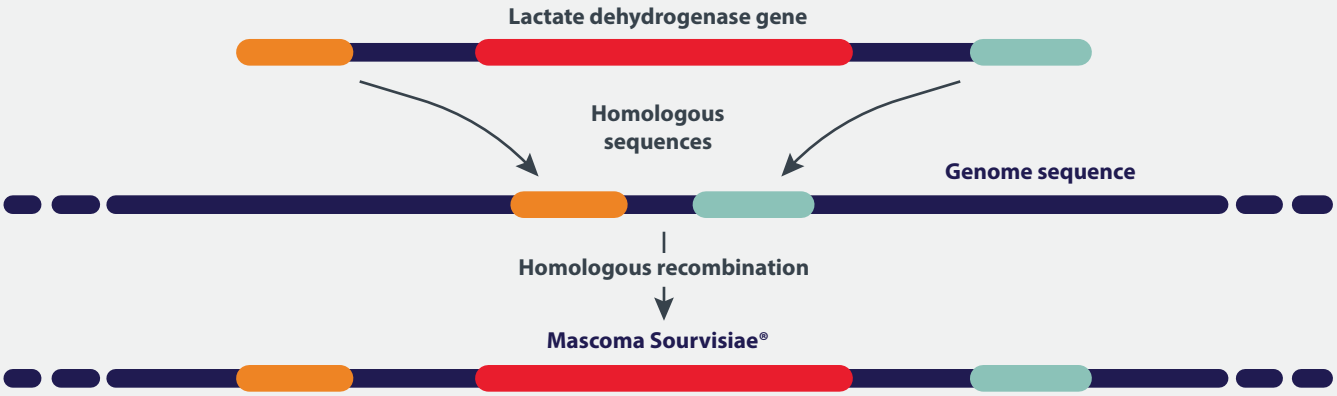


FIG. 2: Incorporation of a lactate dehydrogenase gene into the *Saccharomyces cerevisiae* genome through homologous recombination.

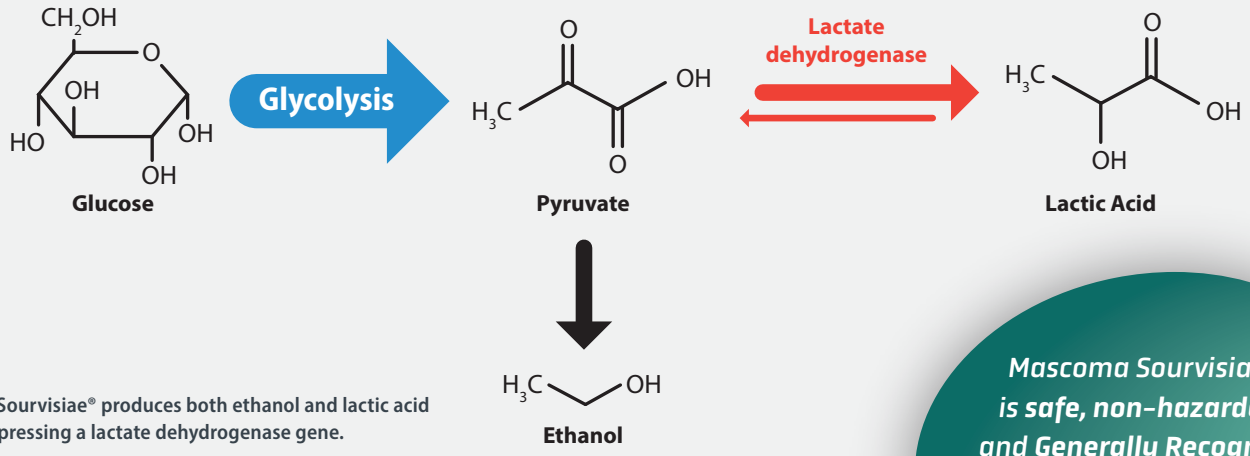


FIG. 3: Sourvisiae® produces both ethanol and lactic acid by expressing a lactate dehydrogenase gene.

Mascoma Sourvisiae® is safe, non-hazardous and Generally Recognized As Safe (GRAS) by the US Food and Drug Administration.

Simple Fermentations

Sourvisiae® is a *S. cerevisiae* yeast that is pitched like a conventional yeast strain and ferments in a normal fermentation time comparable to a traditional ale strain. To determine the optimal pitch rate for your brew, please refer to the **Lallemand Pitch Rate Calculator**.[1]

Sourvisiae® will efficiently metabolize glucose, maltose and maltotriose, but will not over-attenuate by metabolizing dextrins. Sourvisiae® will not metabolize lactose, so this sugar can be used to sweeten or add body to the beer. Sourvisiae® is highly hop tolerant and well suited for hoppy sour styles. The final density with Sourvisiae® is slightly higher than the parental strain due to the presence of lactic acid, even though the same amount of sugar is consumed (Figure 4).

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Controlling Lactic Acid Levels

A typical fermentation with Sourvisiae® will reach a final pH of 3.0-3.2 and lactic acid concentrations of 8-15 h/L. It is important to monitor gravity, pH, and titratable acidity (TA) throughout fermentation. Measurement of TA in addition to pH is important because the pH of the beer is not linearly correlated with acid concentration (Figure 5). The pH buffers (stabilizes) as it approaches 3.0 and so larger increases in acidity result in smaller changes in pH at this point. TA, on the other hand, represents the actual concentration of lactic acid. Using TA to track acid production will result in more consistent lactic acid levels from one brew to the next. Visit our website for more information about **Titratable Acidity**.[2]

A beer with pH 3.0-3.2 and TA of 8-15 g/L is quite sour. If lower levels of lactic acid are desired, a more sessionable sour beer can be produced by either co-pitching with another yeast strain, or blending the fully fermented beer as described below.

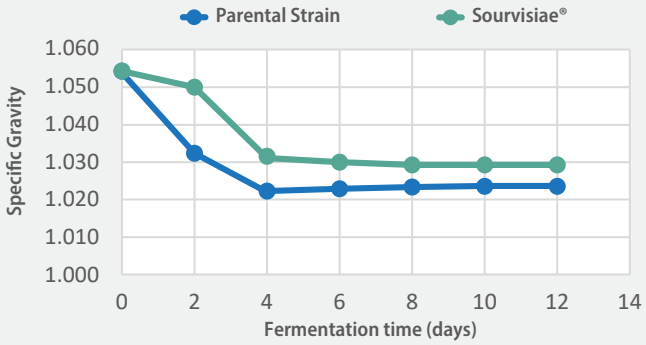


FIG. 4: Fermentation kinetics of Sourvisiae® (green) compared to a conventional ale strain (blue). A slightly higher final gravity and lower apparent attenuation are observed for Sourvisiae® fermentations due to the presence of lactic acid, even though the same amount of sugar is metabolized (real attenuation is the same).

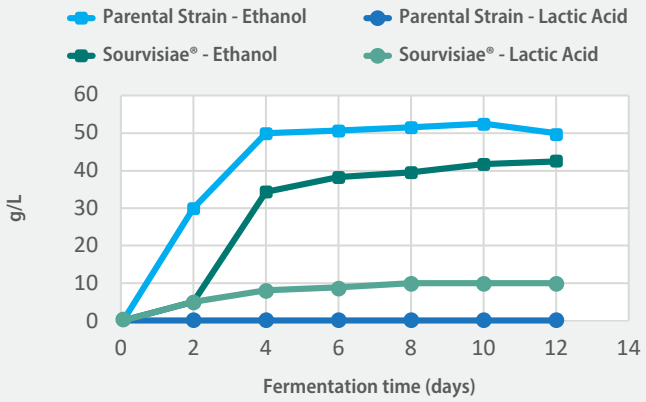


FIG. 5: Production of ethanol and lactic acid from Sourvisiae® compared to a conventional ale strain.

Co-Pitching Yeast

Co-pitching with a secondary conventional brewing yeast results in lower levels of lactic acid since both strains are competing for the same sugars. In most cases, a 50/50 blend of Sourvisiae®/secondary yeast strain will reduce lactic acid levels by 50% or more and result in a pH around 3.5. The amount of lactic acid produced is proportional to the percentage of Sourvisiae® in the pitch, but the results are not always linear and may vary depending on the secondary yeast strain, recipe, and fermentation conditions. It is recommended to start with a 50/50 co-pitch blend and then optimize from there to reach a desired pH/TA level for a specific beer. Use dry yeast for easy measurement and consistent results when co-pitching.

See the **Lallemand Sour Strain Solutions Bifold**[3] and the **LalBrew App**[4] for co-pitching yeast recommendations.

Blending the finished beer

By blending post-fermentation, the brewer is able to specifically target their desired lactic acid level. It is important to note that when blending a sour beer, measuring TA is critical to obtain consistent results. A beer with TA 1.0% lactic acid diluted by half will result in a beer with TA 0.5% lactic acid. Since pH is not linearly correlated with lactic acid concentration (Figure 6), pH cannot be used to accurately calculate the correct dilution required to achieve the desired amount of lactic acid in the final beer.

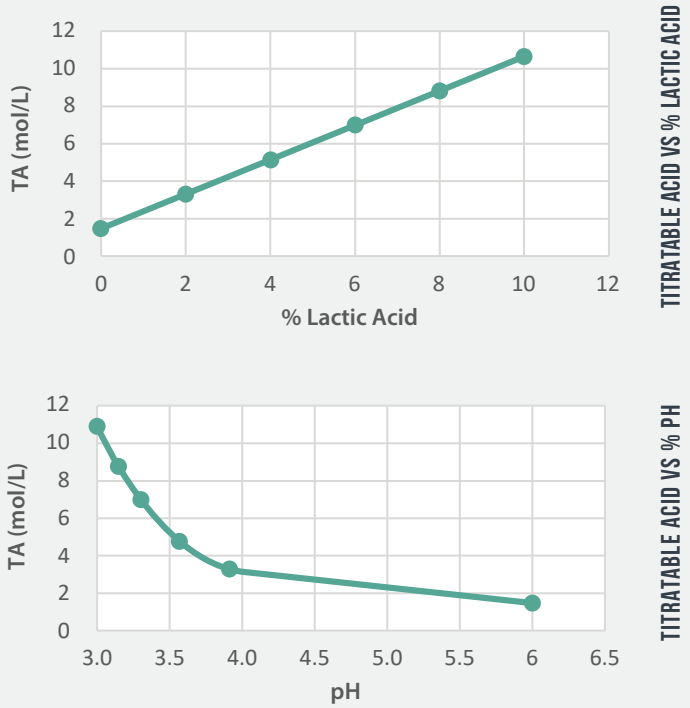


FIG. 6: Correlation of titratable acid with lactic acid concentration (A) and pH (B).

Process Considerations for lactic acid yeast

Sourvisiae® is a simple solution for producing sour beers, but the fact that it produces lactic acid during fermentation requires attention to certain process steps including calculating attenuation & ABV, repitching, propagation, and bottle conditioning.

ATTENUATION & ABV CALCULATION

Since Sourvisiae® produces both lactic acid and alcohol during fermentation, there are implications for determining the attenuation of the fermentation. When alcohol is produced there is a loss of mass in the form of CO_2 resulting in a decrease in density. When lactic acid is produced, there is no CO_2 released and therefore no loss of mass and no change in density. Sourvisiae® fermentations have a real attenuation that is the same as the parental strain (same amount of sugar consumed), but Sourvisiae® will have a higher FG and lower apparent attenuation as determined by measuring density (Figure 3). The amount of lactic acid produced is approximately equal to the reduction of alcohol levels compared to a conventional ale strain (Figure 4). The reduced alcohol level is proportional to the reduced attenuation and **ABV can be calculated with standard calculators using density data**. Typical results for fermentation with Sourvisiae® compared to a conventional brewing strain are shown in Table 1.

TABLE 1: Typical results for fermentation with Sourvisiae® compared to a conventional brewing strain.

	Conventional Brewing Strain	SOURVISIAE® (FASTER. CLEANER. CONSISTENT.)
OG	12°P	12°P
FG	2°P	2.8 - 3.2°P
LACTIC ACID	0%	0.8 - 1.2%
PH	4.4	3.0 - 3.2°P
APPARENT ATTENUATION	83%	73 - 77%
ALCOHOL	5.3%	4.7 - 4.9%

REPITCHING & BREWHOUSE PROPAGATION

Repitching is not recommended due to inconsistent results that could occur in the final beer. However, Sourvisiae® performs well when propagated by combining multiple brews into one fermenter. Simply pitch the appropriate amount of Sourvisiae® for your first wort volume and add your second batch of wort within 24 hours of this first batch.

BOTTLE CONDITIONING

Bottle Conditioning with Sourvisiae® as the fermenting strain is not recommended. The priming sugar will be converted into both lactic acid and ethanol, so levels of lactic acid, ethanol and CO_2 in the beer may be inconsistent. For best results, use a fresh pitch of a separate strain such as LalBrew CBC-1™ to bottle condition Sourvisiae® fermentations.

CROSS CONTAMINATION - LOW RISK COMPARED TO WILD YEAST

Many sour beers are fermented with wild yeast strains that require special sanitary conditions or separate equipment. Sourvisiae® is a *S. cerevisiae* strain and does not require special sanitation measures. Sourvisiae® is sensitive to normal brewery CIP and no special sanitation procedures are required. Sourvisiae® is not detected on wild yeast media and the yeast viability drops quickly in the acidic environment at end of fermentation, so the risk of cross-contamination is considered low.

QUICK FACTS

MASCOMA SOURVISIAE®

BEER STYLES
Sour ales

AROMA
Tangy, intensely sour, slightly fruity

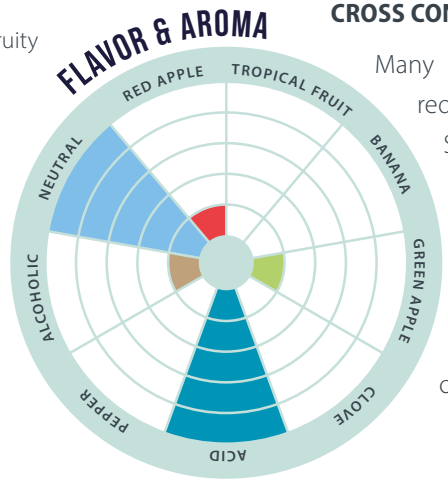
ATTENUATION RANGE
76 - 82 %

TEMPERATURE RANGE
15 - 22°C (59 - 72°F)

FLOCCULATION
High

ALCOHOL TOLERANCE
12% ABV

PITCHING RATE
50 - 100g/hL



REFERENCES
1 https://www.lallemandbrewing.com/brewers-corner/brewing-tools/pitching-rate-calculator/
2 https://www.lallemandbrewing.com/brewers-corner/brewing-tools/measuring-titratable-acidity/
3 https://www.lallemandbrewing.com/wp-content/uploads/2022/11/Sour-Solutions-Bifold-ENG-Digital-WildBrew-Mascoma-Best-Practice.pdf
4 https://www.lallemandbrewing.com/lalbrew-app/