2016-17 Scott Laboratories Cider Handbook

Arkansas Black

Ashmeads Kernal

Baldwin

Black Twig

Crow Egg

Goldrush

Gravenstein

Grimes Golden

Idared

Jonathan

Redfield

Roxbury Russet

Stayman

Sweet Winesap

Winesap

Yellow Bellflower

Images courtesy of Albemarle CiderWorks

Welcome

Last year's version of our regular Fermentation Handbook marked a milestone, as it was the twentieth edition of what has now become an industry resource. As the 2016–17 issue of our Cider Handbook goes to print, we embrace many exciting changes here at Scott Labs.

On September 15, 2015, our fearless leader, Bruce Scott, stepped down as President of the company. It was 40 years to the day that he had joined Scott Laboratories, alongside his father, brother and just a handful of other employees. The next 40 years saw tremendous change and growth to the industry that we love. One of these changes has been an explosion in other fermented beverages. Cider, mead, and even hard sodas are taking market share of a landscape that was previously dominated by beer and wine. For us, this change is very exciting. Not only can we expand our portfolio of products, but we can continue to learn and broaden our breadth of knowledge.

We are continually delighted by you, the cider industry, by your ability to innovate and evolve, and your willingness to experiment. As we begin the design process each year for this Handbook, we research the packaging and general trends within the industry. Each year is so different from the last — new graphic design trends emerge on labels, we see more cider in cans instead of bottles, and a wider range of varietal and flavored ciders have burst on the scene.

It is always our goal with this Handbook to provide a valuable resource with the most current information available. We are grateful to once again feature research pieces from several universities across the country. Special thanks to Cornell University, University of Vermont, Virginia Tech, and WSU Mt. Vernon for their contributions. We continue to learn from their exciting research and appreciate their efforts to propel the industry forward.

As we go to print this year, we are excited to have Alex and Zachary Scott at the helm. Having both been with the company for a dozen-plus years, their roles are an evolution reflective of the growth of the company. We are excited by this new generation of leadership, looking ahead at growth and creativity, while honoring 82 years of tradition.

As always, please feel free to contact us anytime. We look forward to another year of great cider!

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Vendor Notice

The information in this booklet is, to the best of our knowledge, true and accurate. The data and information, however, are not to be considered as a guarantee, expressed or implied, or as a condition of sale of our products. Furthermore, it is understood by both buyer and vendor that cider is a natural product. Circumstances such as fruit quality and cellar conditions are infinitely variable. It is the responsibility of the buyer to adapt the use of our products to such circumstances. There is no substitute for good cidermaking practices or ongoing vigilance.

Please Note

Trade of cider between the United States, Canada and other nations and/or trade blocs (such as the European Community) may involve restrictions. In particular these may involve proscription or limitation on the allowable levels of certain ingredients in fermentation aids, fining agents or stabilization products. To the best of our knowledge, all products (other than lysozyme products) described in this Handbook are legal for cider made and sold in the United States and Canada. Conditions of trade with other nations and trade blocs are subject to ongoing change beyond the control of Scott Laboratories, Inc. or of Scott Laboratories, Ltd. It is the responsibility of users of our products to be informed of current restrictions of other countries or trade blocs to which they wish to export and to use only products and product levels which conform to those restrictions.

Premium Yeast

Overview

Yeast has been an important part of our portfolio ever since our predecessor company (Berkeley Yeast Laboratory) was founded in 1933. Our first commercial yeast offerings consisted of strains given to us from the collection of the University of California in 1933. The College of Agriculture at Berkeley had safeguarded them throughout the dark years of prohibition. In each of the 83 subsequent years, we have learned and evolved. We are uniquely positioned to assist cidermakers in meeting each year's new challenges.

Basics

Every cider fermentation presents different challenges. Issues begin with the product to be fermented. Is it freshly processed fruit or purchased juice or from concentrate? Even if the source is the same, critical factors will vary from month to month and year to year. Sugar, nutrient levels, nitrogen, acidity and NTU levels will be different. For fermentations to be successful, it is important for cidermakers to know and understand their juice. Analysis for Brix, pH, TA and nitrogen levels should always be done and conditions of the fermentation should be considered. This should always occur *prior* to inoculating with yeast. In particular:

Brix

What is the Brix of the juice? The yeast strain chosen should be able to tolerate the alcohol produced from this Brix level. *(See yeast strain selection charts on page 6.)*

pH and SO_2

The effectiveness of SO_2 is directly related to the pH. SO_2 additions should never be standardized. They must ALWAYS be adjusted according to the pH and conditions of the fruit. Additional SO_2 may be necessary if the fruit is overripe, underripe, or compromised.

YAN

What is the YAN (Yeast Assimilable Nitrogen) of the juice? The correct nutrient additions can be decided once the YAN and Brix have been determined. The nutrient needs of the specific yeast strain being used must be considered.

Temperature

What will the fermentation temperature be? Choose a yeast strain that fits within the determined temperature range. Do not stress your yeast by keeping it at the lowest or highest end of its temperature tolerance range.

YSEO

YSEO is a unique and innovative process for yeast developed by Lallemand. The benefits of using the YSEO process are:

- Reduced lag phase
- Better adaptation to stressful conditions
- Optimized fermentation
- Reduced potential for VA

Protocol

Easy Steps for Optimal Yeast Rehydration

STEP 1
Add Go-Ferm or Go-Ferm Protect Evolution to warm water

STEP 2
Cool, add yeast, stir, let stand for 20 minutes, stir

Stir

STEP 3
Atemperate. Repeat if necessary.

STEP 4
Inoculate

Proper yeast rehydration is one of the most important steps to help ensure a strong and healthy fermentation. Normal inoculation for active dried yeast is 2 lb/1000 gal (25 g/hL). when added properly, a 2 lb/1000 gal (25 g/hL) addition of active dried yeast results in an initial cell concentration of 3–4 million viable cells per milliliter of juice. Under favorable conditions, the initial cell population may increase up to 100–150 million viable cells per milliliter of juice before growth stops and alcoholic fermentation begins. This biomass increase is critical for healthy fermentations. When juice is at higher initial Brix, increased inoculation rates are recommended. When using higher rates, be sure to maintain a ratio of 1 part yeast to 1.25 parts yeast rehydration nutrient. Careful rehydration, atemperation and inoculation are all important to help prevent sluggish or stuck fermentations.

Visit www.scottlab.com for a video animation of this protocol

USAGE

1. Suspend 2.5 lb/1000 gal (30 g/hL) of Go-Ferm or Go-Ferm Protect Evolution in 20 times its weight of clean, chlorine free, 43°C (110°F) water. (For example: 2.5 lb rehydration nutrient x 20 = 50 ÷ 8.33 lb/gal water = 6 gal water.) If the water temperature is not high enough, the yeast rehydration nutrient may not go entirely into solution. *Please see page 25 for information on yeast rehydration nutrients.*

   Important: If not using a yeast rehydration nutrient, water temperature should begin at 40°C(104°F) to avoid harming the yeast.

2. Once the temperature of the yeast rehydration nutrient solution has dropped to 40°C (104°F), add 2 lb/1000 gal (25 g/hL)* of active dried yeast. Stir gently to break up any clumps. Let suspension stand for 20 minutes, then stir gently again. Live yeast populations decline when allowed to stand for more than 30 minutes.

   Note: Foaming is not an indicator of yeast viability.

3. Slowly (over a period of 5 minutes) combine an equal amount of the juice to be fermented with the yeast suspension. This will help the yeast adjust to the cooler temperature of the juice and will help avoid cold shock caused by a rapid temperature drop exceeding 10°C(18°F). This atemperation step may need repeating for very low temperature juice. Each atemperation step should last about 15–20 minutes.

   For every 10°C(18°F) temperature difference between the juice and the yeast slurry, an atemperation step must be performed.

   For example, for a juice temperature of 20°C (68°F) and yeast slurry temperature of 40°C (104°F), two atemperation steps are required.

4. Add the yeast slurry to the bottom of the fermentation vessel just as you begin filling the vessel with juice. This is especially important for large tanks with long filling times or when inoculating with strains that are sensitive to the competitive factor (*refer to page 6*). This will allow the yeast a head start over indigenous organisms.

Note: Copies of "Easy Steps for Optimal Yeast Rehydration" may be downloaded in Spanish, French and English from our website: www.scottlab.com.

*The yeast dosage can vary depending on the initial Brix, manufacturer's recommendations and the sanitary state of the fruit, juice or facility.

Cider Yeast Strains

	58W3	71B	Alchemy I	BA11	BM 4x4	C (Lalvin C)	Cross Evolution	CVW5	D21	DV10	EC1118	Fermivin Champion	Fermivin PDM	K1 (V1116)	M2	ICV OKAY	ICV Opale	QA23	R2	Rhône 4600	R-HST	Sensy	VIN 13	W15
Page	7	7	7	7	7	7	7	7	8	8	8	8	8	8	8	9	8	8	9	9	9	9	9	9
S. cerevisiae cerevisiae	○	○		○					○				○	○	○		○			○	○			○
S. cerevisiae bayanus						○		○		○	○	○						○	○					
Yeast hybrid							○									○						○	○	
Yeast blend			○		○																			
Neutral										💧	💧	💧	💧								💧			
Esters	💧	💧	💧	💧				💧						💧	💧	💧	💧		💧	💧			💧	
Enhanced varietal character	💧		💧		💧		💧		💧							💧	💧	💧				💧	💧	💧
Mouthfeel	💧			💧	💧		💧		💧						💧						💧	💧		💧
Degrades Malic Acid		💧				💧																		
Non H_2S or SO_2 producing																💧						💧		
Alcohol Tolerance[1]	14%	14%	15.5%	16%	15%	16%	15%	15%	16%	17%	18%	17%	16%	18%	15%	16%	14%	16%	16%	15%	15%	14.5%	16.5%	16%
Relative Nitrogen Needs[2]	Med.	Low	Med.	High	High	Low	Low	Low	Med.	Low	Low	Low	—	Low	High	Low	Med.	Low	High	Low	Med.	Low	Low	High
Temperature Range (°F)[3]	54-77	59-85	56-61	50-77	64-82	60-85	58-68	57-82	61-82	50-95	50-86	60-85	58-84	50-95	59-86	54-86	59-86	59-90	41-90	56-72	50-86	54-64	54-61	50-81
Speed	Mod.	Mod.	Fast	Mod.	Mod.	Fast	Mod.	Fast	Mod.	Fast	Fast	Mod.	Fast	Fast	Mod.	Mod.	Mod.	Fast	Mod.	Mod.	Mod.	Mod.	Fast	Mod.
Competitive Factor	Yes	Sens.	Yes	Sens.	Yes	Sens.	Yes	Yes	Yes	Yes	Yes	Ntrl.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MLF Compatibility	Ave.	Very Good	—	Below Ave.	Below Ave.	Good	Ave.	Ave.	Ave.	Good	Ave.	Good	—	Poor	Good	Very Good	Poor	Very Good	Good	Good	Ave.	Very Good	Good	Very Good

○ Yeast Strain Type
💧 Highly Recommended
Med. Medium
Mod. Moderate
Ntrl. Neutral
Sens. Sensitive
Ave. Average

[1] The alcohol tolerance column indicates performance possibilities in good circumstances and conditions. Alcohol tolerance may vary as circumstances and conditions vary.

[2] Relative nitrogen needs refer to how much nitrogen one strain requires relative to the other strains on this chart.

[3] The temperature column indicates general performance possibilities. It is not a substitute for sound cidermaking. Yeast may be stressed or die if temperatures are sustained at extremes of their tolerance. Keep in mind that a yeast's ability to ferment within the given range also depends on alcohol and other antagonistic conditions.

When working with high sugar fermentations, lower temperatures are recommended. Increasing dosage of yeast may help prevent a sluggish or stuck fermentation.

Important Notes
This chart is only useful as a quick reference guide. For more information on selected yeast strains, please refer to the yeast section of this handbook.

Premium Yeast

58W3

S. cerevisiae · *cerevisiae*

Isolated during a five-year study by the INRA (National Agricultural Research Institute) in Alsace, France.

Due to its fermentation kinetics, a balanced nutrient strategy and good fermentation practices should be followed.

Vitilevure 58W3™ contributes an overall well-balanced mouthfeel with floral and fruity aromas.

Allows for the release of bound terpenes in aromatic varieties due to the beta-glucosidase activity. This enhances classic varietal characteristics.

#15630 500 g
#15631 10 kg

71B

S. cerevisiae · *cerevisiae*

Isolated and selected by the INRA in Narbonne, France.

Known for producing fruity ciders because it produces long-lived aromas that result from the synthesis of relatively stable esters and higher alcohols.

Softens high acid content by partially metabolizing malic acid.

Sensitive to competitive factors and may have difficulty competing with wild microflora. Careful rehydration with Go-Ferm or Go-Ferm Protect Evolution and early inoculation will help Lalvin 71B® dominate in competitive conditions.

#15059 500 g
#15078 10 kg

Alchemy I

S. cerevisiae · blend

Scientifically formulated blend of yeast strains developed in collaboration with the Australian Wine Research Institute (AWRI) in South Australia.

Alchemy I is a strong aroma producer with fast fermentation kinetics. It is low foaming and has low to medium nitrogen requirements.

Barrel fermentation is not recommended and temperature control is advised.

The ratio of the yeast in the blend has been formulated to provide an optimal aromatic profile.

Alchemy I enhances esters resulting in fruit and floral characters.

#15174 1 kg

BA11

S. cerevisiae · *cerevisiae*

Selected in 1997 near the Estação Vitivinicola de Barraida in Portugal.

Promotes clean aromatic characteristics and intensifies mouthfeel and lingering flavors.

Lalvin BA11™ can encourage the fresh aromas of tropical fruit, cream, vanilla and spice in relatively neutral juice.

#15117 500 g

BM 4X4

S. cerevisiae · blend

Lalvin BM 4X4® is a blend of BM45 and a complementary strain chosen by Lallemand to provide all the advantages of BM45 with even greater reliability under difficult conditions.

Positive interaction between strains means a more dependable fermentation together with increased aromatic intensity and length of finish.

Produces high levels of polyphenol reactive polysaccharides resulting in ciders with increased mouthfeel.

#15176 500 g
#15200 10 kg

C

S. cerevisiae · *bayanus*

Isolated in France.

Produces very clean, fruity styles of cider.

Lalvin C® can also naturally degrade up to 45% of malic acid, depending on the fruit you are fermenting and the style you are trying to achieve.

#15689 500 g

Cross Evolution

S. cerevisiae · hybrid

Hybrid yeast from the University of Stellenbosch in South Africa.

Ideal for aromatic ciders with high alcohol potential (15% v/v) and low fermentation temperatures 14°C(58°F). This strain has reasonably low nitrogen requirements.

Cross Evolution® contributes an increased mouthfeel component resulting in aromatic ciders with a balanced mouthfeel.

Ciders have shown increased fresh fruit and floral aromas, characteristics favored by some commercial cider producers.

#15640 500 g
#15641 10 kg

CVW5 New size!

S. cerevisiae · *bayanus*

Selected from the Lallemand yeast collection, CVW5 is a daughter strain of the Lalvin EC1118.

Works well under low temperatures and low turbidity. Very high ester producer and has the lowest nitrogen demand in the Lallemand yeast collection. CVW5 produces low levels of VA and SO_2.

Strong fermenter even under difficult conditions.

#15237 500g
#15210 10 kg

D21

S. cerevisiae · *cerevisiae*

Selected in France by the ICV.

Noted for its good fermentation performance. Produces very few sulfide compounds during fermentation. Lalvin ICV D21® can help develop fresh fruit aromas, volume and acidity. In highly clarified juices, maintain fermentation temperatures greater than 16°C(61°F) and supplement with proper nutrition.

#15143 500 g
#15163 10 kg

DV10

S. cerevisiae · *bayanus*

Selected in France.

Strong fermentation kinetics. Recognized for low foaming, low VA production and very low H_2S and SO_2 production.

Lalvin DV10™ is well known for clean fermentations that respect fruit while avoiding bitter sensory contributions associated with other more one-dimensional 'workhorse' strains such as PM.

#15062 500 g
#15106 10 kg

EC1118 (Prise de Mousse)

S. cerevisiae · *bayanus*

Selected at the Institut Oenologique de Champagne (IOC) in Epernay, France. Is the original, steady low foamer. Neutral, very clean, robust and reliable.

Ferments well at low temperatures and flocculates with compact lees.

Under low nutrient conditions Lalvin EC1118™ can produce high amounts of SO_2 (up to 50 ppm) and, as a result, may inhibit malolactic fermentation.

#15053 500 g
#15076 10 kg

New name!

Fermivin Champion (formerly Fermichamp)

S. cerevisiae · *bayanus*

Strain selected by INRA, Narbonne, France.

A fructophilic yeast to prevent and restart stuck fermentations.

Does not produce secondary aromas and preserves the specific characteristics of cider when restarting fermentations.

#17143 500 g
#17145 10 kg

Fermivin PDM

S. cerevisiae · *cerevisiae*

Selected in France and a favorite of Normandy cider producers.

Short lag phase, rapid and steady fermentation kinetics.

Preserves the characteristics of the fruit.

#17152 500 g

K1 (V1116)

S. cerevisiae · *cerevisiae*

Selected by the ICV in Montpellier, France, among numerous killer strains isolated and studied by Pierre Barre at INRA.

When fermented at low temperatures 16°C (61°F) with proper nutrition, it is a strong floral ester producer. Can also produce notes of stone fruit and citrus. Not ML compatible.

Among the high ester production strains, Lalvin V1116™ is the most tolerant of difficult fermentation conditions such as extreme temperatures, high alcohol (18% v/v) and low turbidity.

Ferments well under stressed conditions and is useful in restarting stuck fermentations, especially when relative fructose levels remain high.

#15063 500 g
#15077 10 kg

M2

S. cerevisiae · *cerevisiae*

Isolated in Stellenbosch, South Africa.

Enoferm M2™ is a medium-rate fermenter and needs a high level of balanced nutrients for a strong fermentation finish. Requires some temperature control for cider production.

Neutral to low ester-producing strain, noted for accentuating volume in the mouth.

#15648 500 g
#15649 10 kg

ICV Opale

S. cerevisiae · *cerevisiae*

Selected in France by the ICV.

Opale™ has been shown to enhance varietal character and aromatics in juice that might otherwise produce neutral ciders. Can enhance apple, pear and light blossom aromas. Improved mid-palate volume and structure. Astringent components can be softened, especially when lees are stirred during aging.

Lalvin ICV Opale™ has excellent fermentation qualities with a short lag phase and medium nitrogen requirements.

Can produce significant amount of SO_2 and, as a result, may inhibit malolactic fermentation.

#15068 500 g

QA23

S. cerevisiae · *bayanus*

Selected in Portugal.

Lalvin QA23™ has low nutrient and oxygen requirements. It has been known to ferment juice at low temperatures 15°C(59°F) to dryness.

Enhances fruit for a fresh style. Positive for cooler fermentations and highly clarified juice.

#15652 500 g
#15653 10 kg

R2

S. cerevisiae · *bayanus*

Isolated in France.

Has excellent cold temperature properties and has been known to ferment in conditions as low as 5°C(41°F).

Tends to produce VA without proper nutrition.

Lalvin R2™ helps produce intense, direct fruit style ciders by liberating fruity and floral aromas.

#15071 500 g

Rhône 4600

S. cerevisiae · *cerevisiae*

Isolated in France in collaboration with the research center of Inter Rhône.

Lalvin Rhône 4600® has a short lag phase, low nutrient demand and can ferment efficiently at low temperatures 13.5°C(56°F).

Produces high levels of polysaccharides which contribute intense mouthfeel and volume.

Complex aromatic notes and elevated ester production.

#15171 500 g

R-HST

S. cerevisiae · *cerevisiae*

Selected in Austria.

Tolerates fermentation temperatures as low as 10°C(50°F) and alcohol levels up to 15% (v/v). In very cold fermentations, allow the temperature to increase toward the end for a clean finish.

Lalvin R-HST® has a short lag phase and generation time, even at cold temperatures. This allows it to dominate and persist over spoilage yeast such as *Kloeckera apiculata*, where other *S. cerevisiae* might have difficulty.

Retains fresh fruit characters while contributing structure and mouthfeel. It can produce crisp, premium ciders suitable for aging. A favorite for ice cider production.

#15130 500 g

VIN 13

S. cerevisiae · hybrid

From the University of Stellenbosch in South Africa.

Aromatic as well as cold tolerant 10–15°C (50–59°F), VIN 13 also has high alcohol tolerance (16.5% v/v) and low nitrogen requirements (qualities obtained by hybridizing *S. bayanus* and *S. cerevisiae* strains).

Good choice for restarting stuck fermentations, especially when fructose levels remain high. VIN 13 is an outstanding ester producer.

The combination of fermentation kinetics and sensory contributions make this strain very suitable for cold-fermented aromatic ciders that are fermented to dryness. Do not over inoculate.

#15183 1 kg
#15228 10 kg

W15

S. cerevisiae · *cerevisiae*
Isolated in Switzerland.

Its low heat generation during fermentation helps cidermakers minimize the potential for temperature spikes and possible H_2S problems.

Produces higher levels of glycerol and succinic acid, especially when fermented between 15-20°C(59-68°F), which helps add complexity to the mid-palate.

In ciders, Lalvin W15™ helps retain bright fruit characters while optimizing mouthfeel and balance.

#15118 500 g
#15119 10 kg

Non H_2S or SO_2 Producing Strains

ICV OKAY

S. cerevisiae · hybrid

Selected in collaboration with the INRA, SupAgro Montpellier, the ICV and Lallemand for its ability to produce no SO_2 or H_2S.

Lalvin ICV OKAY has a very short lag phase, low nutrient requirements and alcohol tolerance to 16% (v/v). Very low production of acetaldehyde.

Recommended for fresh and aromatic ciders. Very good compatibility with malolactic fermentation.

#15221 500 g
#15222 10 kg

New!

SENSY

S. cerevisiae · hybrid

Selected in collaboration with the INRA, SupAgro Montellier, the ICV and Lallemand for no SO_2 or H_2S production.

Lalvin Sensy™ has a short lag phase, low nutrient demand with a moderate fermentation rate, alcohol tolerance up to 14.5% (v/v) and a temperature tolerance of 12–18°C(54–64°F).

Ciders fermented with Sensy have positive aromatics including descriptors of citrus and tropical fruit. The ciders also have good mouthfeel and a subtle mineral character.

#15225 500 g

Article

H_2S Management through Yeast Selection

Rebekka deKramer
Cider Specialist, Scott Laboratories

Cidermakers have long faced the problem of off flavor and aroma production during fermentation. Some otherwise excellent yeast can produce higher levels of the sulfur compounds than others. H_2S confers negative aroma attributes to ciders. This compound is problematic in cider because of low thresholds of detection. Its chemical reactivity can lead to the formation of less desirable compounds (sulfides and mercaptans) during further aging.

H_2S can arise during fermentation and the level formed is influenced by several environmental and genetic factors of the yeast. There are various mechanisms through which H_2S may be produced by *Saccharomyces cerevisiae*. It may be generated through the degradation of sulfur containing amino acids, the reduction of elemental sulfur, or the reduction of sulfite or sulfate. Release of H_2S during fermentation may be necessary to free up the enzymatic pathway needed to convert sulfate to sulfite for detoxification of acetaldehyde.

H_2S production can be managed with any yeast option, provided the appropriate parameters (macro nutrition, temperature, turbidity, etc.) are met for that particular strain. *(Please see article on Optimizing Nutrient Strategies on page 23 for more information on maximizing the health of your fermentation and avoiding off-odor formation.)* Another relatively new option to the cidermaker is selecting a yeast that has excellent kinetics as well as low production of H_2S, SO_2 and acetaldehyde.

Several years ago concerns regarding SO_2, H_2S and acetaldehyde brought Lallemand, Montpellier SupAgro, and the Institut Cooperatif du Vin together. Their objective was to combine quantitative genetic approach with modern yeast breeding to create new, non-GMO yeast. These new strains would have excellent fermentative qualities but with low sulfur compound and acetaldehyde production.

The first step of this process was to select parent strains. Extensive research has provided evidence that yeast is an important variable in H_2S production and responds differently to physiological and environmental factors in the production of H_2S (Figure 1: Natural variability of wine yeast to produce H_2S). One set of the parent strains were selected for their robust fermentation capabilities and sensory contributions to the wine/cider. The second parent strains were selected for their low nitrogen needs, balanced volatile compound profile and low production of SO_2, H_2S and acetaldehyde.

Next, genetic mapping was done to learn the locations on the first parent's genome which were linked to low SO_2 and H_2S production. They were able to identify two genes on the XIV chromosome of the sulfur metabolism pathway. Once the molecular markers were found, they were then able to begin the process of moving them from one parent to the other through a process of directed yeast breeding and backcrossing. Interestingly (and importantly), during this process they also succeeded in transferring two other highly positive features (low nitrogen needs and low acetaldehyde production) from one parent to the other.

The outcome of this breeding process was two successful strains, ICV OKAY and Lalvin Sensy. Wines and ciders fermented with ICV OKAY and Lalvin Sensy all showed marked reduction of off-sulfur compounds (Figure 3 & Figure 4).

If adequate nutrient strategies cannot be met with your usual yeast selection, or you have certain varietals that are problematic, low H_2S and SO_2 producing strains are an excellent option for preventing the off-flavors and aromas that can commonly occur in cider fermentations. It is important to note that H_2S and SO_2 can still form in a cider, even with low H_2S producing strains, if there is sulfur residue left on the apples at harvest. Native yeast and bacteria can also produce off-aromas during fermentation if not adequately controlled at fruit/juice reception.

Figure 1
Natural variability of wine yeast to produce H_2S

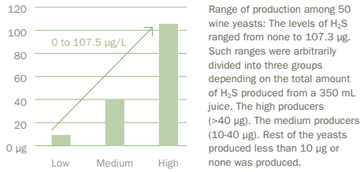


Figure 2
The breeding process

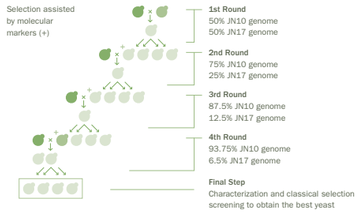


Figure 3
Validation of the transfer of phenotypes of interest coming from the JN17 yeast strain (laboratory scale)

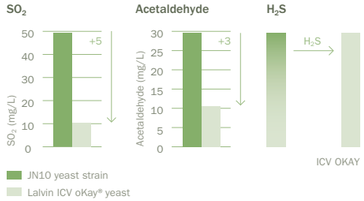
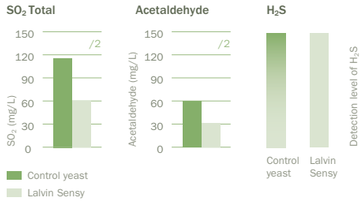


Figure 4



Specialty Yeast Strains

Biodiva

Torulaspora delbrueckii

The *Torulaspora delbrueckii* isolate Biodiva was initially sold in North American in a kit (Level²TD) in which it was partnered with a specific *S. cerevisiae* strain. Based upon market feedback the Biodiva isolate is now available by itself. Cidermakers can match it with a compatible *S. cerevisiae* of their choosing. The result is that cidermakers can now mimic the best of wild fermentations in a controlled setting.

For cider production, using the *S. cerevisiae* strain QA23 with Biodiva is most highly recommended.

Following an inoculation of Biodiva (*Torulaspora delbrueckii*) with an inoculation of an appropriate *S. cerevisiae* leads to an increase in ester levels while helping to promote a complete and clean fermentation. Resulting ciders commonly have more intense aromas, mouthfeel and complexity.

Usage

1. Check the free SO_2 level in the juice; it must be under 20ppm. Turbidity must be >80 NTU.
2. Suspend 2 lbs/1000 gallons (25 g/hL) of *Torulaspora delbrueckii* in 10 times its weight in clean, chlorine free, 30°C(86°F) water. Allow to hydrate for 15 minutes, and then mix gently.
3. Acclimatize the Biodiva starter to the juice temperature by progressively adding an equivalent volume of colder juice to it. The temperature difference between the rehydration suspension and the juice should not exceed 10°C(18°F).Total rehydration time should not exceed 45 minutes. If the YAN is below 80 mg/L of nitrogen, add Fermaid O just after inoculation with Biodiva.
4. After a drop of 1.5 to 3°Brix, inoculate with *Saccharomyces cerevisiae* yeast at 2 lbs/1000 gallons (25 g/hL). Suspend 2.5 lbs/1000 (30 g/hL) of Go-Ferm Protect Evolution and rehydrate with the *Saccharomyces cerevisiae* in 20 times its weight in water at 37°C(99°F). Allow to settle for 15 minutes, and then mix gently. Acclimatize the yeast starter to the juice temperature by progressively adding an equivalent volume of colder juice to it. The temperature difference between the rehydration suspension and the juice should not exceed 10°C(18°F).
5. At 1/3 sugar depletion add 2 lbs/1000 gallons (25 g/hL) of Fermaid K or Fermaid A.

Storage

Store for 24 months at 4°C (39°F).
Use immediately once opened.

Note: The optimum temperature for Biodiva is >16°C (61°F). If the must/juice is under 16°C (61°F) it could result in a long lag phase, slow growth of the yeast, and other problems.

#15685 125 g

Exotics SPH

S. cerevisiae + S. paradoxus hybrid

Anchor Exotics SPH is a product of the yeast hybridization program of The Institute for Wine Biotechnology at the University of Stellenbosch in South Africa. It is a hybrid between *S. cerevisiae* and *S. paradoxus*.

S. paradoxus is the closest relative to *S. cerevisiae*. This hybrid inherited the aromatic capabilities of both its parents, thereby expanding the aromatic potential and complexity from what *S. cerevisiae* strains have to offer.

Ciders produced using this yeast are described as having exotic aromas and flavors, as well as good mouthfeel. It enhances guava, passion fruit, tropical and stone fruit aromas and flavors. Exotics SPH is cold sensitive and ferments at a steady rate in barrels.

Exotics SPH has been found to produce elevated levels of glycerol (9–13 g/L), which can potentially lead to lower alcohol conversions in high sugar juice. It has an alcohol tolerance up to 15.5% (v/v) with medium nitrogen requirements. It has low VA and SO_2 production. It can also partially degrade malic acid and is known to facilitate and enhance malolactic fermentation.

Usage

See rehydration protocol on page 5 for more information.

Storage

Store in a cool, dry place 5–15°C(41–59°F).
Once opened, use immediately.

#15213 250 g

Encapsulated Yeasts

Technology for improved cidermaking

Encapsulated yeast are alginate beads (a natural polysaccharide extracted from seaweed) containing *Saccharomyces* yeast cells. Encapsulation allows substrates and metabolites to diffuse easily throughout the beads without releasing yeast cells into the juice. Once encapsulated, the beads are partially dehydrated in a fluidized bead column and are stored at 4°C(40°F) until ready for use. The dry beads average 2 mm in diameter.

Each of our encapsulated yeast products has a unique cider-making application. *ProDessert* is for fermenting premium dessert/ice ciders, and *ProElif* is for secondary fermentation in sparkling ciders.

ProDessert

Double encapsulated yeast for premium dessert/ice cider fermentation

The most difficult aspect of dessert/ice cider production is arresting the primary fermentation at the desired residual sugar level. ProDessert® was developed by Proenol (in collaboration with Lallemand) to make this process easier and more effective. When using ProDessert, the alcoholic fermentation is arrested by simply removing the beads from the cider. Precautionary measures (e.g. sulfur dioxide additions, chilling and/or filtration) may still be required to completely stop or remove indigenous yeast, although less overall intervention may be needed. For example, the need for large sulfur dioxide additions or drastic tank chilling may be reduced.

Recommended Dosage

100 g/hL 8.0 lb/1000 gal

Note: Each 1 kilo bag will treat approximately 260 gallons.

Usage

1. Remove the beads from the 4°C(40°F) storage temperature and allow them to adjust to room temperature.
2. Place the beads in barrel or tank sized ProMesh bag(s). Use 2 bags/barrel (109 g/bag) and no more than 5 kg (11 lb)/tank bag.
3. Distribute the beads evenly throughout the bag(s) to ensure good contact with the rehydration solution.
4. In a clean container, add 40 g/L (151 g/gal) sugar into a volume of clean, 37°C(98°F) water, 5 times the weight of the beads.
   (For example: 1 bag beads (2.2 lb) x 5 = 11 ÷ 8.33 lb/gal water = 1.32 gal water = 196 g sugar/1.32 gal water.)
5. Once the sugar dissolves, add the bag(s) containing the beads to the rehydration solution.
6. Wait 4–5 hours before inoculation.
   Note: The sugar solution does not get added to the juice.
7. Once the beads are properly rehydrated, suspend the bag(s) in the juice at the start of fermentation.
8. Shake the bag(s) 2–3 times daily and stir tanks daily to help eliminate CO_2 adhering to the beads.
9. Remove each bag when the desired residual sugar level is reached.

Storage

Dated expiration. Store at 4°C(40°F).
Do not freeze. Once opened, use immediately.

For more detailed information, technical data sheets are available on our website at www.scottlab.com.

#15150 1 kg

Promesh Bags

For use with ProDessert

Barrel Bags

For ProDessert use 2 bags/barrel containing 109 g/bag.

One kilogram of beads will treat 260 gallons, or 4 barrels.

Tank Bags

Use up to 5 kg (11 lb.) per bag.

#15158 ProMesh barrel bag
#15159 ProMesh tank bag

Proelif

Double encapsulated yeast for secondary fermentation in methode champenoise-style cider production

ProElif® is an encapsulated yeast product developed by Proenol for secondary fermentations. The yeast cells are double encapsulated in an alginate bead. The beads can be directly inoculated into the bottle (eliminating the need to prepare a starter culture). This helps ensure control of the number of cells per bottle. Upon fermentation completion, the beads have a greater density than the cider and will quickly drop to the neck of the bottle when inverted.

The beads accumulate more tightly than traditional riddling, therefore less cider is lost during disgorging. Traditional freezing and disgorging methods are used to finish the process. The use of ProElif results in a fresh sparkling cider.

If greater yeast character is desired, you may make changes to the base cider with this in mind. For example, ProElif has been used with Opti-WHITE treated base cider with good results.

For ProElif to be successful, the base cider should fall within these parameters:

Alcohol	≤	11.5% (v/v)
Calcium	≤	80 mg/L
Free SO_2	≤	15 mg/L
Protein Stability	=	stable
pH	≥	3.0
Fermentation Temperature	>	12°C(54°F)
Free Assimilable Nitrogen	≥	100 mg/L

The base cider must be stable to avoid agglomeration of the beads which could cause subsequent difficulty during disgorging. All of these parameters act in synergy with one another. It is critical to manage them together. If one parameter is over the limit, try to compensate with the others or ferment at a higher temperature.

Recommended Dosage

133-200 g/hL 1.0-1.5 g/750 mL bottle

Note: 1 g of ProElif beads = 4–6 million active cells/mL.

Usage

1. Prepare the base cider according to normal protocols.
2. To reduce the risk of haze formation and microbial contamination it is important that the base cider fall within the previously mentioned parameters.
3. Filter the base cider through a 0.45 micron sterile membrane filter the same day as bottling to avoid contamination during fermentation. Meticulous hygiene and sterility of the base cider are essential.
4. Tirage liqueur must be filtered the same day as bottling. The addition of tannins to give volume or structure must be made before the final filtration. Since there is no riddling, no adjuvants or riddling agents are necessary.
5. Add the beads directly to the empty bottles (adding after filling is acceptable but before filling is often easier). Temperature difference between the base cider and ProElif should not exceed 10°C(18°F).
6. Add the tirage liqueur and cap the bottles.
7. Store the bottles on their sides for maximum contact between the cuvée and the beads.
8. ProElif is temperature sensitive and the fermentation environment should remain above 12°C(54°F).

Storage

Dated expiration. Store at 4°C(40°F).
Do not freeze. Once opened, use immediately.

For more detailed information, technical data sheets are available on our website at www.scottlab.com.

#15571 1 kg

Protocol

Recommended method to restart stuck fermentations

Sluggish and stuck fermentations present particular challenges. To address them, issues of yeast biomass buildup and low nutrient levels must be met head-on. Failure to do this will compound the problems.

Appropriate yeast rehydration nutrients such as Go-Ferm and Go-Ferm Protect Evolution are useful tools. Both are rich in micronutrients and survival factors. When added to the rehydration water, these factors promote increased biomass of the selected yeast strain. As a consequence, the selected yeast can acclimate more easily in the hostile environment associated with stuck fermentations.

When stuck ciders include high residual sugar levels, an addition of a complex nutrient to the stuck cider is also recommended.

In addition, spoilage organisms like *Lactobacillus* and *Pediococcus* are often present in stuck fermentations. These microorganisms can compete for nutrients and release metabolites that inhibit yeast growth. Adding lysozyme to the stuck cider prior to restarting the fermentation may help control such unwanted bacteria and provide an improved environment for the restart to take place (see page 46).

Adding Reskue to the stuck cider prior to restarting the fermentation may also help reduce accumulated toxins and improve chances for a successful restart.

Visit www.scottlab.com for a video animation of this protocol

For Ciders Stuck at >3°Brix

Steps 1–8: Build-up for Stuck Cider

1. Add 40 g/hL (3.3lb/1000 gal) of Reskue 24–48 hours prior to restarting.
2. After 24–48 hours, rack off from the Reskue.
3. Add a complex yeast nutrient (Fermaid*) directly to the tank of stuck cider at a rate of 0.5–1.0 lb/1000 gal (6-12 g/hL). Many cidermakers also add Lysozyme at this time to reduce potential bacteria problems.
4. In another clean container mix equal volumes of stuck cider and water. Generally this would total 2% of the total cider volume. (Example: For 1000 gal of stuck cider, use 10 gal water + 10 gal cider.) This container will be the "Mother Restart Tank".
5. Calculate the amount of Go-Ferm or Go-Ferm Protect Evolution at 1.25 times the amount of yeast to be used. Dissolve this yeast rehydration nutrient in 20 times its weight of clean, chlorine free, 43°C (110°F) water. (Example: 5 lb Go-Ferm x 20 = 100 lb, divided by 8.33 lb/gal water = 12 gal water needed.) Mix the solution and cool to 40°C(104°F).
6. Select a yeast strain that is both alcohol tolerant and a vigorous fermenter such as K1 (V1116) or VIN 13. Calculate the amount of yeast required for the total volume of stuck cider at 3–5 lb/1000 gal (36–60 g/hL). When the Go-Ferm/water solution temperature has cooled to 40°C(104°F), slowly (over 5 minutes) add yeast. Stir gently to mix and avoid clumping. Let this yeast suspension stand for 15-20 minutes.
7. Check the temperature of the yeast suspension. There should not be more than 10°C (18°F) difference between the yeast suspension and the diluted cider in the Mother Restart Tank. If there is too great a temperature difference, atemperation may be required. Cold temperatures may shock the yeast cells.
8. When the yeast suspension is properly rehydrated and proper consideration has been given to temperature differences, add the yeast to the Mother Restart Tank and wait 20–30 minutes.

Steps 9–12: Inoculation of Stuck Cider

9. Add 10% of stuck cider to the Mother Restart Tank and wait 20-30 minutes. (Example: For 1000 gal stuck cider, add 100 gal cider.)
10. Add 20% of stuck cider to the Mother Restart Tank and wait 20-30 minutes. (Example: For 1000 gal stuck cider, add 200 gal cider.)

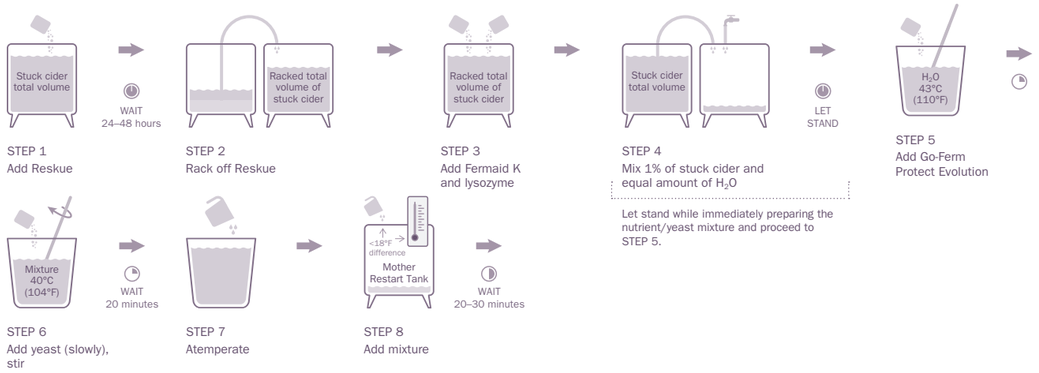
11a, 11b, 11c. Repeat step 10.

12. Add any remaining cider to the Mother Restart Tank.

*Fermaid A, Fermaid K or Fermaid O.

For Ciders Stuck at >3°Brix

Steps 1–8: Build-up for Stuck Cider



STEP 1
Add Reskue

STEP 2
Rack off Reskue

STEP 3
Add Fermaid K and lysozyme

STEP 4
Mix 1% of stuck cider and equal amount of H_2O

Let stand while immediately preparing the nutrient/yeast mixture and proceed to STEP 5.

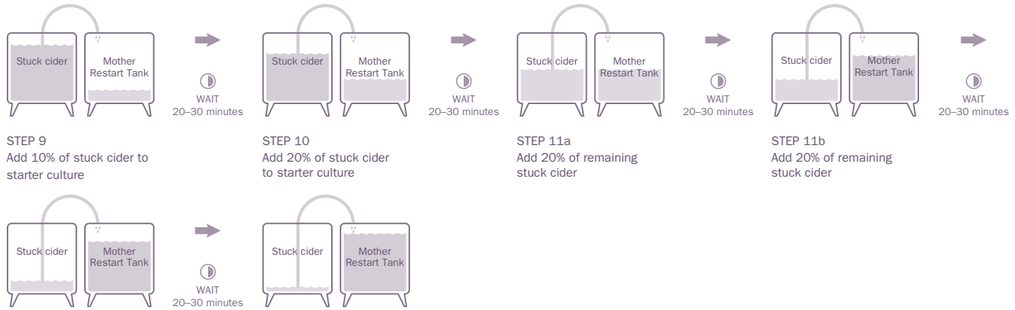
STEP 5
Add Go-Ferm Protect Evolution

STEP 6
Add yeast (slowly), stir

STEP 7
Atemperate

STEP 8
Add mixture

Steps 9–12: Inoculation of Cider



STEP 9
Add 10% of stuck cider to starter culture

STEP 10
Add 20% of stuck cider to starter culture

STEP 11a
Add 20% of remaining stuck cider

STEP 11b
Add 20% of remaining stuck cider

STEP 11c
Add 20% of remaining stuck cider

STEP 12
Add any remaining stuck cider

For Ciders Stuck at 1–2° Brix

Follow this restart protocol, except in Step 3 reduce the complex yeast nutrient addition to 0.5 lb/1000 gal (6 g/hL).

For Ciders Stuck at <1°Brix

Follow this restart protocol, except in Step 3 eliminate the addition of a complex yeast nutrient

Article

Comparison of Juice Quality of Hand and Machine Harvested Cider Apples

Machine harvesting of 'Brown Snout' specialty cider apple

Hand harvesting

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In two sequential studies, we compared juice quality characteristics of 'Brown Snout', a specialty cider apple *(Malus domestica)*, that were machine-harvested and hand-harvested. In the first 2-year study, fruit was cold-stored at (32°F) after harvest (following common practices of cider makers in the region) and in the second 2-year study, fruit was stored under ambient conditions postharvest (56°F mean temperature). In both studies, machine-harvest was performed with the same over-the-row shake-and-catch small fruit harvester. In both studies, the harvest method had no impact on juice quality characteristics, however, storage time did have an impact.

In the first study where harvested fruit was cold-stored for up to four weeks, the soluble solids concentration (SSC, %, measured as °Brix) increased 14% on average each year after storage, while specific gravity (SG) increased 1.3% on average each year after storage. A 1% increase in juice SG corresponds to a potential 1.3% increase in alcohol by volume post-fermentation. Juice pH and titratable acidity (TA, malic acid g/L^{-1}) did not change due to storage in the first year, but pH increased 0.06 units and TA decreased 0.68 g/L^{-1} on average after two weeks storage in the second year. Tannin content (%) did not change after storage in either year.

In the second study where fruit was ambient-stored for up to four weeks, SSC and SG did not change due to storage in the first year. In the second year, SSC increased 13% on average after storage while specific gravity (SG) increased 0.6% on average after storage. The pH increased 0.08 units and TA decreased 0.42 g/L^{-1} on average after storage in the first year, but did not differ due to storage in the second year. Both years' tannin content tended to increase after two weeks storage, 17% in 2014 and 19% in 2015.

The results from both studies indicate that machine harvesting had a minimal effect on juice characteristics measured in these studies, even after ambient storage up to 4 weeks post-harvest. It also suggests that machine harvest may be suitable for cider apples if equipment is available and affordable.

Article

Cider Apple Evaluations in Vermont

Dr. Terence Bradshaw and an apple picker at Sunrise Orchard, Cornwall, VT collect yield data for the project "Apple Market Optimization and Expansion through Value-Added Hard Cider Production", funded by the Vermont Working Lands Enterprise Initiative.

Technician Sarah Kingsley-Richards, and students Cassidy Petit and Victoria Iglesias asses fruit maturity and prepare juice samples in the UVM Apple and Grape Juice Laboratory.

Terence Bradshaw, Ph.D.

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http://go.uvm.edu/ciderrsch

The recent surge in commercial cider production has increased demands for fruit available to cideries from local orchards in Vermont and the surrounding region. As growers consider diverting or specifically growing fruit for cider making, many questions arise. For the past century of commercial apple production, the role of researchers and outreach professionals has been to *minimize* fruit that were not sold to the fresh market. Presently, the vast majority of ciders are made with dessert apple varieties, either specifically grown for cideries or more commonly sourced as cull fruit from packing houses. At the same time, demand for specialty cider apples with acid, tannin, and aroma characteristics sought for making distinctive ciders is increasing. These two supply chains of dessert and specialty cider apple cultivars have different research needs that our team and other like-minded colleagues are addressing.

Dessert cultivar availability to cideries is largely dependent on production of cosmetically-blemished 'seconds', which may only be offered at market prices if a substantial amount of the crop may be sold on the higher-valued fresh market. However, some growers are dedicating blocks of fruit to production specifically for cidermaking, and we are studying impacts of reduced-input management strategies that reduce costs to meet cider fruit prices on fruit quality and quantity. Research in the 2016 and 2017 growing season will focus on effects of reduced pruning and pest management inputs on crop yield, juice quality, and economics of dessert cultivar cider apple production.

Specialty cider cultivars are grown in small amounts in Vermont and the rest of the U.S. As many cultivars are of European origin or are not widely planted outside of limited regions, the horticultural, pest susceptibility, and juice quality characteristics are little-known. We are compiling a long-term database of crop yield and juice quality characteristics, as well as evaluations of finished ciders on specialty cider cultivars grown in Vermont. This database will be used for recommendations to growers and cideries on best cultivars and planting systems to adopt in our region. In limited sampling from 2015, European bittersweet cultivars exhibit high tannin and low acidity relative to North American cider and juice cultivars. In addition, scab-resistant cultivars and local wild or feral selections are being screened for juice quality characteristics suitable for quality cider making. Franklin Cider Apples have shown particular promise as a high-tannin bittersharp apple that may be of interest to cider makers, but increased testing in commercial orchard systems is necessary before recommending for widespread planting. Many specialty cider apples, especially the European bittersweets, are prone to biennialism (producing a full crop only every other year). We are evaluating plant growth regulators to enhance return bloom and improved regularity of cropping and their effects on juice quality.

Juice analysis, including soluble solids (SS), pH, titratable acidity (TA), total polyphenols, and yeast assimilable nitrogen (YAN) for dessert and specialty cider apples grown in Vermont and evaluated in 2015, shown below.

Cultivar	SS (°brix)	pH	TA (g * l⁻¹ malic)[z]	Total polyphenols (mg GAE* l⁻¹)
Ashmead's Kernel	18.0	3.0	10.8	667
Brown Snout	18.2	3.8	4.1	2148
Calville Blanc	15.3	3.1	10.0	728
Chisel Jersey	13.1	4.1	1.5	2408
Dabinett	13.1	4.2	1.1	3656
Esopus Spitzenburg	15.8	3.1	9.3	633
Harry Master's Jersey	12.0	4.3	1.2	2120
Redfield	13.6	3.2	6.5	3268
Yarlington Mill	12.2	3.8	1.7	3538
Crimson Crisp	14.2	3.4	8.3	1089
Crimson Gold	13.8	3.4	7.9	702
Crimson Topaz	14.0	3.2	12.1	617
Fllorina Querina	14.1	3.5	6.3	556
Galarina	14.9	3.5	8.7	668
Liberty	13.0	3.2	8.5	1049
Williams Pride	10.3	3.4	5.5	439
Winecrisp	16.2	3.6	6.1	595
Franklin Cider Apple	16.9	2.8	7.8	3557

[z] Titratable acidity measured in malic acid equivalents, total polyphenols measured in gallic acid equivalents.

Article

Fermentation Optimization and Consumer Acceptance Evaluation or New York Apple Varieties as a Base for Hard Cider & Apple Tannins from Pomace: Production and Evaluation to Improve Quality of Hard Cider

Preference ranking of commercial cider samples

Research ciders made from common apples blended with exogenous tannin or high-tannin apples ready for consumer sensory trials

Christopher Gerling, Olga Padilla-Zakour, Anna Katharine Mansfield, David C. Manns, Cortni McGregor and Micah Martin

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Producers continue to seek tools for adding complexity and mouthfeel to their ciders. Over the past year, work at Cornell University has focused on methods for increasing tannin content in finished products. Earlier trials showed that consumers prefer ciders with at least moderate amounts of tannin, which is more than most commercial apples contain. The Vinification & Brewing lab at the New York State Agricultural Experiment Station in Geneva, NY, fermented ciders from four commonly grown New York apples and then conducted trials with exogenous tannin and blends with small amounts of cider made with high-tannin apples. Consumer sensory trials were then carried out to compare the research ciders with a successful and well-liked commercial product made from cider apples. Results showed that consumers found the ciders with added tannin to be at least as appealing as the commercial cider made from cider apples. Current work is focused on producing a liquid tannin product that is sourced from apples.

Consumer Preference *
Tannin Levels in Cider

Pair	Tannin (mg/L)	Preference
1	0	
1	75	Strong preference
2	75	No preference
2	150	
3	150	No preference
3	225	
4	225	No preference
4	300	

Consumer Preference *
Sugar Levels in Cider

Pair	Sugar (g/L)	Preference
1	10	
1	20	Strong preference
2	20	
2	30	Strong preference
3	30	
3	40	Slight preference
4	40	No preference
4	50	

*194 panelists were given 5 ciders and asked to rate each one for appearance, color, aroma, flavor, carbonation and overall. A 9 point scale was used:
1 = Dislike extremely,
2 = Dislike very much,
3 = Dislike moderately,
4 = Dislike slightly,
5 = Neither like nor dislike,
6 = Like slightly,
7 = Like moderately,
8 = Like very much,
9 = Like extremely

Article

Hard Cider Research Requires an Interdisciplinary Approach

Cider fermentation research conducted at Virginia Tech (photo credit: Tom Boudreau, MS)

Cider apple variety trial at Cornell University (photo credit: Nathan Wojtyna)

Greg Peck, PhD
Assistant Professor of Horticulture
Cornell University, Ithaca, NY

Amanda Stewart, PhD
Assistant Professor of Food Science & Technology
Virginia Tech, Blacksburg, VA

Dr. Greg Peck is a pomologist whose research program focuses on sustainable fruit production systems. Dr. Amanda Stewart is a food scientist whose research program focuses on fermentation science including wine, cider, and fermented foods and health. The Peck and Stewart Labs began collaborative cider-related research projects at Virginia Tech in 2012. Although Dr. Peck has recently started a new position at Cornell University, their research collaboration continues. To date, they have advised five graduate students whose research projects focus on hard cider.

In a recent collaborative study investigating the impact of apple crop load on juice and cider quality, Peck and Stewart found that apple trees with higher crop loads produced smaller, less acidic fruit that were slightly more mature. After pressing and fermentation, the cider made from fruit harvested from trees with intermediate and high crop loads had 27% and 37% greater total polyphenol content, respectively, than the cider made from the apples harvested from their lowest crop load treatment. Yeast assimilable nitrogen (YAN) concentration in juice made from fruit from the low crop load treatment was 18% and 22% greater than in the intermediate and high crop load treatments, respectively. YAN concentrations in juice from the medium and high crop load treatments were similar. In this study, which used York apples grown in Virginia, crop load had a significant impact on polyphenol and YAN content, which can in turn influence blending and yeast nutrition strategies. Through this type of interdisciplinary research, Peck and Stewart aim to provide apple growers and hard cider producers with a better understanding of how apple crop production practices impact fruit and cider chemistry, including factors such as polyphenols and YAN, which are important to cider quality and go beyond what cider makers typically can measure in their own facility (Peck et al., 2016).

In another study, Peck, Stewart, and their colleagues at Virginia Tech identified and quantified individual polyphenols in 20 apple cultivars currently grown in Virginia that have the potential for hard cider production. Harrison, Granny Smith, Rome, Winesap, and Black Twig apples contained the highest concentration of total flavan-3-ols in the flesh tissue, indicating their potential to impart desired astringency and bitterness to cider under typical processing conditions. These results inform cider producers about the variability of polyphenol composition among apple cultivars, and provide baseline data for horticultural, processing, and fermentation research supporting the growing hard cider industry (Thompson-Witrick et al. 2014).

Current research in the Peck and Stewart Labs investigates impacts of fungicide residues on cider fermentation, developing yeast assimilable nitrogen composition recommendations for cider fermentation, studying the impact of pre-harvest environmental conditions on polyphenol development in apples, and several variety trials. The long-term goals of these interdisciplinary projects are to develop crop production, processing, and fermentation strategies specifically designed for hard cider production. Peck and Stewart want their research to enable cider industry professionals to make sound, science-based decisions that lead to improved quality and sustainability.

More about their research can be found at the Virginia Tech Hard Cider Research and Extension Website www.arec.vaes.vt.edu/alson-h-smith/treefruit/horticulture/hard-cider/

The Cornell Hard Cider Resources Website http://blogs.cornell.edu/hardcider/

And, through their faculty websites: http://hort.cals.cornell.edu/people/gregory-peck and

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Nutrients

Overview

Classic yeast strains of *Saccharomyces cerevisiae* perform best when their specific needs are considered. In addition to issues like temperature and turbidity, nutritional factors are critical. If requirements are met, yeast can thrive and perform at their peak while converting juice into cider.

Nitrogen is an important part of yeast nutrition and has a significant impact on the fermentation outcome. YAN (Yeast Assimilable Nitrogen) content in juice directly influences fermentation speed. It impacts the yeast biomass at the beginning of fermentation, as well as the sugar transport kinetics during fermentation.

Interestingly, it is normal for juice to be nitrogen depleted at the end of the yeast growth phase even though the majority of the sugar remains to be fermented. This results in a decrease in both protein synthesis and sugar transport activity.

An addition of YAN at the end of the growth phase reactivates protein synthesis and the sugar transport speed which corresponds to an increased fermentation rate.

Basics

Fruit provides nitrogen in the form of proteins, peptides, alpha amino acids and ammonium ions, but to a lesser degree than grapes. Yeast assimilable nitrogen (YAN) is composed of only two of these elements: alpha amino acids (assimilable organic nitrogen) and ammonium ions (inorganic nitrogen). When determining the YAN in juice, it is critical to take the nitrogen contribution from both of these into account. Healthy fermentations contain a balance of yeast assimilable nitrogen from both sources. Low levels of YAN can put undue stress on yeast cells and significantly hinder their performance. In some cases, yeast may create unpleasant flavors and/or aromas or even stop fermenting.

How much YAN is needed?

As alluded to elsewhere, the range of YAN in raw material for cider can vary tremendously. As a general rule, we recommend aiming for YAN's of 150–200 mg/L in cidermaking. If natural levels are lower, the juice should be considered to be nitrogen deficient and an addition of YAN containing nutrients should be made.

In addition, nutrient management also requires consideration of the following factors:

Initial sugar content

The higher the initial concentration, the more YAN required. Quality and quantity of the nitrogen initially present and supplemented (organic versus inorganic) must be considered.

Temperature

An increase in temperature stimulates the growth of yeast and the fermentation rate. This, in turn, increases the need for nitrogen.

Turbidity

When juice is over-clarified or when using concentrate, many nutritional factors for yeast are removed. This creates the need to supplement with complete and balanced nutrients.

The **yeast strain** selected for the fermentation is also a consideration. Different strains thrive in different conditions.

Oxygen

When adding more O_2 to the juice, nitrogen is captured faster. More is needed when compared to fermentations taking place under anaerobic conditions.

Fruit Quality

The sanitary condition of the fruit, juice chemistry, as well as pre-fermentation cidermaking practices also directly influence the YAN.

Yeast Nutrient YAN Contribution

Nutrient	Dose 20 g/hL (1.7 lb/1000 gal)	Dose 25 g/hL (2 lb/1000 gal)	Dose 30 g/hL (2.5 lb/1000 gal)	YAN Source
Anchorferm	2 mgN/L	2.5 mgN/L	Not recommended	Organic nitrogen from autolyzed yeast
DAP		50 mgN/L	63 mgN/L	Inorganic nitrogen
Fermaid A		30 mgN/L	36 mgN/L	Inorganic nitrogen (from DAP) and organic nitrogen from autolyzed yeast
Fermaid K		25 mgN/L	30 mgN/L	Inorganic nitrogen (from DAP) and organic nitrogen from autolyzed yeast
Fermaid O		10 mgN/L	12 mgN/L	Organic nitrogen from autolyzed yeast
Go-Ferm		7.5 mgN/L	10 mgN/L	Organic nitrogen from autolyzed yeast
Go-Ferm Protect Evolution		7.5 mgN/L	10 mgN/L	Organic nitrogen from autolyzed yeast
Nutrient Vit End		7 mgN/L	8.5 mgN/L	Organic nitrogen from autolyzed yeast
Phosphate Titres		50 mgN/L	63 mgN/L	Inorganic nitrogen
SIY 33 (Fermaid 2133)		8 mgN/L	10 mgN/L	Organic nitrogen from autolyzed yeast

Strategy: Yeast Protection and Nutrition
Yeast nutrient: Recommended addition rates

Juice YAN	Step 1: Yeast Rehydration*	Step 2: Fermentation Nutrition	
		Start of Alcoholic Fermentation	⅓ of Completion
> 200 mg/L	Go-Ferm 30 g/hL (2.4 lb/1000 gal)*	Fermaid O 10–20 g/hL (0.8-1.7 lb/1000 gal)	Fermaid O 10–20 g/hL (0.8–1.7 lb/1000 gal) *or* Fermaid K 25 g/hL (2 lb/1000gal)
125–200 mg/L	Go-Ferm 30 g/hL (2.4 lb/1000 gal)*	Fermaid O 10–20 g/hL (0.8–1.7 lb/1000 gal)	Fermaid A 10–30 g/hL (0.8–2.4 lb/1000 gal) *or* Fermaid K 10–25 g/hL (0.8–2 lb/1000 gal)
< 125 mg/L	Go-Ferm Protect Evolution 30 g/hL (2.4 lb/1000 gal)* Add 20 g/hL Fermaid O to juice	Fermaid A 10–30 g/hL (0.8–2.4 lb/1000 gal) *or* Fermaid K 10–25 g/hL (0.8–2 lb/1000 gal)	Fermaid A 10–30 g/hL (0.8–2.4 lb/1000 gal)** *or* Fermaid K 10–25 g/hL (0.8–2 lb/1000 gal)** *and* Fermaid O 20 g/hL

Note: Knowing the initial YAN in the juice is only one piece of the puzzle. Other factors are critical as well.

Do not forget to consider the balance and availability of nitrogen, micronutrients and microprotectors, relative nitrogen needs of the selected yeast strain, SO_2, temperature, fruit condition, oxygen, and the variety of other factors which can impact yeast health and a successful fermentation.

*Quantity may change based on yeast dose.
**DAP may be required to further adjust the YAN.

Choosing the Right Yeast Nutrient

Highly Recommended	Anchorferm	DAP	Fermaid A	Fermaid K	Fermaid O	Go-Ferm	Go-Ferm Protect Evolution	Inocel	Nutrient Vit End	Phosphate Titres	Reskue	SIY Cell Hulls
Page	26	26	27	27	28	25	25	28	28	29	29	29
OMRI Listed					●	●	●		●			
Contains organic nitrogen	●		●	●	●	●	●		●		●	●
Contains DAP		●	●	●						●		
Contains thiamine	●			●						●		
Yeast nutrient without DAP	●				●	●	●	●	●		●	●
Yeast rehydration nutrient						●	●					
Yeast rehydration nutrient for difficult conditions							●					
Complex yeast nutrient			●	●	●							
Contains added vitamins and/or minerals				●						●		
Contains higher levels of sterols and fatty acids							●					
Inactivated yeast for challenging conditions									●		●	●
Contains cellulose								●				
Approved under TTB 24.246	●	●	●		●	●	●		●	●	●	●
Approved under TTB 24.250				●								

Note: With the exception of Fermaid K, all ingredients of the products shown in the nutrient section of this handbook are listed by the TTB as acceptable in good commercial cidermaking practice listed in 27 CFR 24.246. The ingredients in Fermaid K are listed as acceptable in good commercial cidermaking practice in either 27 CFR 24.250 or 27 CFR 24.246.

For more information please visit www.TTB.gov.

Article

Optimizing Nutrient Strategies for Healthy Fermentations

Cider Fermentation Dynamics: The factors that impact a healthy fermentation

One of the most common issues cider producers face is finishing fermentation with the sensory characteristics they desire. Working with a natural product requires an awareness of its variable and dynamic attributes. The particulars each cider producer faces will vary. At some facilities, the process may begin with whole fruit. A second cider producer may begin with juice (clarified or unclarified, pasteurized or unpasteurized). A third will start with concentrate. In each and every case, however, the cidermaker must be aware of their raw material and act proactively to assure successful fermentations.

No two sets of fruit or circumstances are exactly the same. Apples are comprised of at least 80% water, and 6-15% fermentable sugars, with trace amounts of xylose, galactose, rhamnose, sorbose and inositol. If the apples are harvested before fully ripe, starch may be present. Malic acid is the main acid present. Also present are the apple phenolics which contribute astringency and bitterness. From an organoleptic standpoint, approximately 200 compounds have been identified that contribute to the overall flavors and aromas in cider. These compounds can be grouped accordingly: 92% alcohols, 6% carbonyls and 2% esters with the remaining 2% classed as “other”. It is crucial to understand the many factors that can negatively impact a fermentation. This understanding allows the cidermaker to be proactive and address potential issues before they occur. This is critical as we strive to produce the best possible ciders from the raw materials that nature has given us.

What are the major parameters that influence fermentation performance?

Yeast Strain Selection and Handling

The initial yeast populations we find in fresh juice belong to the generas; *Hansenula*, *Pichia*, *Candida*, *Rhodoturula*, *Torulopsis*, *Kloeckera*, *Metschnikowia* and *Saccharomyces*. In addition, lactic acid and acetic acid bacteria are present. Cleanliness during all stages of harvest, transport and processing is paramount. Inoculation with commercial yeast preparations can contribute positively to ciders while minimizing risks associated with uncontrolled spontaneous fermentations. Cider producers across North America have a diverse portfolio of yeast available to them. They not only turn to the enological yeast but many also choose to use brewing yeast strains as well. Yeast strains chosen for fermentations need to tolerate and grow in circumstances of high physiological stress. Environmental challenges include high sugar, low pH, SO_2, and antagonistic microorganisms. Yeast need to thrive while making, accumulating, and tolerating increasing levels of ethanol. Choose a yeast strain suited for the task. Take into consideration the ethanol and temperature tolerances of the strain, as well as their nutritional needs. *See yeast reference chart on page 6 for guidance.* If you are not using a yeast strain in our portfolio, please consult your supplier to determine the parameters recommended for your chosen strain.

Cell Numbers and Health

In order to ensure that your selected yeast strain dominates during fermentation, inoculation should be done at a rate of no less than 25 g/hL (2 lb/1000 gallons) of juice. This converts to an initial inoculation of approximately $4x10^6$ cells/mL. If yeast inoculations are at recommended levels, they should then be able to suppress indigenous microorganism which otherwise might be competitive. This suppression results in a shorter lag (cell acclimatization) phase and also reduces the likelihood that volatile acidity problems will develop. Further, if the 25 g/hL rate is respected, the yeast will be stronger, grow more rapidly, and finish fermentations faster. While ciders don’t tend to have the same potential alcohol levels as grape wine, these inoculation levels should still be respected. Regardless of the final potential alcohol, the yeast needs to achieve a specific biomass in a beverage in order to start fermentation. If your beginning inoculation is low, due to either poor yeast handling or by using less than the recommended inoculation rates, the remaining population will have to work harder and go through more generations to reach the appropriate biomass. This can lead to a depletion of the key membrane components and overall less vigor in the yeast.

Note also:
If you are producing an ice cider and the initial sugar level is between 25–30°Brix, we recommend increasing the yeast inoculation level to 35 g/hL (2.9 lb/1000 gallons).

If the initial sugar level exceeds 30°Brix, we recommend increasing the yeast inoculation level to 40 g/hL (3.3 lb/1000 gallons). For above 35°Brix, we recommend 50 g/hL (4.25 lb/1000 gallons).

If GoFerm or GoFerm Protect Evolution are used, any increase in yeast inoculation should be matched by a similar increase in these nutrients.

We do **not** recommend re-pitching yeast/yeast harvesting. This is a practice commonly used in brewing. Ciders tend to have lower pH’s and less overall nutrients than beer, and what would typically lead to successful re-pitching with beer might compound fermentation problems in a cider. If you are re-pitching your yeast, make sure to start up a new culture for your next batch if the previous batch had off odors during fermentation.

Nutritional Requirements

Nutrient strategies for fresh pressed juice can differ significantly from the strategies required for cider made from processed juice (clarified, pasteurized, etc) or cider made from concentrate. Measuring your YAN before fermentation is essential for determining when and what nutrients to use. YAN can be variable across apple varieties, orchards and even the age of the fruit. Clarified juice and juice from concentrate will always have lower nutrient levels than their fresh pressed counterparts.

Some factors are more critical at the fermentation's onset (vitamins and minerals), some at mid-point (nitrogen and oxygen) and some later on (polyunsaturated fatty acids and sterols). To achieve optimal fermentation results we recommend that these needs be anticipated with a multi-stage nutrition program including both rehydration and fermentation nutrients. Any program should be tailored to the individual needs of the particular yeast you have chosen, the condition of the juice chemistry, the prefermentation processes, the individual needs of the organism and the initial nitrogen levels. Notably, if nitrogen is deficient, then we can also assume that other essential nutrients are lacking as well.

The Importance of Organic Sources of Nitrogen: Yeast assimilable nitrogen (YAN) comes in two forms. The first is in the form of ammonia compounds. These are inorganic and the yeast assimilate them quickly. The second type of nitrogen is in the form of amino acids. These are organic compounds which yeast consume slowly but on a continued basis. Organic nitrogen has been shown to be 3-5 times more efficient when compared to equivalent nitrogen values of DAP. When complex nutrient strategies include organic forms of nitrogen the kinetics are more controlled with less likelihood of heat spikes when compared to just straight DAP additions. Less stress on the yeast can help minimize off odor production during fermentation.

Oxygen

Many cider producers might think oxygen is their worst nightmare. Though oxidation of the finished product is never desired, active fermentations greatly benefit from oxygen introductions. A small amount of air should be introduced into the fermentation 18–24 hours after yeast inoculation. It is during this period of exponential yeast cell reproduction that the newly produced yeast population needs oxygen to produce the lipids in their cell membrane. Strong membranes will protect the yeast at the end of the alcoholic fermentation from the toxic effects of elevated temperatures and ethanol. Without these lipids the cell membrane becomes leaky and the yeast cell transport systems are compromised. Yeast are excellent oxygen scavengers and will remove all oxygen before any oxidation problems can occur to the juice. Air can be introduced by racking, leaving the air lock off for 24 hours or by venturi device. Oxygen additions should not continue past the halfway point of your fermentation.

Buffering Capacity

There is very little buffering capacity in some apple juice. As a consequence, the pH of the fermentation can drop rapidly at the onset of fermentation. If the pH < 3.0, this initial drop can be extremely damaging to the yeast. Monitor the pH of the fermentation during the first 18–36 hours. If high acidity is not a stylistic choice, adjust the pH > 3.2 with carbonate prior to initiating fermentation.

Temperature

Temperature control during fermentation is critical! Temperature stress can permanently inactivate yeast cells. Temperature stress can be viewed as over-cooling, excessive heating or rapid temperature swings (commonly from hot to very cool). Temperature management is especially important at the end of fermentation when ethanol levels are at their maximum.

For temperature minimums please consult individual strain recommendations. Remember, however, that fermentations should never be initiated at the lower limits of a strain's tolerance. This will only introduce an unnecessary stress variable.

Final Point:
Keep your yeast in suspension

It is important to keep the yeast moving and to have some level of solids in fermenting juice. If the juice is too clear, you can increase the level of solids by adding fermentation nutrients or yeast hulls. As fermentations progress, yeast cells can settle to the bottom of the vessel. As yeast settle they are compacted in the lees and this contributes additional stress. This may result in elevated volatile acidity and sulfide production. Keep your yeast moving, especially in the last third of the fermentation.

Rehydration Nutrients

This is the first stage of your nutrient strategy. Yeast rehydration nutrients provide natural micronutrients (vitamins and minerals) to the yeast during the yeast rehydration phase. If these micronutrients were added directly to the juice, competitive microorganisms would use a significant amount of them and others would be chelated by polyphenols or inactivated by SO_2. By adding these bio-available nutrients at the rehydration stage, yeast cells benefit most directly. Cell viability and vitality are enhanced, resulting in fermentations that finish stronger, with reduced chances of sensory deviations. Never use nutrients containing ammonia salts, such as DAP, during yeast rehydration—they are toxic to the yeast.

Go-Ferm

Yeast rehydration nutrient; OMRI listed

Go-Ferm® is a natural yeast rehydration nutrient containing a balance of vitamins and minerals. It was developed to enhance fermentation kinetics and to help avoid fermentation problems. By suspending Go-Ferm in the rehydration water before adding the selected active dried yeast culture, the yeast soak up the valuable bio-available micronutrients as they rehydrate. Infusing yeast with these critical nutrients arms them against ethanol toxicity and optimizes nutrient availability, protecting and stimulating the yeast culture.

Recommended Dosage

30 g/hL 2.5 lb/1000 gal

Note: This recommendation is based on a yeast inoculum of 2 lb/1000gallons (25 g/hL). If using more or less yeast, respect the ratio of 1 part yeast to 1.25 Go-Ferm.

Usage

1. Mix Go-Ferm in 20 times its weight in clean 43°C (110°F) water. For every 1 kg (2.2 lb) Go-Ferm, use approximately 5 gallons of water.
2. Let the mixture cool to 40°C (104°F) then add the selected active dried yeast.
3. Let stand for 20 minutes.
4. Slowly (over 5 minutes) add equal amounts of juice to be fermented to the yeast slurry. Do not allow more than 10°C (18°F) difference. Atemperate as necessary *(see page 5 for more details).*

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

#15149 1 kg
#15135 2.5 kg
#15161 10 kg

Go-Ferm Protect Evolution

Next generation yeast rehydration nutrient for challenging conditions

Go-Ferm Protect Evolution® is the next generation of natural yeast rehydration nutrient with improved sterol content (quality and quantity) together with micronutrients which help to increase yeast cell viability and vitality. This second generation formulation improves yeast stress tolerance and enhances fermentation security (especially in difficult conditions).

Difficult conditions may include overripe fruit, marginal fruit quality (poorly developed fruit, rot, molds, high bacteria count), insecticide or fungicide residue, low nutrient levels, or over-clarified juice. It is especially useful in cider fermentations when oxygen additions are difficult. The enhanced sterol content can replace the second oxygen addition recommended at 1/3 sugar depletion.

Go-Ferm Protect Evolution provides a combination of protective and nutritive benefits for optimal fermentation and sensory results.

Recommended Dosage

30 g/hL 2.5 lb/1000 gal

Note: This recommendation is based on a yeast inoculum of 2 lb/1000gallons (25 g/hL). If using more or less yeast, respect the ratio of 1 part yeast to 1.25 Go-Ferm Protect Evolution.

Usage

1. Mix Go-Ferm Protect Evolution in 20 times its weight in clean 43°C (110°F) water. For every 1 kg (2.2 lb) Go-Ferm Protect Evolution, use approximately 5 gallons of water.
2. Let the mixture cool to 40°C (104°F) then add the selected active dried yeast.
3. Let stand for 20 minutes.
4. Slowly (over 5 minutes) add equal amounts of juice to be fermented to the yeast slurry. Do not allow more than 10°C (18°F) difference. Atemperate as necessary *(see page 5 for more details).*

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

#15103 2.5 kg

Fermentation Nutrients

For Yeast Nutrition + Fermentation Security

Yeast nutrition refers to the utilization of essential food sources for anabolic and catabolic reactions which ultimately ensure the growth and survival of the cell. Fermentation nutrition is therefore considered a vital part of a controlled fermentation strategy.

Nitrogen is an extremely important yeast nutrient. The cells use nitrogen for growth, protein and enzyme synthesis, and sugar transport. Yeast nutrition, however, is more than nitrogen. Yeast cells also require a balanced supply of minerals (magnesium, zinc, etc.), vitamins and oxygen. Tailor your fermentation regime for optimal yeast reproduction, sugar transport and aromatic expression.

Anchorferm

Yeast nutrient for Anchor yeast to maximize aromatics

Anchorferm is a yeast nutrient containing specific inactivated yeast and thiamine. When using Anchor yeasts in cool ferments, Anchorferm can maximize aromatic potential. The yeast population is kept healthier and the potential for VA and off-sulfur aromas is limited. Anchorferm is not to be considered a primary nutrient source and should be used in conjunction with other nitrogen sources.

Recommended Dosage

20 g/hL 1.6 lb/1000 gal

Usage

Anchorferm may be added at any time during fermentation. For best results, add 20 g/hL at 1/3 sugar depletion.

To avoid CO_2 release and overflowing of fermentation vessels, Anchorferm should be mixed with water or juice to create a slurry. The amount of water used is not critical. Simply add enough water to make a slurry.

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

*This product contains thiamine. When dosed at the recommended 20 g/hL dosage, it is under the TTB maximum legal dose for thiamine hydrochloride = 0.60 mg/L (0.005 lb/1000 gal) of wine or juice. 21 CFR 184.1875.
If using Anchorferm, any nutrient additions cannot contain thiamine, or there is a risk of being over the TTB legal limit for thiamine.

#15147 10 kg

Diammonium phosphate (DAP)

Inorganic nitrogen source

DAP is an inorganic nitrogen source that should be used in conjunction with complex nutrients to ensure a complete nutritional strategy is followed. DAP is used to supplement in nitrogen deficient environments.

Usage

In order to avoid CO_2 release and overflowing of fermentation vessels, all powdered products should be mixed with room temperature water before adding to an active fermentation. The amount of water used is not critical. Simply add enough water to make a slurry.

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

Note: Due to high nutrient requirements, some yeast strains may benefit from additional nutrient supplementation *(see yeast reference chart on page 6)*.

#15805 5 kg

Fermaid A

Complex yeast nutrient

Fermaid® A is a complex yeast nutrient blend of inactivated yeast supplying organic nitrogen (alpha amino nitrogen) and diammonium phosphate (DAP). There are no supplemented vitamins or minerals. The nitrogen blend in Fermaid A is aimed at encouraging a balanced rate of fermentation. An addition elevates the yeast's intracellular amino reserve, reducing the chances of a stuck or sluggish fermentation. The available YAN in the fruit directly impacts the fermentation rate and the formation of flavor-active volatile compounds. For best results, Fermaid A should be used in conjunction with an appropriate yeast rehydration nutrient (Go-Ferm or Go-Ferm Protect Evolution). This will assure proper nutrition of the selected yeast from rehydration through completed fermentation.

Recommended Dosage

10–30 g/hL 0.8–2.4 lb/1000 gal

Usage

In order to avoid CO_2 release and overflowing of fermentation vessels, all powdered products should be mixed with room temperature water before adding to an active fermentation. The amount of water used is not critical. Simply add enough water to make a slurry.

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

Note: Due to high nutrient requirements, some yeast strains may benefit from additional nutrient supplementation *(see yeast reference chart on page 6)*.

#15070A 10 kg

Fermaid K*

Complex yeast nutrient

Fermaid® K is a complex yeast nutrient that contains a blend of inactivated yeast, free amino acids (organic nitrogen derived from inactivated yeast), sterols, unsaturated fatty acids, key nutrients (magnesium sulfate, thiamine, folic acid, niacin, calcium pantothenate) and ammonium salts (DAP). The unsaturated fatty acids and sterols that Fermaid K provides are important survival factors needed to maintain alcohol resistance and permease (sugar uptake) activity.

The nitrogen from the alpha amino acids contained in Fermaid K is utilized much more efficiently than from the ammonia salts. The cell wall fractions in Fermaid K absorb short and medium chain fatty acids that are toxic to the yeast. They also provide nucleation sites to help keep the yeast in suspension. For best results, Fermaid K should be used in conjunction with an appropriate yeast rehydration nutrient (such as Go-Ferm or Go-Ferm Protect Evolution) to assure proper nutrition of selected yeast from rehydration through completed fermentation.

Recommended Dosage

25 g/hL 2.0 lb/1000 gal

*Note: The ingredients in Fermaid K are listed by the TTB as acceptable in good commercial cidermaking practice in CFR 24.250 together with CFR 24.246. The ingredients in all other products shown on pages 25–31 are listed by the TTB as acceptable in good commercial cidermaking practice in CFR 24.246. *For more information please visit www.TTB.gov.*

Usage

In order to avoid CO_2 release and overflowing of fermentation vessels, all powdered products should be mixed with room temperature water before adding to an active fermentation. The amount of water used is not critical. Simply add enough water to make a slurry.

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

Note: Due to high nutrient requirements, some yeast strains may benefit from additional nutrient supplementation *(see yeast reference chart on page 6)*.

#15073 2.5 kg
#15070 10 kg

Fermaid O

Organic yeast nutrient; OMRI listed

Fermaid® O is a blend of highly specific fractions from inactivated yeast that are rich in assimilable amino acids (organic nitrogen). Organic nitrogen is known to be a highly effective nutrient source (especially when compared to inorganic nitrogen) consistently resulting in lower peak fermentation temperatures, lower levels of negative sulfur compounds and cleaner fermentation kinetics. Organic nitrogen use has been correlated with positive aromatic expression. Fermaid O does not contain any DAP or supplemented micronutrients. For optimal results, Fermaid O should be used in conjunction with an appropriate yeast rehydration nutrient (Go-Ferm or Go-Ferm Protect Evolution) to assure proper micronutrient nutrition of selected yeast from rehydration through completed fermentation.

Recommended Dosage

40 g/hL 3.3 lb/1000 gal

Usage

In order to avoid CO_2 release and overflowing of fermentation vessels, all powdered products should be mixed with room temperature water before adding to an active fermentation. The amount of water used is not critical. Simply add enough water to make a slurry.

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

Note: Due to high nutrient requirements, some yeast strains may benefit from additional nutrient supplementation *(see yeast reference chart on page 6).*

#15067 2.5 kg
#15107 10 kg

Inocel

Cellulose powder for over-clarified juice

Inocel is purified cellulose powder. Inocel increases the turbidity of cider. It may be used alone or in combination with complex nutrients to improve alcoholic and malolactic fermentation kinetics. Add to freshly pressed juice at the beginning of fermentation.

Recommended Dosage

10–60 g/hL 0.8–5 lb/1000 gal*

*Each 10 g/hL of Inocel equals a rough increase of 20 NTU

Usage

Blend Inocel into 20 times its weight of room temperature water. Once hydrated, add directly to the juice, mixing thoroughly.

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

#15804 1 kg

Nutrient Vit End

Inactivated yeast for compromised fruit and/or treating sluggish and stuck fermentations; OMRI Listed

Nutrient Vit End™ is a highly specific inactivated yeast. It has high bio-adsorptive properties for binding short and medium chain fatty acids and fungicides. Saturated fatty acids are produced under stressful conditions resulting in a modification of the yeasts sugar transport capacity. When used during fermentation Nutrient Vit End can bind toxins and help minimize the risk of sluggish or stuck fermentations. It can also be used to detoxify the cider for restarting a sluggish or stuck fermentation.

Recommended Dosage

Juice

30 g/hL 2.5 lb/1000 gal

Sluggish or Stuck Cider

40 g/hL 3.3 lb/1000 gal

Usage

Suspend Nutrient Vit End in water, juice or cider and mix well before adding. If using for a stuck or sluggish fermentation, allow to settle and rack off prior to restart.

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

#15679 2.5 kg

Phosphate Titres

DAP and thiamine blend for optimized fermentations

Phosphate Titres is a blend of diammonium phosphate (DAP) and thiamine (vitamin B1) for nutrient supplementation of deficient juice. Yeast requires a supply of thiamine for cell growth. Phosphate Titres can help ensure regular yeast multiplication and sugar utilization. Add at the start of alcoholic fermentation in low YAN juice situations (alongside a complex yeast nutrient) or at 1/3 sugar depletion. Phosphate Titres contains 1% thiamine.*

Recommended Dosage

6 g/hL 0.5 lb/1000 gal*

Usage

Suspend Phosphate Titres in cold water and mix well before adding to juice.

Storage

Dated expiration. Store in a cool and dry environment below 25°C (77°F). Once opened, keep tightly sealed and dry.

*This product contains thiamine. The TTB Maximum Legal Dose for thiamine hydrochloride = 0.60 mg/L (0.005 lb/1000 gal) of cider or juice. 21 CFR 184.1875

#15887 1 kg
#15888 5 kg

New!

Reskue

Specific inactivated yeast for treating stuck fermentations

Reskue™ is a chosen wine yeast that has been inactivated and treated with a specific autolysis process to create cell wall fractions with very high bio-adsorptive properties for saturated short and medium chain fatty acids and fungicide residues. It was designed for use when restarting stuck fermentations. Saturated fatty acids can be created by yeast during stressful fermentation conditions. These fatty acids and fungicide residues can interfere with membrane sugar transport proteins. Use of Reskue™ helps improve these toxic conditions allowing for an easier finish of alcoholic fermentation.

Recommended Dosage

40 g/hL 3.3 lb/1000 gal

Usage

Suspend Reskue in 10 times its weight of clean 30–37°C (86–98°F) water and mix. Wait 20 minutes then add to stuck or sluggish fermentation. For stuck fermentations, allow Reskue to settle for 48 hours then rack off and reinoculate with a restart yeast.

Storage

Dated expiration. Store in a cool and dry environment at 18°C(65°F). Once opened, keep tightly sealed and dry.

#15224 1kg

SIY Cell Hulls

Yeast hulls for difficult fermentation conditions

SIY Cell Hulls™ (yeast ghosts or skeletons) are a preparation of the insoluble fraction of whole yeast cells (i.e. cell walls). The addition of yeast hulls has been shown to increase the number of viable yeast cells and to help increase the surface area of over-clarified juice and cider. In difficult or sluggish alcoholic or malolactic fermentations, yeast hulls assist by absorbing toxins such as hexanoic and decanoic acids and their esters. Yeast hulls are highly beneficial in oxygen deficient juice and cider as they contribute sterols and unsaturated fatty acids. Together with adequate assimilable nitrogen, yeast hulls can help promote cell growth and increase fermentation kinetics. For severe conditions, such as high sugar juice, over-fined juice or warm cellar conditions, higher doses (>25 g/hL) are recommended. Racking will remove yeast hulls and may necessitate a second addition.

Recommended Dosage

25 g/hL 2 lb/1000 gal

Usage

In order to avoid CO_2 release and overflowing of fermentation vessels, SIY Cell Hulls should be mixed with room temperature water before adding to an active fermentation. The amount of water used is not critical. Simply add enough water to make a slurry.

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

#15069 < per lb
44 lb bag

Natural Yeast Derivative Nutrients

Natural yeast derivative nutrients are highly specialized inactivated strains of yeast. These yeast strains are grown in a controlled environment and harvested at the end of their growth phase. At this stage the yeast has produced a range of attractive polysaccharides that are more reactive compared to the polysaccharides that are released during the yeast autolysis phase.

Our inactivated yeasts are derived from the biomass of whole yeast cells and have been treated to suppress their fermentative capacity.

Each of our natural yeast derivative nutrients can be differentiated by the strains of yeast used, the level of refinement of the yeast cells, their polysaccharide contribution, as well as the presence of specific fractions such as glutathione. These tools contribute certain fermentative advantages together with significant cider quality improvement. Used alone, however, they should not be viewed as a substitute for the complete range of fermentation nutrition products listed elsewhere in this handbook.

Choosing the Right Natural Yeast Derivative Nutrient

● Highly Recommended
○ Recommended

	ICV Booster Blanc	ICV Noblesse	OptiMUM White	Opti-WHITE
Page	31	31	31	31
OMRI Listed		●	●	●
Increases aromatic freshness	●		●	●
Develops mid-palate intensity	●	○	○	○
Increases aromatic structure & complexity	●	●	●	○
Decreases alcohol perception	○	●		
Facilitates wood integration	●		●	●
Increase overall balance	●	●	●	●
Avoids off-aromas and oxidation	●	●	●	
Reduces bitterness or green character	○	○	●	●
Reduced production of sulfur off-odors during fermentation	●	●		
Reduces sulfur defects	○	●		

Note: With the exception of Fermaid K, all ingredients of the products shown in the nutrient section of this handbook are listed by the TTB as acceptable in good commercial cidermaking practice listed in 27 CFR 24.246. The ingredients in Fermaid K are listed as acceptable in good commercial cidermaking practice in either 27 CFR 24.250 or 27 CFR 24.246.

For more information please visit www.TTB.gov.

ICV Booster Blanc

Increases smooth mid-palate intensity and fresh fruit notes

ICV Booster Blanc® was developed from a specific ICV yeast strain. This yeast derivative nutrient is produced by the inactivation of yeast cells and through this process soluble fractions of the cells walls are made readily available.

When added to juice, Booster Blanc participates in the colloidal balance of the cider resulting in smooth mid-palate intensity and increased fresh fruit aromas. Interactions take place that diminish bitterness and chemical perceptions. Booster Blanc helps to maintain freshness and aroma stability in ciders that go through MLF.

If used at the beginning of the primary fermentation, it can be helpful in lowering the production of off-sulfur compounds. It can be added toward the end of fermentation to help reveal muted aromatics.

Recommended Dosage

30 g/hL 2.5 lb/1000 gal

Note: Dosage should be increased when fruit is affected by more than 15% rot or when there is an absence of oxygen during fermentation.

Usage

Mix Booster Blanc in 10 times its weight in water or juice. Booster Blanc is only partially soluble. Stir to maintain suspension before and during addition.

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

#15179 2.5 kg

ICV Noblesse

Contributes to balance and softness on the finish; OMRI listed

ICV Noblesse® is a yeast derivative nutrient which adds a perception of sweetness to balanced ciders. The production process used for Noblesse inactivates sulfite-reductase potential, greatly limiting sulfur off-odors. Ciders made using Noblesse exhibit a more intense perception of ripe fruit together with an overall roundness and softness on the finish. Noblesse can help reduce undesirable aggressive characters or sensations of dryness due to the release of low molecular weight polysaccharides. Although immediate results are possible, full integration may take three to five months.

Recommended Dosage

30 g/hL 2.5 lb/1000 gal

Usage

Mix Noblesse in 10 times its weight in water or juice. Add during a pump-over or tank mixing. This product is partially soluble. Stir to maintain suspension before and during addition.

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

#15105 2.5 kg

OptiMUM White

For optimizing aromatic intensity and longevity; OMRI listed

OptiMUM White® is a yeast derivative nutrient which is produced using a new process that increases the glutathione bio-availability and the level of available polysaccharides. Glutathione is a natural antioxidant that has been shown to protect against browning, enhance the fruity nature of aromatic ciders and minimize undesirable aroma compounds. OptiMUM White should be added early in the fermentation process, at juice settling.

This helps protect juice from oxidation. When used at this point it also has a positive impact on aroma preservation. This natural yeast derivative nutrient favors aromatic intensity, stabilization and longevity in ciders.

In order to achieve the maximum anti-oxidant protection OptiMUM White should be used with a complete nutritional program.

Recommended Dosage

20–40 g/hL 1.6–3.3 lb/1000 gal

Usage

Mix OptiMUM White in 10 times its weight in water or juice. Add to the juice after settling or directly to the tank at the onset of fermentation. This product is partially soluble. Stir to maintain suspension before and during addition. Stir to maintain suspension before and during addition.

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

#15198 1 kg
#15202 2.5 kg

Opti-WHITE

Protects fresh aromas; OMRI listed

Opti-WHITE® is prepared using a specific production process that results in a yeast derivative rich in polysaccharides and high in antioxidant peptides (glutathione). These glutathione peptides work synergistically with SO_2, allowing the cidermaker to potentially lower their SO_2 dosage. When added to the juice at the onset of fermentation, Opti-WHITE enhances smoothness, helps avoid browning from oxidation and protects fresh aromas during aging.

Recommended Dosage

25–50 g/hL* 2–4 lb/1000 gal

*Use 50 g/hL for maximum anti-oxidative properties

Usage

Mix Opti-WHITE in 10 times its weight in juice or water. Add to the juice after settling or directly to the tank prior to the onset of fermentation. If adding during the later stages of alcoholic fermentation, add during a tank mixing for proper homogenization. This product is partially soluble. Stir to maintain suspension before and during addition.

Storage

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

#15165 1 kg
#15136 2.5 kg
#15216 10 kg

Tannins

Overview

Tannins come from a variety of sources. These include oak (both american and european, toasted and untoasted), chestnut, grapes (both skins and seeds), exotic woods (such as tara and quebracho) and gall nuts. Though all tannins provide some degree of antioxidative protection, each is also quite distinctive. The selection, processing and blending are all critical when developing commercial tannins. The descriptors often used to characterize tannin types are inadequate to the task. Words such as ellagic (meaning oak or chestnut wood) or proanthocyanidins (meaning from grapes and some exotic woods) are very broad. The producer of tannins needs to understand and quantify the potential of specific raw materials and then apply this knowledge. Tools such as GC/MS (gas chromatography/mass spectrometry), reverse phase HPLC (high performance liquid chromatography) and TLC (thin layer chromatography) analysis (silica/fluorescence; cellulose) are common in this process.

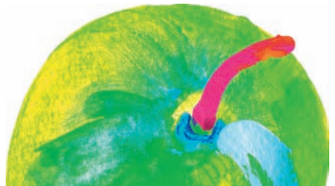
Raw materials need to be tasted in different concentrations in different ciders. Though lab tools are useful for understanding products, tasting still remains the key. There is no substitute if we wish to understand issues such as mouthfeel, relative astringency and increasing roundness. In particular, the polysaccharides linked with tannins contribute to the overall impact on the palate.

These are the elements that went into the development of the Scott'Tan™ product range. It was an elaborate program. We believe you will appreciate the results.

Basics

The tannins we offer for cider can be used during the fermentation, or after fermentation during cellaring.

Common objectives for tannins when used during fermentation are to enhance structure and mouthfeel, to protect from browning, and to deal with the consequences of mold or rot. Uses of tannins during cellaring and finishing include improved mid-palate and texture, perceptions of minerality or sweetness, and improved aging potential.



Fermentation + Cellaring Tannins

The tannins listed here can be used as both fermentation tannins and cellaring tannins.

Protocol

Please refer to protocol on page 35 for Timing of Tannin Additions

FT Blanc

Protection from oxidation and mouthfeel enhancement

Scott'Tan™ FT Blanc tannin is a white gall nut tannin specifically formulated for use on fruit with mold or rot. It helps protect juice from browning by acting as an anti-oxidant. On sound fruit, FT Blanc is an effective anti-oxidant when used with SO_2.

Recommended Dosage
50–200 ppm 5–20 g/hL
0.42–1.6 lb/1000 gal

Usage
Add FT Blanc to the juice or the cider during a tank mixing. Good homogenization is important. If an addition of FT Blanc is made post-fermentation, we recommend waiting 3–6 weeks after the tannin addition before racking, fining, filtering or bottling.

Storage
Dated expiration. Unopened, the shelf-life is 5 years at 18°C(65°F). Once opened, keep tightly sealed and dry.

#15954 1 kg
#15969 5kg

FT Blanc Citrus

Promotes the expression of fruity aromas

Scott'Tan™ FT Blanc Citrus is a mixture of condensed tannins extracted from citrus wood and gallic tannins. The use of FT Blanc Citrus during the course of alcoholic fermentation, and in combination with yeast strains with a marked beta-glycosidase activity (such as 71B, Rhône 4600, VIN 13, QA23 and 58W3), allows for the development of enhanced aromatic potential. The resulting ciders may present more intense aromas of lemon, grapefruit, apple and white flowers, which complement varietal aromas and those produced during fermentation. Scott'Tan FT Blanc Citrus also protects cider from oxidation.

Recommended Dosage
20–150 ppm 2–15 g/hL
0.17–1.25 lb/1000 gal

Usage
In order to benefit from the full effect of the sensory aromatic precursors produced from the tannin, FT Blanc Citrus should be added during alcoholic fermentation, within 24–48 hours after yeast inoculation. Dissolve in ten times its weight in water and add during tank mixing.

Storage
Dated expiration. Unopened, store the product in a dry, cool and well ventilated place. Opened package: carefully reseal and store for use in the same harvest year.

#15974 1 kg
#15975 5 kg

FT Blanc Soft

Oxidation protection and mouthfeel enhancement for cider

Scott'Tan™ FT Blanc Soft is similar to FT Blanc in application but ciders made with it are also characterized by softness and improved mouthfeel. Ciders made with FT Blanc Soft have enhanced texture with a perception of sweetness on the palate. Even relatively small dosages can contribute to minerality in ciders.

Recommended Dosage
50–200 ppm 5–20 g/hL
0.42–1.6 lb/1000 gal

*A small addition of 2.5-5.0 g/hL(0.21-0.42 lb/1000 gal) may help mask the perception of bitterness in a finished cider

Usage
Add FT Blanc Soft to the juice or the cider during a tank mixing. Good homogenization is important. If an addition of FT Blanc Soft is made post-fermentation, we recommend waiting 3–6 weeks after the tannin addition before racking, fining, filtering or bottling.

Storage
Dated expiration. Unopened, the shelf-life is 5 years at 18°C(65°F). Once opened, keep tightly sealed and dry.

#15955 1 kg

New!

Radiance

Tannin blend for highlighting fresh fruit

Scott'Tan™ Radiance will help promote balance and mouthfeel while maintaining acidity when used on finished ciders. It can help unmask and refine aromas and flavors of your fresh fruit. It is also known to contribute notes of vanilla, coconut and caramel.

Recommended Dosage
10–100 ppm 1–10 g/hL
0.08–0.83 lb/1000 gal

Usage
Dissolve Radiance in 10 times its weight of warm water 35-40°C(95-104°F) until fully dissolved. Add to cider gradually during a transfer or pump over. Good homogenization is important. Additions should be made at least 48 hours prior to bottling.

Storage
Dated expiration. Unopened, the shelf-life is 4 years at 18°C(65°F). Once opened, keep tightly sealed and dry.

#15978 250 g

Enzymes

Overview

Enzymes are natural protein catalysts that facilitate and increase the rate of chemical reactions. Enzymes are used to accelerate natural reactions that would otherwise occur slowly in cider. Enzyme use can promote fruit and spice attributes while reducing sulfur off-odors and undesirable herbaceous and mineral characteristics. (D. Delteil, 2003, personal communication).

If time permits and pressing technology allows, the addition of enzymes to the milled apples as soon as possible helps with extraction of aroma precursors, and helps increase juice yield.

Basics

Enzymes are a useful tool to optimize the potential of your fruit. They perform best when remembering a few basics:

Timing

In general, enzymes should be added as early as possible on crushed fruit or juice to provide your fermentation with the natural components of the fruit. Enzymes that contain beta-glucosidase (Lallzyme Beta and Scottzyme BG) are inhibited by sugars and should not be used prior to fermentation. Beta and BG are useful in releasing flavor and aroma compounds. Scottzyme KS is used after pressing to enhance clarification and filterability in cider.

SO_2

Enzyme activity is inhibited by SO_2. In high concentrations (around 200 ppm) SO_2 will denature and inactivate the enzymes. SO_2 can be added after an enzyme addition has been adequately dispersed or vice versa, but do not add SO_2 and enzymes at the same time.

Bentonite

Bentonite will bind with enzymes and inactivate them, so the timing of additions is important. It is best to use bentonite after the enzyme activity has completed. If adding enzymes after using bentonite, make sure to rack cider off of the bentonite prior to adding enzymes.

Conditions

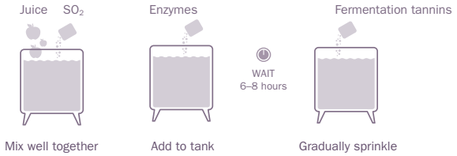
High alcohol, low temperature, high SO_2, fining agent additions and the amount of movement in a tank can inhibit enzyme action. If conditions are not optimal for the enzymes, extra time may be required for the enzyme activity to be completed before proceeding with other additions.

Liquid and Granular/Powdered

The enzymes are granular/powdered or liquid. The granular/powdered enzymes are marked with the symbol. The liquid enzymes are marked with the symbol.

Protocol

Timing of Additions: SO_2, Enzymes and Tannins



Add SO_2 and mix well prior to adding enzymes.

Tannins can be added 6–8 hours later. Yeast derivative nutrients (e.g. Opti-White) can be added at any point during fermentation.

Choosing the Right Enzyme

	Scottzyme					Lallzyme			Rapidase		
● Highly Recommended ○ Recommended	BG	HC	KS	Pec5L	Spectrum	Beta	Cider Clear	MMX	Clear	Clear Extreme	Revelation Aroma
Page	38	38	39	39	39	36	36	36	37	37	37
Release of aromas	●					●		○			●
Useful for hard-to-press fruit		●		●							
Improved pressability		●		●							
Never use BEFORE pressing			●				●				
Enhanced settling			●	●	●		●		○	●	
Improved clarification		○	●	●	●		●	○	○	●	○
Increased yield		●		●							
Reduced solids		●	●	●			●		○	●	
Improved filterability		●	●	●	●		●	●			
Contains betaglucanase								●			
Listed on 24.250.								●			

*Note: The ingredients in MMX are listed by the TTB as acceptable in good commercial cidermaking practice in CFR 24.250.

For more information, please visit www.TTB.gov.

Lallzyme

All Lallzymes are granular and most are sourced from *Aspergillus niger* fermentations (not sourced from genetically modified organisms).

MMX is sourced from a non-GMO *Trichoderma harzianum* fermentation.

Beta

Aroma enhancement

Lallzyme Beta™ is a blend of pectinase and beta-glucosidase for use in ciders with high levels of bound terpenes. Lallzyme Beta has been formulated so that it will not lead to an over-expression of aromas. The glucosidase activity is inhibited by sugars. The cider should have less than 0.5% residual sugar for full enzyme activity. Bench trials are highly recommended before using.

Recommended Dosage

Juice	Not recommended	
Cider	5–10 g/hL	190–379 g/1000 gal

Usage

Dissolve Lallzyme Beta in 10 times its weight in water, gently stir and allow to sit for a few minutes. Then add to cider. For use in cider only since the betaglucosidase activity is inhibited by glucose levels in juice.

Storage

Dated expiration. Store dry enzyme at 25°C(77°F). Once rehydrated, use within a few hours.

#16200 100 g

New!

Cider Clear

Juice clarification and settling

Lallzyme Cider Clear is a new enzyme created specifically for cider. It is a pectinase for juice clarification and settling.

Recommended Dosage

Juice	2–3 g/hL	76–114 g/1000 gal

Usage

Dissolve Lallzyme Cider Clear in 10 times its weight in water, gently stir, allow to sit for a few minutes and then add to juice.

Storage

Dated expiration. Store dry enzyme at 25°C(77°F). Once rehydrated, use within a few hours.

#16209 100g

MMX

Enzyme to improve filterability

Lallzyme MMX™ is a beta-glucanase and pectinase blend. Due to the synergistic activities of the glucanase and pectinase blend, Lallzyme MMX improves the filterability of ciders. This enzyme blend was developed by Lallemand to improve the short maceration of cider on lees.

Lallzyme MMX contains beta-glucanase activities derived from *Trichoderma harzianum*. Enzymes from this source are listed on 24.250.

Recommended Dosage

Juice	Not recommended	
Cider	1–5 g/hL	40–190 g/1000 gal

Usage

Dissolve Lallzyme MMX in 10 times its weight in water, gently stir, allow to sit for a few minutes and then add to the cider.

Storage

Dated expiration. Store dry enzyme at 25°C(77°F). Once rehydrated, use within a few hours.

#16207 100 g

Rapidase

The following Rapidase enzymes are granular and sourced from *Aspergillus niger* fermentations (not sourced from genetically modified organisms).

Rapidase Clear

Enzyme for settling, clarification, and reducing solids

Rapidase Clear is a clarification enzyme preparation. It is a granular pectolytic enzyme that aids in decreasing viscosity, allowing for more compact lees and clearer juice, resulting in clearer ciders.

Recommended Dosage

Juice	1–4 g/hL	38–151 g/1000 gal
Cider	Not recommended	

Usage

Dissolve Rapidase Clear in 10 times its weight in water, gently stir and then add to juice.

Storage

Dated expiration. Store dry enzyme refrigerated at 4–8°C(40–45°F). Once rehydrated, use within a few hours.

#16255 100 g
#16256 1 kg

Rapidase Clear Extreme

Enzyme for settling, clarification, and reducing solids in difficult and extreme conditions

Rapidase Clear Extreme is an enzyme preparation for use in difficult juice conditions (low temperature, pH and/or hard-to-settle varietals). It is a granular pectolytic enzyme that decreases viscosity and promotes solid particle aggregation.

Recommended Dosage

Juice	> 13°C (55°F)	1 g/hL	38 g/1000 gal
	10–12°C (50–54°F)	2 g/hL	75 g/1000 gal
	< 10°C (50°F)	4 g/hL	151 g/1000 gal
For settling time under 6 hours at			
	> 10°C (50°F)	3 g/hL	113 g/1000 gal
Cider	Not recommended		

Usage

Dissolve Rapidase Clear in 10 times its weight in water, gently stir and then add to juice.

Storage

Dated expiration. Store dry enzyme refrigerated at 4–8°C(40–45°F). Once rehydrated, use within a few hours.

#16257 100 g

New!

Revelation Aroma

Enzyme for the extraction of aroma precursors

Rapidase Revelation Aroma contains α and ß-glycosidase activities to breakdown glycosylated aroma precursors. It helps release varietal aromatic precursors for intense and complex aromas. It is known for respecting varietal character. It can be used on the juice or finished cider to release aromas and help clarify, but best results may be seen when added to the juice.

Dosage*

Crushed Fruit	15–22 g/ton
Juice	1–1.5 g/hL (35–55 g/1000 gal)

Usage

Dissolve Rapidase® Revelation Aroma in 10 times its weight in water, stir gently, allow to sit for a few minutes. Sprinkle over crushed fruit or add to the juice before the start of alcoholic fermentation for best results.

Storage

Dated expiration. Store refrigerated at 4–8°C (40–45°F).

#16266 100g

Scottzymes

All Scottzymes® except BG are liquids. Liquid Scottzymes are offered in 1 kg bottles and 25 kg totes. One kg of Scottzymes equals 890 ml while 25 kg totes are 22.25 liters. Scottzymes are the product of natural *Aspergillus niger* fermentations (not sourced from genetically modified organisms).

The 25kg totes are kosher (but not kosher for Passover). To accurately dose liquid Scottzymes, first calculate the dosage then dilute to a 10% solution (v/v).

Protocol
How to make a 10% solution

If using a dose of 20 mL/ton, mix 20 mL of liquid enzyme with approximately 180 mL of water.

BG

Aroma releasing enzyme

Scottzyme® BG is a powdered pectinase with beta-glucosidase activity for the release of bound terpenes. It is generally used for the release of aroma and flavor compounds. Scottzyme BG should be used only in cider, not juice. Scottzyme BG should only be used at the end of fermentation. The glucosidase activity is inhibited by sugars. The cider should have less than 0.5% residual sugar for proper enzyme activity. Bench trials are highly recommended before using.

Recommended Dosage

Juice	Not recommended
Cider	3–5 g/hL 114–190 g/1000 gal

Usage

Powdered enzymes tend to scatter across water or cider. It is best to add just enough cool 21–25°C(70–77°F) water to Scottzyme BG to create a paste. Then add more cool water to dissolve the enzyme completely. It is now ready to be added to the cider. Make sure you have gentle motion in the tank to disperse Scottzyme BG. Use only on cider because the glucosidase activity is inhibited by sugar.

Storage

Store at room temperature for 1–2 years. Once opened, keep tightly sealed and dry. Once hydrated, use within a few hours.

#16176 1 kg

HC

Enzyme for increasing yield and reducing solids

Scottzyme® HC is a pectinase and hemicellulase blend designed to increase yield, reduce solids and improve filtration. It is a strong enzyme, useful for pome (apple or pear) or stone (pitted) fruits. It is best used in conjunction with Scottzyme Pec5L.

Recommended Dosage

Fruit	60-100 mL/ton
Juice	5.3-7.9 mL/hL 200-300 mL/1000 gal
Cider	6.6-9.2 mL/hL 250-350 mL/1000 gal

Usage

Dilute Scottzyme HC to approximately a 10% solution in cool water. Sprinkle the solution over the crushed fruit or add during a tank mixing before alcoholic fermentation. If adding to cider, gently mix a 10% solution into the tank for even dispersion.

Storage

Store at 4°C(40°F) for 1–2 years. Keep tightly sealed and refrigerated once opened.

#16171 1 kg (890 mL)
#16161 25 kg (22.25 L)

KS

Blend of enzymes for enhanced settling and filtration

Scottzyme® KS is a blend of enzymes designed for difficult to settle or hard-to-filter juices or ciders. Scottzyme KS is most effective when used early in processing. It should not, however, be used before pressing. It is never too late to use Scottzyme KS. Customers have reported very favorable results when used to solve “nightmare” filtrations before bottling.

Recommended Dosage

Fruit	Not recommended
Juice	2.6-4.0 mL/hL 100-150 mL/1000 gal
Cider	5.3-7.9 mL/hL 200-300 mL/1000 gal

Usage

Dilute Scottzyme KS to approximately a 10% solution in cool water. Add to the juice after pressing or to the cider after alcoholic fermentation during a tank mixing. Do not use prior to pressing.

Storage

Store at 4°C(40°F) for 1–2 years. Keep tightly sealed and refrigerated once opened.

Warning

Never use Scottzyme KS before pressing. Scottzyme KS has very aggressive enzymatic activities that will break down the fruit and create too many fine solids. After pressing, these activities will help with settling and the breakdown of sticky solids. The goal is to make the juice or cider more manageable.

#16174 1 kg (890 mL)
#16164 25 kg (22.25 L)

Pec5L

Enzyme for pressability, settling and clarification

Scottzyme® Pec5L is a highly concentrated pectinase blend.

It is used for berries, pome and stone fruits for easier pressing and higher yields. It is also used in juice for improved settling, clarification and filtration. When adding to fruit, it is sometimes beneficial to use in conjunction with Scottzyme HC.

Recommended Dosage

Fruit	10-20 mL/ton
Juice	1.0-1.3 mL/hL 40-50 mL/1000 gal
Cider	1.3-1.6 mL/hL 50-60 mL/1000 gal

Usage

Dilute Scottzyme Pec5L to approximately a 10% solution in cool water. Sprinkle over the fruit before pressing or add to the juice before the start of alcoholic fermentation.

Storage

Store at 4°C(40°F) for 1–2 years. Keep tightly sealed and refrigerated once opened.

#16170 1 kg (890 mL)
#16160 25 kg (22.25 L)

New!

Spectrum

Enzyme blend for enhanced clarification and filtration of difficult lots

Scottzyme Spectrum is a blend similar to that of KS, but with increased pectinase activity and arabanase side activity for the most difficult cider clarification tasks.

Scottzyme Spectrum should only be used on finished cider either during settling or to solve filtration issues before bottling.

Recommended Dosage

Fruit	Not recommended
Juice	Not recommended
Cider	2–4 mL/hL 75–150 mL/1000 gal

Usage

Dilute Scottzyme Spectrum to approximately a 10% solution in cool water. Add to the cider after alcoholic fermentation during a tank mixing.

Storage

Store at 4°C(40°F) for 1–2 years. Keep tightly sealed and refrigerated once opened.

Warning

Never use Scottzyme Spectrum before pressing or on the juice. It has our most aggressive enzymatic activity and may result in over clarification of the juice.

#16177 1kg (890 mL)
#16167 25kg (22.25 L)

Image at left:

Scottzyme Spectrum trial shown four days post enzyme addition, settling at room temperature. From left to right:

- Control: 120 NTU
- Enzyme A: 46.1 NTU
- Spectrum: 20.8 NTU

Malolactic Bacteria

Overview

Malolactic fermentation converts malic acid to lactic acid, but is not always desired in cider production. It can, however, have a direct impact on cider quality. Uncontrolled spontaneous malolactic fermentations or wild lactic acid bacteria can result in diminished varietal and fruit flavors, reduced esters, masked aromas and off-characters. The use of selected malolactic strains can contribute positively to ciders while minimizing risks.

For those interested in experimenting with malolactic fermentation, please find select products in this section.

More information and specific protocols can be found on our webiste at www.scottlab.com.

Basics

It is very important to know the status of the cider prior to inoculating with malolactic bacteria. Analyze the cider for pH, SO_2, VA, residual sugar, malic acid and alcohol level. Creating an optimal environment for malolactic bacteria includes:

Temperature
Between 20–25°C(68–77°F).

pH
Above 3.4.

SO_2
Free SO_2 below 10 ppm, total SO_2 below 25 ppm.

Alcohol
Normally, alcohol levels in ciders are not an impediment to malolactic fermentations. Cider makers should, however, be aware that elevated alcohols (e.g. >13% v/v) can cause problems.

Volatile Acidity (VA)
If the pH is high, other bacteria strains may already be growing causing an elevated VA. The cider should be monitored for unwanted bacteria.

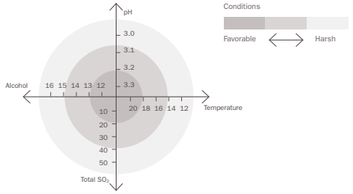
Nutritional Status
Was a complete yeast nutrient used during primary fermentation? Was a high nutrient demanding yeast strain used for primary fermentation? Good nutrition is important for malolactic bacteria. Malolactic nutrients such as Acti-ML, Opti'ML Blanc, and Opti'Malo Plus will help with the growth and survival of specific malolactic bacteria.

Yeast Strain
Choose a yeast strain which is compatible with the selected malolactic bacteria.
See MLF Compatibility in the yeast charts on page 6.

Malic Acid
Measure malic acid levels.
Cider conditions are difficult for bacteria if the malic level is <0.5 g/L or >7.0 g/L.

Culture Growth Conditions
When selecting a bacteria culture, take note that limiting conditions have a compounding inhibitory effect.

For example, if low pH is combined with high SO_2, conditions in a cider will be more antagonistic to the bacteria than low pH alone.



Direct Inoculation Cultures

Alpha
O. oeni for enhancing mouthfeel

Enoform Alpha™ was selected by the Institut Technique du Vin (ITV) from a spontaneous fermentation. It shows good fermentation activity and provides a positive sensory contribution.

Low temperature tolerant to 14°C(57°F). Alpha is a dominant strain.

It is often described as enhancing mouthfeel and complexity while reducing perceptions of green and vegetative characters.

#15601 2.5 hL (66 gal) dose
#15602 25 hL (660 gal) dose
#15603 250 hL (6,600 gal) dose

MBR 31
O. oeni adapted to low temperature and low pH; enhances polyphenolic content and fruit character

Lalvin MBR 31® was selected by the ITV in France.

Performs well even under stressful conditions such as low pH (3.1) and low temperature (greater than 13°C/55°F).

MBR 31 is known for enhancing fruit character. It is sometimes slow to start, but finishes quickly.

#15022 2.5 hL (66 gal) dose
#15032 25 hL (660 gal) dose
#15127 250 hL (6,600 gal) dose

O-Mega
O. oeni adapted to high alcohol and cooler cellar temperatures

Selected in the south of France by the IFV in Burgundy for its ability to complete MLF in a wide range of applications.

O-MEGA® can perform in cool temperatures (down to 14°C/57°F) and higher alcohols (up to 16% v/v) with very low VA production.

Due to a late attack of citric acid, there is a very low level of diacetyl produced, making it suitable for fruit-forward ciders.

#15615 25hL (660 gal) dose
#15616 250hL (6,600 gal) dose

PN4
O. oeni adapted to difficult conditions of pH, alcohol and SO_2

MBR PN4® was isolated in the Trentino region of Italy.

This strain has been known to perform under difficult conditions such as low pH (3.0-3.1) and high alcohol.

Temperature tolerant to 14°C(57°F) and tolerant to total SO_2 levels up to 60 ppm. Known for its fast fermentation kinetics and enhancing spice notes.

#15607 25 hL (660 gal) dose
#15608 250 hL (6,600 gal) dose

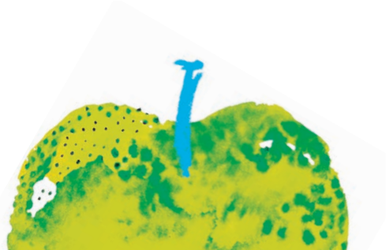
VP41
O. oeni adapted to high SO_2; enhances complexity and mouthfeel

Lalvin MBR VP41® was isolated in Italy.

Performs well at a pH above 3.1 and a total SO_2 level of 50–60 ppm.

In temperatures below 16°C(61°F) it is a slow starter but can complete fermentation. Known for enhancing mouthfeel and due to its low diacetyl production, it is suitable for fruit-forward ciders.

#15048 2.5 hL (66 gal) dose
#15042 25 hL (660 gal) dose
#15044 250 hL (6,600 gal) dose



Malolactic Bacteria Nutrition

Even under ideal conditions *Oenococcus oeni* malolactic bacteria grow slowly. The nutrient needs of the yeast chosen for primary fermentation affect nutrients available for malolactic bacteria. Apples and pears tend to have lower nutrient levels, and this situation is often even more difficult when concentrates are used.

Indigenous microflora utilize the same nutrients. Highly clarified ciders are often stripped of nutrients.

All of these factors contribute to the need for sufficient nutrition for *O. oeni*. A small yeast population with little autolysis or a yeast strain that does not fully autolyze may not provide the needed nutrient release.

O. oeni have complex nutrient needs and cider is often a poor source of these nutrients. Malolactic bacteria nutrients help create a better environment in the cider. Used properly, they help the selected bacteria get a faster start, increase survival rates and lower the risk of problems from undesirable bacteria (biogenic amines, VA, off-flavors and aromas, etc.).

Acti-ML

Bacteria rehydration nutrient

Acti-ML® is a bacteria nutrient used during rehydration of the direct addition malolactic bacteria strains. Acti-ML is a specific blend of inactive yeasts rich in amino acids, mineral cofactors and vitamins. These inactive yeasts are mixed with cellulose to provide more surface area to help keep bacteria in suspension. Acti-ML can help strengthen the development of bacteria growth under difficult conditions.

Recommended Dosage
20 g/hL 50 g/60 gal 1.7 lb/1000 gal

Usage
Mix Acti-ML into 5 times its weight in 25°C(77°F) chlorine-free water. Add bacteria, then wait 15 minutes before adding the suspension to the cider.

Storage
Dated expiration. Store at 18°C(65°F). Once opened, keep tightly sealed and dry.

#15681 1 kg

Opti'Malo Plus

Complete malolactic nutrient

Opti'Malo Plus® is a natural nutrient developed by Lallemand specifically for MLF. It is a blend of inactive yeasts rich in amino acids, mineral cofactors, vitamins, cell wall polysaccharides and cellulose. The cellulose provides surface area to help keep the bacteria in suspension and to help adsorb toxic compounds that may be present at the end of primary fermentation.

Recommended Dosage
20 g/hL 50 g/60 gal 1.7 lb/1000 gal

Usage
Suspend in a small amount of water or cider and add directly to the cider at the same time as the malolactic culture. It should not be added to the rehydration water.

Storage
Dated expiration. Store at 18°C(65°F). Once opened, keep tightly sealed and dry.

#15141 1 kg

Opti'ML Blanc

Malolactic nutrient for difficult cider fermentation

Malolactic fermentation in ciders can often be difficult. Opti'ML Blanc is a unique malolactic nutrient, formulated from a blend of selected inactivated yeasts. It helps compensate for amino nitrogen and peptide deficiencies. The bioavailability of certain peptides stimulates the growth of selected bacteria and shortens the duration of MLF, especially under difficult cidermaking conditions.

Recommended Dosage
20 g/hL 50 g/60 gal 1.7 lb/1000 gal

Usage
Suspend in small amount of water or cider and then add directly to the cider 24 hours before adding the malolactic bacteria.

Storage
Dated expiration. Store at 18°C(65°F). Once opened, keep tightly sealed and dry.

#15217 1 kg

Article

Malolactic Fermentation and Co-Inoculation

Michael Jones
Fermentation Specialist
Scott Laboratories

Malolactic fermentation (MLF) is the bacterial conversion of malic acid (the dominant acid of apples) to lactic acid (the dominant acid of dairy products). Although a number of different lactic acid bacteria can do this conversion, the main one is *Oenococcus oeni*, which is tolerant of alcohol. Many cidermakers try to discourage malolactic in their cider production, but it can also be seen as a tool for developing complexity in your cider base.

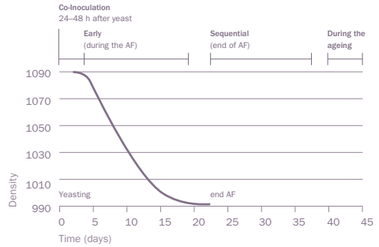
MLF occurs frequently in the traditional farmhouse ciders of Europe. These ciders are often bottle-conditioned (second fermentation in the bottle to create effervescence) and therefore cannot be sulfured or sterile filtered for stability. The MLF there may occur either before or after bottling. Post-bottling MLF may result in "funky" aromas, some similar to hydrogen sulfide.

If cleaner, fresher aromas are desired, completing MLF prior to bottling is recommended. Malolactic fermentation may be initiated by adding bacteria after completing primary fermentation (sequential inoculation) or by adding bacteria immediately after the start of the yeast fermentation (co-inoculation). Sequential inoculation generally takes longer due to the alcohol stress on the bacteria. There is also more opportunity for contamination by other bacteria, and for the creation of diacetyl (butter flavor) through the metabolism of the small amount of citric acid in apples. Co-inoculation gives the bacteria a chance to acclimate to the alcoholic conditions. It finishes MLF faster and any diacetyl that is formed will be consumed by the live yeast.

By metabolizing the malic acid, the green apple aromas of the acid are lost and replaced by aromas of ripe apple and spice (depending on the varieties used). The cider is softer with less of an acidic bite, although one should look out for a rise in pH. Once the MLF is complete, either bottle conditioning or carbonation can take place.

Protocol
For Co-Inoculation

1. $SO_2 \leq 30$ ppm at the juice stage.
2. Inoculate with yeast.
3. 24 hours after adding the yeast, rehydrate bacteria in 20 times its weight in non-chlorinated, non-distilled water at 20°C for no longer than 15 minutes and then add to must.



Microbial Control Agents

Overview

Practices such as adding yeast and ML starter cultures, regular sulfur dioxide additions, acidification, sanitation, and filtration are common ways in which microbial control is applied during cidermaking. Though many cider spoilage problems can be prevented with good cidermaking practices, there are still circumstances that require extra microbial control.

This section describes some of the tools that Scott Laboratories offers to prevent, inhibit or eliminate unwanted microorganisms.

Basics

Removal

Microorganisms are physically removed from the cider. Removal strategies include filtration, centrifugation and some types of fining when followed by racking.

Inhibition

Microbe replication is stopped or slowed, but organisms are not necessarily killed. Microbes may start to grow and multiply once the inhibitory pressure is removed. Inhibition strategies include acidification to lower pH and use of sulfur dioxide at non-lethal concentrations.

Destruction

Microorganisms are killed and will not survive to replicate. Destruction strategies include Velcorin treatment, No Brett Inside® additions, use of lysozyme (especially at pH >4.0), addition of alcohol (as in the case of fortified ciders), and pasteurization.

Choosing the Right Microbial Control Agent

● Highly Recommended
○ Recommended

	Lysozyme		SO_2		Chitosan	DMDC
	Lyso-Easy	Lysovin	Inodose Granules	Inodose Tablets	No Brett Inside	Velcorin
Page	46	46	47	47	48	48
Protection from indigenous yeast			●	●		
Control gram positive bacteria (LAB)	●	●	●	●		
Control gram negative bacteria *(Acetobacter)*			●	●		
Inhibit oxidation			●	●		
Control spoilage yeast *(Brettanomyces)*			●	●	●	●
Protection during stuck and sluggish fermentations	●	●				
Delay MLF	●	●				
Helps prevent refermentation in bottle			○	○		●

Lysozyme

Lysozyme is a naturally occurring enzyme which can be used in cider to control lactic acid bacteria (LAB) including *Oenococcus spp.*, *Pediococcus spp.* and *Lactobacillus spp. Oenococcus oeni* is favorably associated with malolactic fermentation (MLF) but can also produce volatile acidity (VA) under certain conditions. *Pediococcus* and *Lactobacillus* are usually considered spoilage organisms. Lysozyme is a natural product isolated from egg whites and has been used for many years as a biopreservative in the processing and storage of hard cheese.

The enzymatic activity of lysozyme can degrade the cell walls of gram-positive bacteria (including LAB) but not gram-negative bacteria *(Acetobacter)* or yeast. Lysozyme's effectiveness depends on the type of bacteria and the number of cells present.

It is important to note that lysozyme requires a minimum seven day contact time to allow the enzyme to work.

Lyso-Easy

Lactic acid bacteria inhibitor—ready-to-use lysozyme solution

Lyso-Easy is a ready-to-use solution of 22% lysozyme.

Usage

No preparation is needed. Once opened, it should be used immediately.

Storage

Dated expiration. Store tightly sealed at ambient temperature.

#16405 250 mL
#16406 1 L
#16407 5 L

Lysovin

bioseutica

Lactic acid bacteria inhibitor—granular lysozyme

Lysovin is a powdered lysozyme that needs to be properly rehydrated.

Usage

Rehydrate Lysovin in 10 times its weight in warm water. Stir gently for 1 minute and avoid foaming. Allow to soak for 45 minutes. Repeat until the solution is a clear, colorless liquid. *Please refer to www.scottlab.com for the complete rehydration procedure.*

Storage

Store in dry form for 5-10 years at 18°C(65°F). Once rehydrated, Lysovin should be refrigerated and will retain 90% of activity after 12 months.

#16402 500 g
#16400 1 kg
#16401 5 kg

Lyso-Easy + Lysovin

Recommended dosage

1 mL of Lyso-Easy contains 0.22 g granular Lysozyme.

Warning

Do not add Lysozyme right before bottling. If Lysozyme is still in solution at bottling, floculation and settling may occur in the bottle. If spoilage yeasts such as *Brettanomyces* are suspected, SO_2 addition should not be delayed. Lysozyme is only effective against gram-positive bacteria and has no effect on yeast or gram-negative bacteria such as *Acetobacter*.

Lysozyme applications

Inhibit growth of LAB in juice

To inhibit spoilage characters due to uncontrolled microbial growth. This is especially important in high pH conditions or with fruit containing rot.

Lyso-Easy	91 mL/hL	3.4 mL/gal
Lysovin	200 ppm	20 g/hL 0.75 g/gal
Timing	Add prior to fermentation	

Protection during stuck and sluggish fermentations

To encourage yeast growth in the absence of SO_2 while reducing the risk of VA production by lactic acid bacteria.

Lyso-Easy	114–182 mL/hL	4.3–6.8 mL/gal
Lysovin	250–400 ppm	25–40 g/hL 0.94–1.50 g/gal
Timing	Add at first signs of a stuck fermentation	

Inhibit MLF when blending partial and complete ML ciders

Lyso-Easy	136–227 mL/hL	5–8.6 mL/gal
Lysovin	300–500 ppm	30–50 g/hL 1.10–1.90 g/gal
Timing	Add during blending	

Note: Lysozyme activity can decrease over time. If prevention of malolactic fermentation is desired, microbial populations should be monitored during aging.

Note: Lysozyme should never be added to a product right before bottling. It is a protein, so it needs to be counterfined with bentonite prior to bottling. Otherwise, it may floculate in the bottle.

Sulfur Dioxide

Cider quality can be preserved with sulfur dioxide. Sulfur dioxide is used in cider for its anti-oxidant and anti-microbial properties. The effectiveness of sulfur dioxide as an anti-microbial is dependent upon pH. As pH increases, the portion of sulfur dioxide that is active against microorganisms decreases. Therefore, increases in pH require the addition of more sulfur dioxide to maintain adequate anti-microbial activity. Inodose granules and tablets are an easy and effective way to add sulfur dioxide to fruit, juice or cider.

Inodose Granules

Effervescent sulfur dioxide granules

Inodose Granules are small, effervescent granules made of potassium metabisulfite and potassium bicarbonate. As they dissolve into cider or juice, the granules release a precise dose of SO_2. Inodose Granules come in pre-measured packs.

A pack of Inodose Granules 100, for example, will release 100 grams of pure SO_2. Inodose Granules are perfect for SO_2 additions to incoming juice and to ciders prior to clarification and fining. The potassium bicarbonate fraction in these granules has little or no effect on pH.

#15777 2 g (40/box)
#15778 5 g (25/box)
#15780 100 g
#15781 400 g

Note: Volume discounts are available.

Inodose Tablets

Effervescent sulfur dioxide tablets

Inodose Tablets are a blend of potassium metabisulfite and potassium bicarbonate. They are packaged in 2 g and 5 g dosage levels. The effervescent action of the bicarbonate provides mixing in barrels or small tanks while reducing time and labor needed for stirring. The easy-to-use tablet form helps prevent overdose problems associated with traditional forms of SO_2 additions. Sealed strip packages keep unused tablets fresh for optimal potency. The potassium bicarbonate fraction in these tablets has little or no effect on pH.

#15775 2 g (48/box)
#15776 5 g (48/box)

Note: Volume discounts are available.

Inodose Granules + Tablets

Usage

Various applications include:

- During transport of juice.
- To inhibit indigenous yeast and bacteria.
- In tanks before fermentation and directly into barrels after fermentation.
- To make sulfite additions to barrels.

Storage

Store in a dry, well-ventilated environment at temperatures below 25°C(77°F). Use whole packet quickly once opened, as potency will decrease after opening.

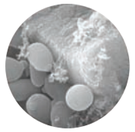
Conversion Chart
PPM of Total Sulfur Dioxide

SO_2 Dose	1 L	1 gal	60 gal	100 gal	1000 gal
2 g	2,000	529	9	5	0.5
5 g	5,000	1,321	22	13	1.3
100 g	100,000	26,420	440	264	26.4
400 g	400,000	105,680	1,761	1,057	106

Note: The SO_2 products contribute 2 g, 5 g, 100 g or 400 g of pure SO_2 when added to the wine. Because they are blends of KMBS and potassium bicarbonate, the tablets and granules actually weigh more than what they contribute in SO_2.

No Brett Inside

Brettanomyces spp. control agent



Images courtesy of Biljana Petrova and Dr. Charles G. Edwards, Washington State University, Pullman, WA

Before
Scanning Electron Micrograph x 20,000 magnification *Brettanomyces* cells prior to being treated with No Brett Inside.

After
Scanning Electron Micrograph x 20,000 magnification *Brettanomyces* cells treated with 4 g/hL of No Brett Inside. Image shows *Brettanomyces* cells attached to the surface of the Chitosan.

No Brett Inside® is a commercial preparation of chitosan that was introduced by Lallemand and is distributed exclusively in the North American market by Scott Laboratories.

No Brett Inside specifically targets *Brettanomyces* cells. The active ingredient, chitosan, works in two ways. The *Brettanomyces* cells are adsorbed onto the chitosan and settle out of the cider. In addition to the physical effect, there is a biological effect which results in cell death. This double action of No Brett Inside will help to control contaminating populations helping to preserve cider quality.*

*No Brett Inside should be added post-ML.

Dosage

4–8 g/hL 9–18 g/60 gal 151–303 g/1000 gal

Usage

Suspend No Brett Inside in 5 times its weight in cool water (No Brett Inside is insoluble, so it will not go into solution). No Brett Inside can be added during a pump-over or during tank/barrel mixings, ensuring a homogenous addition. Leave the No Brett Inside in contact with the cider for 10 days and then conduct a clean racking.

To determine the effectiveness of your addition, a period of 20–30 days post-racking should be respected before microbiological analysis. This is irrespective of the method used (traditional plating, microscopic observations or RT-PCR).

Storage

Dated expiration. Store in a dry, odor-free environment below 25°C(77°F).

#16410 100g

Velcorin

Yeast inhibitor; microbial control agent

Before

After

Usages

To help prevent refermentation in finished ciders.

Ciders containing residual sugar are susceptible to fermentation in the bottle or keg, which can lead to haze, off-odors, off-flavors and effervescence. Adding Velcorin to cider during bottling or kegging can help prevent refermentation. Also, Velcorin can be used to replace or decrease the amount of sorbate which is sometimes used in ciders containing residual sugar.

To control spoilage yeast such as *Brettanomyces*.

Brettanomyces is a spoilage yeast that can produce 4-ethylphenol and other undesirable sensory attributes. *Brettanomyces* can be difficult to control in cider production environments. In this application, Velcorin can be used either in the cellar or at the time of bottling.

To decrease the amount of sulfur dioxide used in ciders.

Sulfur dioxide used in combination with Velcorin has been shown to achieve microbial stability at lower overall sulfur dioxide levels. Velcorin does not provide anti-oxidant protection.

To accommodate for a wider range of packaging options and provide energy savings over pasteurization.

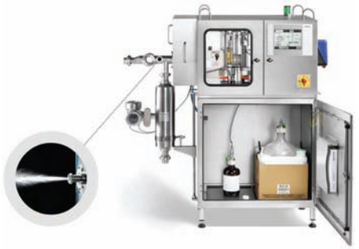
Packaging options are more diverse because the product, Velcorin (DMDC), is used with cold filling technology. Velcorin (DMDC) can be used with all known packaging types, including plastics (such as PET, PVC or HDPE), cans, glass, bag-in-box, and others.

#18000 3 kg

Conditions of Use

Velcorin must be used with an approved dosing system. Scott Laboratories will only sell Velcorin to those using a LANXESS approved dosing machine. Velcorin is a chemical and must be handled with respect. Therefore, all Velcorin handlers must undergo annual safety training (provided at no charge by Scott Laboratories, Inc.). The current cost of a Velcorin dosing machine starts at approximately $74,000.

For more information on Velcorin and dosing machines, please contact Rebekka deKramer at Scott Laboratories, Inc.



Velcorin® DT Touch dosing system

Cleaning

Overview

A clean cellar is one of the basic keys to producing and maintaining quality cider. AiRD products achieve hygiene goals while saving time, water and energy. Our mantra is "work smarter, not harder!"

Cleaning [klee-ning] n.
The active removal of both inorganic (mineral) and organic substances from cider contact surfaces.

Sanitation [san-i-tey-shun] n.
Reduction of viable population of contaminating cells. This is different from both sterilization and disinfection.

Considerations

Water Quality

The quality of the water used should be a concern at all times in a cider production facility. This includes water used in cleaning and sanitation. Water should be potable, free from suspended particles and free from compounds that can impart odor and flavors. We also must consider the hardness of the water used. Hard water can contribute to an unsightly mineral scale on equipment and can act as a reservoir for the accumulation of organic debris and microbes.

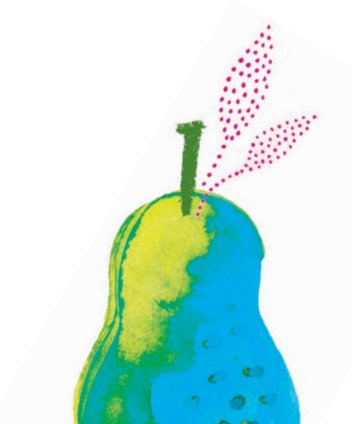
Documentation + Safety Considerations

When designing your program, the following should be considered: cleaning agent concentration, temperature of the water, contact time and flow rate. By maximizing these factors, you can minimize the amount of cleaning and sanitation agents used, as well as conserving water and energy. Always consider chemical compatibility of all agents with equipment, regulations and worker safety.

It is essential to maintain records and incorporate cleaning and sanitation protocols into every stage of your quality assurance program. In addition, all products used in the sanitation program must be approved for use, including the concentration that you intend to use them at. Do not decant into unlabelled containers and do not deviate from the prescribed use. Personal Protective Equipment (PPE) should be used at all times. For details on PPE, please refer to the Material Safety Data Sheet (MSDS).

Benefits of AiRD Products

- Specially formulated for the beverage industries
- Significant water savings since no citric rinse is required.
- Innovative BUILT FORMULA for more effective cleaning.
- Effective at low doses over wide temperature ranges.
- Non-dusting product.
- No chlorine, other halogens, phosphates, silicates or fillers.
- Does not require hazardous shipping.
- Safer and less environmental impact than bulk chemical cleaners.



Choosing the Right Cleaning Agent

Highly Recommended / Recommended	Destainex	Destainex-LF	Oak Restorer-CW	Oak Restorer-HW
Page	51	51	51	51
Dosage	0.5–1.5% w/v	0.5–1.5% w/v	0.5–2.0% w/v	0.5–2.0% w/v
Water temperature for use	104–140°F 40–60°C	104–140°F 40–60°C	68–89°F 20–30°C	104–140°F 40–60°C
pH (1% solution)	~10.5–10.9	~10.8	~10.65	~9.6
Removes tartrates			●	●
Removes color	●	●	●	●
Enhanced antimicrobial activity	○	○	●	●
General purpose cleaning	●	●		
Barrel cleaning			●	●

Water Savings with AiRD Products

Due to its unique formulation, AiRD products can result in up to 50% water savings.*

Classic Method	Water Used*
Rinse	100 gallons
Caustic	200 gallons
Long Rinse	200 gallons
Citric	200 gallons
Rinse	100 gallons
Total	800 gallons

vs.

AiRD Process	Water Used*
Rinse	100 gallons
AiRD Product	200 gallons
Short Rinse	100 gallons
Total	400 gallons

The above shows a common SOP for a 2,000 gallon tank cleaning.
*Not including potential reuse of AiRD solutions. Actual water savings may be greater.

Destainex AIRD

Multi-purpose oxidizing cleaner for organic soils and molds
Cidery Surfaces, Tanks, Lines, Equipment

Destainex-LF (Low Foaming)

AIRD

Low Foaming version of Destainex
Bottling Systems and difficult to rinse systems

Choose Destainex-LF rather than Destainex if using in an application where low foam is desired.

Destainex products are proprietary sodium percarbonate based cleaning agents with sanitizing abilities. These highly effective formulations can be used at low levels to remove color, protein stains, mold, mildew, and biofilms from cider contact surfaces such as: stainless steel, galvanized metals, concrete, polyethylene (low and high density), polypropylene, plastics, flexible hoses, glass and powder-coated surfaces.

Destainex products can be used in both automated (CIP) and manual systems. The sodium percarbonate in Destainex products is complemented with proprietary surfactants and chelation agents, water conditioning materials and rinse aids for a bright, clean and spot free neutral surface.

Recommended Dosage
0.5–1.5% w/v

Usage
Cleaning is most effective when soft or treated warm water is used.

Prepare appropriate volume of potable hot water 40–60°C(104–140°F) and accurately measure the correct weight of your Destainex product. Slowly add the powder into the water mixing until a consistent solution is obtained. Initially the prepared solution will appear milky, but will soon clarify. Once the solution has clarified it is ready for use. Destainex products can be used manually, or with an automated CIP system.

Contact time is based on water temperature and quality, amount of Destainex product used and turbulence of contact. Conduct trials to determine contact time. Average contact time is 20 minutes.

Before and After

Before

After

Before and after photos of the inside of a pressure leaf filter dosing tank, cleaned using Destainex-LF.

Before

After

Before and after photos of pressure leaf filter horizontal screens, cleaned using Destainex-LF.

Storage
Store in a dry, odor free environment between 10–20°C(50–68°F) away from sunlight.

Destainex	#18502	5 kg
Destainex-LF	#18504	5 kg

Oak Restorer-Cold Water (CW)

AIRD

Oak cleaner and refresher

Oak Restorer-hot Water (HW)

AIRD

Oak cleaner and refresher

Oak Restorer products are proprietary cleaners formulated for use on oak surfaces. These products were developed on behalf of winery clients in Australia. These buffered carbonate blends also contain bicarbonates and surfactants to effectively remove tartrate build-up, color, tannin and protein residues, thereby extending the working life of barrels, puncheons, redwood tanks and staves. Oak Restorers are single process cleaning agents requiring only a water rinse. No subsequent neutralization is required. Oak Restorers leave your wooden surfaces refreshed, odorless and pH neutral.

Recommended Dosage
0.5–2% w/v

Usage
Prepare appropriate volume with correct temperature water.
For *Oak Restorer-CW* 20–30°C(68–86°F)
For *Oak Restorer-HW* 40–60°C(104–140°F)

Storage
Store in a dry, odor free environment between 10–20°C(50–68°F) away from sunlight.

Oak Restorer-CW	#18508	5 kg
Oak Restorer-HW	#18510	5 kg

Stability

Overview

The goal of stability is to retain clarity and aromatics in the finished cider. We can separate stability into three distinct areas:

- microbiological stability
- chemical stability
- macromolecular stability

Assessing stability can sometimes be challenging. Thankfully, there are many tools available to help determine and alleviate risk.

Basics

In order to obtain microbiological stability, we need to reduce the potential for microbial contamination, microbial growth, and the production of microbial metabolites (e.g. 4-ethylphenols). Microbial stability can be achieved by either physical or chemical means. For microbial stability options, please review our Microbial Control, Cleaning and Filtration sections.

Macromolecular (or physical) instabilities can be problematic and unsightly. This type of instability is the result of interactions between proteins, polysaccharides and polyphenolics, and can lead to hazes in the final cider.

Chemical instabilities can be caused by metal ions, or polyphenolic precipitation. Until recently, we have had limited tools to deal with such issues. There has, however, been much research done leading to recent developments with regard to stability products. We are pleased to now offer a range of options to assist with polyphenolic precipitation.

Choosing the Right Stabilizing Agent

● Highly Recommended
○ Recommended

	Gum Arabic		Gum Arabic/ Mannoprotein Blends	
	Flashgum R Liquide	Inogum 300	UltiMA Soft	UltiMA Fresh
Page	53	54	54	54
Promote stability	●	●	○	○
Diminish bitterness	●	●	●	●
Diminish harsh tannins and astrigency			○	
Add perception of sweetness and softness	●		●	
Colloidal stability	●	●		
Aromatic stability			○	

Flashgum R Liquide

Gum arabic for colloidal protection

Flashgum R Liquide is a 25% gum arabic derived from Acacia seyal. This preparation offers both colloidal protection and the perception of sweet and soft characters on the palate. Gum arabic products can help reduce the risk of colloidal deposits in the bottle in ciders. Natural polysaccharides reduce astringency and increase feelings of volume and fullness in the mouth. Flashgum R Liquide can provide color protection in fruit ciders.

Recommended Dosage

400–1200 ppm 40–120 mL/hL
1.5–4.5 L/1000 gal*

*Bench trials recommended

Usage

Flashgum R Liquide should be the last commercial product added to the cider. It is best to do inline additions 24–72 hours prior to the final pre-membrane and membrane filtrations. Filterability trials prior to membrane filtration are recommended. If using on cider that is not going to be filtered, add Flashgum R Liquide just prior to bottling.

Storage

Dated expiration. Store in a dry, odor-free environment at or below 25°C(77°F).

#15772 1 L
#15773 5 L

Inogum 300

Gum arabic for colloidal stabilization

Inogum 300 is a clear, 25% solution of purified liquid gum arabic derived from Acacia verek. Gum arabic products help reduce the risk of colloidal deposits collecting in the bottle. Its colloidal protection helps prevent precipitation of unstable color while preserving flavor and structure.

Recommended Dosage

400–700 ppm 40–70 mL/hL
1.5–2.65 L/1000 gal*
*Bench trials recommended

Usage

Inogum 300 should be the last commercial product added to a cider. Ideally it should be added to cider using a dosing pump. If the cider is to be filtered it is recommended that the additions be done 24–72 hours prior to the membrane filtration and that filterability trials be conducted. If the cider is not to be filtered Inogum 300 may be used immediately prior to bottling.

Storage

Dated expiration. Store in a dry, odor-free environment at or below 25°C(77°F).

#15793 1 L
#15794 5 L

UltiMA Fresh

Mannoprotein/gum arabic with positive impact on stability and perceived volume

UltiMA Fresh is the result of a three year research and development program at the IOC. UltiMA Fresh is a proprietary blend of specific mannoproteins together with gum arabics. It has been shown to have a volume enhancing effect on ciders, while also reducing perceptions of bitterness and acidity. Bench trials are highly recommended and allow the cidermaker to fine tune use of UltiMA Fresh for optimal results. It is a fully soluble product. If the cider is not to be filtered, it may be used immediately prior to bottling. Gum arabic and mannoproteins both have some stabilizing effects on cider, though the addition of this product is not a replacement for good cidermaking practice and thorough analysis.

Recommended Dosage

15–30 g/hL (1.2–2.4 lbs/1000 gal)*
*Bench trials recommended

Usage

UltiMA Fresh can be the last commercial product added to the cider. Before adding, dissolve product in 10 times its weight in water or cider. Ideally, it should be added to the cider using a dosing pump. If the cider is to be filtered, it is recommended that the addition be done 24–72 hours before the membrane filtration and that filterability trials be conducted prior to that.

Storage

Dated expiration. Store in a dry, well ventilated environment with temperatures less than 25°C (77°F).

#17010 1 kg

UltiMA Soft

Mannoprotein/gum arabic with positive impact on stability and perceived softness and volume

UltiMA Soft is the result of a three year research and development program at the IOC. On ciders it can soften, enhance body, add to length, and lower astringency. If the cider is not to be filtered, this fully soluble product can be added immediately prior to bottling. Bench trials are recommended. Gum arabic and mannoproteins both have some stabilizing effects on cider, though the addition of this product is not a replacement for good cidermaking practice and thorough analysis.

Recommended Dosage

15–30 g/hL (1.2–2.4 lbs/1000 gal)*
*Bench trials recommended

Usage

UlitiMA Soft can be the last commercial product added to the cider. Before adding, dissolve product in 10 times its weight in water or cider. Ideally, it should be added to the cider using a dosing pump. If the cider is to be filtered, it is recommended that the addition be done 24–72 hours before the membrane filtration and that filterability trials be conducted prior to that.

Storage

Dated expiration. Store in a dry, well ventilated environment with temperatures less than 25°C (77°F).

#17012 1 kg

Fining Agents

Overview

Fining agents can be used on juice or cider to deal with a variety of issues. These include enhancement of stability and clarity, improved filterability and removal of undesirable characters and components. Fining can also unmask hidden flavors and aromas and reduce the risk of microbial spoilage. Some fining agents are single function while others can perform multiple tasks. Sometimes a combination of products is required to resolve a single problem.

Bench trials are always recommended prior to product use. Samples of fining agents for bench trials are available on request. Dosage for all fining agents, regardless of intended purpose, should be determined by such trials. Protocols should be carefully observed for bench trials and cellar additions should be prepared and used the same way.

Visit our website at www.scottlab.com for specific product bench trial data sheets.

Remember that the extent of fining can make a difference as to a cider's body, aroma, flavor and color. It can also impact the amount of filtration that will be necessary.

Types of Fining

Clarification + Improve Filterability

Fining to clarify and improve filterability may involve the use of reactive components and/or settling agents to eliminate undesirable substances. Fining can also be used to complement and potentially reduce the need for mechanical clarification by centrifugation or filtration.

Improvement of Aroma and Flavors

Fining to improve aroma and flavors may involve issues like removing bitterness, reducing perceived oxidation and eliminating "moldy" or sulfur off-odors.

Notes

Always prepare fining agents in water (not cider or diluted cider).

Addition by pumping using the Venturi effect is a very efficient way of dispersal. A Mazzei injector is a particularly effective tool for this purpose. Closed circulation after addition is also beneficial. Consult the manufacturer's recommendations prior to use.

Though most fining agents react rapidly when contact is made, varying tank sizes and addition methods mean that it is always prudent to give products time to work. Recommended minimum and maximum contact times for some of the most common fining products are shown on the right.

	Contact Time Minimum*	Contact Time Maximum
Bentolact S	7 days	2 weeks
Bentostab	7 days	3 weeks
Caséinate de potassium	2 days	15 days
Colle Perle, Inocolle	7 days	3 weeks
Cristalline Plus	2 weeks	4 weeks
Freshprotect	7 days	2 weeks
Polycacel	10 days	3 weeks
Polycel	7 days	2 weeks
Reduless	3 days	5 days
Sparkolloid, Hot and Cold Mix	2–7 days	2 weeks

*A larger vessel requires longer contact time. Above times are estimates only. Contact times may vary depending upon the product, as well as the size and shape of container being used.

Choosing the Right Fining Agent

● Highly Recommended
○ Recommended
** Hot Mix is for cider only.*
Cold Mix is for juice only.

	Casein and/or Bentonite Formulations					Isinglass	Gelatin		PVPP			Silica Gel	Sparkolloid NF*	
	Bentolact S	Bentostab	Caséinate de potassium	Polycacel	Reduless	Cristalline Plus	Colle Perle	Inocolle	Freshprotect	Polycacel	Polycel	Gelocolle	Cold Mix	Hot Mix
Page	57	57	57	60	60	58	58	59	59	60	60	59	58	59
Treat moldy juice	●		○	●				●	●	●	○			
Remove bitterness or off-flavors	●		●	○			○	○	●	○	○			
Treat oxidized juice	●		●	●					●	●	●			
Treat oxidized cider			●	●						●	●			
Promote protein stability	●	●												
Clarification	●			●		●	●	●		●	●	●	●	●
Diminish bitterness	●		●	●		○	○		●	●	●			
Diminish harsh tannins and astringency							●							
Help reduce microbial populations via settling							●	●						
Enhance aromatics				○	●			●		○				
Promote a uniform gentle tannin fining prior to aging								○						
Help unmask hidden aromatics				○	●		○	●		○				
Improve cider filterability						●			●			●		●
Inhibit browning or pinking	○		●	●					○	●	●			
Help compact lees	○	○					○					○	●	●
Remove haze left by other fining agents												○		●
Reduces sulfur defects					●									
Preserve cider color				○						○	○			

Bentolact S

Formulated for the preventative treatment of juice prone to oxidation; helps prevent formation of undesirable off-characters

Bentolact S is a proprietary IOC blend of soluble casein and bentonite. It is most effective when used early (e.g. during cold settling of juice). Bentolact S can help reduce bitterness associated with heavy press fractions. The negative charge of bentonite attracts and precipitates positively charged colloidal and proteinaceous materials which can contribute to off-odors and haze. At the same time the casein will help remove phenolic compounds associated with bitterness and oxidation. Higher dosages may be used for poor quality juice. Bentolact S is supplied in dry form which is soluble in water. For best results, it should be mixed in the juice or cider during a tank mixing.

Recommended Dosage*

Juice
200–1000 ppm 20–100 g/hL
1.7–8.4 lb/1000 gal

Cider
1000–2000 ppm 100–200 g/hL
8.4–16.7 lb/1000 gal

*Bench trials recommended

Usage

Dissolve in 10 times its weight in cold water and mix vigorously to avoid any lumps. Allow the mixture to stand for 3 hours. Add to the juice or cider during a good mixing. Depending upon the cider, a Bentolact S addition may take up to 7 days to settle.

Storage

Dated expiration. Store in a dry, well-ventilated environment at a temperature below 25°C(77°F). Once hydrated, Bentolact S should not be stored for more than 24 hours.

#15787 1 kg
#15788 5 kg
#15789 25 kg

Bentostab

Deproteinizing bentonite for cider clarification

Bentostab is a bentonite for clarification and protein precipitation. Montmorillonite particles allow for good colloidal adsorption.

Recommended Dosage

Juice 30–100 g/hL 2.5–8.3 lbs/1000 gal
Cider 10–70 g/hL 0.83–5.8 lbs/1000 gal

Usage

Dissolve Bentostab in approximately 20 times its volume of cold water and mix vigorously to avoid any lumps. Allow the mixture to stand for 3 hours. Add to the juice or cider during a good mixing. Depending upon the cider, a Bentostab addition may take up to 7 days to settle.

Storage

Dated expiration. Store in a dry, well-ventilated environment at a temperature between 5–25°C(41–77°F). Once hydrated, Bentostab should not be stored for more than 24 hours.

#15766 5 kg

Caséinate de potassium

To help prevent oxidation and for the removal of oxidized components

Caséinate de potassium is used in both juice and cider for the treatment of oxidized phenolics and bitter compounds. In juice it can be used preventatively, while in cider it can diminish and remove off-compounds. Further, Caséinate de potassium can help remove yellow color from oxidized ciders.

Recommended Dosage*

Juice
500–1000 ppm 50–100 g/hL
4.2–8.4 lb/1000 gal

Cider
200–1000 ppm 20–100 g/hL
1.7–8.4 lb/1000 gal

*Bench trials recommended

Usage

Mix the Caséinate de potassium in approximately 10 times its weight of cold water. Allow the solution to stand for about 4 hours. Stir to remove any lumps. For juice, add the Caséinate de potassium solution before settling or at the start of alcoholic fermentation. For cider, add the Caséinate de potassium solution gradually during a tank mixing or via fining connection. Mix vigorously after adding the Caséinate de potassium solution. Minimum contact time is 2 days, maximum is 15 days.

Storage

Dated expiration. Store in a dry, odor-free environment below 25°C (77°F). Once hydrated, Caséinate de potassium will not keep for more than 48 hours.

#15807 1 kg
#15808 5 kg

Cold Mix Sparkolloid NF

For superior clarification of juice

Cold Mix Sparkolloid® NF was developed by Scott Laboratories to clarify and fine juice. It is a blend of polysaccharides with a carrier and has a strong positive charge. This positive charge neutralizes the repelling charge of particulate matter, allowing aggregation and formation of compact juice lees. Cold Mix Sparkolloid NF does not remove desirable color constituents and works well with pectolytic enzymes.

Recommended Dosage

Juice

125–250 ppm 12–24 g/hL
1.0–2.0 lb/1000 gal

Usage

Mix 1-2 gallons of water per pound of Cold Mix Sparkolloid NF. Slowly stir the Cold Mix Sparkolloid NF into the water. Agitate the blend with a high-speed mixer until all of the translucent globules of clarifier have been dissolved and the mixture is smooth and creamy. Add the mixture slowly to the juice and thoroughly combine. Let it settle one week or more, depending on the volume of juice involved. Afterwards, filter, preferably from the top of the tank. Juice generally separates and forms a clear supernatant within 48 hours. Once mixed and chilled (if the juice has been heated), juice should be left undisturbed without further mixing if natural settling is going to be the only separation method.

Storage

Keep tightly sealed and dry. Shelf-life is 4 years at 18°C(65°F).

#15036 25 lb

Colle Perle

Gelatin for treatment of astringent ciders

Colle Perle is a hydrolyzed gelatin solution at a concentration of 150 g/L. Primary uses are clarification and the removal of bitter tannins and phenolics. Colle Perle flocculates and settles well. Desirable aromas and flavors are retained while harsh characters are removed. It is particularly useful to optimize potential of hard pressed product. It can also be used in conjunction with bentonite to compact lees.

Recommended Dosage*

Juice, Cider

800–1500 ppm 80–150 mL/hL
3.0–5.7 L/1000 gal

*Bench trials recommended

Usage

Juice

Add at the beginning of cold settling and mix evenly and completely throughout the juice. When used in juice Colle Perle should be used in conjunction with bentonite or Gelocolle to improve settling. Racking should be done after 1 week.

Cider in Tanks

Add gradually to the cider during a tank mixing or mix cider vigorously to ensure even distribution. Alternatively add through a racking valve while using a tank agitator for even distribution. Racking should be done after 1 week. Filtration is possible 48-72 hours after fining with Colle Perle.

Storage

Dated expiration. Store in a dry, well-ventilated environment below 25°C(77°F).

Note: Maximum clarification is achieved after one week. This is when filtration is most productive. It is not recommended to leave gelatins in cider for more than 30 days.

#15798 1 L
#15799 5 L
#15800 20 L

Cristalline Plus

Isinglass clarification treatment

Cristalline Plus is a blend of isinglass and citric acid stabilized with potassium metabisulfite. It has a high positive charge and can improve clarity and filterability even in very difficult ciders. Cristalline Plus is not sensitive to cold temperatures and may be slow to complete settling.

Recommended Dosage*

15–30 ppm 1.5–3 g/hL
0.12–0.25 lb/1000 gal

*Bench trials recommended

Usage

Dissolve Cristalline Plus in 150–200 times its weight in water 15–20°C(59–68°F). Allow to swell for 3 hours. Add additional water if solution is too viscous. Add homogenized solution to cider, taking care to mix well. Rack once lees are well settled.

Storage

Dated expiration. Store in a dry, odor-free environment below 25°C(77°F).

#15770 100 g
#15771 1 kg

Freshprotect

PVPP blend for treatment of oxygen sensitive juice and cider

Freshprotect is a proprietary IOC blend of polyvinylpolypyrrolidone (PVPP) and bentonite. It was specifically formulated to help minimize problems associated with the oxidation of polyphenols including color, bitterness and herbaceousness in oxygen sensitive juice. These characteristics are significantly mitigated with the use of Freshprotect. PVPP is intended as a processing aid. Ciders made with it must be racked or filtered afterwards. Freshprotect has also been known to help correct sensory off-aromas.

Recommended Dosage*

Juice

200–1000 ppm 20–100 g/hL
1.7–8.3 lb/1000 gal

*Bench trials recommended

Usage

Mix Freshprotect into 10 times its weight in cool water (do not mix in juice or cider). Allow to soak for 1 hour. Then add the mixture into the tank slowly; making sure the solution is thoroughly blended into the juice.

Storage

Dated expiration. Store in a dry, odor-free environment below 25°C(77°F).

#15790 1 kg
#15791 5 kg
#15792 20 kg

Gelocolle

Silica gel for improved settling

Gelocolle is an aqueous solution of suspended silica commonly used in conjunction with gelatins, isinglass and other organic fining agents. It helps compact lees and reduces the risk of overfining. It is also useful for hard-to-filter ciders where it helps chelate proteins and other compounds.

Recommended Dosage*

200–1000 ppm 20–100 mL/hL
0.75–3.8 L/1000 gal

*Bench trials recommended
Note: Use 1.0 mL of Gelocolle to 1.0 mL of gelatin.

Usage

Gelocolle should be added directly into the cider 1 hour after fining with organic fining agents. Mix thoroughly.

Storage

Dated expiration. Store in a dry well-ventilated environment between 10–20°C(50–68°F). Gelocolle solidifies at temperatures of less than 0°C(32°F). This process is irreversible. Once opened, use immediately.

#15782 1 L
#15783 5 L

Hot Mix Sparkolloid NF

For superior clarification of cider

Hot Mix Sparkolloid® NF is specially formulated to clarify without impacting aroma, body or flavor. It can be used after bentonite or carbon fining to help compact lees. Hot Mix Sparkolloid NF can be helpful in removing haze left by other fining agents and enhances filterability. Use post-alcoholic fermentation only.

Recommended Dosage*

125–500 ppm 12–48 g/hL 1.0–4.0 lb/1000 gal

*Bench trials recommended

Usage

Heat water to boiling [1–2 gallons of water per pound Hot Mix Sparkolloid NF (8–15 L/kg)]. Slowly stir in the Hot Mix Sparkolloid NF. Maintain temperature above 82°C(180°F) while agitating the mixture constantly until all of the translucent globules of clarifier have been dissolved and the mixture is smooth and creamy (approximately 20–30 minutes). While still hot, slowly add the mixture to the cider. This is easily accomplished by adding to a tank being mixed by a Guth agitator or by introducing the hot mixture into the line during a tank circulation. Let the cider settle 1 week or more, depending somewhat on the volume of cider involved. Then filter, preferably from the top of the tank.

Storage

Keep tightly sealed and dry. Shelf-life is 4 years at 18°C(65°F).

#15035 25 lb

Inocolle

Gelatin to enhance the bouquet of finished ciders or for the treatment of moldy juice

Inocolle is a partially hydrolyzed gelatin solution at a concentration of 100 g/L. It softens cider while improving aromas and flavors. It can help clarify cider by removing both colloidal and unstable materials. Moldy aromatics in juice or cider may be improved by the addition of Inocolle.

Recommended Dosage*

Ciders

300–600 ppm 30–60 mL/hL
1.1–2.2 L/1000 gal

*Bench trials recommended

When used with Gelocolle

250–500 ppm 25–50 mL/hL
0.95–1.9 L/1000 gal

*Bench trials recommended

Usage

Juice

Introduce into juice gradually while mixing vigorously to assure even treatment. Racking should be done after 1 week. Do not adjust juice acidity prior to treatment with Inocolle.

Cider

For enhanced settling and gentler fining introduce into cider 1 hour before adding Gelocolle. Mix vigorously to assure even treatment. Racking should be done after 1 week. Filtration is possible 48–72 hours after treating with Inocolle.

Note: Maximum clarification is achieved after 1 week. This is when filtration is most productive. It is not recommended to leave gelatins in cider for more than 30 days.

Storage

Dated expiration. Store in a dry, well-ventilated environment below 25°C(77°F).

#15795 1 L
#15796 5 L
#15797 20 L

Polycacel

PVPP and casein for treatment of oxidized juice or cider or for preventative treatment of browning

Polycacel is an IOC blend of polyvinylpolypyrrolidone (PVPP), micropulverized cellulose and soluble casein for use on problem phenols associated with browning. Its proprietary formulation helps avoid the over-stripping sometimes associated with high doses of caseinates and PVPP. It can be used either preventatively in juice or in cider destined for prolonged tank storage. Cider flavors and aromas are enhanced while color is improved.

Recommended Dosage*

For Oxidized Juice
300–700 ppm 30–70 g/hL
2.5–5.8 lb/1000 gal

For Protection of Cider
150–300 ppm 15–30 g/hL
1.25–2.5 lb/1000 gal

*Bench trials recommended

Usage
Several hours prior to use mix Polycacel into 20 times its weight in cool water (do not mix in juice or cider). Mix well and allow to sit for 2 hours. Add the mixture into the tank slowly; making sure the addition is thoroughly blended into the juice or cider being treated.

Storage
Dated expiration. Store in a dry, odor-free environment below 25°C(77°F).

#15785 1 kg
#15786 5 kg

Polycel

PVPP for treatment of browning

Polycel is formulated to help prevent and/or treat compounds which cause browning. Polycel is polyvinylpolypyrrolidone (PVPP) and it complexes with polyphenols like catechins as well as other compounds associated with browning. As it is insoluble in water and alcohol it precipitates out and leaves no residue. It can be used together with bentonite and/or casein.

Recommended Dosage*

For Oxidized Juice
400–800 ppm 40–80 g/hL
3.3–6.7 lb/1000 gal

For Preventative Treatment of Cider
150–300 ppm 15–30 g/hL
1.25–2.5 lb/1000 gal

For Curative Treatment of Cider
300–500 ppm 30–50 g/hL
2.5–4.2 lb/1000 gal

*Bench trials recommended

Usage
Mix Polycel into 20 times its weight in cool water (do not use cider or juice). Mix well and allow to sit for 1 hour. Add the mixture to the tank slowly, making sure the addition is thoroughly blended into the juice or cider being treated. Depending upon the cider, Polycel may take up to a week to settle out. PVPP is intended as a processing aid. Ciders made with it must be racked or filtered afterwards.

Storage
Dated expiration. Store in a dry, odor-free environment below 25°C(77°F).

#15784 1 kg

Reduless

Reduces sulfur off aromas

Reduless is a proprietary fining product from Lallemand for the reduction of sulfur off aromas such as H_2S and dimethyl sulfide. Its formulation includes bentonite together with other natural elements which are rich in copper. Reduless can naturally enhance roundness while treating sulfur problems. It has also been shown to reduce phenol related defects.

Recommended Dosage
100–150 ppm 10–15 g/hL
0.8–1.2 lb/1000 gal

Usage
Mix Reduless in 10 times its weight in water. Add immediately to the tank. If prepared in advance, resuspend the product prior to its addition to the tank. Gently mix and rack off or filter after 72 hours. The maximum potential copper contribution when used according to the recommendation is 0.02 ppm.

Storage
Store at room temperature, away from direct sunlight and strong odors. It can be stored for up to 4 years from production date.

#15116 1 kg
#15115 2.5 kg

Corks & Packaging

Micro-Agglo Corks

- Suitable for most cork and cage finish bottles
- 25.5 mm x 44 mm
- Minimum order is 1,000

Custom Corks

- Relvas champagne style corks
- Sized per customer specification
- Side & end fire branding available at no charge
- Minimum order 10,000

Stock Cages

- 38CL for cider and beer, gold disc silver wire, finished disc size 26.5 mm
- 38CL for cider and beer, black disc black wire, finished disc size 26.5 mm
- Packed 2,700 per box
- Minimum order is one box
- For additional color options see “Custom Cages” above right

Custom Cages

- Unlimited disc color options
- Lithograph printed per customer artwork
- 14 wire color choices
- Minimum order 10,000

For more information contact Scott Labs’ Packaging Department at (707) 765-6666.

Special thanks to Snowdrift Cider Company for contributing this product photo. Snowdrift has proudly been purchasing Scott Labs sparkling corks and wirehoods for their cider lineup since 2010.

Portfolio

Mazzei Injecting Devices

Mazzei Injector

A highly efficient, low cost device for energizing fermentations by automatically injecting air (thus oxygen) during pump-over. Engineered by the world's leading manufacturer of high-performance venturi-type injectors that transfer or mix liquid or gas additives into solution.

Made from cast stainless steel, the model SS-2081 has 2" triclamp connections and a 1½" suction connection. Cider pumped through the injector creates a vacuum after the throat of the device, in turn creating suction through the lateral port. A simple valve can be added to the suction port to allow throttling of the suction.

Features and Benefits

- No moving parts.
- Not an electrical device.
- Internal vanes are cast into the injector and angled to intensify the mixing of the air with the cider.
- Fining agents and other additives can be introduced at the suction port. With the addition of a ball valve and hose, the operator can control the rate at which the liquid is drawn from a convenient vessel.
- No need for air hoses, automated systems, or dangerous and expensive oxygen tanks.
- Can be used during racking or mixing.
- Easy to clean.

Filtration Equipment

Crossflow Filters

Velo Acciai

Originally developed for wine clarification, the Crossflow TMF offers compactness, ease of operation and high quality filtration. The concept behind the Crossflow system is "Set and Forget" and this is exactly what the Crossflow delivers. Automated cycles for filtration and cleaning allow the Crossflow unit to virtually run without the need for an operator. The savings on filtrations are not limited to labor as media costs are also minimized compared to pad or D.E filtrations.

The Crossflow TMF also allows for future growth with a modular design which allows for additional filter elements to be added at a later date.

Units in standard production include 3, 6, 9, 12, 24, 36, 48 and 60 element designs, with each filter element having the equivalent of 10 square meters of filtration surface.

Scott Plate Filters

Scott plate filters are designed specifically for North American needs. Efficiency, economy and sanitary construction are paramount. Plate filters can be used for clarification and sterile filtrations. Available in both a 40x40 and 60x60 cm with chassis sizes ranging from a 20 plate capacity up to a 200 plate capacity. Sanitary features include DIN connector fittings, diaphragm gauges and sanitary valves.

Standard Features

- Stainless steel construction (AISI 304)
- Tri-Clover fittings on inlet/outlet
- In-line sightglasses, bleed valves, pressure gauges, inlet/outlet valves, inlet/outlet manifolds, drain valves
- Heavy duty spindle closure
- Noryl plates are standard
- Mounted on wheels
- Stainless steel drip pan

Additional options are available. Please contact Scott Laboratories for more information.

Pressure Leaf Filters

Velo Acciai

Pressure leaf filters are offered in a range of sizes to accommodate a variety of production needs. Vertical leaf filters are available in sizes from 2.7m² to 50m². Sizes 5m² and larger feature a vibrating dry cake discharge system. Horizontal leaf filters are available in sizes from 2m² to 50m². Sizes 5m² and larger feature a spinning disc dry cake discharge system.

All leaf filters are made from stainless steel (AISI 304) and include a feed pump, Tri-Clover fittings, butterfly valves, sightglasses, calibrated flow-meter and automatic D.E. Dosing by adjustable output pump.

Scott Cartridge Filter Housings

Scott Laboratories sanitary cartridge filter housings are made of electropolished 316L stainless steel, which ensures strength, corrosion resistance, improved cleanability and excellent chemical compatibility.

Housing Features

- Available in 10", 20" and 30" lengths
- Available in sizes to accommodate 1-12 filter cartridges at a time
- Both 226 (code 7) and 222 (code 8) adapter cups are available.
- "T-style" flow pattern
- Drain and vent ports allow for complete and easy drainage of the vessel
- 100 psi pressure rated for liquid applications providing added assurance of high-pressure stability
- Gauges and fittings included

Scott Lenticular Filter Housings

Scott Laboratories lenticular filter housings filter without product loss due to an enclosed design. The filter requires less space than a standard plate filter due to its vertical design, and is simple to set up and break down. Housings can be loaded with as few as one module, and modules can be back flushed and reused multiple times (if using the Pall SupraDisc II filter modules).

Features

- Material in 316L stainless steel, sanitary construction with electro polish
- Equipped with sanitary pressure gauges, two butterfly valves and fittings
- Vent valve and drain included with the housing
- A 12" 3-high lenticular housing can hold the equivalent of almost 36 40x40 filter sheets.

Filter & Filtration Media

Scott Laboratories' expertise in wine filtration dates back to the 1940s. Though it began with filter sheets, today our program covers virtually every stage of filtration, from juice clarification to membranes for bottling lines. Members of Scott's staff have been helping customers solve filtration problems for decades.

Seitz SUPRAdisc II

Lenticular Filter Module

The SUPRAdisc II design combines the filtration performance of Seitz media and the structural robustness of interlocking dual drainage plates. This is the most robust design available in the market today. The dual drainage plate design optimizes flow distribution providing unobstructed process flow. These advancements in module design enhance the integrity as well as provide superior resistance to back pressure failures of the filter media, giving the SUPRAdisc II the unique ability to be backflushed.

Seitz Pre-Cart PPII

Depth filter cartridge
Maximum production efficiency

During the production of cider it is an economic essential to protect expensive final membrane filters against premature blockage. Due to their high particle loading capacity, this type of filter cartridge is particularly suited for the filtration of cider with residual solids load.

Seitz Membra-Cart XLII

Final filter cartridge (membrane)
Maximum security

This membrane filter cartridge for microbiologically reliable filtration offers maximum security due to the tested organism retention and documentable integrity testing. Titer reductions of 10^9 for bacteria (at 0.45 µ) and 10^{10} of yeast (at 0.65 µ) are typical and represent the highest level of secure cider filtration.

Seitz K-Series Depth Filter Sheets

The first effective depth filter media microfilter was developed and produced by Seitz in 1914. Seitz continues to be a world leader in new technologies as well as the most popular filter pad in North America.

Due to the material composition and structural design, SeitzSchenk depth filter sheets can basically be compared with a maze-like, extremely fine, three-dimensional matrix with numerous branched micro-channels. This forms a structure with a void volume amounting to as much as four liters per square meter of filter area. The greater the void space, the greater the holding capacity of the pad and therefore the serviceable life.

Filter pads are one of the most popular options for cidermakers, brewers and distillers to filter their products. Pads are easy to use and offer repeatable and reliable ranging from rough to polish to pre-bottling. Filter pads are available from Scott Laboratories in various grades and dimensions. Most modern sheet filter units accommodate 20x20 cm, 40x40 cm or 60x60 cm pads. Scott Laboratories stocks significant inventory of all these sizes in grades ranging from 0.2 µ–55 µ sizes.

Article

When To Crossflow Cider?

Joel Allan
Process Filtration Specialist
Scott Laboratories

Crossflow filtration technology eliminates the need for traditional filter aids such as filter pads or diatomaceous earth. Each element has 10 square meters of surface area and typically has a service life of up to 5 years or more. A system can be as small as a single element and as many as 60. Also included in the design is the capability to be modular to accommodate future increases in production. Scott Laboratories offers both semi and fully automatic versions. Large systems (12 elements or more) are exclusively fully automatic.

There are many things to consider when evaluating the purchase of a crossflow. We have highlighted some of the benefits below:

- When you are consistently spending money on media and labor.
- No generation of solid waste. Traditional pad or DE filtrations result in solid waste that is often too wet for municipal disposal, creating a challenging waste stream.
- A more consistent performance for predictable production. Crossflow is a single step filter so cider need not be filtered multiple times. The elements are a nominal 0.2 micron grade that allow for smooth transition to a final 0.45 micron membrane cartridge prior to bottling.
- "Self-Cleaning Filter". The secret is that the "crossflow" sweeping action keeps solids in suspension allowing for faster and longer run times. Just as with other filtration methods, however, efficiency is highest when the cider is racked off lees and fining agents resulting in < 1% suspended solids.
- Less dissolved oxygen pickup

Anticipated output per element is approximately 150 gallons per hour. Gas can be used to recover nearly all the product at the end of a filtration cycle. There is always a minor fixed loss so the larger the batch size, the greater the recovery. For example a 3 element crossflow's loss is approximately one gallon.

There is virtually no dissolved oxygen pickup within the system if the starting and finishing tank have a gas blanket on them. The machine also adjusts itself while running to maintain set speed, requiring very little labor from an operator. Both pad and pressure leaf filtration require constant monitoring to avoid pressure spikes.

An isobaric option is also available for processing carbonated cider but must be requested at the time of ordering. It cannot be added later like more elements can.

For more information about the crossflow or other filtration equipment, please contact Process Filtration Specialist, Joel Allan, at joela@scottlab.com.

The graph shown is a suggested batch size to media type. Many factors contribute to the suggested media and may vary with your production demands and value of your cider. If you do multiple batches of varying sizes contact Scott Laboratories for additional information to assistance in sizing the right media for you.

	500 gallons	1000 gallons	2000 gallons	3000 gallons	4000 gallons	6000 gallons	7000 gallons and up
40x40 Sheet Filter	●	●	●	●			
Lenticular	●	●	●	●			
Crossflow	○	○	○	●	●	●	●
Pressure leaf		●	●	●	●	●	●

● Highly Recommended
○ Recommended

For information on filtration type, sizing and media, contact Maria Peterson at mariap@scottlab.com

Frequently Asked Questions

What grade filter media should I use?
Filtration is primarily used in cidermaking to achieve two goals: to attain an acceptable level of clarity and to improve microbial stability. Consider these goals when selecting your porosity (by micron rating).

The following porosity ranges can be considered a guideline:
> 5 micron = rough
1–5 micron = polish
< 1 micron = sanitizing

If the final goal is to filter through a sterile membrane before bottling, one must consider preparation through a rough, polishing and sanitizing grade filter prior to sterile filtration. Depending on the initial state of the cider clarity (quantity and type of solids in suspension), filtration steps can be added or removed to enhance efficiency. In general, selecting media grades from each category will achieve your primary goals of clarity and improved microbial stability.

How much cider can I filter through a 0.45 micron membrane cartridge filter before having to replace it?
The membrane will last as long as it continues to let cider through, while also passing regular integrity testing. The rate of fouling is dependent upon the preparation of the cider (pre-filtration or fining), as well as other constituents of the cider (colloids and gums, for example). Regeneration using forward flushes of warm water (120–140°F/49–60°C), as well as chemical regeneration, can help to increase the longevity and throughput of membranes (or any filter media). Filter regeneration is always more effective when performed before filters are entirely clogged.

What are the effects of fining agents, such as activated carbon and bentonite, on filtration?
Fining agents can be very useful. Some products, however, can also lead to the premature clogging of your depth and surface filter media if they have not been properly settled out and racked off the lees prior to filtration. For example, a relatively small amount of fining lees can immediately clog depth media. Also, products like bentonite and carbon can disable hollow fiber crossflow filters by jamming capillaries. Clean rackings after full settling can help prevent these issues and will help optimize efficiency of filtration.

My cider filtered easily through my EK filters, but when I started bottling the next week, my membrane clogged immediately. Why?
Depth filtration (sheets, lenticular, DE, etc.) can manage large colloidal proteins much more effectively and help prepare the cider for membrane (surface) filtration. The assistance of depth filtration is optimally effective if done within a 24 hour window of membrane filtration. If not done within this time frame, the colloidal material in the filtrate begins to regroup and can cause surface clogging on your membrane. If you must wait longer than 24 hours, you can alternatively repeat the filtration through the same grade depth filtration media before filtering through the membrane. You may also consider the use of enzymes to mitigate other clogging factors (i.e. pectins and glucans), as well as submitting samples to your laboratory for analysis to help determine strategies to proceed.

Visit our website for our video series, Drops of Knowledge, showing detailed videos on set-up and usage for sheet filters, lenticular filter and cartridge filters.

Visit www.scottlab.com and click on the Forms & Downloads section.

Filter Cartridge Cleaning Procedure

1. Forward flow with cold water up to 68°F (20°C) at flow rates up to 8 gallons per minute per 10” of membrane cartridge length. Do not allow backward flow through membrane cartridges.
2. Forward flow with hot water up to 140°F (60°C) at flow rates up to 4 gallons per minute per 10” of membrane cartridge length. Do not allow backward flow through membrane cartridges.
3. Soak overnight in a 2% by weight, caustic solution [2% by weight, sodium hydroxide mixed with water at temperature up to 145°F(63°C)]. Caution: This solution is highly caustic and can cause severe eye injury. Required safety equipment: rubber gloves, rubber apron and full face shield.
4. After soaking, remove membrane cartridges and hose down with tap water.
5. Soak in a high acid solution with pH below 2.0 for at least one hour. Be certain to take proper safety precautions. Remove cartridges and hose down with tap water. Install cartridges in the housing.

- Seitz PREcart PPII is cleaned in the same manner as the membrane cartidges. In addition you can backwash (reverse flow) the Seitz PREcart PPII to remove inorganic material.
- After cleaning, acidified SO_2 solutions (pH 2, 200 ppm) can be used for short term storage, though O-rings must be removed during storage in SO_2. Solutions of alcohol (40%) such as vodka can be used for short or long term storage.

Filter Sheet Cleaning

Rinsing and Sterilization

Unsterilized sheets should be rinsed with water or recirculated with product for a minimum of 10 minutes prior to use.

- Hot Water Sterilization: 20 minutes at a minimum 180°F.
- Steam sterilization (stainless steel plates ONLY): 20 minutes at a maximum pressure of 7 psi (0.5 bar) and a maximum temperature of 230°F (110°C). Do not expose filter plates to heat in fully tightened condition. Retighten filter after cooling.
- Suggested compatible sanitizers:
  - Sulfur Dioxide @ 1000 ppm
  - 5% Citric Acid Solution
  - Starsan at 300ppm
- Avoid ozone or chlorinated chemicals.

Important Factors for Good Sheet Filtrations

- Maintain consistent conditions of flow and pressure throughout filtration.
- Use only proper grades suggested for specific purposes. Do not mix grades within a single filtration without a diversion plate.
- If regeneration is attempted, use only clean water below 120°F (49°C) in reverse direction of flow. Regeneration is most effective if done right before high differential pressure is reached; i.e., 15–20 psi (1.0–1.4 bar).
- Assure sheets are properly oriented in filter with creped filter sheet surface (rough) facing the incoming product and screened side (smooth) facing outgoing product.
- If excess edge leakage occurs (more than 3–5 gallons per 8 hour shift), check condition of filter for proper gaskets, good lubrication, or warped plates.
- Ciders should not be premembrane filtered with sheets more than 24 hours before the membrane filtration. With recently blended ciders, sheet filtration may be necessary immediately prior to membrane filtration.

		Optimum gal/hr/sheet	Maximum gal/hr/sheet	Maximum Differential Pressure
20 x 20 cm	S	5	9	21 psi (1.5 bar)
	P	9	13	45 psi (3.0 bar)
40 x 40 cm	S	20	25	21 psi (1.5 bar)
	P	35	50	45 psi (3.0 bar)
60 x 60 cm	S	46	50	21 psi (1.5 bar)
	P	75	100	45 psi (3.0 bar)
12” Lenticular	S	225	250	21 psi (1.5 bar)
	P	390	500	45 psi (3.0 bar)
16” Lenticular	S	625	690	21 psi (1.5 bar)
	P	1,090	1,350	45 psi (3.0 bar)

S Sterilizing
P Polishing

Supra Disc II Lenticular Filter Module Backflush

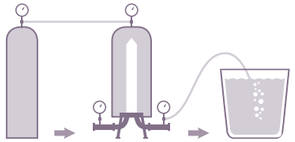
The backflush is a mechanical means used to clean and regenerate filters in order to improve operational economics and minimize production downtime. This type of cleaning cycle is most effective for the removal of hard, non-deformable contaminants that cake well on the filter. Our recommendation is to initiate a filter backflush when the differnetial pressure reaches 50% of the recommended final change out differential pressure. These cleaning cycles have significant practical and economic value. Experience has shown as much as a five fold increase in filter life.

Procedure

1. Backflush the modules with clean, ambient temperature water at half operating flow rate and no more than 7 psi (0.5 bar). Go slowly, but get up to 5psi.
2. Increase water temperature to 120–140°F (49–60°C) while forward flowing for 10 minutes.
3. Stop flow and soak for 10 minutes, then restart forward flow using ambient temperature water for 10 minutes.
4. Drain housing.
5. Note: Typically the lower the differential pressure at the time of backflush, the more effective the procedure will be. Do not wait until terminal pressure is achieved to perform your filter regeneration.

Note: Only the Supra Disc II modules are back flushable. Backflush plates should be used.

Bubble Point Integrity Test



Bubble Points for Typical Cider Filter (Air as The Test Gas)

Filter Grade	Wetting Fluid	Minimum Bubble Point
XL II 0.45 µ Membrane	Water	26.1 psig
XL II 0.65 µ Membrane	Water	19 psig

If the bubble point is greater or equal to the minimum bubble point listed above, the filter has passed the test.

Test Method

1. Sanitize filter.
2. Drain housing.
3. Connect the upstream port of the filter to compressed air (use a regulator).
4. Connect flexible hose from the downstream port of the filter into a bucket of water.
5. Gradually increase the pressure from zero, using the pressure regulator.
6. Observe the bucket of water for vigorous bubbling.
7. The bubble point is reached when bubbles are produced from the hose at a steady rate.

Test Considerations

- Failure to wet the filter completely may result in a false failure.
- Some air will diffuse at lower pressure to form bubbles. This will not result in vigorous bubbling and is NOT the bubble point.
- If failure occurs, open the filter housing to ensure that the filter is installed correctly in the housing. Replace and retest. Dispose after two failures.

Note: If you have achieved a pressure above 26.1 psi or 19 psi respectively and have not seen bubble point, your cartridge is sound. Do not continue to increase the pressure as you can eventually damage the media.

General Tools
Calculations and Conversions

VOLUME CONVERSIONS

1 mL	=	0.035 fl oz	mL = milliliter
1 fl oz	=	30 mL	fl oz = fluid ounce
1 L	=	1000 mL	gal = gallon
1 L	=	0.2642 gal	L = liter
1 gal	=	3785 mL	hL = hectoliter
1 gal	=	3.785 L	
1 hL	=	100 L	
1 hL	=	26.4 gal	

MASS CONVERSIONS

1 kg	=	1000 g	mg = milligram
1 kg	=	2.205 lb	g = gram
1 g	=	1000 mg	kg = kilogram
1 lb	=	453.6 g	lb = pound
1 metric ton	=	1000 kg	
1 metric ton	=	2205 lb	
1 US ton	=	2000 lb	
1 US ton	=	907 kg	

OTHER CONVERSIONS

1 lb/1000 gal	=	454 g/1000 gal	1 ppm	=	1 mg/L	
	=	0.454 kg/1000 gal	*barrel	=	60 gal	= 227.1 L
	=	120 mg/L	1°Brix	=	1% sugar (wt/vol)	
	=	27.2 g/barrel*				
	=	0.120 g/L				
1 kg/hL	=	1000 g/hL				
	=	10,000 mg/L				
	=	2.271 kg/barrel*				
	=	10 g/L				

TEMPERATURE CONVERSIONS

F° = Degree Fahrenheit
C° to F° = (C° x 9/5) + 32

C° = Degree Celsius
F° to C° = (F° – 32) x (5/9)

F°	0	32	40	50	60	70	80	90	100	110	120
C°	-18	0	4	10	16	21	27	32	38	44	49

INTERNET CONVERSION TOOLS

www.onlineconversion.com

BENCH TRIAL CALCULATOR

We recommend performing bench trials with many of our products including lysozyme, tannins, enzymes and fining agents. This calculator will help determine the amount of any given stock solution to achieve a range of concentrations in various-sized sample bottles.

For Powdered Products (Lysovin, Tannins, Fining Agents, etc.)

$$\text{mLs of stock solution to add per sample bottle} = \frac{(\text{sample size in mLs}) \times (\text{desired concentration in ppm}) \times (0.0001)}{\%\ \text{concentration (w/v) of stock solution}}$$

For Liquid Products (Scottzymes, Gelatins, etc.)

$$\text{mLs of stock solution to add per sample bottle} = \frac{(\text{sample size in mLs}) \times (\text{desired concentration in mLs/1000 gal}) \times (0.000026)}{\%\ \text{concentration (v/v) of stock solution}}$$

For example
If you have a 10% stock solution of KS and wish to create a 150 mL/1000 gal dose in a 375 mL sample bottle you would calculate:

$$\textit{mLs of stock solution to add per sample bottle} = \frac{(375) \times (150) \times (0.000026)}{10} = 0.146\ \text{mL}$$

Therefore, you would need to add 0.146 mL of a 10% KS stock solution to a 375 mL bottle to represent a concentration of 150 mL/1000 gal.

American Beauty

Chenango Strawberry

Detroit Red

Early Harvest

Golden Pearmain

Lowry

Michelin

Monark

Pink Pearl

Pink Pearmain

Razor Russet

Rubinette

Spice of Old Virginia

Summer Limbertwig

Thompkin's County King

Willow Twig

Images courtesy of Albemarle CiderWorks

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Scott Laboratories Canada
Pickering, Ontario
905 839 9463
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info@scottlabsltd.com

Order Form 2016

Please Note

- All pricing for sale within United States is FOB Petaluma.
- For large orders, please call for a price quotation and order early to ensure product availability.
- Maximum credit card order is $3000.
- We accept Visa, Mastercard and American Express.
- Credit application available online at **www.scottlab.com**.

Return Policy

Return Policy for Fermentation and Filtration Products
We offer credits if products are returned within 15 days of shipment. **Please call Scott Laboratories prior to return for authorization.** Once we receive your returned items we will issue a credit to your account. Please note that we are not responsible for perishable items that have not been stored properly by the customer. If you are returning items for any reason, the following conditions apply:

- Sealed units must be unopened and undamaged upon return.
- **Goods that have been marked or labeled will not be accepted and no credit will be issued.**
- Damage claims must be reported within 5 working days of receipt of your order.
- Original packing must be retained for shipping company inspection of shipping damage claims.
- Sorry, but we do not accept returns on malolactic bacteria.
- A 20% restocking fee will be applied to all returns.
- Customer to pay return freight costs.

Note: To avoid problems, all packages should be opened immediately upon receipt and contents should be checked against the packing slip.
Scott Laboratories should be informed immediately of any discrepancies.

Submit Orders

Scott Laboratories Inc. (U.S.A.)

Call 707 765 6666
Fax 707 765 6674
Mail P.O. Box 4559, Petaluma, CA 94955-4559
E-Mail fermentation@scottlab.com

Scott Laboratories Ltd. (Canada)

Call 905 839 9463
Fax 905 839 0738
Mail 950 Brock Rd. South, Unit 1, Pickering, Ontario L1W 2A1
E-Mail info@scottlabsltd.com

Customer Information Please print clearly

Company Name

Customer Number

Contact Name

Customer Signature

Bill to Address

Ship to Address

Telephone Number

E-Mail Address

Purchase Order Number

Credit Card Number

Expiration Date (mm/yy)

Name on Card

Signature

Ship Via Please mark preferred carrier and shipping method

UPS FedEx

1 Day 2 Day Saver Most Economical

Please note: Malolactic bacteria and encapsulated yeasts will be shipped overnight due to temperature sensitivity of the products.

Number of Pages Faxed

Page	Product #	Product	Size	Quantity	Price ($)	Ship Date
Premium Yeast						
7	15630	58W3	500 g			
7	15631	58W3	10 kg			
7	15059	71B	500 g			
7	15078	71B	10 kg			
7	15174	Alchemy I	1 kg			
7	15117	BA11	500 g			
7	15176	BM 4x4	500 g			
7	15200	BM 4x4	10 kg			
7	15689	C	500 g			
7	15640	Cross Evolution	500 g			
7	15641	Cross Evolution	10 kg			
7	15237	CVW5	500 g			
7	15210	CVW5	10 kg			
8	15143	D21 (ICV)	500 g			
8	15163	D21 (ICV)	10 kg			
8	15062	DV10	500 g			
8	15106	DV10	10 kg			
8	15053	EC1118 (Prise de Mousse)	500 g			
8	15076	EC1118 (Prise de Mousse)	10 kg			
8	17143	Fermivin Champion	500 g			
8	17145	Fermivin Champion	10 kg			
8	17152	Fermivin PDM	500 g			
8	15063	K1 (V1116)	500 g			
8	15077	K1 (V1116)	10 kg			
8	15648	M2	500 g			
8	15649	M2	10 kg			
8	15068	Opale (ICV)	500 g			
8	15652	QA23	500 g			
8	15653	QA23	10 kg			
9	15071	R2	500 g			
9	15171	Rhône 4600	500 g			
9	15130	R-HST	500 g			
9	15183	VIN 13	1 kg			
9	15228	VIN 13	10 kg			
9	15118	W15	500 g			
9	15119	W15	10 kg			

Page	Product #	Product	Size	Quantity	Price ($)	Ship Date
Non H_2S or SO_2 Producing Strains						
9	15221	ICV OKAY	500 g			
9	15222	ICV OKAY	10 kg			
9	15225	Sensy	500 g			
Specialty Yeast Strains						
11	15685	Biodiva	125 g			
11	15213	Exotics SPH	250 g			
Encapsulated Yeasts						
12	15150	ProDessert	1 kg			
12	15158	ProMesh Barrel Bag	—			
12	15159	ProMesh Tank Bag	—			
13	15571	ProElif	1 kg			
Rehydration Nutrients						
25	15149	Go-Ferm	1 kg			
25	15135	Go-Ferm	2.5 kg			
25	15161	Go-Ferm	10 kg			
25	15103	Go-Ferm Protect Evolution	2.5 kg			
Fermentation Nutrients						
26	15147	Anchorferm	10 kg			
26	15805	DAP	5 kg			
27	15070A	Fermaid A	10 kg			
27	15073	Fermaid K	2.5 kg			
27	15070	Fermaid K	10 kg			
28	15067	Fermaid O	2.5 kg			
28	15107	Fermaid O	10 kg			
28	15804	Inocel	1 kg			
28	15679	Nutrient Vit End	2.5 kg			
29	15887	Phosphate Titres	1 kg			
29	15888	Phosphate Titres	5 kg			
29	15224	Reskue	1 kg			
29	15069	SIY Cell Hulls (Yeast Hulls)	1 lb			
29	15069	SIY Cell Hulls (Yeast Hulls)	44 lb bag			

Page	Product #	Product	Size	Quantity	Price ($)	Ship Date
Natural Yeast Derivative Nutrients						
31	15179	ICV Booster Blanc	2.5 kg			
31	15105	ICV Noblesse	2.5 kg			
31	15198	OptiMUM White	1 kg			
31	15202	OptiMUM White	2.5 kg			
31	15165	Opti-WHITE	1 kg			
31	15136	Opti-WHITE	2.5 kg			
31	15216	Opti-WHITE	10 kg			
Fermentation + Cellaring Tannins						
33	15954	FT Blanc	1 kg			
33	15969	FT Blanc	5 kg			
33	15974	FT Blanc Citrus	1 kg			
33	15975	FT Blanc Citrus	5 kg			
33	15955	FT Blanc Soft	1 kg			
33	15978	Radiance	250 g			
Lallzyme						
36	16200	Beta	100 g			
36	16209	Cider Clear	100 g			
36	16207	MMX	100 g			
Rapidase						
37	16255	Rapidase Clear	100 g			
37	16256	Rapidase Clear	1 kg			
37	16257	Rapidase Clear Extreme	100 g			
37	16266	Revelation Aroma	100 g			
Scottzymes						
38	16176	BG	1 kg			
38	16171	HC	1 kg			
38	16161	HC	25 kg			
39	16174	KS	1 kg			
39	16164	KS	25 kg			
39	16170	Pec5L	1 kg			
39	16160	Pec5L	25 kg			
39	16177	Spectrum	1 kg			
39	16167	Spectrum	25 kg			

Page	Product #	Product	Size		Quantity	Price ($)	Ship Date
Direct Inoculation Cultures							
41	15601	Alpha	2.5 hL				
41	15602	Alpha	25 hL				
41	15603	Alpha	250 hL				
41	15022	MBR 31	2.5 hL				
41	15032	MBR 31	25 hL				
41	15127	MBR 31	250 hL				
41	15615	O-MEGA	25 hL				
41	15616	O-MEGA	250 hL				
41	15607	PN4	25 hL				
41	15608	PN4	250 hL				
41	15048	VP41	2.5 hL				
41	15042	VP41	25 hL				
41	15044	VP41	250 hL				
Malolactic Bacteria Nutrition							
42	15681	Acti-ML	1 kg				
42	15141	Opti'Malo Plus	1 kg				
42	15217	Opti'ML Blanc	1 kg				
Lysozyme							
46	16405	Lyso-Easy	250 mL				
46	16406	Lyso-Easy	1 L				
46	16407	Lyso-Easy	5 L				
46	16402	Lysovin	500 g				
46	16400	Lysovin	1 kg				
46	16401	Lysovin	5 kg				
Sulfur Dioxide							
47	15777	2 g SO_2 Inodose Granules	(40/box)	1-4			
47	15777	2 g SO_2 Inodose Granules	(40/box)	5-19			
47	15777	2 g SO_2 Inodose Granules	(40/box)	20+			
47	15778	5 g SO_2 Inodose Granules	(25/box)	1-4			
47	15778	5 g SO_2 Inodose Granules	(25/box)	5-19			
47	15778	5 g SO_2 Inodose Granules	(25/box)	20+			
47	15780	100 g SO_2 Inodose Granules		1-19			
47	15780	100 g SO_2 Inodose Granules		20-59			
47	15780	100 g SO_2 Inodose Granules		60+			

Page	Product #	Product	Size		Quantity	Price ($)	Ship Date
47	15781	400 g SO_2 Inodose Granules		1-14			
47	15781	400 g SO_2 Inodose Granules		15+			
47	15775	2 g SO_2 Inodose Tablets	(48/box)	1-4			
47	15775	2 g SO_2 Inodose Tablets	(48/box)	5-19			
47	15775	2 g SO_2 Inodose Tablets	(48/box)	20+			
47	15776	5 g SO_2 Inodose Tablets	(48/box)	1-4			
47	15776	5 g SO_2 Inodose Tablets	(48/box)	5-19			
47	15776	5 g SO_2 Inodose Tablets	(48/box)	20+			

Microbial Control Agents

48	16410	No Brett Inside	100 g			
48	18000	Velcorin	3 kg			

Cleaning

51	18502	Destainex	5 kg			
51	18504	Destainex-LF	5 kg			
51	18508	Oak Restorer-CW	5 kg			
51	18510	Oak Restorer-HW	5 kg			

Stability

53	15772	Flashgum R Liquide	1 L			
53	15773	Flashgum R Liquide	5 L			
54	15793	Inogum 300	1 L			
54	15794	Inogum 300	5 L			
54	17010	Ultima Fresh	1 kg			
54	17012	Ultima Soft	1 kg			

Fining Agents

57	15787	Bentolact S	1 kg			
57	15788	Bentolact S	5 kg			
57	15789	Bentolact S	25 kg			
57	15766	Bentostab	5 kg			
57	15807	Caséinate de potassium	1 kg			
57	15808	Caséinate de potassium	5 kg			
58	15036	Cold Mix Sparkolloid NF	25 lb			
58	15798	Colle Perle	1 L			
58	15799	Colle Perle	5 L			
58	15800	Colle Perle	20 L			
58	15770	Cristalline Plus	100 g			
58	15771	Cristalline Plus	1 kg			

Page	Product #	Product	Size	Quantity	Price ($)	Ship Date
59	15790	Freshprotect	1 kg			
59	15791	Freshprotect	5 kg			
59	15792	Freshprotect	20 kg			
59	15782	Gelocolle	1 L			
59	15783	Gelocolle	5 L			
59	15035	Hot Mix Sparkolloid NF	25 lb			
59	15795	Inocolle	1 L			
59	15796	Inocolle	5 L			
59	15797	Inocolle	20 L			
60	15785	Polycacel	1 kg			
60	15786	Polycacel	5 kg			
60	15784	Polycel	1 kg			
60	15116	Reduless	1 kg			
60	15115	Reduless	2.5 kg			