

The background of the slide is a light gray gradient with several realistic water droplets of various sizes scattered across it. The droplets have highlights and shadows, giving them a three-dimensional appearance. The main title is centered in the upper half of the slide.

# **PRACTICAL HIGH-ACIDITY WINEMAKING STRATEGIES FOR THE MIDWEST**

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**GRAPE BREEDING & ENOLOGY PROJECT**

# GETTING STARTED

- *A BASIC UNDERSTANDING OF PH AND TOTAL ACIDITY IS INVALUABLE TO PRACTICAL WINE MAKING.*

# PH VS. TA (TOTAL ACIDITY)

- BOTH ARE A MEASURE OF THE RELATIVE STRENGTH OF ACIDITY IN WINE, BUT THEY DO NOT CORRELATE EXACTLY.
- PH: THE INVERSE LOG OF HYDROGEN IONS IN A SOLUTION
- PH: A LOGARITHMIC SCALE FROM 0 TO 14
- A PH OF 3.0 IS 10X HIGHER (OR “STRONGER”) THAN A PH OF 4.0.
- **TYPICALLY A PH BETWEEN 3.1 AND 3.6 IS DESIRABLE FOR WINE.**

## PH VS. TA (TOTAL ACIDITY)

- TOTAL ACIDITY IS AN EMPIRICAL MEASUREMENT OF **ALL** OF THE ACIDS IN A SOLUTION, OFTEN GIVEN IN GRAMS/LITER.
- THE HIGHER THE ACIDITY, THE MORE TART A WINE WILL TASTE.
- PH IS ABOUT MICROBIAL STABILITY, MOUTH FEEL, STRUCTURE, AND AGE-ABILITY OF A GIVEN WINE.
- PH IS **QUALITATIVE** ACIDITY. TOTAL ACIDITY IS **QUANTITATIVE**...

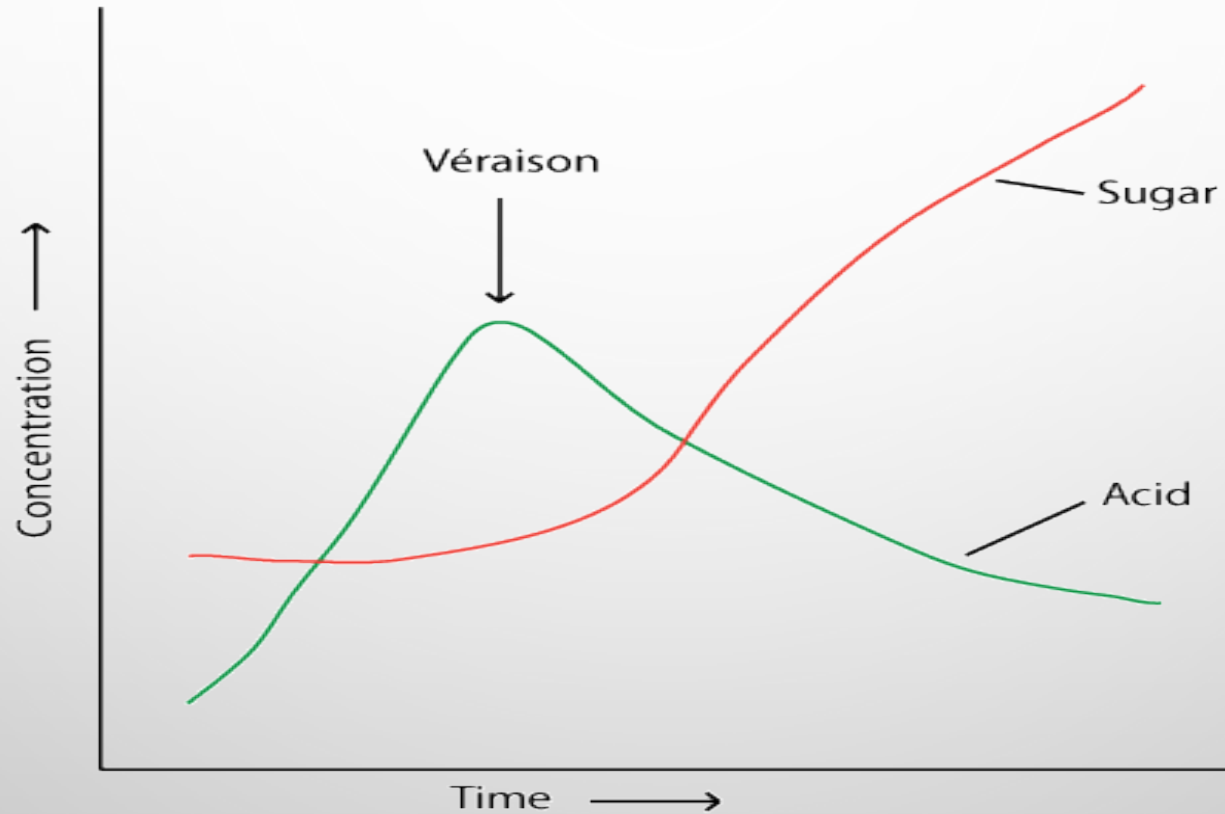
“... THE BEST THING FOR A VINEYARD ARE THE FOOTPRINTS  
OF THE WINEMAKER...”



# **WINE IS MADE IN THE VINEYARD FIRST!!!**

- **WINEMAKING STARTS IN THE VINEYARD.**
- **VITICULTURAL PRACTICES AND HARVEST TIMING HAVE MAJOR EFFECTS**
- **ACTIVE COLLABORATION BETWEEN VITICULTURIST AND WINEMAKER**
- **VITICULTURE AND ENOLOGY ARE “TWO WINGS OF THE SAME BIRD”...**
- **KNOWLEDGE OF ALL COLD-CLIMATE VARIETIES WILL HELP TO MAKE BALANCED WINES FROM THESE CHALLENGING VARIETIES.**

# POST-VÉRAISON SUGAR/ACID CURVE



Changes in sugar and acid levels as a grape berry grows



## ACIDS AND PH CHANGES

- **THROUGHOUT RIPENING, AS ACIDITY DECREASES, PH INCREASES...**





# **DETERMINING RIPENESS, AND WHEN TO PICK?**

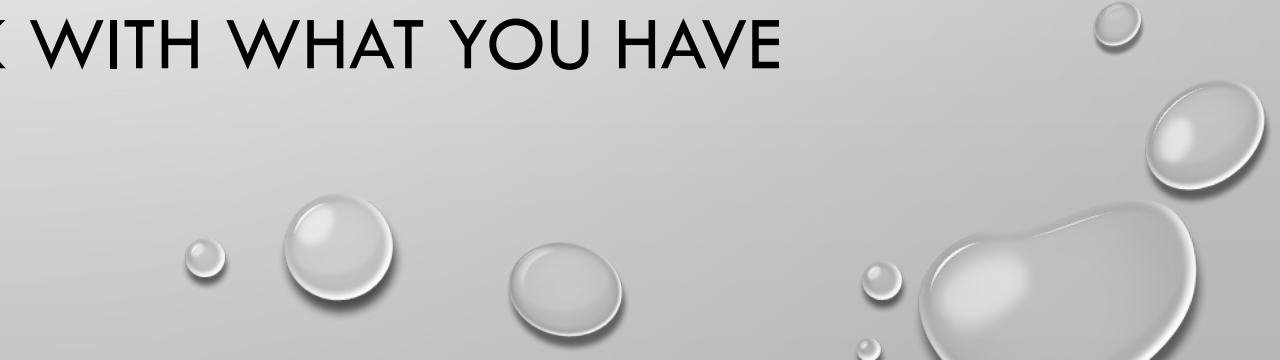
**RIPENESS IS MORE THAN A NUMBER.**

- AROMA AND FLAVOR
- TEXTURE AND COLOR
- CONDITION, OF VINEYARD, VINE, STEM, CLUSTER, BERRY, SKIN AND SEED...
- OVERALL HEALTH, CROP LOAD, PEST ACTIVITY AND DISEASES
- IMPENDING WEATHER AND PICKING CREW/MACHINERY AVAILABILITY

***USE THE LAB IN YOUR MOUTH AND NOSE.***



**THE MIDWEST WINEMAKING “HIGH ACIDITY” BLUES,  
OR, “...HOUSTON, WE HAVE AN ACIDITY PROBLEM !”**

- THERE ARE MANY DIFFERENT TECHNIQUES AND METHODS AVAILABLE.
  - IT IS BEST TO USE A **VARIETY** OF METHODS.
  - SOME METHODS LOWER ACIDITY DIRECTLY, WHILE SOME LOWER THE *PERCEPTION* OF ACIDITY.
  - “EMBRACE ACIDITY” AND WORK WITH WHAT YOU HAVE
- 

## DE-ACIDIFICATION WITH “CARBONATES”, SO EASY, BUT...

- CALCIUM CARBONATE, POTASSIUM CARBONATE, POTASSIUM BICARBONATE
- CAN NEGATIVELY AFFECT AROMAS, FLAVORS AND TEXTURE.
- IF NEEDED, USE EARLY (BEFORE FERMENTATION), & NO MORE THAN 1 G/LITER.
- GENERALLY, 1 GRAM/LITER OF CARBONATE/BICARBONATE WILL LOWER TA BY ABOUT 1.5 GRAM PER LITER.
- DO BENCH TRIALS FIRST!

# WATER ADDITION, AKA “AMELIORATION”

- ADDING WATER WILL LOWER TOTAL ACIDITY.
- QUALITY OF WATER IS IMPORTANT.
- SMALL ADDITIONS WORK WITHOUT DILUTION OF FLAVOR/AROMA
- DO BENCH TRIALS
- 2 GALLONS PER 100 GALLONS WILL REDUCE TA BY 0.1 GRAMS PER LITER.
- YOU CAN ADD SOME SUGAR TO RAISE/RESTORE BRIX.
  
- **27 CFR 24.178 AMELIORATION:** “...IN PRODUCING NATURAL WINE FROM JUICE HAVING A FIXED ACID LEVEL EXCEEDING 5.0 GRAMS PER LITER, THE WINEMAKER MAY ADJUST THE FIXED ACID LEVEL BY ADDING AMELIORATING MATERIAL...”

# YEAST SELECTION

- SOME YEAST STRAINS WILL PARTIALLY METABOLIZE MALIC ACID AND CONVERT IT TO ETHANOL (ALCOHOL).

# LALVIN "C"



- CAN LOWER TA BY 40%
- HAS HIGH ALCOHOL TOLERANCE (16%)
- GOOD FOR SPARKLING WINE PRODUCTION

# LALLEMAND 71 B



- CAN LOWER TA BY 40%,
- GOOD FOR REDS AND FRUIT WINES

# LALLEMAND SVG



- CAN LOWER TA BY 25%
- GOOD FOR AROMATIC WHITES





## **OTHER STRAINS:**

**“MAURIVIN B” (CONVERTS UP TO 56% MALIC)**

**“EXOTICS SPH”**

**“ICV OPALE”**

**“ICV-GRE”**



# “MLF” – MALOLACTIC FERMENTATION

(THINK: GREEN APPLES TO MILK...)

- MLF CONVERTS STRONGER **MALIC** ACID TO WEAKER **LACTIC** ACID
- MLF INCREASES COMPLEXITY AND MOUTHFEEL, CREATES “CREAMY” TEXTURE.
- ALL **RED** WINES ARE PUT THROUGH MLF (EXCEPTIONS ARE “*BEAUJOLAIS NOUVEAU*” WINES, OR PORT WINES.)
- MLF WILL ALTER AROMATICS. THE USE OF “PARTIAL” MLF IN WHITES, ROSÉS, AND *MÉTHODE CHAMPENOISE*, IS A STYLISTIC/REGIONAL CHOICE.
- MLF BACTERIA PRODUCE **DIACETYL**, WHICH GIVES THE “BUTTERY” AROMAS AND FLAVORS OF MANY POPULAR CHARDONNAYS.

# TECHNIQUES IN MALOLACTIC FERMENTATION

## A BRIEF REVIEW...

- MLF CAN OCCUR “SPONTANEOUSLY” WHEN CELLAR TEMPERATURES RISE, OR WHEN USING ML POSITIVE BARRELS.
- YOU CAN ADD A PURE STRAIN OF ML BACTERIA DURING YEAST FERMENTATION.
- ADDING MLF BACTERIA EARLY WILL PRODUCE **LESS** DIACETYL. ADDING AT THE END WILL PRODUCE **MORE** DIACETYL.
- “PARTIAL” MLF, SPLIT THE WINE AND ENCOURAGE ONE PART (AND THEN RE-BLEND)
- CAN STOP MLF BEFORE IT FINISHES, BY ADDING SO<sub>2</sub>, CHILLING, AND/OR FILTRATION.

**“VP41” IS A PROVEN BACTERIA CHOICE FOR COLD CLIMATE VARIETIES.**

# MALOLACTIC FERMENTATION:

## PRACTICAL METHODS

### TO ENCOURAGE

- TEMP. ABOVE 65F (70F IS BEST)
- PH RANGE 3.2 TO 3.7
- LOW FREE SO<sub>2</sub>, BELOW 30PPM
- LOW TOTAL SO<sub>2</sub>, BELOW 60PPM
- DO NOT OVER-CLARIFY OR FILTER
- ALCOHOL BELOW 13%
- STIR OR RE-SUSPEND THE LEES

### TO DISCOURAGE

- TEMP. LOWER THAN 60F
- PH LOWER THAN 3.2
- FREE SO<sub>2</sub> ABOVE 30PPM
- ALCOHOL ABOVE 13%
- STERILE FILTRATION
- DO NOT STIR OR RE-SUSPEND LEES

# BLENDING TO LOWER ACIDITY

- SIMPLE FACT: BLENDING LOW-ACID WINES WITH HIGH-ACID WINES CAN LOWER TOTAL ACIDITY.
- THE 75% VARIETAL LABELLING RULE EXISTS FOR A REASON, IT HAS VAST AND ESTABLISHED HISTORICAL PRECEDENT WORLDWIDE, AND SIMPLE WINEMAKING PRACTICALITY.
- BLENDS SELL!!! BLENDED WINES WITH “FANCIFUL” NAMES ARE VERY POPULAR NOW.
- BY ACKNOWLEDGING BLENDING IN YOUR WINE, YOU ARE MAKING PART OF YOUR WINEMAKING PART OF YOUR WINE *MARKETING!*... (*DON'T FORGET MARKETING!*)

# COLD STABILIZATION, AKA “TARTRATE STABILITY”

- TRADITIONAL “COLD-CONTACT” CHILLING PROCEDURE WILL CAUSE EXCESS TARTARIC ACID TO PRECIPITATE AS SODIUM BI-TARTRATE “CRYSTALS”.
- THIS EFFECT WILL LOWER TOTAL ACIDITY. (**WHITES AND REDS**)
- WINES SHOULD BE CONDUCTIVITY-TESTED TO INSURE THE COLD-STABILIZATION IS COMPLETE, AND/OR SUFFICIENT TO INSURE TARTRATE STABILITY.
- THIS METHOD REQUIRES SUBSTANTIAL CHILLING OVER A LONG PERIOD, BUT IS OFTEN PROVIDED “FREE OF CHARGE” DURING A MIDWEST WINTER!

# “FREE” COLD STABILIZATION !



# TECHNICAL REDUCTION OF TA VS. “*PERCEPTIONAL*” REDUCTION OF ACIDITY

SO, DE-ACIDIFICATION WITH CARBONATES, WATER-AMELIORATION, YEAST SELECTION, MALOLACTIC FERMENTATION, BLENDING AND COLD-STABILIZATION ALL ABSOLUTELY REDUCE THE AMOUNT OF TOTAL ACIDITY IN MEASURABLE **GRAMS PER LITER** IN A GIVEN JUICE, MUST, OR WINE.

BUT, THERE ARE TECHNIQUES WHICH CAN AND DO REDUCE THE *PERCEPTION* OF HIGH ACIDITY IN A GIVEN WINE...



# BARREL MATURATION, “SUR-LIE” AGING

- BARREL FERMENTATION/MATURATION, CAN REDUCE THE *PERCEPTION* OF HIGH-ACIDITY.
- YEAST **AUTOLYSIS** DURING BARREL MATURATION, AKA ”SUR LIE” AGING, WORKS TO ADD “SMOOTHNESS”, A CREAMIER TEXTURE, INCREASED COMPLEXITY AND RICHNESS.
- BARREL MATURATION GENERALLY ENCOURAGES MLF.
- THOUGH NOT ACTUALLY RESPONSIBLE FOR LOWERING ACIDITY, THE TEXTURAL EFFECTS CERTAINLY CAN HELP “SOFTEN” OR MOLLIFY THE *PERCEPTION* OF HIGH ACIDITY.

# RE-SUSPENDING LEES, “SUR LIE” MATURATION



# SWEETENING...

SWEETENING, THOUGH IT DOES NOT LOWER TA, IT CAN HELP “BALANCE” OR MOLLIFY HIGH-ACIDITY. THERE ARE **4 WAYS TO SWEETEN**:

- STOPPING FERMENTATION EARLY, (WITH SO<sub>2</sub>, COLD-TEMP, FILTER.)
- ADDING DRY SUGAR. (BEET, CANE, OR CORN, THE YEAST DOESN'T CARE.)
- ADDING SWEET/UNFERMENTED JUICE, AKA “SWEET RESERVE”.
- ADDING GRAPE CONCENTRATE, WHICH HAS A BRIX OF ABOUT 70 DEGREES, AND CAN COMPLEMENT AND ACCENTUATE FLAVORS AND AROMAS.

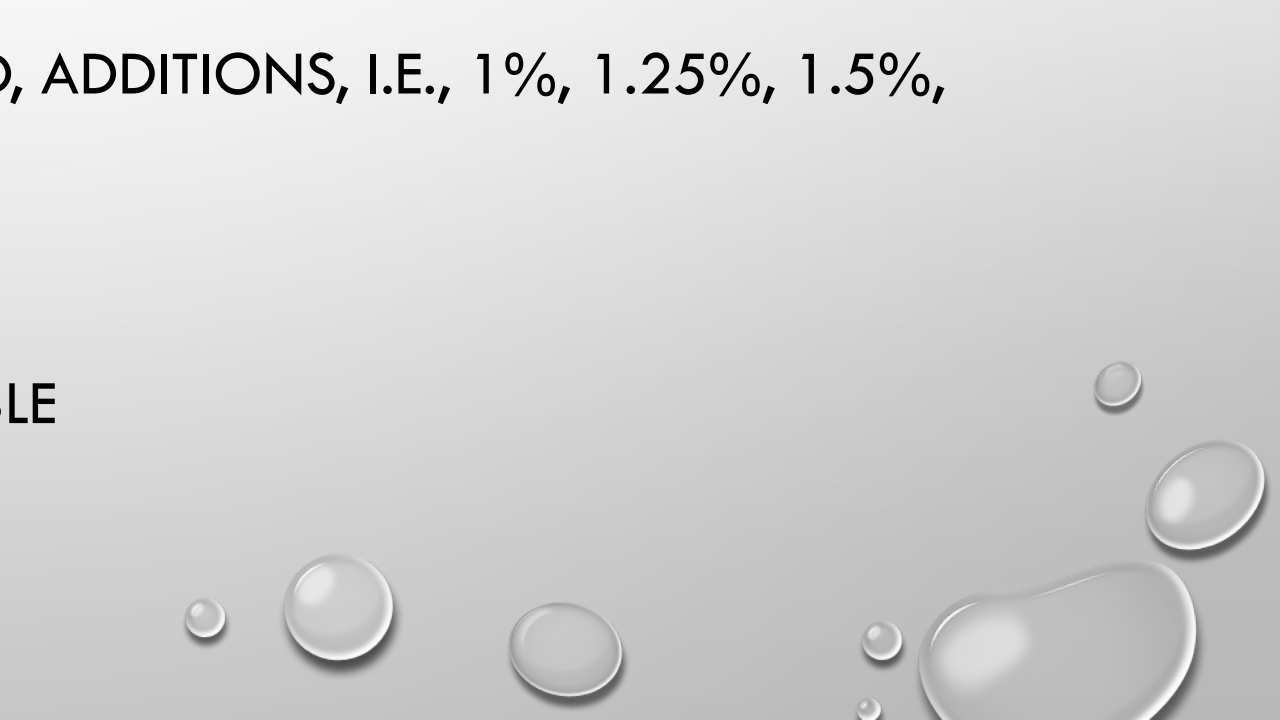
**BENCH TRIALS, BLENDING AND ADDITIONS  
TAKE THE TIME TO TEST THEM ON A SMALL SCALE...**



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# **SMALL PERCENTAGE ADDITIONS CAN MAKE BIG CHANGES, WORK *THE VARIABLES!***

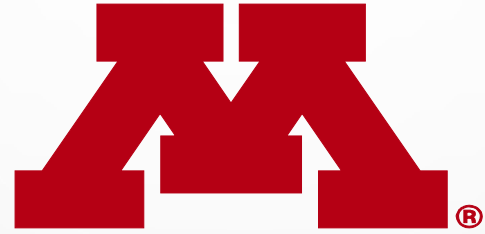
- TAKE THE TIME TO DO YOUR BENCH TRIALS.
  - DO MULTIPLE PERCENTAGE, OR SCALED, ADDITIONS, I.E., 1%, 1.25%, 1.5%, 1.75%, 2%, ETC.
  - TASTE BENCH TRIALS “BLIND” IF POSSIBLE
- 



# **YOU HAVE CHOICES, USE THEM! IN SMALL STEPS...**

- DON'T JUST USE THE “BIGGEST HAMMER” IN YOUR HIGH-ACIDITY WINEMAKING TOOLKIT, USE ALL OF YOUR TOOLS, OR A WELL-CHOSEN SELECTION OF THEM.
  - DO BENCH TRIALS, SMALL-SCALE EXPERIMENTS CAN BE MANIPULATED AND ADJUSTED EASILY.
  - ONCE YOU DECIDE TO ADD SUGAR, WATER, ANOTHER WINE, ETC., MAKE THE ADDITION IN MULTIPLE SMALLER “STEPS” TO TEST AND VERIFY THE RESULTS. ONCE YOU ADD SOMETHING, YOU CAN'T TAKE IT OUT!
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# ACKNOWLEDGEMENTS:



UNIVERSITY  
OF MINNESOTA  
**Driven to Discover**<sup>SM</sup>

# ACKNOWLEDGEMENTS:

MATTHEW CLARK, PHD  
PROJECT DIRECTOR



JOHN & JENNY THULL  
VITICULTURE





**THANKS !**  
**ANY QUESTIONS ?**

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