HEALTHY MEAD FERMENTATIONS

AN OVERVIEW OF BEST FERMENTATION PRACTICES AND AVOIDING STUCK AND SLUGGISH FERMENTATIONS.

MAJOR INFLUENCES/CHALLENGES

Nutrition
Survival factors
pH
Microbial competition
Ethanol
Osmotic shock
Toxins
Adequate yeast population
Highly clarified must

NUTRITION

Nutrient deficiency
- Stuck or sluggish fermentation
- Off characters
- Diminished flavors and aromatics

Complete nutrient vs DAP
- Organic nitrogen (amino acids) vs inorganic nitrogen (ammonia)
- Complete nutrient = macro- and micro-nutrients, minerals, vitamins

Action
- Monitor Yeast Assimilable Nitrogen (YAN)
- Rehydration nutrients
- Complete nutrient, using DAP only in the most severe deficiencies

NUTRITION (cont'd)

DETERMINING NITROGEN NEEDS			
Brix	Low N needs	Medium N needs	High N needs
20	150	180	250
22	165	200	275
24	180	220	300
26	195	240	325
28	210	260	350
30	225	280	375

NUTRITION (cont'd)

NUTRIENT ADDITIONS FOR HEALTHY FERMENTATIONS			
YAN Addition (ppm)	**Rehydration**	**2-3 ˚Brix drop**	**1/3 Drop in Sugar**
0-50	30 g/hL Go-Ferm PE	N/A	30 g/hL Fermaid O
51-100	30 g/hL Go-Ferm PE	20 g/hL Fermaid O	40 g/hL Fermaid O
101-150	30 g/hL Go-Ferm PE	40 g/hL Fermaid O	40 g/hL Fermaid K

***Determine YAN addition by subtracting measured YAN from yeast YAN requirements.**

SURVIVAL FACTORS

Sterols and long-chain fatty acids

- Enable yeast to expel EtOH, maintain membrane integrity

Action

- Rehydration nutrients high in survival factors
- Aeration during yeast growth phase

pH ("REAL" ACIDITY)

pH $\geq$ 3.2 is usually not a problem

pH <3.2 is usually stressful to yeast

Lack of buffer capacity in mead fermentation

- Precipitous drop in pH during fermentation
- Increase in succinic and acetic acid during fermentation

Action

- Addition of calcium carbonate during or after fermentation if pH too low
- Do not correct acid prior to fermentation

COMPETITION (UNWANTED MICROBES)

Wild yeast, fungi/mold, bacteria

- Wild yeast can deplete thiamin within 3 hours
- Botrytis can decrease amino acid content 7-61%

Action

- Sufficient SO_2 to knock down unwanted microbes
- Proper cleaning and sanitation
- Lysozyme or Bactiless
- Tannin (to rob oxygen)

OSMOTIC SHOCK

High sugar must

- Creates pressure across yeast cell membrane
- High enough osmotic pressure can inhibit or kill yeast

Action

- Use yeast selected to withstand osmotic stress
- Increase yeast addition rate and YAN
- Reduce sugar level by addition of water or low Brix must

ETHANOL

High alcohol can be toxic to yeast

- Alters cell membrane, allowing acidification of cells
- Inhibits nutrient transport
- Toxic effects increased with high temperature

Action

- Dilute honey to lower sugar level
- Use yeast pre-conditioned for high alcohol
- Build up sterols and fatty acids (survival factors) to withstand alcohol
- Ferment at lower temperatures
- Increase yeast addition rate

TEMPERATURE

Too hot or too low puts stress on yeast

- Too high may blow off aromatics
- Too high (combined with alcohol) may stress or kill yeast
- Too low: fermentation may become stuck or sluggish, may form sulfide

Action

- Control temperature to accommodate specific yeast
- If fermenting cold, agitation may be needed to keep yeast in suspension

TOXINS

Medium chain fatty acids (FA), volatile acidity (VA)

- FA: created during fermentation by stressed yeast
- VA: from bacteria, wild yeasts, cultured yeast under stress, infected grapes

Action

- FA: fining with inactivated yeast to adsorb toxins.
- VA: if diluted honey is infected by bacteria, SO_2 addition and clarification before fermentation; lysozyme or Bactiless
- Reduce stress on yeast
- VA removal by selected membranes

ADEQUATE YEAST POPULATION

Starting population should be ≥3,000,000 cells/mL

Action

- Inoculation rate of 20-30 g/hL (200-300 ppm) of active dry yeast
- Increase inoculation to offset other stresses (i.e., high alcohol, high sugar)

HIGHLY CLARIFIED MUST

Overly clarified must causes yeast stress

- Over-clarifying can strip out survival factors
- May increase acetic acid due to yeast stress
- Harder to keep yeast in suspension

Action

- Utilize rehydration nutrients, complex nutrients w/survival factors
- Add cellulose powder or cellulose and inactivated yeast to get light turbidity

THE END

THANK YOU

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