

Commercial Winemaking Production Series

Treatment of Film Yeasts

Surface yeasts in tanks and barrels

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Biofilms

Film yeasts are particularly common in viticultural areas that use native American grape varieties or French-American crosses, both often rich in nutrients. These often bubbly surface biofilms appear to be synergistic layers of multiple species including strains of “wild” wine-specific yeasts such as *Brettanomyces*, *Candida*, etc. They can appear so predictably during every vintage that the off-odor they generate has frequently been mistaken for varietal aroma. It is particularly disconcerting as they sometimes appear resistant even against the recommended doses of molecular sulfur dioxide (SO₂) in wine. The organisms may employ detoxification mechanisms similar to those used by the surface (“flor”) yeasts in the production of Spanish Sherry or to *Saccharomyces cerevisiae*’s unique sulfite resistance in general.

The winemaker’s options are limited. The addition of sorbate may generate the feared geranium off-odor if malolactic bacteria growth is possible; i.e. at low free and bound SO₂. The use of antimicrobial agents such as allyl isothiocyanate disks floating on the wine surface is not permitted by the Alcohol and Tobacco Tax and Trade Bureau of the U.S. Department of the Treasury and would impart unpleasant off-odors. Historical remedies such as dispensing a



Film yeast in a tank of Chancellor wine

layer of olive oil or paraffin on top of the wine will create other problems and are best left to home winemakers.

Headspace management

The most important aspect of preventing film yeasts is the proper topping of tanks and barrels, as these yeasts depend on the presence of oxygen. If tanks can be kept only partially full, frequent (bi-weekly) sparging with nitrogen or argon is advised to keep oxygen out of the headspace. Especially in warm areas with high relative humidity, the suspected organisms are part of the airborne microflora and will descend onto the wine’s surface whenever possible. Therefore, it is not recommended to constantly reopen wine containers, e.g., for the ever-popular barrel or tank tastings with winery visitors. Opening bungs and topping barrels too frequently (more than once every two months) is



also discouraged. In variable-capacity tanks, organisms can often find a home around the inflatable and oxygen-permeable gaskets. In fixed-capacity tanks, the air that replaces the wine sampled via the top gas vent is likely to be contaminated. Another likely source of contamination is the often-neglected fluid inside the fermentation lock that acts as the barrier between cellar air and wine headspace.

Cellar air filtration

Winemakers have had good success with UV radiation-based air filtration systems that keep the cellar air free of undesirable contaminants. Reducing the number of insects in the cellar, especially bacteria-carrying fruit flies, is also crucial to prevent microbial infection of the wine. The practice of spitting wine into the cellar drains after tasting it is unsanitary and will lead to growth of microbes, especially vinegar bacteria across drains and catchbasins.

Excess nutrients

Adding excessive yeast nutrient to juices and musts — to prevent sluggish or stuck fermentations — is strongly discouraged, as the leftovers will act as food for spoilage microorganisms. Exact measurement of the juice nitrogen status prior to fermentation is necessary in order to avoid microbial instabilities later on, in the tank or even in the bottle. It is unwise to use nutritional supplements that contain undefined amounts of yeast-available nitrogen, phosphate, sterols, vitamins, and other growth factors.

Reference

Park, H. and A.T. Bakalinsky. 2000. SSU1 mediates sulfite efflux in *Saccharomyces cerevisiae*. *Yeast* 16, 881–888.

SO₂ requirements

Table 1: Free sulfur dioxide required at a measured wine pH and for wines around 12 percent alcohol by volume (equal to 0.85 mg/L molecular SO₂).

Free SO ₂ (mg/L) required at wine pH										
3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	
3.00 13	3.10 16	3.20 20	3.30 25	3.40 32	3.50 40	3.60 50	3.70 63	3.80 79	3.90 100	
3.01 13	3.11 16	3.21 20	3.31 26	3.41 32	3.51 41	3.61 51	3.71 64	3.81 81	3.91 102	
3.02 13	3.12 17	3.22 21	3.32 26	3.42 33	3.52 42	3.62 52	3.72 66	3.82 83	3.92 105	
3.03 13	3.13 17	3.23 21	3.33 27	3.43 34	3.53 43	3.63 54	3.73 68	3.83 85	3.93 107	
3.04 14	3.14 17	3.24 22	3.34 28	3.44 35	3.54 44	3.64 55	3.74 69	3.84 87	3.94 110	
3.05 14	3.15 18	3.25 22	3.35 28	3.45 35	3.55 45	3.65 56	3.75 71	3.85 89	3.95 112	
3.06 14	3.16 18	3.26 23	3.36 29	3.46 36	3.56 46	3.66 57	3.76 72	3.86 91	3.96 115	
3.07 15	3.17 19	3.27 23	3.37 29	3.47 37	3.57 47	3.67 59	3.77 74	3.87 93	3.97 117	
3.08 15	3.18 19	3.28 24	3.38 30	3.48 38	3.58 48	3.68 60	3.78 76	3.88 95	3.98 120	
3.09 15	3.19 19	3.29 25	3.39 31	3.49 39	3.59 49	3.69 62	3.79 78	3.89 98	3.99 123	
3.10 16	3.20 20	3.30 25	3.40 32	3.50 40	3.60 50	3.70 63	3.80 79	3.90 100	4.00 126	
Molecular SO ₂ :		0.85	mg/L @ 12% alcohol by volume							

SO₂ requirements

Table 2: Free sulfur dioxide required at a measured wine pH and for wines around 14 percent alcohol by volume (equal to 0.6 mg/L molecular SO₂).

Free SO ₂ (mg/L) required at wine pH																				
3.0		3.1		3.2		3.3		3.4		3.5		3.6		3.7		3.8		3.9		
3.00	9	3.10	11	3.20	14	3.30	18	3.40	22	3.50	28	3.60	35	3.70	44	3.80	56	3.90	70	
3.01	9	3.11	11	3.21	14	3.31	18	3.41	23	3.51	29	3.61	36	3.71	46	3.81	57	3.91	72	
3.02	9	3.12	12	3.22	15	3.32	19	3.42	23	3.52	29	3.62	37	3.72	47	3.82	59	3.92	74	
3.03	10	3.13	12	3.23	15	3.33	19	3.43	24	3.53	30	3.63	38	3.73	48	3.83	60	3.93	76	
3.04	10	3.14	12	3.24	15	3.34	19	3.44	24	3.54	31	3.64	39	3.74	49	3.84	61	3.94	77	
3.05	10	3.15	13	3.25	16	3.35	20	3.45	25	3.55	31	3.65	40	3.75	50	3.85	63	3.95	79	
3.06	10	3.16	13	3.26	16	3.36	20	3.46	26	3.56	32	3.66	41	3.76	51	3.86	64	3.96	81	
3.07	10	3.17	13	3.27	17	3.37	21	3.47	26	3.57	33	3.67	42	3.77	52	3.87	66	3.97	83	
3.08	11	3.18	13	3.28	17	3.38	21	3.48	27	3.58	34	3.68	42	3.78	53	3.88	67	3.98	85	
3.09	11	3.19	14	3.29	17	3.39	22	3.49	27	3.59	35	3.69	43	3.79	55	3.89	69	3.99	87	
3.10	11	3.20	14	3.30	18	3.40	22	3.50	28	3.60	35	3.70	44	3.80	56	3.90	70	4.00	89	
Molecular SO₂ :		0.60		mg/L @ 14% alcohol by volume																

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