Characteristics of yeast causing clouding of dry white wines.

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Introduction.

Under the conditions which prevail during the storage of bottled dry white wines, at the winery as well as in retail stores, a cloud and/or sediment may develop. The formation of this cloud and/or sediment has been attributed in most cases to metallic contamination, chiefly iron and copper. In addition to copper and iron, Marsh (1940) states that tin, chromium, nickel and aluminum have been shown capable of causing clouding in wine. It has been recognized for many years that iron and copper cause a type of clouding in wine, termed “casse”. The factors which characterize specific casses of these metals have been fairly well established.

Table 1, which is reproduced in part from Marsh (1940) describes the defects which characterize clouding of wine by iron or copper.

| TABLE 1. Characteristics of Iron and Copper Casse
| (Modified from Marsh, 1940) |
|--------------------------|--------------------------|
| Iron casse white | Iron casse blue | Copper casse |
| Kind of turbidity | Ferriphosphate | Ferritannate | Cuprosulfite |
| Appearance | Bluish-white opalescent haze finally depositing a white precipitate | Blue haze turning black upon flocculation and precipitation | Whitish haze turning brown upon flocculation |
| With access of air | Haze appears | Haze appears | Haze disappears |

Another type of spoilage involving the clouding of wine is that resulting from the growth of lactic acid bacteria. This spoilage termed “tourne” in French literature, exhibits a peculiar silky sheen when the wine is gently agitated in the bottle. Cruess (1935) and Douglas and Cruess (1936) investigated this spoilage and attributed it to Lactobacillus Hilgardii: Fornachon et al. (1949) and Vaughn et al (1949) gave careful taxonomic consideration to the organisms involved and defined two species; namely Lactobacillus hilgardii and Lactobacillus trichodess. These organisms are quite susceptible to SO₂ (75 p.p.m.) and therefore easily controlled.

Still another type of cloud or sediment has recently appeared in wines of all classes, but most commonly in dry white wines. The formation of this
cloud can first be detected by a fine yellowish-gray sediment, which upon shaking disperses as a cloud in the wine. In the later stages a permanent cloud forms and the sediment becomes brownish in color. This particular type of clouding in dry white wines was first observed in California bulk wine in 1936. The wine had been sulfured and subjected to the usual cellar treatment. The further addition of sulfur dioxide (approximately 25—50 p.p.m.) to the cloudy wine was followed by filtration, a procedure which appeared to be an effective means of control.

The following season a similar clouding appeared in bottled wine, and was treated in the manner indicated above. The addition of large dosages of sulfur dioxide solved the problem, though only temporarily. Since then, this type of spoilage has occurred to a limited extent each season in wines from most sections of California.

In so far as can be determined the occurrence of this new type of cloud in bottled wines appears to be limited to California. The first published reports on yeast clouding or sediment formation in bottled wines in California were those of Baker (1936) and Baker and Cruess (1937) concerning sweet Sauterne; and that of Phaff and Douglas (1944) relating to fortified wines. Baker stated that on microscopic examination it was found that “in practically every case the cloudiness was due to growth of yeast.” He succeeded in isolating several cultures of yeast from several samples of clouded Sauterne type wine. Taxonomy of these cultures was not included, designation being made only by the symbols S—2, S—3, S—5 and S—6. Culture S—2 was characterized as follows: cells oval to sausage shape, film formation, alcohol formation and fermentation negative, utilization of alcohol positive, growth in 10 % alcohol, and spores formed on carrot wedges. Although the type of media used and the spore shape observed were not mentioned, it appears that this organism was a member of the genus Pichia. Cultures S—3, S—5 and S—6 were characterized by Baker as follows: Cells predominantly round or sometimes oval, several sugars fermented with the formation of gas, 11 % alcohol produced in 20° Balling grape juice, spore formation negative on carrot and potato wedges. Culture S—3 grew in 13 % alcohol. These data are not sufficient to speculate on the taxonomy of these organisms. It is presumed that Baker and Cruess were able to reproduce clouding by inoculation into wine, since they suggest a control procedure based on laboratory tests. Pasteurization of bottled Sauterne at 60° C. for 30 minutes was suggested for one-fifth gallon and pint bottles, and 40 to 45 minutes at the same temperature for one-half and one gallon bottles.

Phaff and Douglas isolated the single species Zygosaccharomyces mellis from dessert wines. They were, however, unable to induce this organism to grow and produce a sediment in fortified wines.

According to Fessler (1948) several methods of control, other than pasteurization, that have been tried in the industry are: use of sodium benzoate, monochloracetic acid, high concentrations of SO₃, and filtration through germ-proof filters.

It appears that the causitive organisms have gradually developed such a high tolerance to SO₃ (300—350 p.p.m.) that the amounts required for control result in an objectionable odor and flavor. The use of preservatives such as sodium benzoate and monochloracetic acid is considered unwise because of restrictions or complete prohibition by the Food and Drug laws.

The use of germ-proof filters as a means of control has failed because of the presence of large numbers of yeast cells in the wine and the occurrence of flaws in the filter pads. This combination of factors has been sufficient to