Malo-lactic fermentation (MLF) is the bacterial conversion of the inherent malic acid of a wine to lactic acid and carbon dioxide. MLF is initiated by certain strains of lactic acid bacteria at some time after the alcoholic fermentation. The primary effects of this secondary fermentation are a natural deacidification of the wine and an apparent improvement in flavor due to unknown biochemical changes associated with the bacterial metabolism (2).

A major problem in producing quality table wines in the Eastern United States is overcoming the high natural acidity of the grapes. Several artificial methods of reducing acidity are currently used, but all are somewhat detrimental to wine quality. Therefore, the stimulation of MLF appears as an attractive solution to this problem. Unfortunately, the initiation of MLF in Eastern table wines is not predictable. In years when acidity of the grapes is high and MLF would be most beneficial, the low pH inhibits the bacteria responsible for the fermentation (3). Also, hot-pressed musts (crushed grapes pressed after heating to 62 C) which are often used for red table wine production in the East are probably less susceptible to MLF. Reports have indicated that grapes fermented "on the skins" are more susceptible to MLF than musts pressed at crush (2).

This report is concerned with preliminary studies testing a new product as a potential stimulant to induced MLF in Eastern grape musts. The product, termed a bioenhancer, was developed by CPC International, Inc. (Argo, Ill.), and is currently being tested as a stimulant in fermented food systems.

Four hot-pressed grape musts (Table 1) were used in this study. Chemical analyses of the musts were accomplished by standard procedures (1). Two trial fermentations were conducted with duplicate 100-ml amounts of each must in milk-dilution bottles equipped with water seals. Two bioenhancers (code no. 11 and 12) were added to each must, except controls, in a concentration of 0.20% (w/v) on a dry-weight basis. The sugar content of each must was adjusted to 22° Brix with sucrose, and they were pasteurized at 80 C for 15 min. After cooling, each lot was treated with 50 μg of sulfur dioxide per ml and equilibrated overnight. After the addition of a 1% yeast inoculation (Montrachet no. 522), each lot was inoculated with a 1% culture of Leuconostoc citrovorum (ML 34) grown in grape juice as described by Kunkee (2). MLF was followed by paper chromatographical analysis of the organic acids (2) as the wines were incubated at 21 C. Completion of the fermentation was based upon the complete disappearance of malic acid on the chromatograms.

The results recorded in Table 2 demonstrated that the bioenhancers had a profound effect on stimulation of MLF. In every case, MLF was complete at least twice as rapidly as the corresponding control lot. The bioenhancers were even effective at pH 3.0 where no MLF was ob-
TABLE 2. Days required for the completion of malo-lactic fermentation in four hot-pressed grape musts treated by the addition of the bioenhancers.

| Added nutrient | Time required for fermentation (days) |
|----------------|--------------------------------------|
|                | Concord | Concord and Couderc | Seibell 10878 |
| Control (none) | 74      | 100                | —        |
| Bioenhancer 11 | 35      | 36                 | 92       |
| Bioenhancer 12 | 40      | 35                 | 84       |

a Average of duplicate samples from two trials.

b Least significant difference: (P 0.05 = 5.03; P 0.01) = 6.21.
c MLF not observed after 120 days.

In addition, both bioenhancer preparations appeared to be equally effective to stimulate MLF. The results of this study indicate that the bioenhancers possess a great deal of potential as agents for the stimulation of MLF. However, much additional experimentation will be necessary to demonstrate that these agents can be effective under normal commercial cellar practices and also have no detrimental effects on the wine quality.

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