[Bull. Res. Inst. Ferm. Yamanashi Univ. No. 11, Nov. 1964]

## Studies on the Application of Ion Exchange Process to Fermentation Industries

XIII. On the Stabilization of Metallic Deterioration of Wines (Part 1).
Moto-o KAGAMI : *Hakko Kogaku Zasshi* (*J. Ferm. Tech.* Japan), **42**, 565 (1964)

The present paper describes the initial steps in an ivestigation of the effectiveness of the chelating resin on table wines contg. 20 *mg/l* Cu and 10 *mg/l* Fe. The behavior of some typical ions in the wines were investigated using three forms (H, Na, Mg) of the resin (Dowex A-1) with batch process. It was shown that the adsorption attains equilibrium slowly, and of the cations, Cu was removed to the largest degree followed by Fe, Ca and Mg, however K was removed scarcely. It has been found that the treatment is not only detrimental to the flavor but in many case the wines appears to have improved in organoleptic characters.

XIV. On the Stabilization of Metallic Deterioration of Wines (Part 2).
Moto-o KAGAMI and Satoshi ŌMURA : *Ibid.*, **42**, 571 (1964)

The effect of the chelating ion exchanger in the three forms mentioned above on the removal of Cu added to table wines was examined. Treatmeat of wine with the resin was carired out by passing at the rate of 10-30 *v.v.h.* through a columns contg. 7.5 *ml* and 40 *ml* of the resin. It was found that treatment in all three forms removed Cu very effectively from the tested wines especially from white wine.

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## Studies on Fermentative Processing of Apple Fruit

I. Experimental Production of a Fruit Wine from Apples Combined with Grapes.
Hiroshi MASUDA, Noritaka SHIJO and Hiroyuki MURAKI : *Hakko Kogaku Zasshi* (*J. Ferm. Tech.* Japan), **41**, 655 (1963)

In this study a fruit wine was exptl. produced from a combination of apples (**I**) and grapes (**II**). The results are summarized as follows : (1) High acidity of **II** in Japan was lowered by the addn. of **I**. When malo-lactic fermentation occurs in the wine, the acidity will be further lowered by the consumption of malic acid which is replaced with **II** tartaric acid by the addn. of **I**. Thus the most adequate acidity can be expected in the resulted wine. (2) Nitrogenous compd. and tannins

in the wine were inevitablly of less quantities than pure grape wine. (3) The mixing of both fresh juices followed by fermentation gave better quality to the resulting wine than the mixing of both after sep. fermentation. By the former method, a ratio of less than 50% **I** juice gave good results in organoleptic taste-testing. (4) The max. absorptions at about 230 and 320 $m\mu$ of grape wine diminished by the addn. of **I**. This diminution was consistently related to the quantity of **I** added in the case of fermentation after mixing, and irregularly in the case of mixing after sep. fermentation.

## II. On the Maceration of Fresh Pulp in Cider-Making.

Hiroshi MASUDA, Noritaka SHIJO and Hiroyuki MURAKI ; *Ibid.*, **42**, 7 (1964)

In the process of cider-making, the effects of the maceraion (**I**) of the crushed apple pulp for 20 hrs. were tested in two ways ; one was in an oxidative state by contact with air and the other was in a nonoxidative state using $SO_2$. The yield of juice was increased by **I** in both ways. The oxidative **I** decreased acid and tannin contents in the juice by the action of the enzymes in apple tissues. Probably due to the high acidity of the Kogyoku variety, the activity of polyphenol oxidase and the decrease of tannins was not so remarkable and caused no difficulty in normal cider-making. The decrease of acids reached about 45% compared with the unmacerated juice, and the resulting cider also had a reduced acid content. Sugars in the jujce also decreased but volatile acids increased slightly. The non-oxidative **I** caused no decrease in the acid content, but considerable increase in the tannin content in the juice and the resulting cider. The scores of organoleptic taste-testing showed the good effects of **I** on the quality of cider, especially in the case of the oxidative **I**. From these results it is concluded that **I** of the fresh pulp may be recommended for the apple varieties with relatively high acidity.

## III. On Défécating (Keeving) Cider.

Hiroshi MASUDA, Noritaka SHIJO and Hiroyuki MURAKI : *Ibid.*, **42**, 11 (1964)

The most suitable method for défécating cider from the apples with a considerably high acidity, was investigated. It was performed by the addn. of $CaCO_3$ and pectic enzymes "Sclase" to the juice and the cooling of the juice to 5—7°C. The formation of the brown head and the clarification of the juice was complete, and the obtained cider was naturally sweet and gave the best results in organoleptic taste-testing. Both $CaCO_3$ and pectic enzymes were indispensable for successful défécation. The use of $CaHPO_4 \cdot 2H_2O$ instead of $CaCO_3$ was undesirable. The yield of cider was lowered through complete défécation.

IV. Fermentation of Milled Apple Pulp in Cider-Making.
Hiroshi MASUDA, Noritaka SHIJO and Hiroyuki MURAKI : *Ibid.*, **42**, 379 (1964)

Different ciders were exptl. produced by the fermentation of crushed apple pulp. Thick wort of just crushed apple pulp was difficult to ferment, and addn. of apple pomace (**I**) to the pressed juice in a ratio below 50% is recommended. The ciders obtained by this method had rich body and intense aroma of apple fruit. Addn. of 35 to 50% **I** gave the best scores in organoleptic taste-testing. Nitrogenous compd. and tannins in the cider increased and fixed acids decreased by the addn. of **I**. The decrease of fixed acids was greater with the addn. of smaller (5 % for example) amt. of **I**. These changes produced no undesirable effects on the quality of the ciders.

V. Use of Complex Yeast Cultures in Cider-Making.
Hiroshi MASUDA, Noritaka SHIJO and Hiroyuki MURAKI : *Ibid*, **42**, 383 (1964)

Various kinds of apple juice were fermented with *Saccharomyces cerevisiae* (**I**), *S. rosei* (**II**), *Kloeckera magna* (**III**) and *Torulopsis bacillaris* (**IV**) separately and in various combinations. Analyses of the resulting ciders showed that the yield of EtOH was highest with **I** alone and considerably low with **III** and **IV** ; **II** produced the most aldehydes and volatile esters ; **IV** formed a remarkable amt. of volatile acids ; **III** caused a considerable decrease in the fixed acid content. With the mixed cultures of **I** : **III** and **I** : **IV** in proportion of 2 : 1, it was observed that **III** or **IV** depressed the fermenting activity of **I**, and the yield of EtOH was lowered while considerable amt. of residual sugars remained in the ciders. In organoleptic tast-testing, the use of **IV** and **I** alone and in combination with each other gave the best scores. By these results it was shown that natural sweet cider of good quality may be obtained by the suitable use of the mixed yeast cultures.

VI. Production of Brandies from Apple Pomace.
Shōro AMEMIYA, Shuki MOROZUMI, Noritaka SHIJO and Hiroyuki MURAKI : *Ibid.*, **42**, 388 (1964)

Apple brandies were exptl. produced from the apple pomace (**I**). A brandy made from the macerates of **I** had similar flavor to that from the normal juice, while the fermentation of the thick wort of **I** gave a brandy with intense aroma of apple fruit. The quality of these brandies was quite high and showed that **I** may be used as a component of superior brandies. The yields and analytical data of the apple juice, **I** macerates, material ciders, and brandies were shown.

VII. Experimental Production of a Sherry-type Wine from Apples. Hiroshi MASUDA, Noritaka SHIJO and Hiroyuki MURAKI : *Ibid.*, **42**, 548 (1964)

An apple juice mentioned above was concd. to a sugar content of 25 %, racked from the sediment, and fermented with a sherry yeast "Jerez-5". Three years later the resulting wines were blended and aged in three kegs after the model of the "solera system". During the storage, the yeast formed only thin and small islands of film on the wines, but the finished wine had the characteristic flavor somewhat of "flor". The addn. of film growth factors has a possibility to improve the quality of the wine. Fixed acids in the wines decreased during the storage, while aldehydes, volatile acids and esters increased. The oxidative maceration of the crushed pulp may be recommended to reduce the acidity of the juice so as not to be too high after the concn. A good apple wine similar to a brown sherry can be obtained by the above process.

〔山梨大醗酵研　No. 11, Nov. 1964〕

# 酵母による鉄含有物質の生合成に関する研究
## （第1報）*Saccharomyces cerevisiae* における鉄の消長について

四条徳崇，田中健太郎，川西康博，伴野文男：日本農芸化学関東支部大会講演（1964年4月1日　於東京大学農学部）

Noritaka SHIJO, Kentaro TANAKA, Yasuhiro KAWANISHI and Fumio TOMONO : Studies on Biosynthesis of Iron Containing Substances by Yeasts. Part 1. The Fate of Iron in *Saccharomyces cerevisiae*

$^{59}Fe$(**I**)をトレーサーとして，過量の $Fe^{+3}$ をブドウ果汁に加え，ブドウ酒発酵をおこなったところ，酵母が鉄を菌体内に取込み，更にこれをブドウ酒中に鉄含有物質として排出することが推測された，そこで人工培地に **I**-$Fe^{+3}$ を加え，これに *S. cerevisiae* (OC-2) を加え，振盪培養し，経時的に試料を取り，菌体と培養液に分離したのち，それぞれ放射能(**II**)，菌体数，菌体重量および pH を測定した結果，培養の初期には，菌体内の $Fe^{+3}$ は徐々に増加するが，その後時間の経過と共に，培養液中の鉄含有物質量も増加してくる。約20時間で菌体内の **II** は最高となり，培養液中の **II** は約32時間で最高となり，以後はほとんど変化しない。次に前述の方法で培養し酵母の**II**取込量が最高となる32時間で菌体を分離し，これを **I**-ラベル酵母とする。これを **I**-$Fe^{+3}$ を含まない培養液で同様に培養したところ，菌体内の**II**は，時間の経過と共に減少し，酵母と培養液中の**II**の増減は全く逆の経過を示した。また培養液中に排出された鉄含有物質について可視部吸収スペクトル，ペーパークロマト等の実験を行なったところ，初めの培養液に加えた $Fe^{+3}$ は，酵母により資化され，$Fe^{+2}$ コンプレックスの形で排出されることが認められた。