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ENCLOSURE (B) 3

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THE ABSORPTION  
OF INORGANIC NUTRIENTS IN THE  
ALCOHOLIC FERMENTATION BY YEAST

by

CHEM. ENG. LIEUT.  
M. KUNO

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ENCLOSURE (B)3

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LIST OF TABLES  
AND ILLUSTRATIONS

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Table	I(B)3	Change in Concentration of $\text{SO}_4$ , $\text{PO}_4$ , K, and Mg During Fermentation .....	Page 46
Figure	1(B)3	Systematic Analysis of Culture for Mg and $\text{PO}_4$ .....	Page 47
Figure	2(B)3	Systematic Analysis of Culture for $\text{SO}_4$ and K .....	Page 47
Figure	3(B)3	Change in Concentration of Mg, $\text{SO}_4$ , and $\text{PO}_4$ During Fermentation .....	Page 48
Figure	4(B)3	Change in Concentration of K During Fermentation .....	Page 48

## ENCLOSURE (B)3

SUMMARY

The absorption of phosphate, sulphate, potassium and magnesium from the Knopp's culture solution during the fermentation by *Saccharomyces formosensis* Nakazawa, the distillery yeast employed for alcohol production from cane sugar, was investigated. The absorption of sulphate, phosphate, and potassium during the yeast growth increased during the first part of the fermentation. After 120 hours the concentration of those ions in the culture solution increased gradually with time. The absorption curves of these ions, therefore, indicated a minimum at about 120 hours.

The absorption of magnesium was not apparent throughout the growth of the yeast.

I. INTRODUCTIONA. History of Project

Many investigations of organic constituents in the course of alcoholic fermentation have been studied, but since the absorption of inorganic materials by the yeast had been studied by only a few investigators,\* The present research was undertaken with *Saccharomyces formosensis* Nakazawa.

B. Key Research Personnel Working on Project

Chem. Eng. Lt. Comdr. Y. MOMOTARI  
Chem. Eng. Lt. M. KUNO

II. DETAILED DESCRIPTIONA. Test Procedure1. Components of the culture solution.

Sucrose.....	100.00 gm
KNO <sub>3</sub> .....	2.00 gm
KCl.....	0.12 gm
KH <sub>2</sub> PO <sub>4</sub> .....	0.25 gm
MgSO <sub>4</sub> ·7H <sub>2</sub> O.....	0.25 gm
H <sub>2</sub> O.....	1000.00 cc

2. Procedure.

*Saccharomyces formosensis* Nakazawa, distillery yeast No. 396, was cultivated for 3 days in 10 cc of Knopp's solution and introduced into 2990 cc of Knopp's nutrient kept at about 23°C. After each 30 hours, 200 cc portions were removed, boiled to stop fermentation, and the yeast cells filtered off. The filtrate was evaporated to dryness, dissolved in HCl, and diluted to 100 cc.

The procedures for systematic analysis are shown in Figures 1(B)3 and 2(B)3, and the results are shown in Table 1(B)3 and Figures 3(B)3 and 4(B)3.

\*S. Tanaka: Mem. Coll. Sci. Kyoto Imp. Uni., A, 129 (1939).

## ENCLOSURE (B)3

III. CONCLUSIONS

The experimental results show that potassium, sulphate, and phosphate are absorbed by the yeast during fermentation.

After the first 120 hours, the absorption of these constituents decreases and they are slowly removed from the yeast.

Magnesium does not appear to be necessary for the fermentation, since none is absorbed during the process.

Potassium, sulphate and phosphate appear to be absorbed by the yeast during fermentation, and hence their presence may be considered as necessary.

Table I(B)3

CHANGE IN CONCENTRATION OF  $\text{SO}_4$ ,  $\text{PO}_4$ , K AND MG  
DURING FERMENTATION

Hour	$\text{SO}_4$		$\text{PO}_4$		K		Mg	
	$\frac{\text{mg}}{100\text{cc}}$	mol. ratio	$\frac{\text{mg}}{100\text{cc}}$	mol. ratio	$\frac{\text{mg}}{100\text{cc}}$	mol. ratio	$\frac{\text{mg}}{100\text{cc}}$	mol. ratio
0	9.4	0.965	17.2	0.986	90.5	0.998	2.6	1.056
30	7.9	0.811	15.7	0.900	89.8	0.991	2.5	1.016
60	7.6	0.780	14.6	0.838	88.3	0.974	2.7	1.095
90	6.0	0.616	13.2	0.757	84.3	0.930	2.4	0.975
120	2.7	0.277	8.9	0.510	77.2	0.852	2.5	1.016
150	3.0	0.308	9.1	0.522	75.8	0.836	2.4	0.975
180	4.2	0.431	10.7	0.613	75.5	0.833	2.4	0.975
210	4.7	0.482	12.0	0.688	77.0	0.849	2.5	1.016
240	5.5	0.564	13.2	0.757	81.0	0.893	2.3	0.934
270	6.9	0.708	14.5	0.831	82.0	0.904	2.4	0.975

(Tabulated Data for Curves Shown in Figure 3(B)3)

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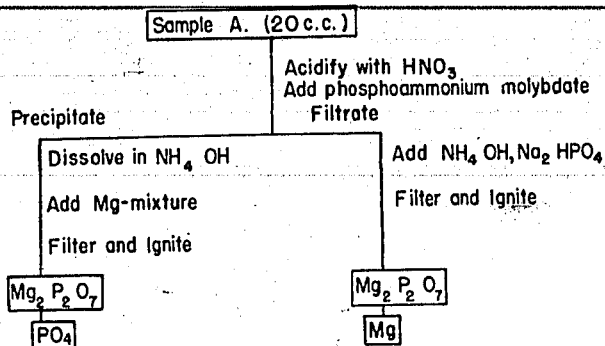


Figure 1 (B)3

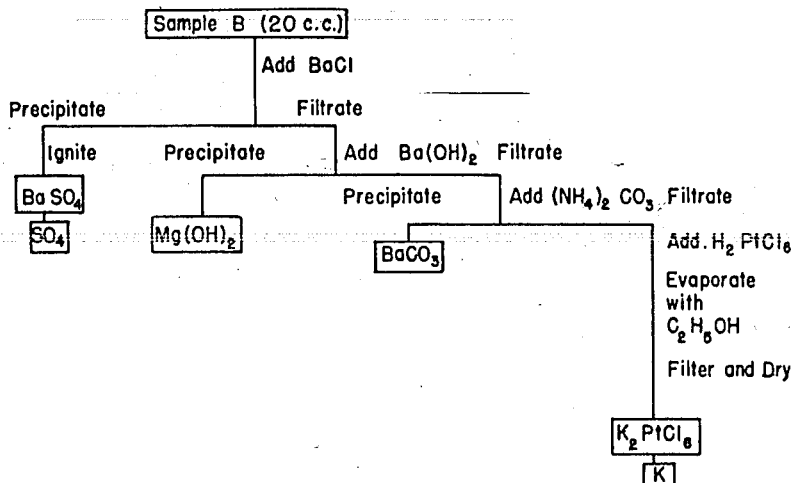
SYSTEMATIC ANALYSIS OF CULTURE FOR Mg AND PO<sub>4</sub>

Figure 2 (B)3

SYSTEMATIC ANALYSIS OF CULTURE FOR SO<sub>4</sub> AND K.

## ENCLOSURE (B)3

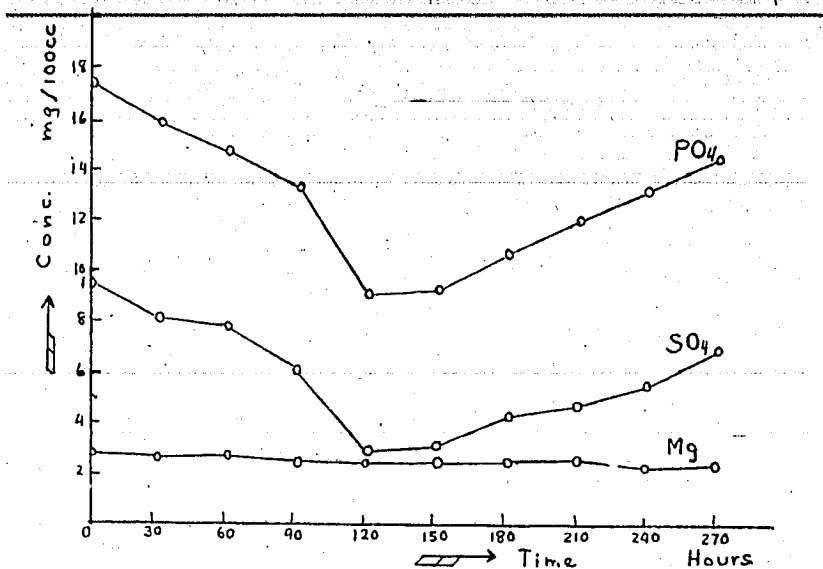


Figure 3 (B)3

CHANGE IN CONCENTRATION  
OF Mg, SO<sub>4</sub> AND PO<sub>4</sub> DURING FERMENTATION

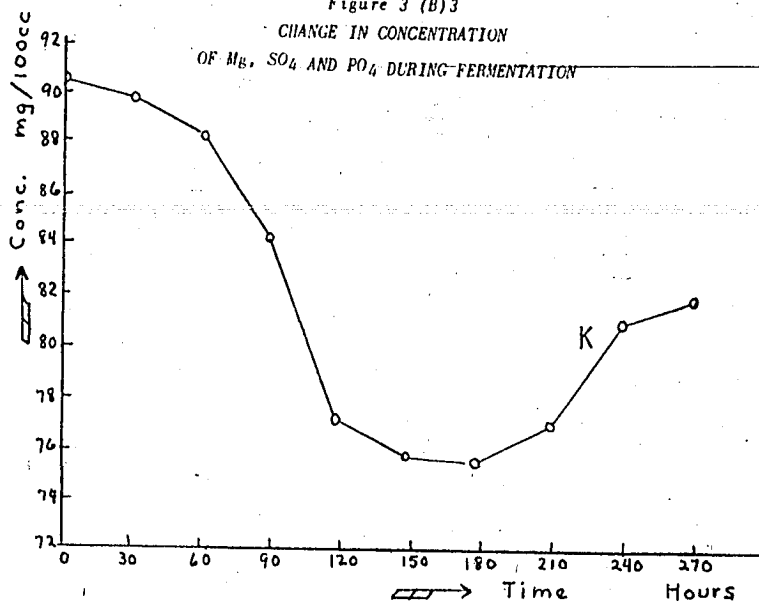


Figure 4 (B)3

CHANGE IN CONCENTRATION OF K. DURING FERMENTATION