

## KATAGIRI LABORATORY (March 1942~September 1960)

Head: Dr. Hideo Katagiri

This laboratory was established in March, 1942 and studies on biochemistry and applied microbiology as described below were carried out. Prof. H. Katagiri was retired in September, 1960.

### I. Studies on malting and amylolytic enzymes<sup>1-5)</sup>

It was found that addition of ammonium phosphate to steep liquor brought out a favorable effect on barley malting in accelerating the formation of amylases and in decreasing the consumption of starch of green malts. Changes of chemical composition of barley during malting were observed with barley steeped in ammonium phosphate solution and water. Several factors influencing on activation of zymogen amylase were investigated. Some synthetic detergents, e.g. sodium dodecyl sulphate and alkyl dimethylbenzyl ammonium chloride, inhibited markedly the activity of  $\beta$ -amylase, which was observed to be denatured by the treatment with the detergents. While  $\alpha$ -amylase activity was not influenced by the addition of such surface active agents.

### II. Studies on alcoholization of fiber materials<sup>6,7)</sup>

Changes in the chemical composition of the saccharified solution of mulberry-tree hydrolyzed with dilute acid solution at high temperature and pressure were investigated. Glucose, mannose, arabinose and xylose were found in the saccharified solution.

### III. Studies on metabolism of *Propionibacterium*<sup>8-19)</sup>

Some strains of *Propionibacterium* were isolated from milk and their microbiological properties and formation of organic acids from sugars were investigated. Metabolic pathways of succinic acid, propionic acid, citric acid,  $\alpha$ -ketoglutaric acid, fumaric acid and other organic acids in *Propionibacterium* were elucidated.

### IV. Studies on the biosynthesis of pyocyanine<sup>20-28)</sup>

A strain of *Pseudomonas aeruginosa* producing pyocyanine was isolated and the factors or conditions to influence the production of pyocyanine were demonstrated. Physiological significance of this antibiotics was elucidated in connection with the respiration system of bacteria.

### V. Studies on production and metabolism of ketonic acids<sup>29-32),38-44)</sup>

Many strains of *coli-aerogenes* bacteria were found to produce a large amount of

$\alpha$ -ketoglutaric acid as a major oxidation-product of carbohydrates under suitable conditions. Relationship between  $\alpha$ -ketoglutaric acid production and respiration system or other factors was demonstrated. Formation of glutamic acid from this ketonic acid by transaminase reaction was shown. Metabolism and interrelation of  $\alpha$ -ketoglutaric acid, glyoxylic acid, pyruvic acid and other organic acids were studied. Oxidation-reduction system between glycollate and glyoxylate in yeast was also elucidated.

## VI. Studies on the cellulose decomposing bacteria<sup>33-36)</sup>

Several strains of cellulose decomposing bacteria were isolated, and their microbiological properties and the effect of the factors on the digestion of cellulose were investigated.

## VII. Studies on the industrialization of microbial retting<sup>37)</sup>

A newly designed concrete fermentation tank for microbial retting which was equipped with a sensitive thermostat, was made and its ability was tested.

### Publications

1. H. Katagiri, M. Ikemiya and H. An-yoji: Effect of the composition of steep liquor upon barley malting. *Bull. Inst. Chem. Res., Kyoto Univ.*, **31**, 232 (1953).
2. H. Katagiri, M. Ikemiya, T. Taniguchi and H. An-yoji: Changes of chemical constituents of barley during matting. *Bull. Inst. Chem. Res., Kyoto Univ.*, **31**, 433 (1953).
3. H. Katagiri, M. Ikemiya and H. Yomo: Studies on barley malt. Some investigation upon zymogen amylase. *Bull. Inst. Chem. Res., Kyoto Univ.*, **32**, 220 (1954).
4. H. Katagiri and M. Ikemiya: Studies on inhibition of enzyme activity by detergents. *Symposium on Enz. Chem.*, **12**, 5 (1957).
5. M. Ikemiya, J. Yagi, H. Inoue and T. Osumi: The inhibitory effect of synthetic detergents on enzyme. (II) Action of detergents upon Taka-amylase. *J. Fermentation Tech.*, **39**, 208 (1961).
6. H. Katagiri, C. Tatsumi and Y. Fujii: Studies on the utilization of pentose by microbiological method. Pentose-assimilable yeasts (II). *Bull. Inst. Chem. Res., Kyoto Univ.*, **27**, 74 (1951).
7. H. Katagiri and C. Tatsumi: Studies on the alcoholization of cellulose materials: (VIII) Methods of paper chromatography of sugars in saccharified solution of mulberry-tree. *Bull. Inst. Chem. Res., Kyoto Univ.*, **31**, 384 (1953).
8. H. Katagiri and Y. Ichikawa: Studies on the *Propionibacterium* (I). *Bull. Inst. Chem. Res., Kyoto Univ.*, **24**, 78 (1951).
9. H. Katagiri and Y. Ichikawa: Studies on the *Propionibacterium* (II). *Bull. Inst. Chem. Res., Kyoto Univ.*, **26**, 100 (1951).
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11. H. Katagiri and Y. Ichikawa: Studies on the *Propionibacterium* (IV). *Bull. Inst. Chem. Res., Kyoto Univ.*, **31**, 65 (1953).
12. H. Katagiri and Y. Ichikawa: Studies on the *Propionibacterium* (V). *Bull. Inst. Chem. Res., Kyoto Univ.*, **32**, 106 (1954).
13. H. Katagiri and Y. Ichikawa: Studies on the *Propionibacterium* (VI). *Bull. Inst. Chem. Res., Kyoto Univ.*, **34**, 285 (1956).
14. Y. Ichikawa: Microbiological studies on propionic acid bacteria. Part 1. Isolation of propionic

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15. Y. Ichikawa: Microbiological studies on propionic acid bacteria. Part 2. Anaerobic decomposition of the substrates by *Propionibacterium arabinosum*. *J. Agr. Chem. Soc. Japan*, **29**, 353 (1955).
  16. Y. Ichikawa: Microbiological studies on propionic acid bacteria. Part 3. Formation of propionate from succinate. *J. Agr. Chem. Soc. Japan*, **29**, 357 (1955).
  17. Y. Ichikawa: Microbiological studies on propionic acid bacteria. Part 4. On the aerobic decomposition revealed by *Propionibacterium arabinosum*. *J. Agr. Chem. Soc. Japan*, **29**, 361 (1955).
  18. Y. Ichikawa: Microbiological studies on propionic acid bacteria. Part 5. Oxidation of propionic acid. *J. Agr. Chem. Soc. Japan*, **30**, 734 (1956).
  19. Y. Ichikawa: Microbiological studies on propionic acid bacteria. Part 6. Oxidation of propionate (2). *J. Agr. Chem. Soc. Japan*, **31**, 185 (1957).
  20. H. Katagiri, T. Shibutani and M. Kurachi: Studies on the metabolic products of *Pseudomonas aeruginosa*: On the production of antibiotic substances. *Bull. Inst. Chem. Res., Kyoto Univ.*, **25**, 71 (1951).
  21. M. Kurachi: Studies on the metabolic products of *Pseudomonas aeruginosa* sp. (II). On the quantitative determination of pyocyanine (I). *Bull. Inst. Chem. Res., Kyoto Univ.*, **32**, 105 (1953).
  22. M. Kurachi: Studies on the biosynthesis of pyocyanine (III). *Bull. Inst. Chem. Res., Kyoto Univ.*, **36**, 163 (1958).
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  24. M. Kurachi: Studies on the biosynthesis of pyocyanine (V). On the bacterial mutation from the viewpoint of pigmentation. *Bull. Inst. Chem. Res., Kyoto Univ.*, **37**, 59 (1959).
  25. M. Kurachi: Studies on the biosynthesis of pyocyanine (VI). On the biochemical degradation and resynthesis of pyocyanine. *Bull. Inst. Chem. Res., Kyoto Univ.*, **37**, 73 (1959).
  26. M. Kurachi: Studies on the biosynthesis of pyocyanine (VII). On the effect of anthranilic acid (1). *Bull. Inst. Chem. Res., Kyoto Univ.*, **37**, 85 (1959).
  27. M. Kurachi: Studies on the biosynthesis of pyocyanine (VIII). On the effect of anthranilic acid (2). *Bull. Inst. Chem. Res., Kyoto Univ.*, **37**, 101 (1959).
  28. M. Kurachi: Studies on the biosynthesis of pyocyanine (IX). On the effect of pyocyanine on respiration of bacterial cells of *Pseudomonas aeruginosa*. *Bull. Inst. Chem. Res., Kyoto Univ.*, **38**, 364 (1960).
  29. H. Katagiri and T. Tochikura: Studies on the microbiological production of ketonic and amino acids. *Bull. Inst. Chem. Res., Kyoto Univ.*, **38**, 94 (1960).
  30. H. Katagiri and T. Tochikura: Microbiological studies of *coli-aerogenes* bacteria (XIV). Competition between glyoxylic reductase and glutamic dehydrogenase. *Bull. Inst. Chem. Res., Kyoto Univ.*, **38**, 379 (1960).
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  32. H. Katagiri, T. Tochikura and H. Matsuoka: Glyoxylate-glycollate system in yeast. *Bull. Inst. Chem. Res., Kyoto Univ.*, **38**, 406 (1960).
  33. M. Ikemiya, J. Yagi and T. Osumi: Studies on the cellulose decomposing organisms (I). Isolation of bacteria from soil and onion. *J. Fermentation Tech.*, **39**, 148 (1961).
  34. M. Ikemiya, J. Yagi and T. Osumi: Studies on the cellulose decomposing organisms. Isolation of bacteria from soil (2). *J. Fermentation Tech.*, **39**, 281 (1961).
  35. M. Ikemiya, J. Yagi and T. Osumi: Studies on the cellulose decomposing organisms (III). The influence of various factors on the cellulose decomposition by the strain T-2 and T-4. *J. Fermentation Tech.*, **39**, 333 (1961).
  36. M. Ikemiya, J. Yagi and T. Osumi: Studies on the cellulose decomposing organisms (IV). Factors affecting the formation of cellulase (II). *J. Fermentation Tech.*, **39**, 586 (1961).
  37. T. Hayashi, T. Itoh and H. Katagiri: Industrialization of fermentation retting. *J. Fermentation Tech.*, **33**, 337 (1955).

**Patents for microbial production of  $\alpha$ -ketoglutaric acid and L-glutamic acid**

38. H. Katagiri and T. Itoh: Jap. Pat. 416553 (1954).
39. H. Katagiri and T. Itoh.: Jap. Pat. 220023 (1956).
40. H. Katagiri, K. Imai and T. Tochikura: U.S.A. Pat. 2786799 (1958).
41. H. Katagiri, T. Tochikura and K. Imai: Jap. Pat. 248111 (1959).
42. H. Katagiri, T. Tochikura and K. Imai: Jap. Pat. 248175 (1959).
43. H. Katagiri and T. Tochikura: Jap. Pat. 254410 (1959).
44. H. Katagiri and T. Tochikura: U.S.A. Pat. 2953499 (1960).