

Chapter I



INTRODUCTION

Vinegar has been known and appreciated as an important food adjunct (condiment and preservative) for as long as man has been able to practice the arts of brewing and wine making. Vinegar may be produced from a wide variety of sugary materials and it may also be produced from a variety of surplus products. Such commodities as fresh figs, dates, citrous fruits, pineapples, coconut juice, coconut toddy, and whey can be used for the production of vinegar (2, 4, 7, 29, 35, 37, 39). Hydrolyzed starchy substances, such as potatoes, rice, corn, wheat, and other grains may also be used (43).

Three basic processes for the production of vinegar are known. Firstly, the "slow" process was discovered by French scientist, this method took a long time in processing and was adapted to the production of the finest quality vinegar (31).

Secondly, the generator process, quick vinegar, the German process or the Schützenbach process was developed in 1832 (33). This process gave higher state of efficiency than the slow process (31). The last process was submerged culture process which permitted thirty times faster oxidation of the same amount of alcohol with continuous uninterrupted supply of oxygen (14, 43). The manufacture of vinegar involves two steps: (16)

- (1) the fermentation of sugar to ethyl alcohol and
- (2) the oxidation of alcohol to acetic acid.

In the first step the hexose sugars of the raw material, whether there at the beginning or formed by enzymic or chemical hydrolysis, are converted by species of yeasts of the genus Saccharomyces into alcohol through anaerobic fermentation. Then the alcohol contained in the vinegar stock is converted to acetic acid by oxidative enzymes produced by the acetic acid bacteria through aerobic fermentation.

Many vinegar manufacturers in Thailand still resorted to natural fermentation in the successive conversion of starchy or sugary raw materials first to wine and subsequently to vinegar. The wild yeasts and acetic acid bacteria which may be present in certain fruits may bring about spontaneous fermentation of the sugary juice but the manufacturer should not depend on chance alone and should use viable cultures of the selected pure strains of alcohol yeast and acetic acid bacteria in order to ensure production of vinegar with desirable flavor and aroma. Although various papers have been published on the kinetics of the alcoholic fermentation of some fruits (18,20) and the acetification of the fermented liquor (21), little quantitative information has been obtained using tropical fruits. Pineapple is one of tropical fruits grown in Thailand and many products from pineapple have been interested but little attention has been given to the utilization of pineapple juice in fermentation. So the purpose of this work was the study of the alcoholic fermentation and

acetic acid fermentation of pineapple juice by rapid method using pure cultures of yeast and acetic acid bacteria with its possible application to an industrial fermentation process in Thailand.

The objective and scope of this work were about the study of vinegar-making by rapid fermentation or generator method with pineapples as raw material. For the alcoholic fermentation, Saccharomyces ellipsoideus was used and effects of nutrients such as diammonium hydrogen phosphate and dipotassium hydrogen phosphate and sugar concentrations were studied. Then the fermented pineapple juice from alcoholic fermentation was further proceeded in acetic acid fermentation with pure culture of Acetobacter aceti. The generator in this work was built following the principle of quick vinegar process (16). In this step, the effects of adding dipotassium hydrogen phosphate and acetic acid, air flow rates and fermented juice flow rates were studied. The results were represented in term of percent acetic acid formed.