



CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This study is the first in a series on the production of Candida utilis using pineapple juice as substrate. The experiment was divided into two parts. Investigation of the desirable composition of medium for growth of the yeast was first studied with the emphasis on the yeast yield and protein content. The growth of C. utilis on pineapple juice supplemented with various sources of nitrogen such as peptone, urea, and ammonium sulfate, and other nutrient materials, i.e., phosphorus and growth factors was examined in shake flask study. It was found that pineapple juice like most of the other carbohydrate raw materials required the addition of nutrient nitrogen, phosphorus and potassium for yeast to utilize sugar in it. The medium that gave better yield among the nine media tried was medium 1 which composed of - $(\text{NH}_4)_2\text{SO}_4$ 0.5% (w/v) and KH_2PO_4 0.5% (w/v). The yeast yield of 42.1% was obtained with the protein content of 55.2%. In the second part, batch cultivation of C. utilis using the medium 1 was studied in stirred vessel fermenter. The effect of aeration and agitation on the yeast yield, protein content, sugar consumption, and reduction of chemical oxygen demand (COD) were determined. The agitation speed of the fermenter was kept constant at 1400 rpm

during cultivation. By varying the aeration rates at 0.5, 1. and 1.5 volume of air per volume of culture medium per minute (VVM), the yeast yields were 45.76, 49.41, and 46.21%, respectively at the end of 8 hours cultivation. It appeared that at 1 VVM aeration rate, better growth and higher yield were obtained. However, the protein content of the yeast cultivated in the same medium was independent of the aeration rates studied. The average protein content of C. utilis was 55.38%. The sugar consumption during the growth of yeast resulted in the reduction of COD. It was also found that the COD reduction was better at aeration rate of 1 VVM than the other two aeration rates. At the end of 8 hours cultivation, the COD reduction was in the range of 70-80%.

6.2 Recommendations

The study on the production of Candida utilis from pineapple juice should be further investigated as follows:

1. The composition of the medium for the growth of Candida utilis should be further studied in details to obtain better yield and higher content of protein in the yeast cells.
2. The effect of aeration should be studied accompanying with the effect of agitation. Both the aeration rates and agitation speed should be varied in order to get better yield, Emphasis is on the exact quantity of the oxygen absorbed by the yeast cell rather than the amount of air employs.

3. For practical stand point, continuous culture is recommended. Continuous process could give better control, shorter retention period, and lower operation costs.

4. Amino acid composition and nucleic acid content of the yeast as well as some other chemical analyses should be determined. These properties are essential in the utilization of the yeast protein in food and feed supplement. Other characteristics of the protein, i.e., color, flavor, taste etc. should also be studied for the acceptability of the protein to animals and human.

5. This study can be applied to the utilization of organic nutrients in other waste effluents such as sulfite waste, molasses, and other agricultural wastes, i.e., tapioca waste, fruit wastes, ect. Thus, the growth of Torula yeast on the waste liquid serves two purposes, in that a useful feed product is made and at the same time a waste - water treatment is effected.