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MANUFACTURE OF EDIBLE YEAST EXTRACT FROM BREWERY WASTE YEAST

By

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DECLARATION

The work in thesis was carried out by me as an in plant research at The Lion Brewery Ceylon Limited under the supervision of Prof (Mr) Authur Bamunuarachchi and Dr (Mr) K K D S Ranaweera, Faculty of Applied Sciences, University of Sri Jayewardenepura and Mr Saman Perera, The Head of Quality Assurance, The Lion Brewery Ceylon Limited. A report on this thesis has not been submitted to any other university for another degree.

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We, Prof Arthur Bamunuarachchi and Dr K K D S Ranaweera and Saman Perera jointly here by certify that the statement in the preceding page made by the candidate is true and that this thesis is suitable for submission for the university for the purpose of evaluation

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ABSTRACT

Yeast extract is a well known material in the food industry. It is an essential item in numerous supplements, food ingredients, food flavourings, pharmaceuticals & neutraceuticals, pet care products and microbiological media preparations.

Brewer's waste yeast is the main raw material in yeast extract preparations. Autolysis, enzymatic lysis, chemical and physical lysis are the widely used methods. However the exact processing conditions are kept secret by well known commercial producers.

Lion brewery generates approximately 720,000 liters (668,572 kg) of waste yeast slurry annually.

In the work presented here, an effort was made to develop a proteineous edible food of non animal origin by using brewery waste yeast through an economically feasible technology. Success will lead to the potential for a commercial product whilst eliminating an environmental hazard by disposal of yeast.

A number of lysis techniques and combinations of various lysis methods were tried out. Autolysis, combined plasmolysis-autolysis method, and enzymetic method were found to be the most effective methodologies for effective cell lysis. All these method delivered above 40 Microscopic Lysis Ratio. In combined plasmolysis-autolysis

method yeast was first treated with 3 % V/V alcohol and allowed to plasmolyse at room temperature for 24 h. Then sample was treated with 0.30 % salt concentration and heated to 45°C and kept for 48 h and then heated to 80°C for 30 min to remove alcohol residue. This method delivered 45 % MLR which was the highest yield obtained.

Purified product was analyzed for nutritional quality and found to be rich in protein, and Thiamin and microbiological results were satisfactory. Sensory evaluation revealed that there is a perceived significant difference in the test product over the similar product available in the market

CHAPTER 01

1.0 INTRODUCTION

1.1 Background

1.1.1 Manufacture Of Beer- The Brewing Process.

a. Brewing

At the brewery the malt is cleaned, weighed and crushed to produce "grist". The grist is mixed with hot water in a "mash tun" (tank) and allowed to stand at a temperature which lets the starch from the malt to be converted into fermentable sugars. The mash is then transferred to a "lauter tun" where the liquid is separated from the grain residue. This sweet liquid is called "wort", (pronounced "wert".)

The wort is transferred to another tank called the "kettle" where liquid sugars are added and the mixture is boiled. During boiling, the protein material in the wort joins together to form "trub". The trub is removed by transferring the wort to a whirlpool.

b. Fermentation

After the trub is removed, the wort is cooled, and then transferred to a fermenter - a large closed vessel. Yeast is then added which converts the sugars into alcohol and carbon dioxide gas. During fermentation the yeast cells multiply many times. The carbon dioxide gas which is released is collected for use later. Fermentation continues until only non-fermentable sugars remain, when the fermenter is chilled to four degrees centigrade to stop fermentation. Yeast settles to the bottom of the vessel and from here it is removed for re-use, or sold and used to produce food products such as Marmite & Vegemite.

c. Storage

Once the yeast is removed the beer is passed from fermentation to storage vessels. During transfer the beer is cooled to minus one degree centigrade. Hop extract, which gives beer its characteristic bitter flavour, is added at this stage, which permits greater flavour control and enables the brewer to maintain a better taste consistency. The beer stays in storage at this temperature, and any material which might impair the appearance, flavour and shelf-life of the beer settles out.

d. Filtration

Following a set time in storage, carbon dioxide gas collected during fermentation is added to give beer its characteristic head and sparkling taste. The beer is then passed through a filtration system to remove surplus yeast and protein.

e. Pasteurization.

This is a process of heating and rapid cooling which prolongs shelf-life and destroys any bacteria or other organisms in the beer. Canned and bottled beers are pasteurized in their containers, while draught beer is pasteurized by means of a special heat exchanger called a flash pasteurizer.

f. Packaging.

The filtered and sparkling beer is packaged into bottles, cans and stainless steel casks, or kegs, ready for distribution. .

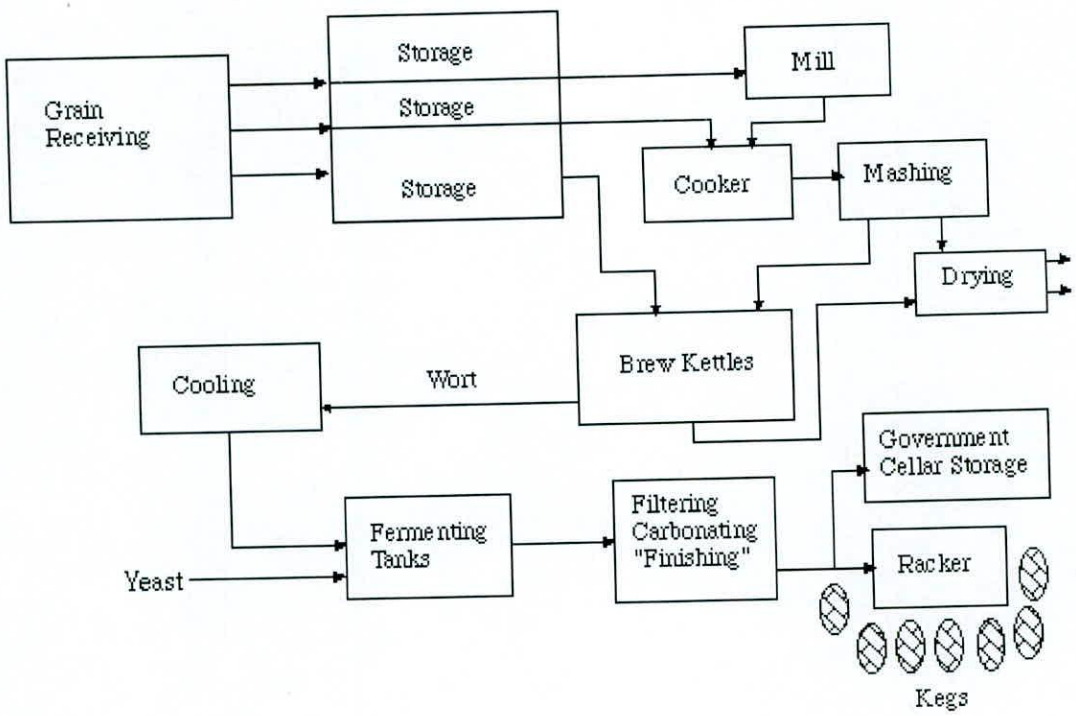

Figure 1.1 Brewing Process Flow Diagram

1.1.2 Yeast Use and Waste Yeast Generation in Breweries

During fermentation the yeast cells multiply many times and huge volumes of yeast cells are produced. At the end of the fermentation period, yeast settles to the bottom of the fermenting vessel and from here it is removed for re-use, or sold and used to produce food products such as Marmite & Vegemite.

1.1.3 Amount and composition of brewery waste Yeast

Waste yeast is produced at a uniform rate with a constant composition in the brewery, although several types of yeast are used in the brewery they differ only in terms of settlability, thickness (number of yeast cells per mm3) and flavour producing characteristics. However the chemical constituents of brewers yeast remain more or less the same for different yeast strains