# STUDIES ON THE STARTERS USED IN "BALADY" BREAD MANUFACTURING

THESIS

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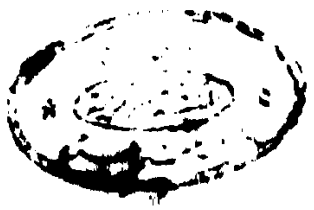

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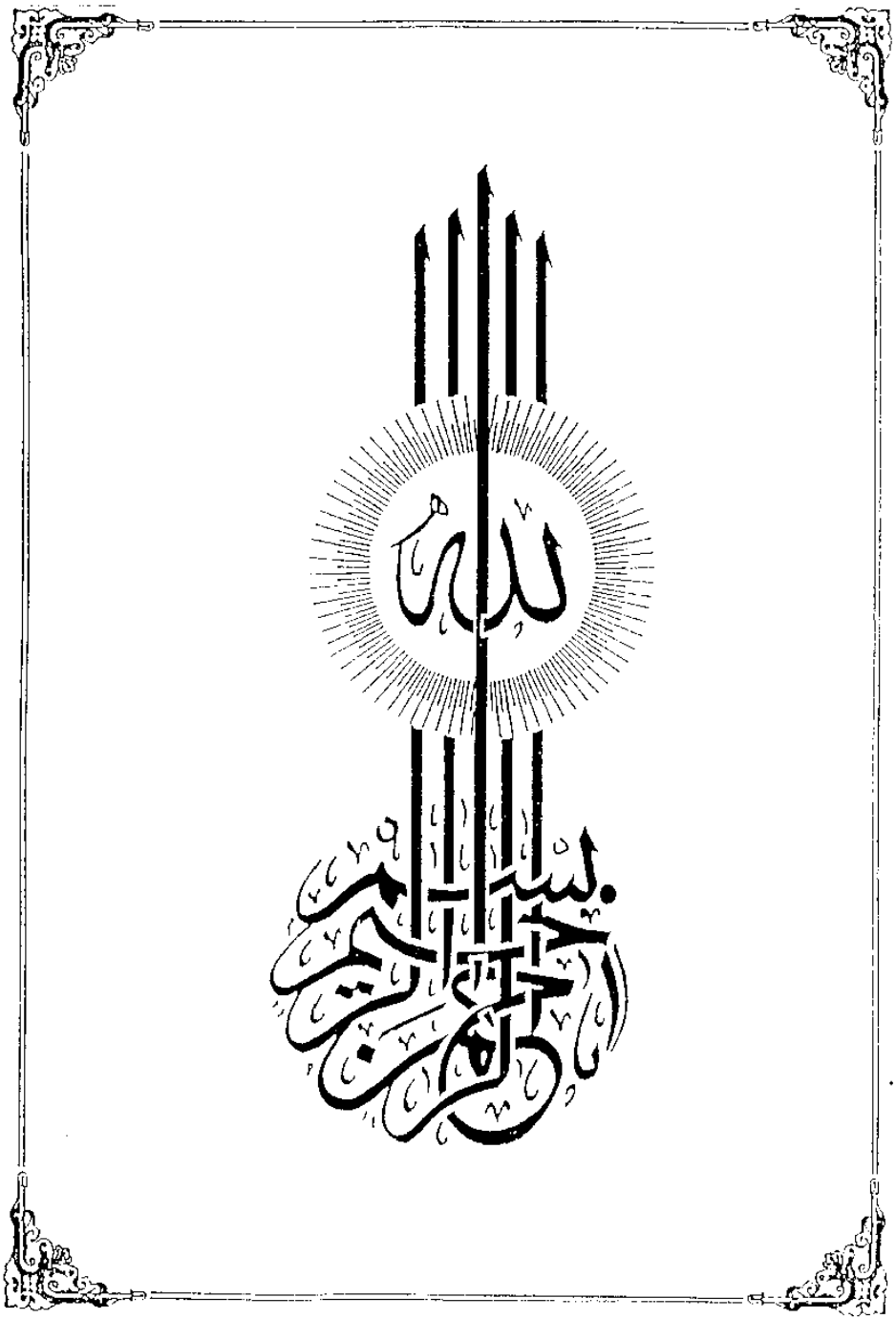

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# INTRODUCTION

Cereals, and in particular bread of some kinds or other, have been considered from the commencement of civilization the chief foods for the human race, if not the principal one.

Bread was extensively used by the early Egyptians and there is some evidence that white bread was appreciated by the wealthier classes. Leavend bread was said to have been known in Egypt since 2000 B.C. In its early days, under the rule of the pharaohs, Egypt was the largest wheat-growing and bread-consuming country in the world.

The following table gives the total consumption of cereals per Capita/year in some countries of the world.

Table (1):- Net food supply per Capita Calories (F.O.A. 1967).

| Country | Yearly consumption from cereals | Daily Calories | | |
|---|---|---|---|---|
| | | From Cereals | From Food | Cereal / Food |
| | kg. | Calories | Calories | % |
| Jugoslavia | 188.6 | 1822 | 2525 | 72.1 |
| A.R.E. | 212.8 | 2075 | 2901 | 71.5 |
| Italy | 155.0 | 1490 | 2530 | 58.8 |
| France | 120.4 | 1154 | 2850 | 40.4 |
| Germany | 97.7 | 938 | 2840 | 33.0 |
| Norway | 103.6 | 996 | 3120 | 31.9 |
| Canada | 77.6 | 775 | 3115 | 24.9 |
| U.S.A. | 71.9 | 718 | 3090 | 23.3 |

In Egypt the consumption of wheat increased annually. The following table indicates the consumption of wheat during the last ten years.

Table (2):- Represents the progress of the individual personnel consumption of wheat in A.R.E.
(El-Remally,1971).

| Year | Total consumption (Thousand Tons) | Population number (Thousand, Person). | Average Personnel consumption. kg/year |
|---|---|---|---|
| 59/60 | 2661 | 25984 | 102.4 |
| 65/66 | 3327 | 30076 | 110.6 |
| 66/67 | 3575 | 30818 | 116.0 |
| 67/68 | 3498 | 31578 | 110.7 |
| 68/69 | 3657 | 32357 | 113.0 |
| 69/70 | 3868 | 33155 | 116.7 |
| 70/71 | 4102 | 33973 | 120.7 |

Since much of bread flavour originates during fermentation and hence alterations in processing provide opportunities to modify or intensify flavour,

knowledge concerning flavours produced during fermentation is very essential for the advancement of the breadmaking process as well as the improvement of the organoleptic qualities of bread.

In order to justify the origin of bread flavour it is of considerable importance to study the microflora in the starter used in "balady" breadmaking and changes occur during the different steps and also the flavour compounds produced during dough fermentation and baking. Such a possibility is worthy of study especially that breadmaking is one of the important food industries in Egypt and the methods used might be considered primitive since most of the processes involved are carried out by hand. However, this study is obviously important owing to the little information concerning this subject.

Furthermore, a great impetus of commercial bakery in other countries were realized during the last few years, and it is important to introduce suitable methods in the local industry.

## AIM OF INVESTIGATION

Breadmaking in Egypt, is mainly a mixed type of fermentation. The so called "Sultani" starter is composed of several microorganisms. Accordingly, one would expect the physical, chemical and biochemical changes which occur during the making of the "balady" bread to be different than those changes occurring in bread in which baker's yeast is used.

This study was initiated to investigate the microbial flora of the "Sultani" starter and to follow the changes which occur in this flora during breadmaking. The objective of this study is also to identify the volatile compounds i.e. carbonyl compounds, organic acids, and alcohols, which contribute to the flavour of "balady" bread and their changes which occur during breadmaking.

## REVIEW OF LITERATURE

The flavour constituents, of dough, resulting from fermentation may be affected by several factors, including duration of fermentation, temperature, sugar concentration, salt concentration, strain of yeast and bacteria. Bread produced by the sponge dough method has better flavour than that produced by the straight dough method. Differences in fermentation probably are chiefly responsible for flavour differences between the two types of bread. Long fermentation time produces greater quantities of acetic and lactic acids and is generally regarded as producing more favourful bread.

### I. Fermentation and bread flavour:

Yeast varieties differ markedly in their ability to produce acids, alcohols, and esters. Therefore, yeast genera, species and variety are important in determining the final bread flavour constituents. The role of microorganisms other than yeast in bread flavour has been examined by many investigators. Schulz (1941), studied the action of various bacteria on the baking process. The bacteria were obtained in a high

concentration by growing them in suitable media, and then, added to the dough. His experiments showed that the acid and aroma producing organisms of the leaven exerted a pronounced inhibiting effect on the growth of inoculated injurious organisms. The acid-producing bacteria were always entirely effective in purifying the leaven (or sour dough) from harmful organisms present in normal flour. According to Schulz (1952), sour dough must contain two types of micro-organisms to yield good bread. These microbs, which produce both lactic and acetic acid, were identified as Bacterium panis fermenti (Lactobacillus brevis)and Bacillus lactis acidi (Lactobacillus lactis).He also stated that undesirable bacteria, such as coliform, B.mesentericus, and B.subtilis, are always encountered in flour and dough and produce spontaneous fermentation which may causes serious defects. These harmful bacteria greatly reduce or sometimes entirely destroy the aroma produced by desirable microorganisms. Matsumata et al., (1954) isolated many strains of souring bacteria from sour doughs collected from many places. Four of these strains which gave rise to particularly rapid acid fermentation belonged to Lactobacillus

plantarum and its varieties. When yeast and these bacteria were cultured in a mixture, the acid production of bacteria was supperessed and gas production of yeast was severly affected by bacteria. Seliber and Rychkovskaya (1956) found that mixed culture with Saccharomyces cerevisiae showed active competition with B.bacterium type organisms, feeble competition with Streptobacterium, and symbiosis with Thermobacterium. Capacity of the yeast to assimilate lactic and acetic acids was an influential factor in symbiosis. Inoculation of the acid dough with antagonistic bacteria, e.g., puterfactive organisms, intensified acid production. Other evidence, that was observed in sterilized medium, might be adaptable to commercial production, was that the initial yeast: bacteria ratio, might be quite low, that, the yeast proliferation coefficient was not high at any production stages, that lactic acid bacteria could penetrate yeast cells in the dough, and that acidity raised, even to complete elimination of yeast cells from the dough. Rohrlich and Stegemann (1958) isolated L.plantarum as well as L.brevis from sour dough showing the highest degree of

acid formation. Robinson et al. (1958a) found that the majority of bacteria present at the end of the six hours of dough fermentation were lactobacilli. Undesirable organisms such as coliforms and micrococci were also detected but in small numbers. Most of the bacteria isolated belonged to the genera Micrococcus, Aerobacter, Bacillus, Proteus, and Lactobacillus.

Robinson et al. (1958b) obtained acceptable flavours and odours in bread by the use of selected microorganisms. The best bread resulted from the use of a starter of L.bulgaricus.

Frazier (1958) stated that leavening of dough is usually accomplished by means of bread yeast. Strains of Saccharomyces cerevisiae, used in the manufacture of baker's yeast, produce carbon dioxide rapidly as well as alcohol in the bread dough. However, other activity gas-forming microorganisms, such as wild yeast, coliform bacteria, saccharolytic Clostridium species, heterofermentative lactic acid bacteria and various naturally occurring mixtures of these organisms, have been used instead of baker's yeast for leavening.