شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

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يجب أن

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في درجة حرارة من ١٥-٢٥ مئوية ورطوبة نسبية من ٢٠-٤٠%

To be Kept away from Dust in Dry Cool place of 15-25- c and relative humidity 20-40%

بعض الوثائـــــــق الاصليـــــة تالفـــة

بالرسالة صفحات لم ترد بالاصل

٤٥٢٥

IMPROVEMENT OF ETHANOL PRODUCTION BY *SACCHAROMYCES CEREVISIAE* USING MICROBIAL BIOTECHNOLOGY TECHNIQUES

By

Abd El-Nasser Abd El-Hafez Khattab

B.Sc. Agric. (Genetics), Fac. of Agric. Kafr El-Sheikh, Tanta Univ., 1991

Thesis

Submitted in Partial Fulfillment of the Requirements for the degree of

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Department of Genetics

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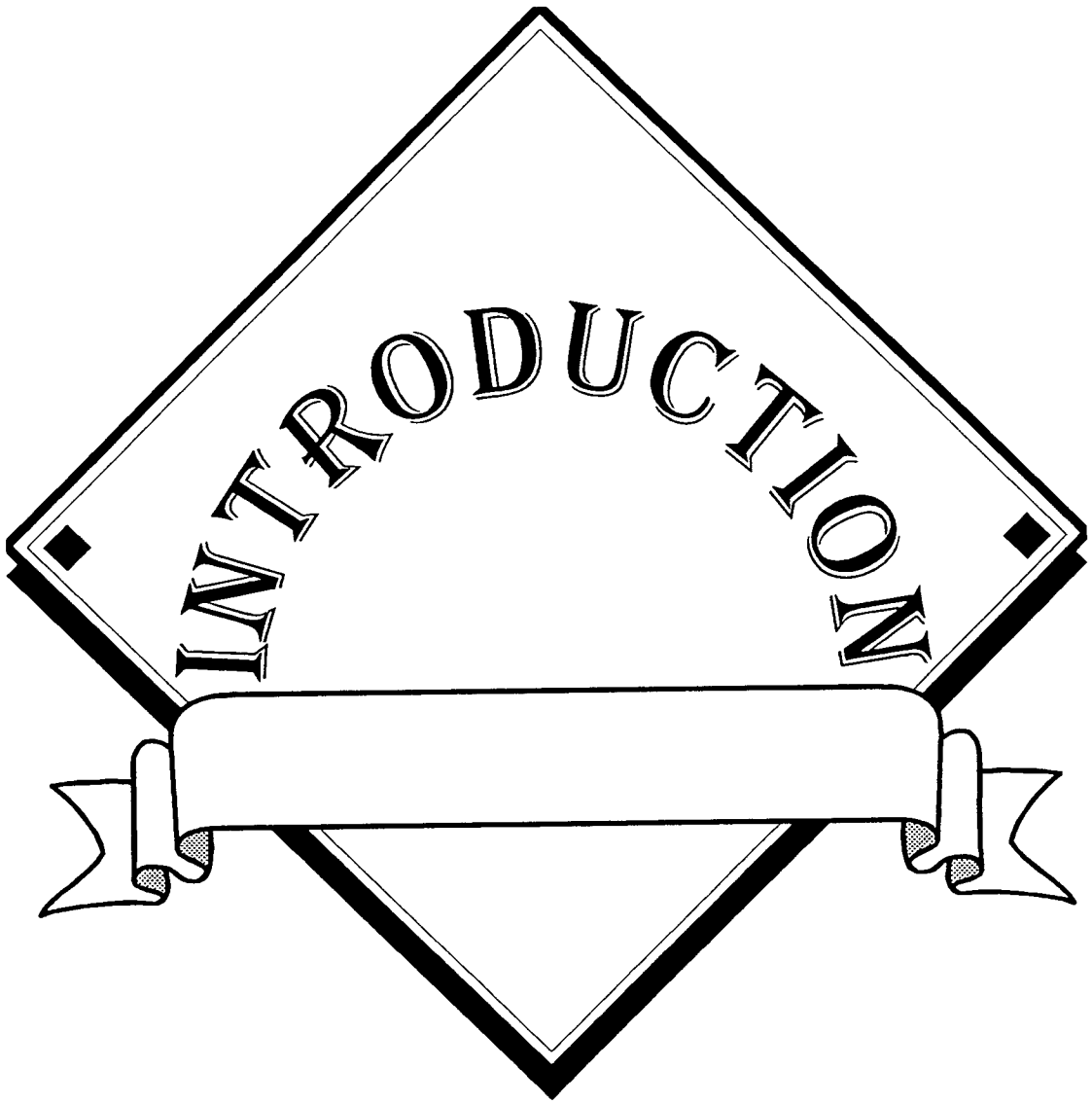
INTRODUCTION

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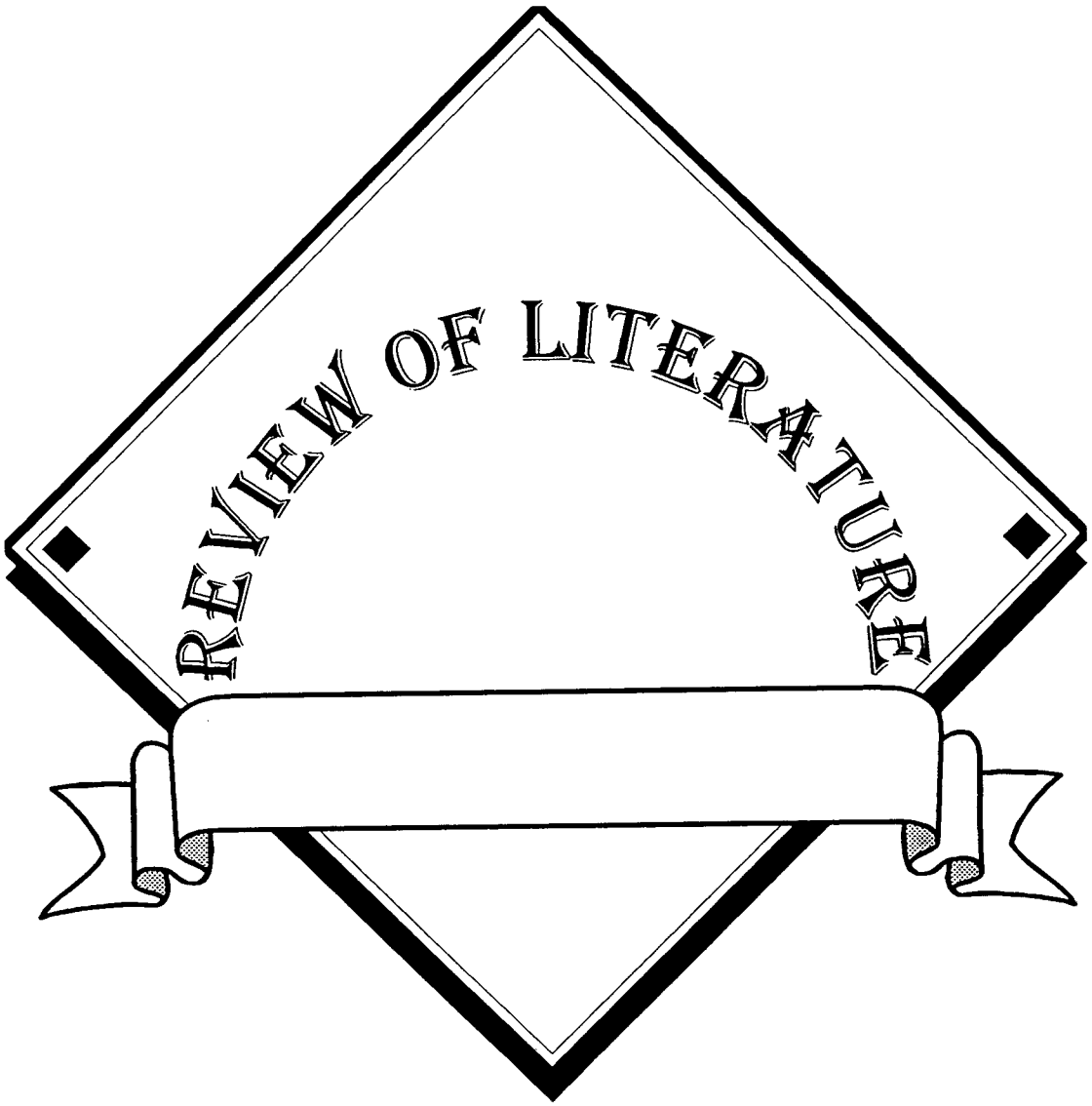
Yeasts are a group of lower eukaryotic microorganisms showing biological and biochemical diversity. In common usage, the term "yeasts" is used to describe strains of *Saccharomyces cerevisiae* that have a great commercial value in baking, brewing and effectively able to produce ethanol from molasses.

Alcoholic fermentation is considered as the most important example of microbial production of ethanol. Ethanol is widely used in both medical and pharmaceutical preparations. Furthermore, in addition to its use as a fuel, ethanol has considerable value in chemical industries resulting in the production of "Alcochemicals" as opposed today's "petrochemicals" **(Stewart 1981).**

Ethanol is an ideal fuel and also has the basis for countless chemicals transformations. However, optimal conversion of carbohydrates to ethanol requires yeast cells that are tolerant to high concentrations of the substrate (carbohydrates); end product (ethanol) and at the same time able to produce efficiently ethanol at relatively high temperature. On the other hand, industrial yeast strains have been reported to be polyploid or aneuploid **(Spencer *et al.*, 1983),** suggesting that an increase in chromosome number may be considered as an advantageous in processes involving the use of such strains.

The present investigation was programmed towards the induction of mutations and the selection (out of the treated *S. cerevisiae* population) of the more ethanol producer isolates. However, to achieve such goals, three common mutagens were used. They were: ultraviolet "UV", gamma rays "γ-rays" and N-methyl-N-nitro-N-nitrosoguanidine "MNNG". These

mutagens have been used, for a considerable extent, in the improvements of distiller's yeasts. Furthermore, among the wide variety of strain improvement techniques, protoplast fusion seems to be an efficient way to induce genetic recombinations and polyploidization in yeast, **(Gupthar and Garnett, 1987 and Gupthar, 1992).** This method has also been proved to be valuable in the development of new industrial yeast strains. With the advantage of protoplast fusion, it was possible to develop, constitutive, high yielding strains with desirable properties. Moreover, cellular DNA contents and its relation to ethanol productivity of protoplast fusants in comparison with parental strains were also determined.


REVIEW OF LITERATURE

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It's well known that out of about 50.000 identified fungal species, 500 are classified as yeasts. However, there is only a minor fraction of these yeasts which can be considered to have commercial importance. They include *Saccharomyces, Candida* (*Yarrowia*) and *Kluyveromyces.* Although all of these three genera possess industrial importance, the genus *Saccharomyces* may be regarded as the most extensively utilized group of yeasts for the benefit of mankind. Perhaps the best known of these group is *Saccharomyces cerevisiae* which is used in a variety of industrial operations **(Reed and Nagodawithana, 1991).**

Saccharomyces cerevisiae is employed in three main industrial processes. The first include the production of industrial and medical alcohol "Ethanol". The second class involving baking yeast. The third class of industrial processes is more recent and employes yeast for production of biomass, extract, autolysates, and flavor compounds. A new catogary has been emerging to the forefront involving the production of recombinant proteins through the genetic expression of recombinant yeast system **(Becker *et al.*, 1990).**

I. Genetic variabilities and ethanol production:

There are some techniques used for the induction of genetic variations towards selection of the higher ethanol production and tolerant yeast strain (s) such as continuous culture selection, mutation induction and protoplast fusion. Each of these techniques offers advantages and/or disadvantages at the same time; thus a combination is often needed to achieve the desired objective. The most wide spread, if not the exclusive tool, for increasing genetic variability in microorganisms is still the