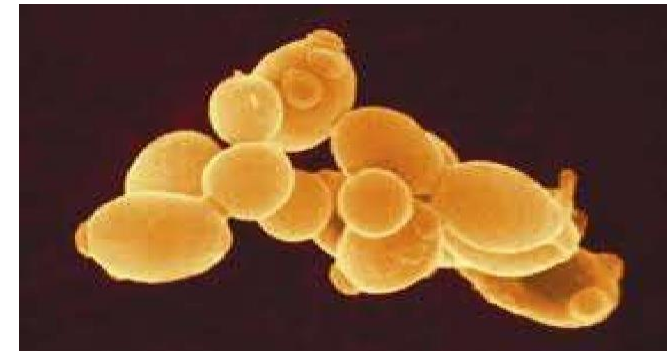


Yeasts



Introduction



- In 1680, Dutch naturalist Anton van Leeuwenhoek first microscopically observed yeast.
- Researchers were doubtful whether yeasts were algae or fungi, but in 1837 Theodor Schwann recognized them as fungi.
- In 1857, Louis Pasteur proved in the paper "*Mémoire sur la fermentation alcoolique*" that alcoholic fermentation was conducted by living yeasts and not by a chemical catalyst.

Introduction.....



- the late 18th century, two yeast strains used in brewing had been identified: *Saccharomyces cerevisiae* (top-fermenting yeast)
S. Carlsbergensis (bottom-fermenting yeast)
- In 1825, a method was developed to remove the liquid so the yeast could be prepared as solid blocks.

Introduction

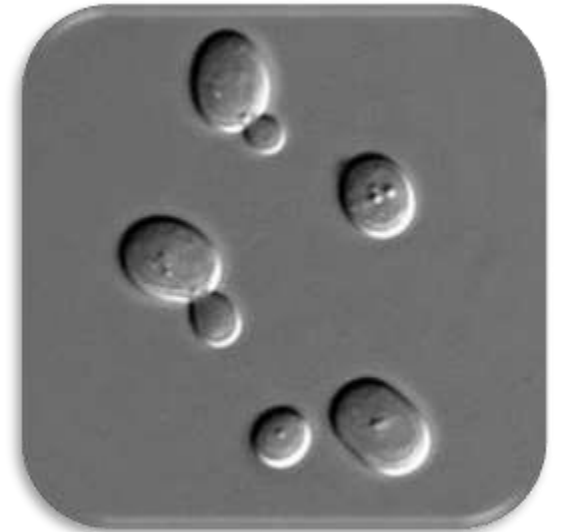


- Yeasts are eukaryotic , single-celled microorganisms classified as members of the fungus kingdom.
- 1,500 species are currently identified(1% of all fungal species).
- Yeast sizes vary greatly.
- typically measuring 3–4 μm in diameter , although some yeasts can grow to 40 μm in size.

Introduction



- Most yeasts reproduce asexually by mitosis, and many do so by the asymmetric division process known as budding.
- The budding yeasts ("true yeasts") are classified in the order *Saccharomycetales* within the phylum Ascomycota.



Nutrition and growth



- Yeasts are chemoorganoheterotrophs.
- Unlike bacteria, no known yeast species grow only anaerobically (obligate anaerobes).
- Yeasts grow best in a neutral or slightly acidic pH environment.
- Yeasts vary in regard to the temperature range in which they grow best. For example:

Saccharomyces telluris grows at -2 to 20 °C

Candida slooffii grows at 28 to 45 °C

Ecology



- Yeasts are very common in the environment:
 - ✓ skin fruits (such as grapes, apples, or peaches)
 - ✓ soil
 - ✓ insects
 - ✓ nectar flowers and honey bees
Dekkera intermedia and *Candida blankii*
 - ✓ seep sea
 - ✓ between hand toes
 - ✓ mammalian intestine

Reproduction

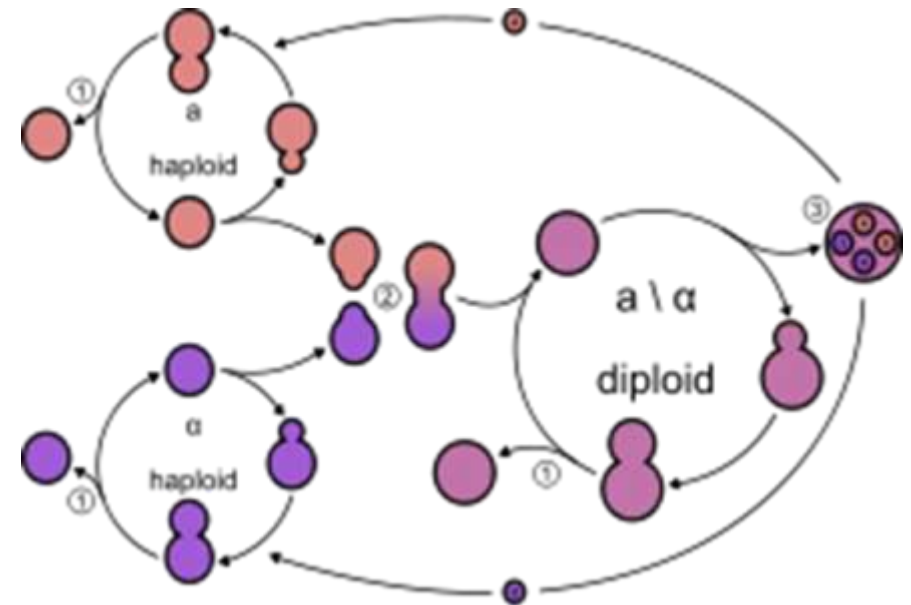


- Yeasts, like all fungi , may have asexual and sexual reproductive cycles.
- The most common mode of vegetative growth in yeast is asexual reproduction by budding.

Reproduction.....



- under high-stress conditions such as nutrient starvation, haploid cells will die;
- however, diploid cells can undergo sporulation, entering sexual reproduction (meiosis) and producing a variety of haploid spores, which can go on to mate (conjugate), reforming the diploid



Importance of yeast



The yeasts have a lot of economic value to the mankind.

They have certain beneficial as well as harmful activities.

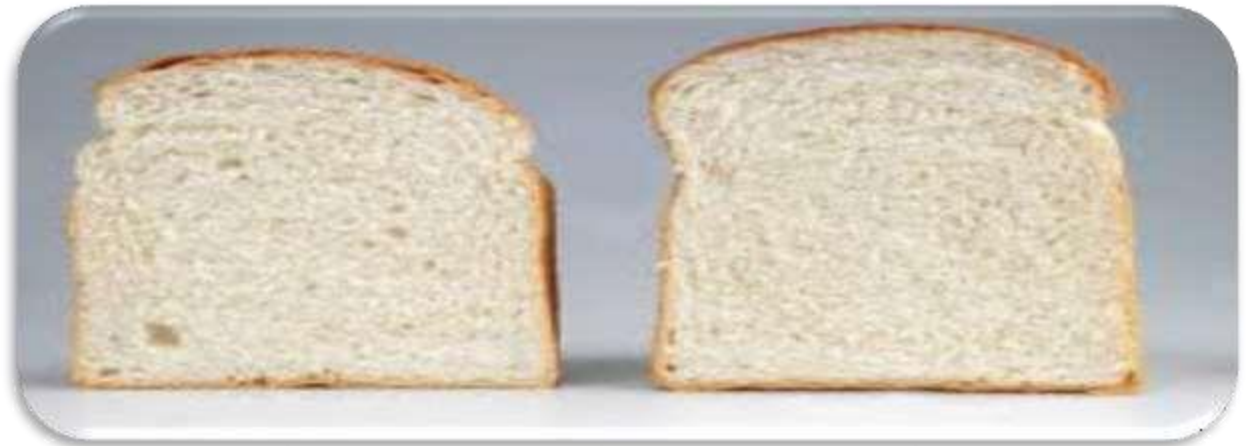
Beneficial issues



1) Food industry

Bread Making: For the manufacture of bread, yeast is mixed with white flour .

The process of fermentation starts .The bread swells up and becomes spongy due to the pressure exerted by accumulated carbon dioxide.



Food industry



- Flavor and quality of bread is attained by selecting different strains of yeast .



Beverages

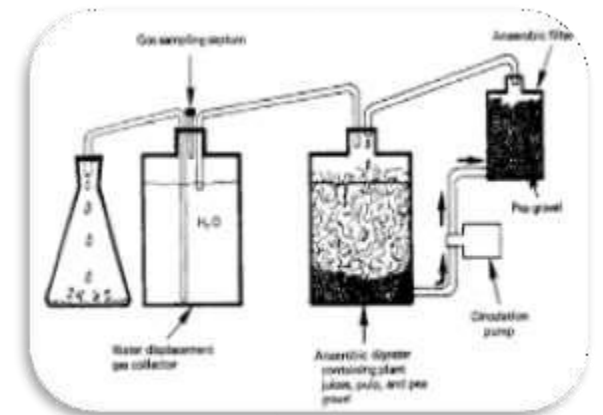
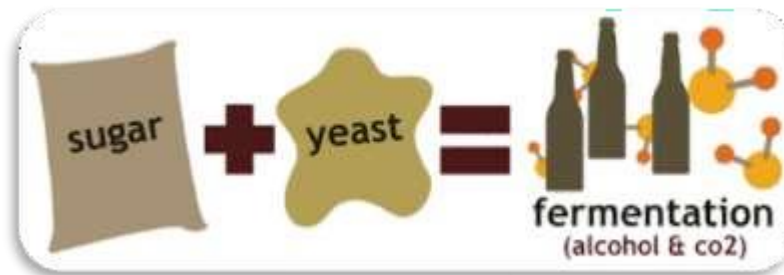


Fermentation *alcoolique* :

Breakdown of starch and sugar by yeast into carbon dioxide and ethyl

alcohol in the absence of oxygen is called alcoholic fermentation.

The alcohol is the major ingredient in brewing industry.



2) Use in Brewing Industry



Beer:

- Yeast is added to malted grains and allowed to ferment .
- The type of yeast used will affect the type and flavor of beer produced.
- Commonly used Yeast is *S. Cerevisiae* , also known as a “top fermenting” or “top cropping” yeast ”.

Use in Brewing Industry



Wine:

- Yeast is naturally present on the skins of grapes and can be used to naturally ferment grape juice into wine.
- There are many different strains of *S. Cerevisiae* and each will produce a unique flavor characteristic in a finished wine.
- *Zygosaccharomyces* and *Brettanomyces*...

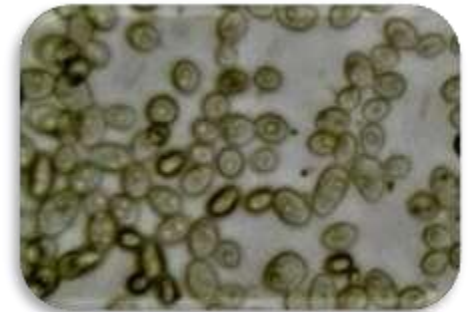
Non alcoholic beverages

- can be producing carbon dioxide, but only trace amounts of alcohol

✓ Root beer



[kombucha](#)



Industrial ethanol production



- In the industry of fermentation, yeast is used not only in food industries to make bread, wine and beer, but also in non-food industries, such as the Biofuel industry, to produce ethanol.





Yeast as a source of food:

- Yeast contains nutritive substances and proteins in sufficient quantities.
- Dried yeast cells contain 40 - 50% of protein.
Some strains of yeast have considerable amount of fat.





Yeast as a source of Vitamins

- with ultra-violet rays, they produce Vitamin - D
- Yeast is used in the preparation of Vitamin - B complex tablets. When yeast cells are irradiated.

3) Nutrition



- Yeast is a good source of protein, B vitamins, and minerals.
- Yeast intended as a nutritional supplement is often sold as “nutritional yeast” or “yeast extract.”

Nutritional supplements



- Yeast is used in nutritional supplements , especially those marketed to vegans.
- It is often referred to as "nutritional yeast" when sold as a dietary supplement.
- “Nutritional yeast” is a deactivated yeast, usually *S. cerevisiae*.
- It is an excellent source of protein and vitamins, especially the B- complex vitamins



- Some brands of “nutritional yeast”, though not all, are fortified with vitamin B₁₂, which is produced separately by bacteria.



4) Use in Medicine



- **Lowering high cholesterol**

Research showed that taking a specific red yeast product for two to three months could significantly lower total and “bad cholesterol” (low-density lipoprotein (LDL))

- They are also utilized in medicine as a source of enzymes

Probiotics



- Some probiotic supplements use the yeast *S. boulardii* to maintain and restore the natural flora in the gastrointestinal tract.
- *S. boulardii* has been shown to reduce the symptoms of acute diarrhea.



Aquarium hobby



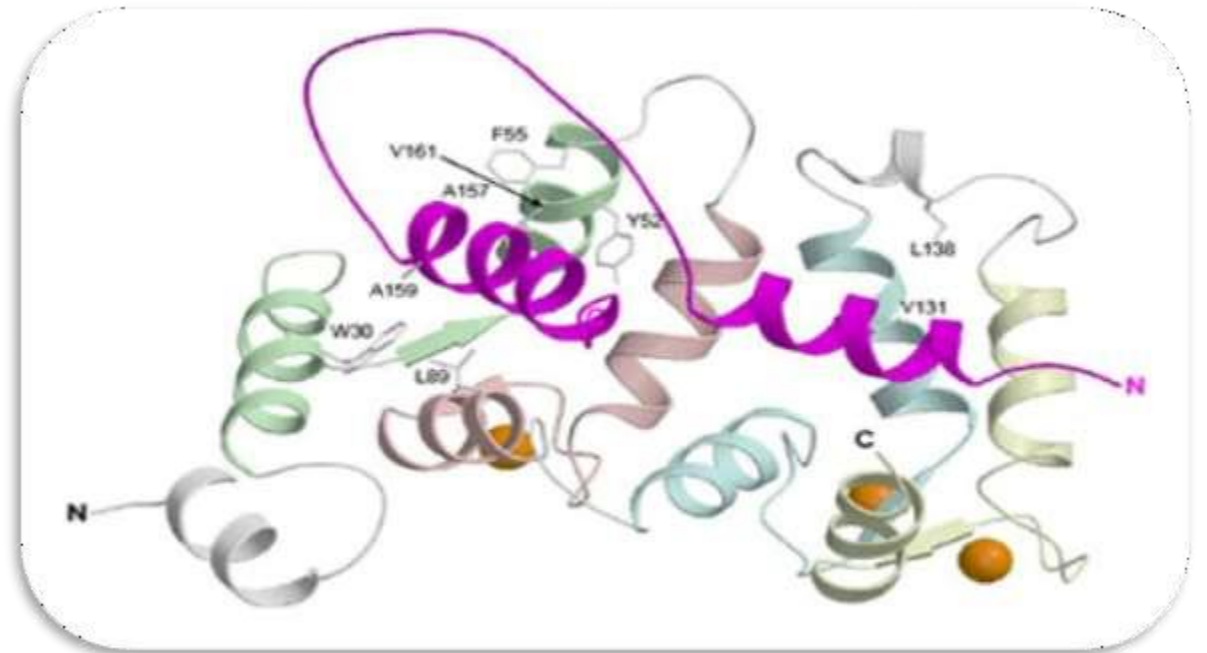
- Yeast is often used by aquarium hobbyists to generate carbon dioxide (CO₂) to nourish plants in planted aquaria.



6) Use in Molecular Genetics



- Yeasts are Model organisms in genetics.
- Used as Synthetic pathways for antibiotics or other molecules of interest.
- Used in Gene Therapy



5) Yeast and biotechnology:



- In the industry of fermentation, yeast is used not only in food industries to make bread, wine and beer, but also in non-food industries, such as the Biofuel industry, to produce ethanol.

Yeast two hybrid ...

7) Cleansing of Environment



- Yeast protects and cleans the environment by following ways:

1. Pollution cleanup
2. Waste recycling
3. Bioremediation (*Yarrowia lipolytica* and *S. cerevisiae*)

3) Food spoilage



- During their growth, yeasts metabolize some food components (sucrose, ethanol, acetic acid) and produce metabolic end products .
- This causes the physical, chemical, and sensible properties of a food to change, and the food is spoiled .



4) Intoxication



- Yeasts cause Intoxication of food and imbibed drinks.



Disadvantages:



1) YEAST & WEIGHTLOSS

● Yeast infections can range in severity from minor discomfort to a life-threatening ailment, depending :

- ✓ on your immune system
- ✓ the type of yeast
- ✓ the location of the yeast
- ✓ the way you combat it



6) Diseases

- Some species cause skin, hair and nail infections in humans
e.g. *Candida Albicans*

- Yeasts cause respiratory diseases in humans e.g.

Cryptococcus gattii and *Cryptococcus neoformans*



5) Plant Pathogens



- Certain species of Yeast are plant pathogens and decrease crop production.



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