Yeast

BAKING INDUSTRY RESEARCH TRUST

> INFORMATION SHEET

WHAT IS YEAST?

Yeast is a single-celled fungus that converts sugar and starch into carbon dioxide bubbles and alcohol. This makes yeast an extremely important ingredient in the production of bread, beer, and wine. There are many varieties of yeast. Baker's yeast is called *Saccharomyces cerevisia, "saccharo"* meaning sugar and *"myces"* meaning fungus. This yeast can metabolise simple sugars, such as glucose, sucrose and maltose. It is used to leaven bread and works by converting sugar into carbon dioxide, which causes the dough to rise so the bread will be light and airy.

The typical yeast cell is a similar size to a human red blood cell and is spherical to ellipsoidal in shape. Due to its small size, it takes about 30 billion yeast cells to make up to one gram of compressed baker's yeast. Yeast reproduces by budding, which is when a new bud grows from the side of an existing cell. This bud eventually breaks away from the mother cell to form a separate daughter cell. Each yeast cell, on average, undergoes this budding process 12 to 15 times before it is no longer capable of reproducing. During commercial production, yeast is grown under carefully controlled conditions on a sugar-containing medium typically composed of beet and cane molasses. Under ideal growth conditions a yeast cell reproduces every 2–3 hours.

HISTORY

Hieroglyphics suggest that ancient Egyptians were using yeast and the process of fermentation to produce alcoholic beverages and to leaven bread over 5,000 years ago. The science responsible for these actions was not understood and most likely looked upon by early man as a mysterious phenomenon. Early fermentation systems for bread making were thought to be formed by natural microbial contaminants of flour, milled grains and from fruit juices containing sugar, including wild yeasts and lactic acid bacteria that are found associated with cultivated grains and fruits. Leaven was a soft dough-like medium and a small portion of this dough was used to start or leaven each new bread dough. Over time this helped to select for improved yeasts as "good" batches of dough were saved for inoculating the next batch.

In the late 1860's Louis Pasteur identified yeast as a living organism responsible for alcoholic fermentation and dough leavening. With this new knowledge and the ability to isolate yeast strains, the commercial production of baker's yeast began around the turn of the 20th century. Since that time, bakers, scientists and yeast manufacturers have been working to produce pure strains of yeast that meet the needs of the baking industry.

TYPES OF YEAST

There are different types of yeast that can be used in bread making:

Active Dry Yeast is an older type of yeast which is generally no longer used in bakeries. The yeast is dormant, and is best used after proofing and rehydrating, which involves the yeast being sprinkled over warm water with pinch of sugar, and left to stand for 10 minutes until creamy and bubbly.

Instant Dry Yeast has been developed from special strains of yeast that withstand drying. It comes in smaller granules than active dry yeast, absorbs liquid rapidly, and doesn't need to be hydrated or "proofed" before being mixed into flour and dry ingredients.

Bread Machine Yeast and *Rapid Rise Yeast* are instant yeasts that may include bread improvers such as ascorbic acid.

Compressed Yeast, also known as fresh or cake yeast is made of living yeast pressed into blocks, available in 1 kilogram blocks in New Zealand. This yeast is most suited for use in small bakeries, as it has good rising qualities and produces excellent-tasting bread, croissants and Danish pastries. Fresh yeast should be proofed in tepid water (26–32ºC) without contact with salt or sugar.

Cream Yeast is ready to be used immediately and can be metered directly into a mixer. Its performance is consistent as it is unlikely to be damaged during storage and transport.

TYPE	COMPRESSED	ACTIVE DRY	INSTANT	CREAM
Storage temperature	1–4.5ºC	Room temperature	Room temperature	1–4.5ºC
Shelf life	2–3 weeks	12 months	12 months	2 weeks
Moisture content	70%	8%	5%	82%
Particle size	Large chunks	Irregular spheres	Rods	Beige Liquid
Dough application	Direct	Rehydration	Direct with added water	Directly metered

NB: 1. Dried yeast is at least twice as potent, weight for weight, as compressed yeast.
2. For 500 g white flour use 25 g compressed yeast or 1 tsp dried yeast.

TYPICAL YEAST LEVELS

PRODUCT %	BAKER'S YEAST
Bread	1.5–5.0
Hamburger buns	3.0–4.5
Bagels	0.5–3.0
English muffins	4.0–8.0
Croissants	5.0–7.0
Yeast raised donuts	3.0–6.0
Danish	4.0–10.0

CONDITIONS FOR YEAST

As yeast is a living organism it needs certain conditions to be controlled so that it can operate at its optimum and avoid risks of inactivity:

- Sugars are required as a food source for yeast.
- Warm temperatures are needed. Temperatures close to freezing point will slow yeast activity and temperatures below freezing or above 46°C will kill yeast cells.
- Water is used to disperse the yeast and dissolve other materials. Yeast needs to always be surrounded by water as its natural environment.
- Nitrogen is critical for optimum yeast activity. If soluble nitrogen is lacking in bread dough then improvers containing nitrogen, such as ammonium chloride, can be added.
- Mineral salts encourage yeast activity and accelerate fermentation.

FERMENTATION

In bread making, yeast ferments the carbohydrates present in sugar and flour, breaking them down to simpler sugars and eventually to carbon dioxide gas. The formation of gas causes the dough to rise. Fermentation softens the gluten, a complex protein which makes bread more elastic. Kneading develops the gluten and spreads the gas cells evenly through the dough to create a fine textured product. When bread is baked the initial heat increases yeast action, expanding the gas cells and the loaf rises. Once the dough reaches 46°C the yeast is killed and the loaf cooks to a crisp brown crust with a soft moist and even crumb. Therefore, during fermentation, yeast is a key ingredient and serves three primary functions:

- Production of carbon dioxide. This is generated by the yeast as a result of the breakdown of fermentable sugars in the dough. The production of carbon dioxide causes expansion of the dough as it is trapped within the protein matrix of the dough.
- Dough maturation. This is accomplished by the chemical reaction of yeast-produced alcohols and acids on flour protein and by the physical stretching of the protein by carbon dioxide gas. These results in the light, airy physical structure associated with yeast-leavened products.
- Development of flavour. Yeast gives bread and other yeast-leavened products their characteristic flavor. During dough fermentation, yeast produces many secondary metabolites such as ketones, higher alcohols, organic acids, aldehydes and esters. Some of these, alcohols for example, escape during baking. Others react with each other and with other compounds found in the dough to form new and more complex flavor compounds. These reactions occur primarily in the crust and the resultant flavor diffuses into the crumb of the baked bread.

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