

YEAST EXTRACT

A TREASURE
FROM NATURE
FOR FOOD



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Nowadays, food manufacturers have several challenges to face when responding to consumer trends. Consumers are more and more careful about the composition and the quality of the products they eat: naturalness, nutrition and pleasure are essential criteria in the purchase decision. 55% of the world consumers look for natural features when buying products¹. In this context, choice of ingredients is strategic for food formulators.

Yeast extract is one of those strategic ingredients for food and beverage industry.

Yeast culinary potential has been employed for centuries and is well-known all over the world. As for yeast extract, it has been used since the beginning of the 20th century for its organoleptic qualities. In today's world, it raises some questions:

- What is it exactly?
- How is it produced?
- Is it natural?
- How does it improve taste?

1. FoodBev Media, according to Euromonitor ; <https://www.foodbev.com/news/almost-half-of-consumers-expect-products-to-be-all-natural-euromonitor/>, December 2016



#1
What is
yeast
extract?

A few definitions and historical facts

Yeast definition

Yeast is a microorganism which belongs to the **fungus family**. The first yeast originated hundreds of millions of years ago. It is composed of: proteins 49%, carbohydrates 40%, minerals 7% and lipids 4%. Those components are protected from the extracellular environment by a cell wall.

Yeast has been used as a natural origin food ingredient for centuries

Whether it is “baker’s yeast” or “brewer’s yeast”, yeasts are applied to make many products. Indeed, fresh yeast has been utilized for thousands of years to make everyday consumer products such as bread, beer and wine thanks to its **fermentation properties**. In the absence of air, yeast cells produce carbonic gas and aromas. During bread making, baker’s yeast gives bread its unique taste and texture using sugar and oxygen to perform fermentation. Regarding beer or wine, yeasts can adapt in different substrates, like grapes or malt, and provide the product different tastes, different alcohol levels...

Yeast extract as a natural flavoring ingredient

After centuries of bread, beer and wine, a new potential has been discovered for yeast in the 19th century by Professor von Liebig. He has been the first scientist to find out that yeast could be interesting to substitute taste of meat in a dish.

At the beginning of the 20th century, the interest in yeast as an **aromatic base to improve the flavors** of soups, sauces, broths and other dishes has been developed until the 50’s, when yeast extract was introduced to the market...



Yeast extract is an ingredient from nature

Yeast extract is coming from yeast

Yeast extract comes from fresh yeast and is therefore a **natural origin ingredient**. No synthetic or chemical ingredients are added during its production. It keeps its natural attributes and organoleptic qualities throughout the whole manufacturing process: its inner enzymes² cut yeast proteins into amino acids to isolate tasty components. Thus, we obtain a yeast extract.

Yeast extract as a food ingredient



Natural ingredient

Yeast extract has a natural origin, and using it as a food ingredient is **valuable for food manufacturers and consumers**, especially as it is minimally processed. As a matter of fact, the natural attribute of food and beverage products is what consumers are looking for. Moreover, clean label represents a major challenge: consumers seek products with natural ingredients that they recognize.

52% of respondents of a survey across Europe, North America and Asia-Pacific said they would spend over 10% more on a food or beverage product that contains ingredients they recognize and trust³. Besides, 56% of consumers are interested in a “natural” feature on food and beverage products⁴. Tasty natural products are achieved with yeast extract.



Yeast extract and gluten

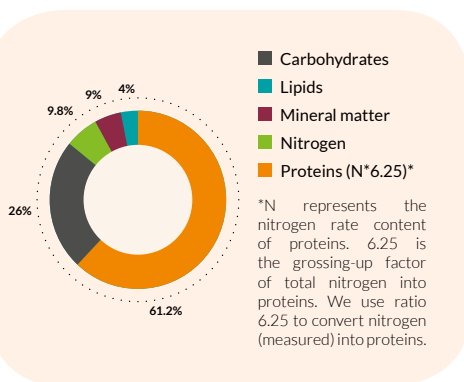
Baker's yeast extracts usually **do not contain gluten** as no gluten derivative is used during process. This is a good thing when you know that gluten-free is one of the main food trends: the prevalence of gluten intolerance has been estimated to globally approximate 1%⁵. According to this trend, even people who do not have celiac disease are trying to avoid it.

This is a **real challenge for food manufacturers**, because gluten-free products are often associated with bad taste: the consumer wants to eat gluten-free and tasty products. We invite you to refer to the related legislation of your country on this subject.

On another note, yeast used to produce brewer's yeast extracts comes from the beer manufacturing. Thus, because of use of cereals such as barley or wheat in beer manufacturing, brewer's yeast extracts may contain residual gluten. Gluten declaration and gluten-free status depend on local regulation.

Composition of yeast extract

Composition of yeast extract is based on composition of yeast: proteins, free amino acids, carbohydrates, vitamins and minerals.





100% vegan

Yeast extract is a non-animal ingredient which make it the ideal choice for many vegan products. This is a chance to **bring taste to vegan products** and also proteins, vitamins and minerals. Meat and cheese analogs, vegetal-based products can be formulated with yeast extract. The food industry is the first one to be concerned, when the number of vegetarians, vegans, and flexitarians are still growing.



2/10

Eat vegan occasionally in France ⁶



3/10

Eat meat alternatives for ethical concerns in Germany¹⁰



31%

Of the American population is having occasional **meat-free days**⁸



+82%

Of increase in **the vegan products offer** in French supermarkets in 2016⁷

50%

Of product launches in Asia Pacific between 2011 and 2016 had **vegan or vegetarian claims**⁹



An ingredient which fits a non-GMO approach

The yeast strains selected to manufacture Biospringer yeast products are **not genetically modified organisms**¹¹. All our products are non-GMO products. Moreover, we take part to the «Non-GMO Project USA». The «Non-GMO Project USA» is a non-profit organization focusing on genetically modified organisms. The organization began as an initiative of independent natural foods retailers in the USA and Canada. The goal is to prevent genetically modified foodstuffs from being present in retail food products. It provides third-party verification and labeling for non-genetically modified food and products. The non-GMO project acts for the reduction of contamination risk of the non-genetically modified food supply with genetically modified organisms.



A Halal and Kosher certified ingredient



All our products are certified Halal and Kosher by recognized organizations. Certification is renewed annually and is done batch by batch for Kosher Passover certification. The Halal certification is renewed annually in the presence of a religious representative. For further information about certifications, please contact our local teams.



Process resistant

Yeast extract is a **process resistant ingredient** (acid, heat, and freeze) and is therefore suitable for many applications, regardless of the process, such as soups, broths, fish, meat and analogue products and seasonings.

7. Les Echos, selon Xerfi; <https://business.lesechos.fr/entrepreneurs/actu/030546509865-les-vegan-cultivent-l-ambiguite-avec-les-produits-d-origine-animale-313011.php> 8. Mintel, Meat-free days is the top reason for eating protein alternatives among US consumers, 2017, <http://www.mintel.com/press-centre/food-and-drink/meat-free-days-top-reason-for-protein-alternative-use/> 9. Protein trend: plant-based protein will continue to flourish in Asia, Mintel, 2016 / 10. Mintel, Vegetarian meals and meal centres increased seven-fold un Germany between 2011-2015, 2016, <https://www.mintel.com/press-centre/food-and-drink/vegetarian-meals-and-meal-centres-increased-seven-fold-in-germany-between-2011-2015-2016>, 11. Directive 2001/18/EC and its subsequent modifications, dated 12.03.2001, replacing the Directive 90/220/EEC

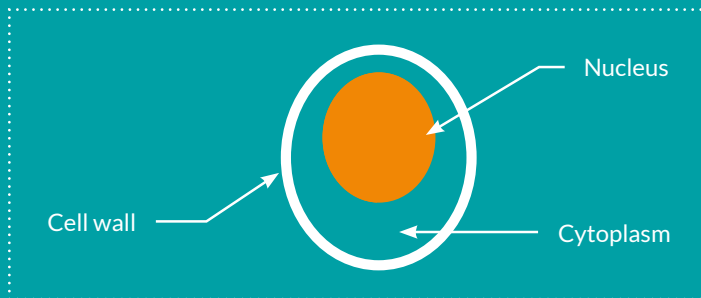
#2
How is
yeast extract
produced?



It all starts with fresh yeast composed by:

- **Cell wall**, to separate and protect the yeast cell from extracellular environment,
- **Cytoplasm** rich in nutrients such as proteins, free amino acids, vitamins and minerals,
- **Nucleus**, location of the precious DNA molecule of the yeast, its genetic information.

Yeast cell:



Basically, yeast extract is only yeast, without its cell wall - Nothing else.

Its production consists in 3 steps:

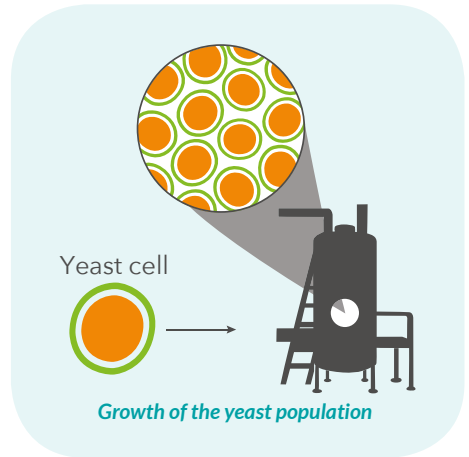
- fermentation,
- breakage,
- separation,

without any chemical additives.

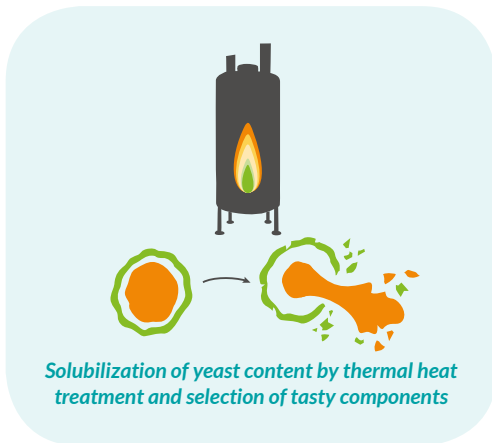
Thanks to a copy of natural phenomenon, Biospringer preserves the characteristics of the original yeast.

Fermentation

To fit with customer's final expectation and depending on the uses, **a specific yeast strain** is selected. Once this selection is made, yeast fermentation starts. It is conducted in tanks under regular growing conditions: a glucose source, a monitored temperature (around 30°C / 86°F) and a sufficient oxygen supply. Those conditions are essential for the efficient growth and the multiplication of yeast population. This first step results in a juice called "yeast cream".



Breakage



Breakage induces a solubilization of the yeast cell content. This one uses heat and the own enzymes naturally present in the yeast cell, without any additions. This step is also known by scientific term of autolysis.

To do so, and after a cooling step to stop the multiplication of yeast population, the yeast cream is placed in large tanks at a temperature of 45-55°C¹² (113-131°F) and the inner enzymes break down the proteins and other macromolecules into smaller molecules.

It allows the **selection of tasty components** (*elementary particles*):

- **Protein portions:** peptides, free-amino acids such as glutamic acids
- **Nucleic acid:** Ribonucleic Acid (*RNA*), Oligonucleotides, Nucleotides (*IMP-GMP*)
- **Polysaccharides:** sugars, mannans and glucans

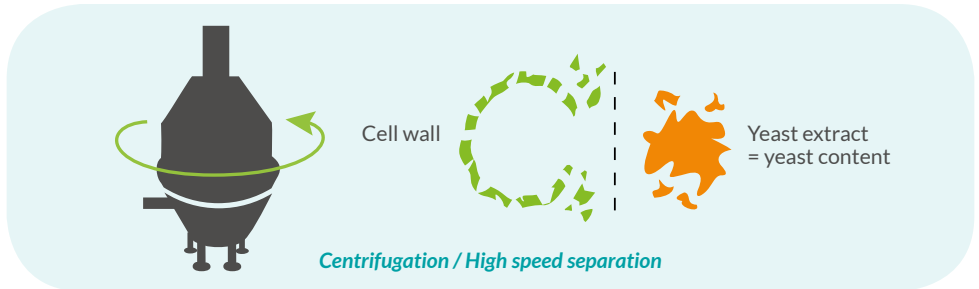
It is necessary to monitor the lysis to select the "right" tasty components in the correct ratio.

This step induces the dissolution of the yeast cell content in elementary particles able to leave the yeast cell wall, giving rise to the soluble yeast extract. **Each parameter of the breakage (duration, temperature and pH) is crucial and influences the final tasting properties of yeast extract.**

Separation

Centrifugation then allows the separation of cell walls from tasty components and nutrients obtained during the breakage.

Every nutrient from the initial yeast is preserved into yeast extract. This centrifugation ends with a flavorful solution, which is concentrated in a gentle evaporation (60°C/140°F) to **preserve all organoleptic properties and qualities of the product**. At the end of this step, water is evaporated, and nothing remains but yeast extract.

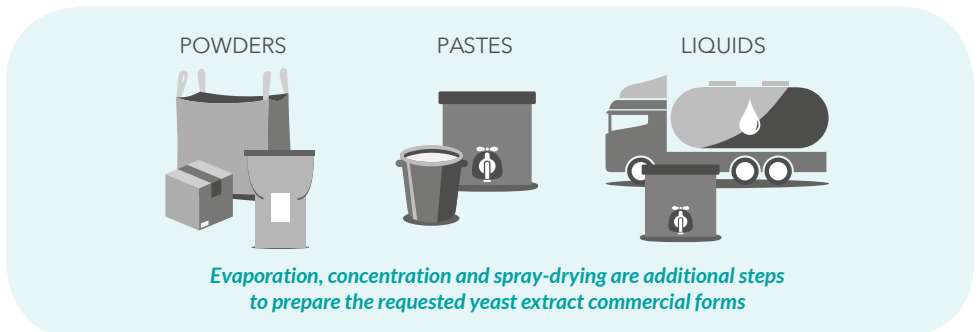


Different forms of yeast extract

The result of this process is a yeast extract powder, liquid or paste:

- **Paste and liquid** forms are obtained after the standard production that ends after evaporation and concentration.
- **Powder** form needs an additional step which consists of spray drying. The liquid is fed into a so-called spray tower and dried using hot air. Then water evaporates, yeast extract falls down and is collected at the base of the tower; it confers its final texture.

Depending on intended usage, a form is preferred due to its technological properties and capacity of incorporation into a formula and industrial production lines.



The image shows two bowls of ramen on a light grey surface. The foreground bowl is in sharp focus, showing a slice of gyoza (dumpling) on top of the noodles, along with green onions, red chili, and other toppings. A pair of chopsticks with red and black patterns is resting on the bowl. The background bowl is blurred. A semi-transparent white rectangle is overlaid on the center of the image, containing the text.

#3
**What are
the main uses of
yeast extract?**

Yeast extract main applications in food industries

A natural and culinary ingredient from yeast

Yeast extract is added in everyday consumer products. It is commonly incorporated by many professionals in the **food industry** as an **aromatic ingredient**.

It has several functionalities:

1. Improve and build taste
2. Bring signature flavor
3. Make healthy formulations
4. Bring richness
5. Or as an ingredient in flavor manufacturing

Thanks to a wide range of aromatic notes, it improves the taste of many **savory or sweet foods**. These properties in taste perception are attractive for nutrition purposes, and make yeast extract an appropriate solution for developing healthier products. Yeast extract allows food manufacturers engaged in a nutritional improvement approach to **reduce salt, fat or sugar content** in their dishes while keeping pleasure and taste in their products.

Yeast extract in your kitchen

Basically, there are two different uses of yeast extract:

As a food ingredient

Employed as an ingredient, the historical product is the bouillon cube, which is sold worldwide for seasoning dishes. It is also present in soups, meat, snack seasonings, soy sauce, dressings and gravies.

As a condiment or spread

Directly consumed by consumers as a condiment, "yeast extract spread" is a very specific everyday product for Anglo-Saxon market (Great Britain, Australia...).

Red Fishcake with Sea Bream

Ingredients

Fish (cod, white flower croaker, snappers), egg white, algae salt, sea bream stock, sugar, mirin, starch, vegetable oil, **yeast extract**, seasoning (amino acids), processed starch, shell calcium, coloring.



Yeast Extract spread

Ingredients

Yeast extract (barley), salt, vegetable juice concentrate, vitamins (thiamin, riboflavin, niacin, vitamin B12, folic acid), natural flavoring (celery), folic acid.



Taste

What is taste?

Different words describe taste: flavor, savor, aroma... Taste is the consequence of what our tongue perceives when something is eaten. Actually, both the mouth and nose are concerned when it comes to sending information to the brain, in order to characterize that taste: the two senses, taste and smell, combine and are integrated into the higher cerebral level and that is what allows our brain to define the taste and the flavors of food.

5 TASTES ARE COMMONLY DESCRIBED: SALT, SWEET, SOUR, BITTER AND UMAMI.

If « Saltiness », « sweetness », « bitterness » and « sourness » are well-known and recognized around the world, **umami** has been characterized later. It was discovered in 1908 and means “**delicious**” in **Japanese**. It provides a pleasant taste of broth or meat with a long-lasting effect and appetizing sensation which covers the whole tongue.

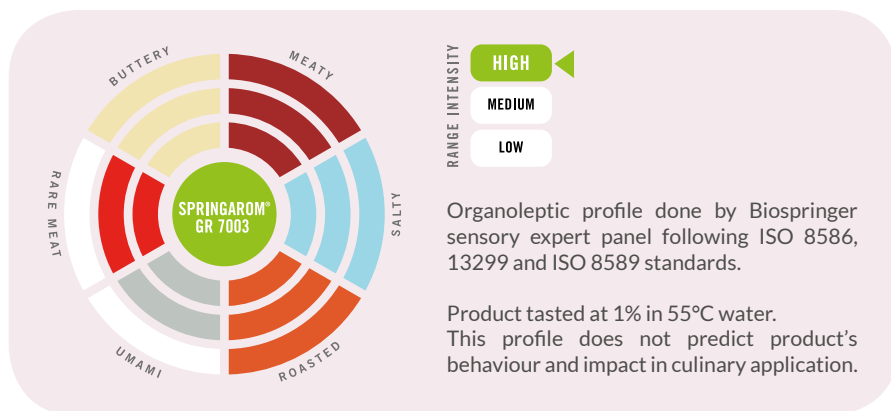
Even though there is a worldwide consensus about these 5 tastes, neurobiologists’ knowledge is constantly evolving. They have shown that the specific molecules linked to each taste arouse sensory images specifically recognized by the brain. This is why new flavors and concepts are more and more highlighted, like **kokumi** (specifically a taste and flavor modulator) characterized by smoothness and mouthfullness, which is often associated to the **taste of “slow-cooking” or “home-prepared food**.

What is yeast extract taste?

Yeast extracts are natural flavor ingredients¹³. Some provide the **essential flavor notes** to bring body and depth to a recipe and some others are **specific notes** themselves, to drive the taste in a certain direction by providing a **signature** (chicken, beef, and cheesy flavor notes). As they balance the overall flavor by bringing the umami taste and richness, they are always combined with other ingredients in recipes.

Zoom on the diversity of yeast extract tastes

Yeast extract main contribution is for **taste improvement**. It brings vegetal aromatic notes and also meaty, toasted, roasted, cooked, salted, buttered notes... with different levels of intensity. Each of these aromatic possibilities is differently exploited, depending on the final expected application. Our Springarom® yeast extract reflects an example of the diversity of tastes:



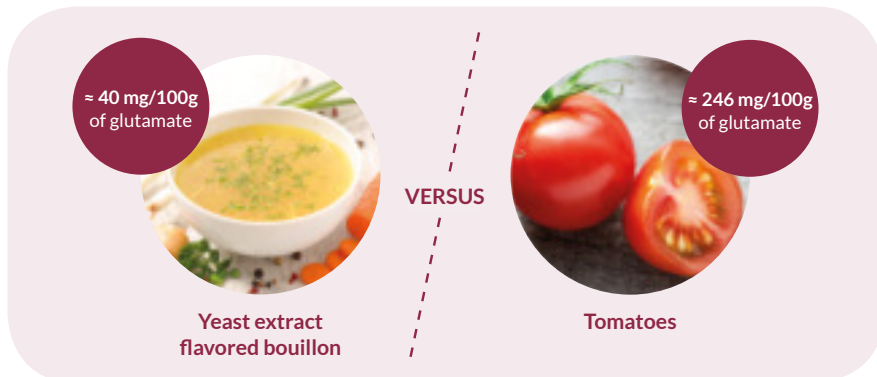
These different tastes are developed thanks to a modulation of various parameters during production:

- **Strain selection:** before starting the production of yeast extract, the yeast strain is selected for its ability to bring a specific flavor relating to customers’ needs.
- **Breakage parameters:** each one is pre-eminent and influences the final tasting properties of yeast extract.

For example, temperature and steps duration are some of the parameters that can be changed depending on the final taste expected. Breakage of yeast cell and its modulation is precisely one of Biospringer’s expertise.

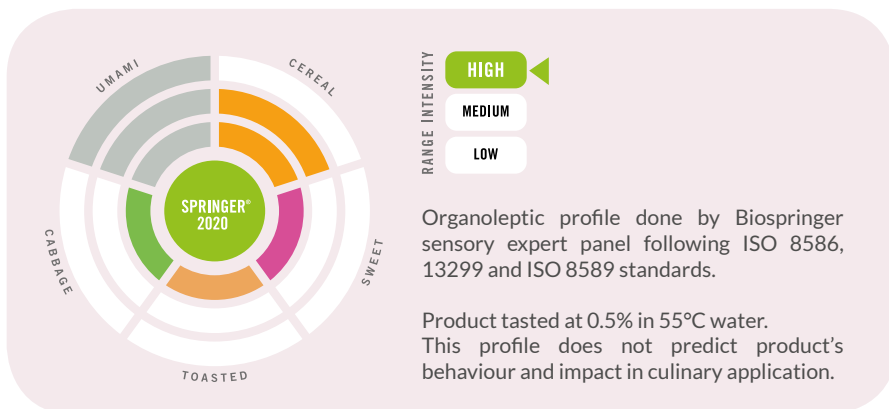
Focus on umami taste

Although it is a taste which is often associated with **Asian cuisine**, umami is found worldwide **in a very large number of foods** like parmesan, onions, fish sauce, and even tomatoes! Everyone has ever experienced umami in his everyday cooking. Umami taste in food is due to its natural content in glutamic acid. Yeast extract contains only approximately 5 percent of glutamate when one tomato contains approximately twice the amount of glutamate present in 200 ml of yeast extract flavored bouillon¹⁴.



The umami taste of yeast extract is partly explained by its **protein content, very similar to that of meat broth**. As a result of its special and unique taste, yeast extract has been employed as an ingredient in food products for approximately the past 70 years.

Our Springer® 2020 yeast extract provides natural umami taste in foods:



How does yeast extract improve taste in food?

It is by combining ingredients that we get a tasty and flavorful dish.

Thanks to its natural content, yeast extract is an attractive ingredient in food formulation. **Some of its components bring savory notes to the product while others round off original taste of foods.**

Let us see the properties of yeast extract with a few examples of recipes:

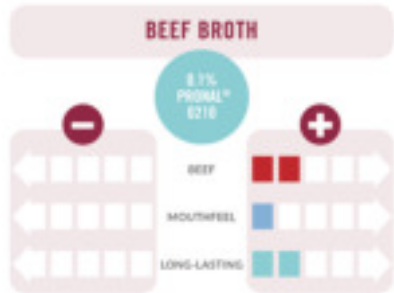
- **Yeast extract improves and builds taste** by providing base-notes to get subtle and savory taste profiles, ideal to give a bouillon or meaty note to basics flavors.

Example from China:



Springalys® D201 (dosage 0.3%) improves spiciness, masks bloody off-notes.

Example from South America:



Pronal® O210 (dosage 0.1%) adds roundness and improves the beef taste.

- **Yeast extract gives richness thanks to the umami taste.** It brings a savory and rounded mouthfeel perception of taste ideal for salt reduction.

Example from Asia Pacific:



Springer® 2006 (dosage 0.3%) adds umami and balances the taste.

Example from Europe, Middle East and Africa:



Springer® 2012 (dosage 0.38%) allows a 30% salt reduction without compromising the taste.

- *Yeast extract brings smoothness and mouthfulness by boosting saltiness, sweetness and umami notes.*

Example from North America:



Springer® 4101 & Springer® 2020 (dosage 0.24%) improve naturally the chicken flavor with an umami contribution.

Example from Europe, Middle East and Africa:



Springer® 4115 (dosage 0.2%) provides smoothness and mouthfeel effect.

- *Yeast extract brings signature flavor by bringing more specific flavor notes such as white meat chicken, red meat, beef juice, roasted/grilled/smoked meat, cheese...*

Example from North America:



Springarom® CH 7012 (dosage 1.4%) provides a rich cheesy note.

Example from Asia Pacific:



Springer® 6008 (dosage 0.3%) contributes to grilled, roasted meat notes.

Nutritional profile improvement

Major public health issues explain current trends in nutrition


Salt, sugar, fat...Those ingredients are major concerns in the food industry. Consumers are more and more aware of the correlation between food and health: obesity, diabetes, cardiovascular health... all of these medical issues are strongly influenced by food consumption and lifestyle habits.

Besides, food crisis and the growth of environmental awareness explain the fact that the consumer is looking for more simplicity and naturalness. This is the source current food trends: the craze for healthy snacks and healthy ingredients such as super foods, plant proteins, clean label...

In this context, **improvement of food formulation** is a tremendous issue for food manufacturers. They are trying to reduce salt, sugar and fat contents in their products in order to answer consumers' expectations and needs, while paying attention to **develop tasteful products** at the same time. Quite a considerable challenge!

Salt reduction

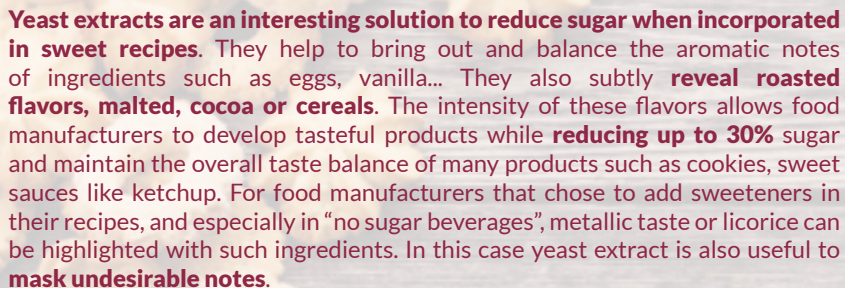
According to the World Health Organization (WHO), the average daily salt intake is between 9g and 12g¹⁵, when official recommendations say it should be around 5g for an adult. Indeed, excessive sodium consumption is known to possibly lead to hypertension and a higher risk of developing cardiovascular health issues. In this context, food manufacturers are strongly encouraged to **reformulate** their products to reduce salt content, **without compromising the taste**.



Yeast extracts offer taste properties to support the development of salt-reduced and flavorful foods and beverages. Thanks to their strong natural aromatic taste, similar to that of spices, yeast extracts allow manufacturers to **reduce up to 30%** the sodium content of numerous dishes (soups & broth, sauces & dressings, snacks & seasonings and more) without compromising their taste. They help to **increase the salty perception** (thanks to umami taste) or bring some nice flavor notes. The product taste is reinforced and the lack of salt/sodium is not noticed while still very good.

Sugar reduction


Diabetes, as well as most of metabolic diseases, is a growing problem since 8.5% of the world's population (or 422 million people) are diabetic¹⁶. These numbers are serious, and there are now strong public campaigns to fight against it. Furthermore, the World Health Organization (WHO) recommends reducing the daily intake of free sugars to less than 10% of the total energy intake for adults and children¹⁷. In this context, the food industry has a key role to deliver a satisfying taste when reducing sugar in foods and beverages.



Yeast extracts are an interesting solution to reduce sugar when incorporated in sweet recipes. They help to bring out and balance the aromatic notes of ingredients such as eggs, vanilla... They also subtly **reveal roasted flavors, malted, cocoa or cereals.** The intensity of these flavors allows food manufacturers to develop tasteful products while **reducing up to 30%** sugar and maintain the overall taste balance of many products such as cookies, sweet sauces like ketchup. For food manufacturers that chose to add sweeteners in their recipes, and especially in “no sugar beverages”, metallic taste or licorice can be highlighted with such ingredients. In this case yeast extract is also useful to **mask undesirable notes.**

Fat reduction

Lipids are essential components of a living cell. However, a high fat intake can lead to obesity increasing risks of heart diseases. In 2016, 39% of the world’s adult population were overweight (1.9 billion adults) and 650 million of these were obese. Worldwide obesity has tripled since 1975¹⁸. Regarding fats, the main goal for food technologists is the reformulation of products to reduce fat content while preserving gustative properties, texture, pleasure and shelf life.



Yeast extracts are an interesting solution to recover a lingering effect and roundness in low-fat foods. They provide a **sensation of mouthfulness and smoothness** and give a richer, fuller and stronger taste, allowing a **fat reduction up to 30%.**

For example, in a low-fat peanut butter, yeast extract will intensify fatty flavor: all without compromising the flavor of the recipe.

Clean label

Yeast extract comes from fresh baker’s or brewer’s yeast and has therefore a natural origin. It is used in very small quantities, similar to spices and seasonings. Generally less than 1% is enough to obtain a result because its taste is intense: in the list of ingredients, yeast extract is almost always at the end (the ingredients are ranked in descending order¹⁹).

Moreover, its production is carried out without adding any chemical molecule.

Yeast extract is a natural and simple flavoring ingredient, like herbs and spices are applied by cooks to create recipes.

Unlike chemical glutamate or MSG, it is not an additive: **the packaging of products containing yeast extract can announce “without additives”.**

18. World Health Organization, fact sheet on obesity and overweight, Oct 2017 / 19. According to: Regulation (EU) No 1169/2011 of the European Parliament and of the Council, article 18, available here: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011R1169&from=en> - US Food & Drug Administration, Code of federal regulations, title 21, available here: <https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcr/CFRSearch.cfm?r=101.4>

A close-up photograph of a woman with long, wavy blonde hair smiling and looking down at a skewer of food. She is holding a glass of dark red wine. To her right, a man with dark hair is also smiling and looking at the skewer. The background is a blurred outdoor setting with green foliage. A semi-transparent white rectangular box is overlaid on the center of the image, containing text.

#4
Biospringer
is an expert of
yeast extract

Biospringer is a key player and global producer of yeast extracts. As a matter of fact, it relies on Lesaffre's 165 years of expertise and know-how in yeasts and fermentation.

Today, 1 bread out of 3 is made with Lesaffre yeast and more than one billion people across the world consume food made with Lesaffre's yeast products every day.

With eight production plants (France, United States of America, Brazil, China (PRC), Republic of Serbia), a commercial team across Europe, Middle East, Africa, America, Asia and Oceania, a worldwide network of Culinary Centers, a team of technologists and R&D, **Biospringer brings taste and pleasure to customers.**

Our technical expertise

Thanks to Lesaffre technical expertise on yeasts, Biospringer has developed a **strong knowledge on fermentation and breakage of yeast cell.**

Indeed, Biospringer R&D center is composed of **20 scientists fully dedicated to yeast extract**, who are part of a strong Lesaffre R&D team of 570 experts worldwide. These scientists actively work on strain selection and parameters of yeast cell breakage to provide the best taste options and sensory properties to the customer.

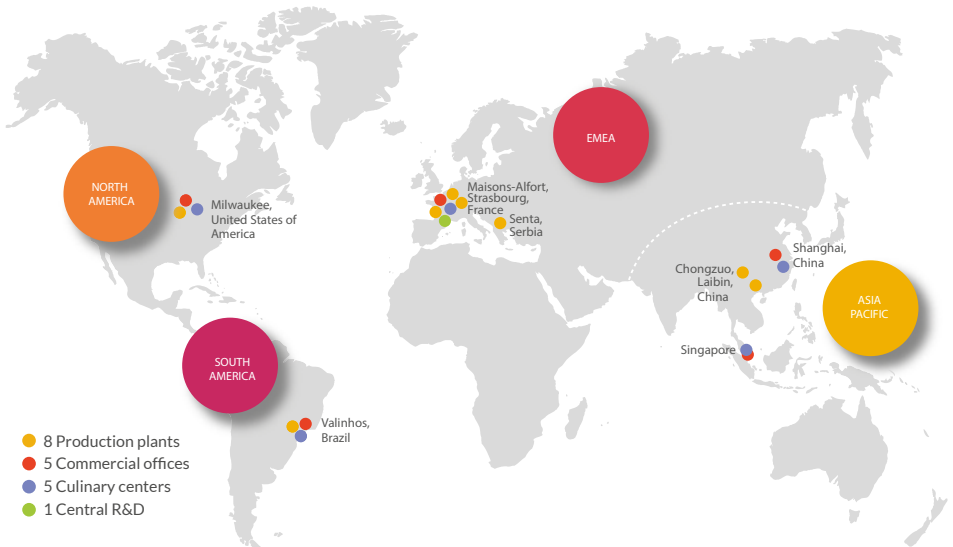
This expertise also lies in a sensory laboratory, a branch of the R&D department dedicated to the sensory analysis and taste properties of Biospringer's products. These specialists monitor potential opportunities brought by yeast extract in terms of taste and develop scientific sensory profile of our products.

Expert on taste building

By providing close technical assistance, the Culinary Center builds strong and reliable partnerships with Biospringer's customers. Our team of food product experts is dedicated to **find technical solutions** with Biospringer's natural and vegan yeast products. They initiate **new product development and implement innovations** relating to customers' needs: taste improvement, healthier formulations, clean label solutions... Studying the solutions for today and tomorrow is the main goal of those experts.



Local teams worldwide





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