

EAT 
functional

YASO®
TECHNOLOGY



GROWING DEMAND FOR HEALTHY, SUSTAINABLE, AFFORDABLE, AVAILABLE PLANT BASED FOOD

New eating trends like “the healthier the better” and consumption of plant-based proteins are widespread rapidly. The plant-based (meat, dairy) alternatives food segment provides a brilliant opportunity for companies where the demand is much higher than the supply with little competition.

YASO®

TECHNOLOGY

YASO® is a novel, premium quality whole product from sprouted soybean. It has the highest nutritional value among all existing soya derivatives on the market and contains high quality complete proteins. The technology is the world's first high yield, industrial-scaled sprouting process of soybean with unique patented composition.

Based on favorable composition and nutritional benefits of YASO® different functional foods can be developed. These value-added premium products are not only nutritious, natural, and fit into a sustainable and healthier future but also the highest quality ones on the market offering unbeatable price for value.

HEALTHY – UNIQUE NUTRITIONAL VALUE AND HEALTH BENEFITS

Increasing health consciousness among consumers and rising vegan population is driving the sprouted grains and seeds market. Every day new products are launched in the sprouted grains and seeds category owing to their high demand.

SUSTAINABLE – LOWER ENVIRONMENTAL FOODPRINT

Industrial animal-based protein production is not sustainable anymore due to its negative effects on the environment. Meat-equivalent protein production can be done by using ten times less water to produce eight times more protein.

AFFORDABLE – COST ADVANTAGE

For fighting the increasing food prices YASO® enables producers to offer meat-equivalent nutrition value for half of the cost of regular protein sources. YASO® can be easily introduced in more than 20 different product categories tailored for any market, and our functional food solution uses resources with the highest efficiency.

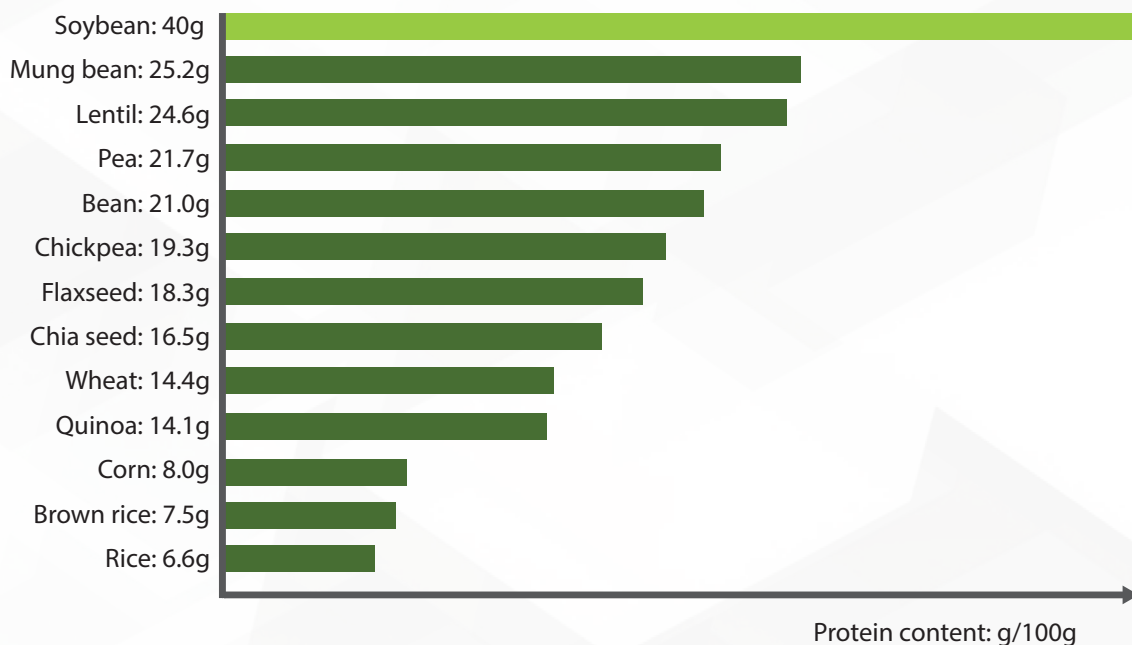
AVAILABLE – FOOD SECURITY

Food security is an emerging challenge worldwide. It becomes harder and harder to provide sufficient and accessible food for everyone. Soybean is storable for a year. It is still relatively easily accessible from the market. YASO® technology eliminates all issues around human consumption of soybean-based food. YASO® is an ideal raw material in most of the segments of food industry and YASO® as a raw material or YASO® based ready meal that offers meat equivalent protein source can be stored for years providing the opportunity to dramatically reduce vulnerability caused by today's hectic global food supply chain.

SOYBEAN AS AN IDEAL RAW MATERIAL – ADVANTAGES AND CHALLENGES

HIGHEST PROTEIN CONTENT

Protein is essential to human health. The special position of soybean among vegetable protein sources is based on the facts that it is **the only available crop that has 40% high quality protein in comparison to any other grains and seeds.**



1 Figure: Protein content of different seeds and grains: g/100g

HIGHEST QUALITY PROTEIN

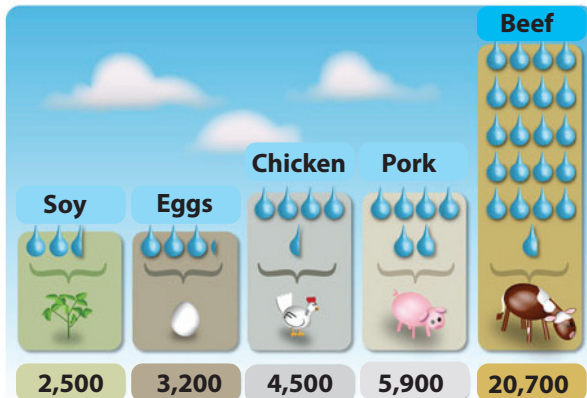
Different sources of protein vary in their ability to provide us with the essential amino acids we need for growth and repair (the human body cannot synthesize these amino acids). Animal sources, and only plants like **soy** and quinoa, **provide the full range of essential amino acids needed by humans** in sufficient quantity.

COMPETITIVE PRICE

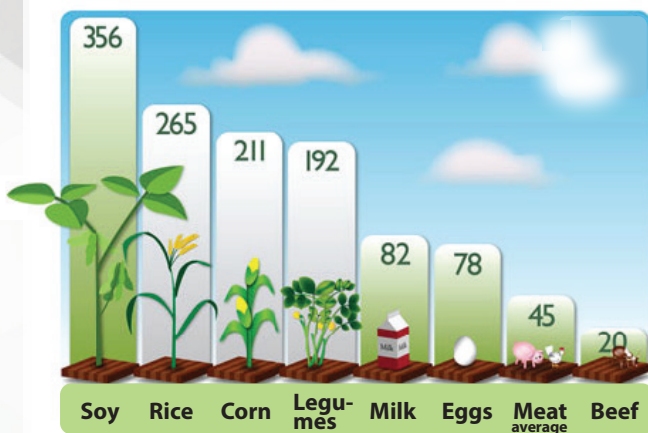
Thanks to the advantages composition of soybean, it is perfect **meat alternative at affordable price**. Soybean is cheaper protein source than meat, poultry, and eggs.

SUSTAINABLE PROTEIN SOURCE

Soybean is sustainable protein source. One of the reasons soybean is widely cultivated is that it contains more protein per acre of land than any other crop. Production of protein from soybean uses less water than similar processes with animal sources. It is the world's most efficient, abundant, and cost-effective protein source.



2 Figure: Water demand of equal amount of protein (Gallons per month); virtual water trade to Japan and in the world, T. Oki, M. Sato, A. Kawamura, M. Miyake, S. Kanae and K. Musiake



3 Figure: Protein production from equal size of land (Lbs); USDA; FAO/WHO/UNICEF Protein Advisory Group (2004)

FOOD SECURITY:

EASY ACCESS, EASY STORAGE

Food security is more than just ensuring there is enough food to eat. It is also about the quality of the food and the reliability of global food supply. Rise in climate change and global population and even **supply chain disruptions** such as those experienced in the **pandemic or caused by the Russo-Ukrainian War** ensuring food security is of critical importance.

YASO® as a solution:

- The raw material, soybean can be either locally produced or easily purchasable on the world market. It can be stored for a year (harvest to harvest).
- YASO® can be locally produced out of soybean as a raw material and can be easily stored for years.
- YASO® thanks to its favourable composition can be used as a meat substitute.
- YASO® can be produced in any location even in metropolitan areas in any climate and geographical location, while animals can be raised mainly in rural environment that offers proper circumstances.
- It is more efficient than animal protein production. The protein production circle can be shortened significantly (no inefficiency due to feeding animals first with plant protein with a low conversion rate to animal-based protein).
- Thanks to the germination process YASO® eliminates all issues that prevented wider range soy based human food production so far.
- YASO® has reduced allergenicity compared to soybean.

CHALLENGES AND OPPORTUNITIES OF HUMAN CONSUMPTION OF SOYBEAN-BASED PRODUCTS – SPROUTING AS A PERFECT SOLUTION

Despite the numerous advantageous properties of soybean its **human consumption is limited by the presence of antinutritional factors** (naturally occurring metabolites that the plant produces to protect itself from pest attacks) like trypsin inhibitors, phytic acid, lectins and stachyose.

These antinutritive factors, which are also presented in other legumes, are responsible for:

- causing mineral deficiencies when consumed in large quantities. Phytic acid and lectins prevent the absorption of iron, zinc, and calcium.
- reducing digestion and absorption of dietary proteins. (trypsin inhibitors)
- causing bloating. Stachyose is responsible of flatulence causing effect.

Standardized controlled sprouting process

overcomes the above disadvantages. Thanks to germination and heat treatment of YASO® technology trypsin inhibitors are fully inactivated, lectins partially hydrolyzed, heat inactivated and dissolved, while stachyose are dissolved and leaked out.

Sprouted soybean has been consumed for thousand years in the Far East, but **before YASO® industrial scale production was not solved.**



First YASO® production plant Hungary

UNIQUE, PATENTED, INDUSTRIAL SCALE, CONTROLLED AND OPTIMISED SPROUTING TECHNOLOGY FOR SOYBEANS

It is **well known to sprout various grains and seeds** on an industrial scale in the food industry, **except soybeans**. This conventional sprouting method is not suitable for sprouting soybean, because the sprouting percentage is very low, and the sprouting process easily undergoes undesired fermentation process (e.g., putrefaction) at higher layer thicknesses. Therefore, sprouted soybeans cannot be found in the market, while a wide variety of other seeds are available like mung bean, lentil, chickpea, chia seed, flax seed etc.

An effective industrial solution has been developed to solve the problem that is suitable for large scale production based on **maximized sprouting ratio and minimized sprouting surface**.

Based on this technology other seeds and grains can be also effectively sprouted.



SOYBEAN



**INDUSTRIAL SCALE
SPROUTING PROCESS**



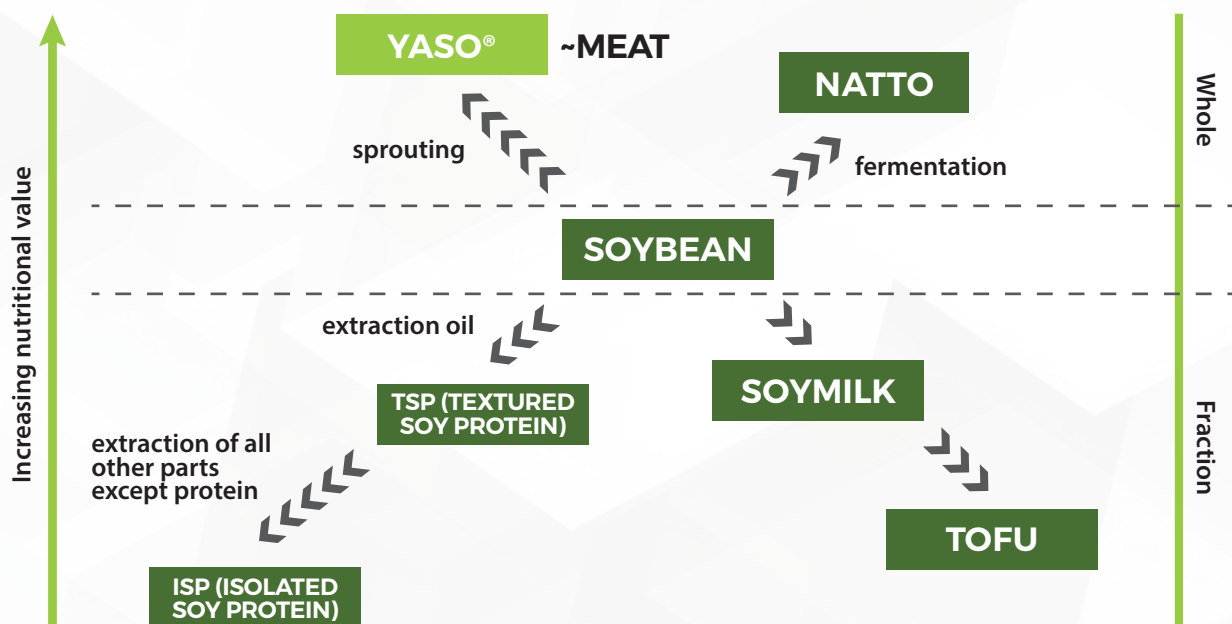
**IMPROVED
QUALITY PRODUCT**

Industrial scale sprouting

WHAT IS YASO® ?

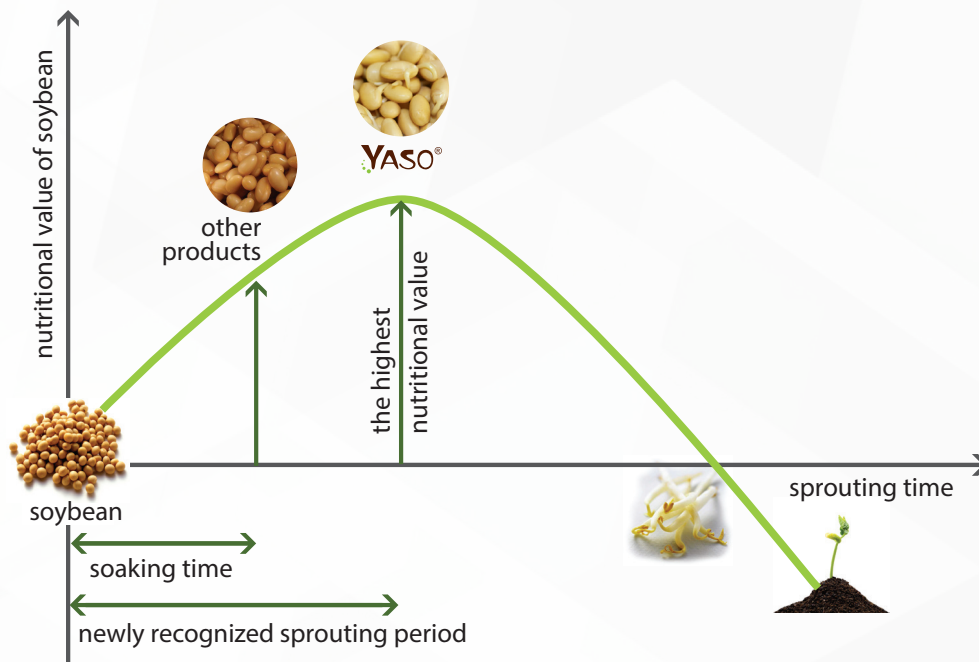
YASO® specially sprouted soybean, is a patented breakthrough in whole soybean processing for the food industry! It is a new premium raw material made from the highest quality non-GMO soybean. Thanks to the germination process YASO® has the highest nutritional value among soy products.

It brings a completely new dimension to the use of soybean in food manufacturing. The creators of YASO® have combined the unique nutritional composition of soybean, the health advantages of sprouted foods, and the demand of large-scale processing.



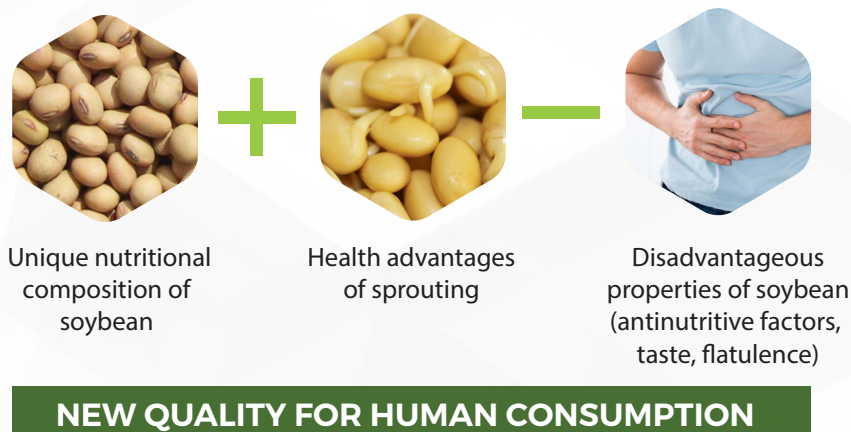
4. Figure: Positioning of YASO®

Analysing the nutritional composition of the soybeans throughout the germination process, we have **determined the point at which maximum nutritional density is achieved.** By arresting the sprouting process at this peak, these nutrients are retained, offering a unique, nutrition-packed form of soybean to the food industry (Figure 5).



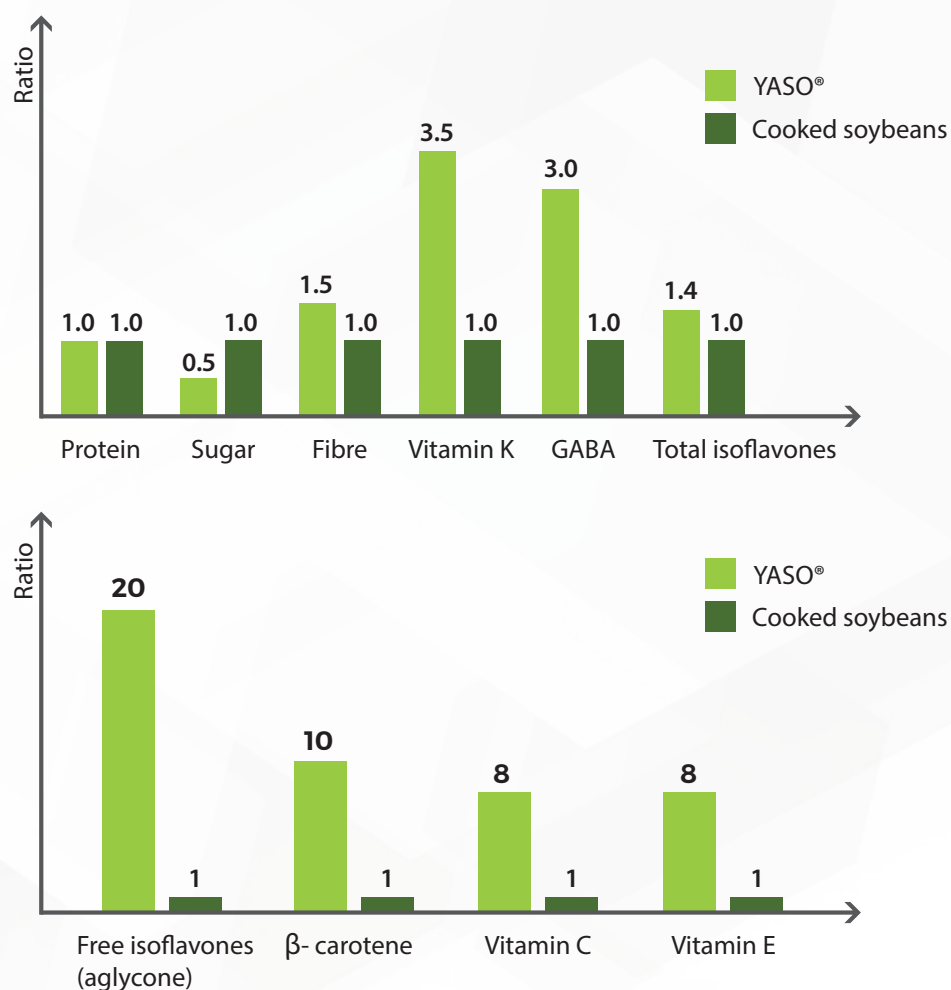
5. Figure: Correlation between sprouting time and nutritional value

The process of germination **enhances the nutritional advantages of soybean but eliminates the disadvantageous properties** (antinutritive factors, taste, and flatulence).



The sprouted soybean becomes a rich source of **highly digestible complete protein, omega-3 fatty acids and fibre** combined with **low levels of carbohydrates**. As a result of sprouting it has **increased vitamin (C,E,K) and mineral, free isoflavonoids, GABA and antioxidant** content compare to soybean (Figure 6). It is easier to digest, has increased nutrient absorption, and causes no flatulence. It has better taste because free amino acids like glutamic acid (umami taste), alanine and aspartic acid increased significantly thanks to germination. It is well suited for specialist diets, particularly for healthy aging and weight loss management.

The scientific background of sprouting was developed with the collaboration of Budapest University of Technology and Economics, Department of Applied Biotechnology and Food Science. (Wageningen Academic Publisher, 2016 Review).



6. Figure: YASO® nutritional value compared to cooked soybean

SPROUTING	
INCREASES*	REDUCES*
<div>1</div> <div>NUTRIENT ABSORTION IRON, MAGNESIUM, ZINC</div> <div></div>	<div>7</div> <div>ANTINUTRIENTS & PHYTIC ACID, TRYPSIN INHIBITOR, HEAMAGGLUTININ</div> <div></div>
<div>2</div> <div>VITAMIN A, B, C, K</div> <div></div>	<div>8</div> <div>CARBOHYDRATE (NO FLATULENCE)</div> <div></div>
<div>3</div> <div>MAKES EASIER TO DIGEST</div> <div></div>	<div>9</div> <div>ALLERGENS -40%</div> <div></div>
<div>4</div> <div>PROTEIN AVAILABILITY</div> <div></div>	
<div>5</div> <div>FIBRE CONTENT</div> <div></div>	
<div>6</div> <div>TASTE</div> <div></div>	

*compared to soybean

7. Figure: Why sprouting?

YASO® AS AN UNIVERSAL, HEALTHY, SUSTAINABLE, AFFORDABLE AND AVAILIABLE RAW MATERIAL - UNLIMITED POTENTIAL IN EVERY SEGMENTS OF FOOD INDUSTRY

The new product, YASO® is sprouted and cooked or uncooked whole soybean, available ground, or whole, pale cream-coloured with neutral or nutty flavour for industrial use.

It has a wide range of application possibilities; it can be used in every segment of food industry.



WHOLE



GROUND



YASO® reference products

HEALTHY, VALUE-ADDED, NEW PRODUCTS

YASO® is a perfect raw material for Free-from foods, Lactose free, Gluten free, Better for you products, Naturally healthy products, Foods with health bonus.



PLANT-BASED ALTERNATIVES

YASO® perfectly suits into plant-based nutrition that directly replaces animal products, thanks to its favorable composition similar to meat.

Plant-based alternative products on the market are containing mainly non-sprouted ingredients. Using sprouted soybean instead of non-sprouted lentil, mung bean, chickpea, etc. has many advantages:

- its protein content is double than other seeds
- the protein composition and quality is similar to that of meat (it contains all 9 essential amino acids) other seeds and grains doesn't contain complete proteins one or more essential amino acids are missing from them, so several seeds must be combined to achieve same composition
- it is easier to digest (pre-digested protein),
- doesn't cause flatulence
- higher vitamin and mineral content
- better utilization of vitamins, minerals etc.
- better taste

YASO® IS PERFECT PROTEIN SOURCE FOR MALNUTRITION

- top quality meat substitute at affordable price (half price of meat)
- top quality sustainable protein source for feeding scheme (FAO, WHO etc.)
- locally produced
- improving nutrition and food safety

YASO® BASED NOVEL REFERENCE PRODUCTS

Several new, premium qualities, value-added, YASO® based healthy food product lines have been developed with high protein content as reference products corresponding to the market demands and trends.

YASO® is suitable for

PLANT BASED PRODUCTS WITH SPROUTED SOYBEANS

- Tofu
- Vega burger
- Vega bites
- Meat free sausage
- Pate
- Ready to eat products
- Soybeans in tomato sauce
- Roll
- IQF (Individually Quick Frozen) soybeans

DAIRY FREE PRODUCTS WITH SPROUTED SOYBEANS

- Tofu
- Soymilk
- Yoghurt

GLUTEN FREE PRODUCTS WITH SPROUTED SOYBEANS

- Gluten free crackers
- Gluten free crisps
- Gluten free roasted protein snack
- Gluten free vitality blend
- Gluten free porridge
- Gluten free pasta

HEALTHY MEAT PRODUCTS WITH SPROUTED SOYBEANS (PARTIAL MEAT REPLACEMENT)

- White sausage with meat
- Grill sausage with meat
- Burger and bites with meat
- Smoked dry sausage with meat
- Other products with meat

NOTES AND SOURCES

SCIENTIFIC BACKGROUND OF SOYBEAN SPROUTING

Bartalné-Berceli M., Izsó E., Gergely Sz., Jednákovits A., Szilbereky J. and Salgó A.: Sprouting of soybean: a natural process to produce unique quality food products and additives.

Quality Assurance and Safety of Crops and Foods, 8(4):519-538. 2016 Wageningen Academic Publishers, Review Article

This review summarizes the general physiological and compositional changes that occur during the germination process in soybean. The benefits of a strictly controlled short-term germination process and the potential of an innovative sprouting procedure are discussed. The patented germination technology provides the highest quality soybean product as a raw material, which can be used in a wide range of food industry.

MONITORING OF SOYBEAN GERMINATION PROCESS

Bartalné-Berceli M., Izsó E., Gergely Sz., Salgó A. (2022): Monitoring of soybean germination process by near-infrared spectroscopy.

Acta Alimentaria (online first) DOI: 10.1556/066.2021.00232

The germination process was monitored with near-infrared spectroscopy (NIR) based on changes in the amount, status, or character of the water. NIR spectroscopic measurements combined with sophisticated chemometric methods are capable of detecting and monitoring complex physiological processes such as germination in real-time.

NOVEL, VALUE-ADDED BREAD PRODUCT WITH YASO®

Bartalné-Berceli M., Izsó E., Gergely Sz., Salgó A. (2018): Development and application of novel additives in bread-making.

Czech Journal of Food Sciences, 36(6): 470–475.

Novel, value added bread product was developed using YASO® with improved nutritional value (higher protein, dietary fibre) and with the same sensory properties compared to control bread in industrial scale.

RHEOLOGICAL PROPERTIES OF YASO® CONTAINING BREAD PRODUCTS

Bartalné-Berceli M., Izsó E., Gergely Sz., Salgó A. (2021): Effects of special additives in wheat dough system measured by Mixolab technique.

Czech Journal of Food Sciences, 39(6): 460-468.

YASO® in grinded form was tested in bread dough systems in three different concentrations (10, 30, and 50 %). Rheological differences were sensitively detected by the Mixolab technique in the mixed dough. Based on Mixolab curves, optimal level of Yaso was detected as 30%.

LICENSE FOR USING OUR TWO PATENTED TECHNOLOGIES

1. Soya bean food product and compositions comprising there of EP Patent No: EP 2 358 219
2. A novel raw material for Functional Foods and process for the preparation thereof EP Patent No: EP 2 908 664

EXPERTS ON THIS TOPIC



**PROF. DR. ANDRAS SALGO,
DSC,
PROFESSOR EMERITUS**

- Former head of Department of Applied Biotechnology and Food Science, Budapest University of Technology and Economics
- 48 years experience in education and research in food science
- More than 150 scientific articles, 2000 citations, Hirsch index=22



**DR. JENO SZILBEREKY,
PHD**

- Chemical engineer and pharmaceutical researcher
- Significant experience in research, product development, commercialization of products and innovative company management
- Owner of Sinnex Ltd. a producer of natural health products
- 21 scientific publications, 34 patent and patent applications



**DR. ANDREA JEDNAKOVITS,
PHD**

- Pharmacist and pharmaceutical researcher
- She directed the research and development activity of Biorex pharmaceutical research company.
- Expert in research coordination, product development and IP
- 21 scientific publications, 15 patents



**DR. JANOS ADAM,
PHD**

- Plant production and plant physiology expert with over 10 years of professional experience
- Horticultural Engineer, Expert in Plant Protection, with a PhD from Crop and Horticulture Science
- Vertical farm technology specialist, experienced project manager in the fields of R&D, innovation and AgriTech
- Experienced in food safety and food security topics and quality systems

ABOUT EATFUNCTIONAL

EATfunctional is created by seasoned researchers, entrepreneurs, and professionals to revolutionize food industry with making available the benefits of breakthrough patented technologies developed by two of our funders.

The first technology is industrial-scale high yield sprouting process of soybean (YASO®), pulses, and seeds. This solution can create healthy, sustainable, and affordable new plant-based protein source that eliminates all the issues around human consumption of traditional soybean-based food.

The second technology enables us to incorporate any Biological Active Ingredients (BAI) (vitamins, minerals, antioxidants, L-carnitine etc.) into sprouted seeds (wheat, rice, corn, legumes etc.) in optimal amount. This way food producers can create novel functional food lines to reduce disease risk for specific groups of consumers.

We are offering the technologies and the knowledge we accumulated over the past decades for food industry players and can support them to introduce exciting high business potential new product lines that are addressing the latest trends of the industry. We are also looking for partners who are representing us in certain markets.

For more information, contact us on info@eatfunctional.eu or visit our website: www.eatfunctional.eu

