Professional Certificate in Tempeh Fermentation and Food Safety

Introduction to Tempeh Fermentation

Tempeh is a traditional fermented soy food originating from Indonesia. It is made by culturing whole soybeans with the fungus Rhizopus oligosporus under controlled conditions. The fermentation process not only imparts a unique nutty flavor and texture to the soybeans but also significantly enhances their nutritional value. This introduction to tempeh fermentation will cover key terms and vocabulary related to the process, including:

Soybeans: The primary ingredient in tempeh, soybeans are a rich source of plant-based protein, fiber, and various essential nutrients.

Rhizopus oligosporus: The fungal culture used to ferment soybeans into tempeh, Rhizopus oligosporus is a filamentous fungus that grows rapidly and produces enzymes that break down soybean proteins and carbohydrates during fermentation.

Inoculation: The process of adding the fungal culture to soybeans to initiate fermentation.

Inoculum: The fungal culture used for inoculation, typically prepared as a spore suspension.

Spore suspension: A solution containing fungal spores, used to inoculate soybeans for tempeh fermentation.

Fermentation: The metabolic process by which Rhizopus oligosporus breaks down soybean proteins and carbohydrates to produce enzymes and other metabolites, resulting in the transformation of soybeans into tempeh.

Tempeh starter: Another term for the inoculum, consisting of a Rhizopus oligosporus spore suspension used to inoculate soybeans.

Fermentation temperature: The temperature at which tempeh fermentation occurs, typically ranging from 28-32°C (82-90°F).

Fermentation time: The duration of tempeh fermentation, typically ranging from 24-48 hours.

Fungal mycelium: The network of fungal filaments (hyphae) produced by Rhizopus oligosporus during fermentation, which binds soybeans together and forms the distinctive tempeh structure.

Whole soybean tempeh: A type of tempeh made using whole soybeans, resulting in a firm, nutty texture.

Ground soybean tempeh: A type of tempeh made using ground soybeans, resulting in a softer, more

crumbly texture.

Tempeh cake: The final product of tempeh fermentation, consisting of whole or ground soybeans bound together by fungal mycelium.

Curing: The process of allowing tempeh to age for several days after fermentation, enhancing flavor and texture.

Vacuum-packaging: A method of packaging tempeh under vacuum to extend shelf life and prevent contamination.

Modified atmosphere packaging (MAP): A method of packaging tempeh in a controlled atmosphere, typically consisting of a mixture of carbon dioxide and nitrogen, to extend shelf life and prevent contamination.

Tempeh safety: Ensuring the safety of tempeh by preventing contamination with harmful bacteria or molds during fermentation and storage.

Tempeh quality: Ensuring the quality of tempeh by maintaining optimal fermentation conditions, preventing contamination, and monitoring the development of fungal mycelium.

Tempeh processing: The series of steps involved in transforming soybeans into tempeh, including soaking, cooking, inoculation, and fermentation.

Soybean soaking: The process of soaking soybeans in water prior to cooking and fermentation.

Soybean cooking: The process of cooking soybeans prior to inoculation, typically by boiling or steaming.

Tempeh inoculation: The process of adding the Rhizopus oligosporus spore suspension to soybeans to initiate fermentation.

Tempeh fermentation: The process of culturing soybeans with Rhizopus oligosporus under controlled conditions to produce tempeh.

Tempeh aging: The process of allowing tempeh to age for several days after fermentation, enhancing flavor and texture.

Tempeh packaging: The process of packaging tempeh for storage and transportation, typically using vacuum-packaging or modified atmosphere packaging.

Tempeh storage: The process of storing tempeh in appropriate conditions to maintain quality and safety.

Tempeh handling: The process of handling tempeh during processing, packaging, and storage to prevent contamination and maintain quality.

Tempeh contamination: The presence of harmful bacteria or molds in tempeh, which can result in spoilage or foodborne illness.

Tempeh spoilage: The degradation of tempeh due to the growth of harmful bacteria or molds.

Foodborne illness: Illness caused by consuming contaminated food, including tempeh.

Tempeh microbiology: The study of the microorganisms involved in tempeh fermentation, including Rhizopus oligosporus and other bacterial and fungal species.

Tempeh mycology: The study of the fungal species involved in tempeh fermentation, particularly Rhizopus oligosporus.

Tempeh biochemistry: The study of the biochemical changes that occur during tempeh fermentation, including the production of enzymes and other metabolites.

Tempeh sensory evaluation: The assessment of tempeh quality based on sensory attributes, such as appearance, texture, flavor, and aroma.

Tempeh nutritional value: The nutritional content of tempeh, including its protein, fiber, and essential nutrient content.

Tempeh functional properties: The functional properties of tempeh, such as its water-holding capacity, emulsification, and gelation properties.

Tempeh food applications: The use of tempeh in various food products, such as tempeh burgers, sausages, and stir-fries.

Tempeh market potential: The potential for tempeh as a commercial food product, including its potential for growth and expansion in different markets.

Tempeh production scale-up: The process of increasing the production of tempeh to meet commercial demand.

Tempeh production cost: The cost of producing tempeh, including the cost of raw materials, processing, packaging, and storage.

Tempeh production efficiency: The efficiency of tempeh production, including the optimization of processing steps and the reduction of waste.

Tempeh sustainability: The sustainability of tempeh production, including the environmental impact of soybean cultivation and the use of renewable energy sources.

Tempeh innovation: The development of new tempeh products and processing techniques, including the

use of alternative protein sources and the incorporation of functional ingredients.

Tempeh consumer education: The education of consumers on the benefits of tempeh, including its nutritional value, food applications, and sustainability.

Tempeh industry standards: The establishment of industry standards for tempeh production, including quality control, safety, and labeling requirements.

Tempeh regulations: The regulation of tempeh production, including food safety and labeling requirements.