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FORMULATION AND FERMENTATION OF WHEAT – GREEN PEA BREAD USING *Lactobacillus Plantarum:* A FUNCTIONAL FOOD APPROACH

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ABSTRACT

Bio preservation is the one of the notable techniques used as an alternate source for chemical preservatives. Some of the foods have short self life and some have long. Therefore, spoilage controlling of foods are mostly critical for food industries. Bio preservation makes a solution to solve these issues. It includes microbes as a bio preservative. Some of them also helps to increase the nutritional value as well as the shelf life. Most of the beneficial microbes such as *lactobacillus, E. coli,* etc. can improve the gut health and act as a normal flora for humans. *Lactobacillus sps,* are mostly used for food preservation as it produces a component named bacteriocin, it increases the shelf life of the food. The collaboration of green peas, wheat flour with lactobacillus can form as a nutritional food which was both benefits for gut health and other vitamins and minerals. It also acts as a snack which had more shelf life. Green peas had more nutritious value and it contains minerals such as potassium, calcium and also rich in vitamin C and other antioxidant properties. It mostly supports the cardiovascular functions. Wheat flour is also a dietary food which had more number of proteins and fibers and also have some phytochemical properties. The fusion of these things can be more beneficial for human especially for diabetic patients.

Key words: *Lactobacillus sps*., Bacteriocin, Green pea, Wheat flour, Bio preservative, Dietary food.

INTRODUCTION

Cereal-based fermented products are worldwide food resources. Essential for human nutrition, since they are an important source of protein, dietary fibers, carbohydrates, as well as micronutrients (Guyot, 2012). In the last years, functional fermented non-dairy foods/beverages from cereal origin are globally gaining in interest (Leroy and De Vuyst,2014) in reason of the versatility in answering to the major trends in food consumption (vegetarian, vegan, low-fat, low-salt). However, contamination with spoilage filamentous fungi remains a major threat for the cereal-based market. Losses of food due to fungal spoilage are difficult to estimate (Pitt and Hocking, 2009).

The most common contaminant molds responsible for spoilage of cereal matrices belong to the Genera *Penicillium*, *Fusarium*, *Aspergillus*, *Cladosporium*, and *Rhizopus*. In General, the control of filamentous fungi in the food industry relies on Physical and chemical treatments. In the last years, eco-friendly preservatives' approaches have been emerging, including the employment of Lactic acid bacteria (LAB) with antifungal properties. Due to their large Safe history of use for food fermentations, LAB can be deliberately added into the food chain, suggesting that they could be integrated into food systems as natural food preservatives (Oliveira *et al.,* 2014;Pawlowska *et al.,* 2012).

In the production of bread, the temperatures reached during the baking stage destroy the fungal vegetative forms, but some of the spores are resistant to this treatment and grow in the final product. In addition, post preparation practices lead to an increasing contamination of the bread (Cizeikiene *et al*., 2013; Jideani & Vogt, 2016)

Furthermore, the adaptability of *Lactobacillus plantarum* to cereal–legume matrices make it particularly suitable for novel bakery formulations like wheat–green pea bread. Its robust metabolic capacity allows it to ferment complex carbohydrates and proteins, generating beneficial compounds such as exopolysaccharides, peptides, and phenolic metabolites. These compounds not only contribute to bread softness, volume, and sensory quality but also enhance its functional value by exhibiting antioxidant and immuno modulatory properties. Importantly, the antimicrobial action of *L. plantarum* against molds and spoilage bacteria addresses one of the major challenges in bakery products, where fungal contamination often limits shelf life. Thus, incorporating *L. plantarum* as a starter or co-culture offers a dual advantage of improving both the technological quality and the bio-preservative potential of wheat–green pea bread.

COMPARISON BETWEEN *Lactobacillus plantarum* AND LACTIC ACID BACTERIA:

HABITAT AND VERSATILITY:

L. plantarum: Found in a wide range of environments – fermented foods (vegetables, dairy, cereals, meat), plant surfaces, and even the human gastrointestinal tract. It adapts well to different ecological niches.

Other Lactic acid bacteria (e.g., *Lactococcus lactis, L. delbrueckii, Pediococcus, Streptococcus thermophilus*): Often more -specific, e.g., dairy-associated or limited to certain fermentations.

METABOLISM:

L. plantarum: Facultative heterofermentative – can ferment both hexoses (producing mainly lactic acid) and pentoses (producing lactic acid, acetic acid, or ethanol).

Other LAB: Many are obligate homofermentative (e.g., *L. delbrueckii* → mainly lactic acid) or obligate heterofermentative (e.g., *Leuconostoc* → lactic acid, CO_2, ethanol).

STRESS TOLERANCE:

L. plantarum: High tolerance to acidic conditions, salt, bile, and oxidative stress; survives harsh environments better than many LAB.

Other LAB: Often more sensitive to oxygen, pH changes, and bile salts.

PROBIOTIC POTENTIAL:

L. plantarum: Widely studied for probiotic effects—gut colonization, antimicrobial production (bacteriocins like Plantaricins), immunomodulation, cholesterol lowering.

Other LAB: Some species (e.g., L. *rhamnosus, L. casei, L. acidophilus)* are probiotic, but many LAB strains (e.g., *Lactococcus, Leuconostoc*) are not gut associated.

ROLE IN FERMENTATION:

L. plantarum: Contributes to shelf-life extension, flavor development, and nutritional enhancement in a wide variety of plant- and cereal-based fermentations.

Other Lactic acid bacteria: often restricted to dairy fermentations (e.g., yogurt, cheese), meat fermentations, or wine/beer fermentations.

CONCLUSION:

The application of *Lactobacillus plantarum* in the biopreservation of wheat–green pea bread represents a promising strategy to enhance microbial safety, extend shelf life, and reduce dependence on chemical preservatives. Understanding its mechanisms of action and potential benefits provides valuable insights for the development of clean-label, nutritionally enriched bakery products that meet consumer expectations for both quality and safety.

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