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Postbiotics from Indigenous foods: An Emerging Opportunity for Agricultural Value Addition

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Introduction

Agriculture does not cease when the crops are harvested. Overall quality of a crop in terms of nutritional and functional point of view depends on how they are processed, fermented and turned into food products. In India, numerous meals have developed through fermentation using microorganism that are either naturally occurring or purposefully produced. These foods are mostly made of locally cultivated fruits, vegetables, cereals, pulses, and other agricultural resources. The biological products produced during these processes are presently being studied by modern nutrition science. This has raised the awareness to "Postbiotics", a new category within a broader category of "biotics". According to the consensus statement of the International Scientific Association of Probiotics and Prebiotics (ISAPP), a postbiotic is a preparation of inanimate and/or their constituents that benefits the host health. This definition is crucial because as it separates postbiotics from probiotics which need live microorganisms (Vinderola *et al*., 2022). The technological benefits of postbiotics are a contributing factor in their popularity. Postbiotic preparation may provide more stability during processing and storage than probiotic products since it is not dependent on survival of live microorganisms. While highlighting their potential uses in functional foods, preservation and health-oriented foods, recent reviews have emphasized the need for more robust clinical data and characterization (Wei *et al*., 2024). This new field may offer agricultural systems to chance to transition from primary crop production to fermentation-based processing, value addition and creation of higher value food products.

Postbiotics in context of indigenous foods

The word "Postbiotics" has previously been used inconsistently, with non-viable probiotics, heat killed probiotics, paraprobiotics and microbial metabolites. The ISAPP consensus statement stressed that postbiotics should include identifies inanimate microorganisms and/or their components along with proof of a health benefit to create a consistent scientific definition

(Salminen *et al.*, 2021). When researching indigenous fermented foods this distinction is crucial. Many compounds produced by fermentation may have biological function but not all fermentation metabolites are postbiotics. To claim that the substance is postbiotics should be backed up by appropriate terminology and supporting data. Traditional fermentation differs from standardized industrial fermentation. This is because they are often influenced by various factors such as raw materials, fermentation process, microorganisms and cultural practices.

The microbial diversity of traditional meals is particularly fascinating because various microorganisms have varying metabolic characteristics. Bacillus species are capable of substantial proteolysis and generation of enzymes and bioactive peptides whereas lactic acid bacteria can produce organic acids, bacteriocins, exopolysaccharides and other metabolites. As a result, depending on microbial community and fermentation conditions, the same food substrate may yield significantly diverse metabolic profiles (Makut *et al.*, 2026). Because of its incredibly varied indigenous food patterns, Northeast India offers a particularly intriguing environment for postbiotic research.

Fermentation techniques employing soyabeans, bamboo shoots, grains, vegetables, fish and other locally availed materials have been developed by communities throughout the region. According to recent studies, traditional fermented meals of northeast India are a varied assortment that involve intricate microbial populations. Significant microbial diversity was found in these diets according to recent reviews which emphasized the need for metabolomic, mechanistic, and safety studies (Saikia *et al.*, 2026).

Postbiotics as an opportunity for value addition in agriculture

Postbiotics are significant for reasons other than human health. Agriculture based economies get a chance to turn locally accessible agricultural resources into more valuable food products. Producers and small processing businesses may be able to create fermented goods, microbial cultures, and eventually standardized functional food product from agricultural substrates rather than only selling crop as a commodity. At various points in the food chain, this strategy might offer value. These methods are especially applicable to indigenous and underutilized crops. It aligns with a larger trend towards circular and sustainable food systems and thus agricultural resources are used more effectively. Cereals, pulses, fruits and vegetables and other agricultural commodities can act as a microbial fermentation substrate during manufacturing stage. Microbial growth and compounds produced during fermentation can be influenced by agricultural raw material. As a result, local and underutilized crops can be used as a valuable agricultural resource for innovative food product development. The potential lactic acid bacteria and indigenous fermented foods as sources for postbiotic development and functional food applications has been particularly highlighted by recent studies (Makut *et al.*, 2026). Recent research employing *Bacillus Subtilis* isolated from Hawaijar a fermented soybean food product associated with Meitei community of Manipur demonstrated α-glucosidase α-amylase inhibitory potential in fermented soyabean protein preparations revealing how local microbial strains may be investigated for metabolic functionality (Singh *et al.*, 2023).

Postbiotics and preservation of food

Food preservation is a potential field. The antibacterial qualities of several postbiotics treatments may aid in the inhibition of unwanted microbes. There is a growing interest in their possible use as natural bioprotective agents. According to recent research, certain preparations of postbiotics can have antimicrobial and antioxidant properties making them intriguing candidates for applications related to food safety and quality (Pawar *et al*., 2026). This could be very helpful for agricultural items that are susceptible to spoilage after harvest. However, before practical implications, this field has to carefully assess strain specificity, effective concentrations, food matrix interactions, sensory effects and safety.

Future prospects

The future of postbiotics depends on establishing a solid link between agricultural resources, food nutrition, and microbiology. Metabolomics, genetics, and microbiome analysis are among the advanced approaches that research scientist might use to uncover microbial alterations that occur during fermentation. By using these methods, researchers may be able to screen native microorganisms and identify the fermentation conditions that yield desired functions. Opportunities for local crop use, food entrepreneurship, the creation of functional foods, and higher value processing may arise for agricultural communities.

Conclusion

Postbiotics are an emerging link between microbial science and food innovation. Indigenous food makes a starting point of the postbiotic research as it brings together agricultural raw materials, microorganisms and centuries of processing experience. The potential for agriculture goes beyond growing more crops. It involves turning locally accessible resources into food ingredients that are safer, more valuable and scientifically validated. Postbiotic research could aid in shift by investigating the potential integration of beneficial microbial preparations produced during food processing into functional foods. Therefore, the task of the future is not just to find 'new postbiotics' but to provide a scientifically validated route from conventional agricultural food resources to verifies postbiotic constituents and beneficial food applications.

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