

# Exploring the Potential of Functional Meat Products in Northeast India

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The human race has always known that there is a critical relationship between the food we eat and our health. The adage "Food is medicine and medicine is food" is well recognized and over time, this idea has increasingly changed. Any food's primary purpose is to supply the essential elements that control our bodies' metabolisms. Nonetheless, several nutrients provide health advantages beyond just controlling metabolism. Meat being a good source of protein has several nutritional components including vital vitamins, minerals, fatty acids, and amino acids. It has significant concentrations of iron and zinc, proteins, vitamin B<sub>12</sub>, and omega-3 fatty acids. While meat is high in nutrients, it is also known to include fats like cholesterol and saturated fatty acids, which are linked to chronic illnesses including obesity, some types of cancer, and cardiovascular diseases that has also been highlighted by the medical and nutritional fields (Fernández-Gine's et al., 2005). With the passage of time, there has been an increasing demand of meat products which are not only safe and nutritious but also therapeutic containing low levels of fat, cholesterol, reduced content of sodium chloride and nitrite and updated fatty acid profile composition (Tehreem et al., 2019). Researchers, Nutritionist and Food Technologist are working towards developing functional meat products that possess natural antioxidants and antimicrobials, low fat, lesser sodium content, enriched with dietary fibres and  $\omega$ -3 and  $\omega$ -6 fatty acids (Porte and Godoy, 2008). As a result of rise in the health consciousness the demand for functional meat products has subsequently taken a sharp rise in the recent years.

## Functional meat products

By adding natural substances that are beneficial to health, conventional meat products can be improvised bringing in some unique functional propositions for the consumers. According to Zhang *et al.* (2010), the incorporated nutraceutical properties can help the body by delaying the ageing process and bolstering

the immune system's ability to fight off illnesses. The natives of Northeast India, by default have minimized the disadvantages of meat products through their traditional system of incorporating locally available herbs and spices into their cuisine. By adopting a similar approach of adding beneficial crop produces, indigenous to Northeast India, a number of commercially viable functional meat products can be manufactured, a few of which are discussed below:

1. **Functional sausage with Chinese chives:** Chinese chive (*Allium tuberosum*), also known as garlic chive, is a monocotyledonous plant belonging to the Allium genus. This herb is mostly found in Manipur, Mizoram and some parts of Meghalaya. This herb is known to be a rich source of secondary metabolites such as polyphenols, flavonoids, and sulfides (Wouters et al., 2013). Since decades, this herb is being consumed in numerous ways due to its promising health benefitting properties such as anti-oxidant, detoxification, and anticancer effects. It is also known to have sulfur-containing compounds that exhibit antibacterial (Lundegårdh et al., 2008) and anticancer (Xiao et al., 2005) properties. This herb is also considered of being very effective in inhibiting a wide range of microorganisms. Sausage incorporated with Chinese chives has proven to exhibit enhanced nutritional properties. The final meat product resulted in higher amount of vitamin A, vitamin C, minerals, and dietary fibers as compared to regular sausage. Apart from these, the storage properties of the final meat product were also enhanced resulting in longer shelf life.
2. **Functional sausage with perilla seed:** Perilla seed (*Perilla frutescent*), mostly found in Meghalaya is a kind of mint herb of the lamiaceae family. It contains omega 3 alpha linolenic acid (ALA) comprising of almost 54-64 % (Mohammad, 2011). It is proclaimed to be rich source of antioxidant components such as phenolic compounds,

flavonoids and anthocyanins Perilla seeds are also known to be useful in treatment of asthma and other seasonal allergies due to the presence of alpha-linoleic compound. In addition to these it has good antibacterial properties, lowers cholesterol, helps in slowing down the aging process, inhibits the formation of tumors, improves vision, improves brain function and reduces the possibility of having a stroke. Manufacturing of meat sausages through incorporation of perilla seeds into the product not only enhanced the sensory appeal but also magnified the functionality of the food in manifolds. The phytochemical properties of the seeds were expressed in the product as well. On analysis, sausage with perilla seeds, showed higher levels of protein and polyunsaturated fatty acids (PUFA) when compared to the general standard sausages. This high level of PUFA in the product can prove to be the sought after factor since PUFA is known to lower cholesterol level and reduce the risks associated to heart diseases, hence finding a place in the platter for people conscious of cholesterol levels and heart issues

### 3. Functional sausage with chameleon plant:

Chameleon (*Houttuynia cordata*), belonging from saururaceae family, is found in Assam, Arunachal Pradesh, Manipur, Nagaland and Meghalaya and is known to be a potential source of antioxidants. It is believed in treating diseases like cancer, coronary heart disease, anemia, diabetes, etc. Anti-inflammatory characteristics are reported to be exhibited from the essential oil present in *H. cordata*. It is also reported to exhibit anti-oxidant activity due to the presence of catechin and procyanidin B., chlorogenic acids and its derivatives. It has anti-viral activities as well, exhibited by quercetin 7-rhamnoside (Q7R), a flavonoid present in *H. cordata* (Kumar et al., 2014). Incorporation of leaves or roots of this plant after proper processing into emulsified meat products will enhance the functional and physicochemical properties of the final product. The claim was proved when leaves of chameleon plant were blended while preparation of sausage, which resulted in products that showed higher levels of total flavonoid content than that of the regular

sausage. Flavonoid is known as powerful antioxidant with anti-inflammatory and immune system benefits.

4. **Functional sausage with blood fruit:** Blood fruit (*Haematocarpus validus*) belongs to the Menispermaceae family. This fruit is abundantly available in the southern part of Assam and Garo Hills is known to have high levels of beta carotene, anthocyanin and iron content (Rahim et al., 2015). The components like carotenoids, anthocyanin and ascorbic acid act as free radical scavengers or antioxidants that quench out the toxic radicals generated inside the body due to various physiological functions. Addition of blood fruit pulp in the conventional sausage has shown to exhibit its functional properties. The final meat product was found to be enriched with beta carotene, anthocyanin, total flavonoid and high iron content. They were also found to have higher amount of fiber and ascorbic acid. These attributes confer an additional health advantage to the final functional meat product against the normal products.

5. **Functional meat product with sage:** Sage (*Salvia officinalis*) is a member of the mint family of plants and closely related to rosemary. It is a crop of Mediterranean region but found abundantly in Manipur state of India. It is locally called as lombha by the inhabitants of Manipur and used in their local dishes. It is known for its natural antiseptic, preservative and bacteria-killing abilities in meat (Miraj and Kiani, 2016). This herb blends well with meat and can be used in emulsified meat products, non-emulsified meat products and enrobed meat products. It can also be used in meat curries as well. Meat products blended with sage has enhanced physicochemical and sensory properties. Meat products incorporated with sage was found to have higher fiber content and higher essential oil content enhancing the sensory attributes of the final product. The antimicrobial properties of the herb were also found to be infused in the final product resulting in increased shelf life.

6. **Functional meat product with Schezwan pepper:** Schezwan pepper (*Zanthoxylum khasianum*)

commonly found in Meghalaya belongs to the Rutaceae family and is reported to control blood pressure, reduce risk of cholesterol accumulation and reduce rheumatism, arthritis and gastrointestinal problems. The dried seeds can be used as a flavouring agent in meat products to prepare various emulsified meat products contributing to the enhancement of the health benefits of the final product. Meat product blended with this herb resulted in unique flavor and aroma contributing to its sensory attributes. The product was found to be more palatable than the regular sausage. This herb is also known to speed up the metabolic process and burns calories more quickly.

**7. Functional meat product with bamboo shoot:**

Fermented bamboo shoot is another popular functional ingredient that can be incorporated to meat products. It is especially popular among the natives of Manipur, Mizoram, Meghalaya and Nagaland. It is known for its numerous health benefits such as aids in weight loss, reduces risk of cancer, strengthens immune system, cures snake and scorpion bites, contains significant amount of dietary fiber and is effective against respiratory disease and helps improve heart health. Pork or chicken curry can be blended with fermented bamboo shoot and retorted to prepare ready to eat retort meat products. Retort products have shelf life upto 12 months. Research shows that meat products blended with fermented bamboo shoots have enhanced physicochemical properties. The final meat products have higher amount of proteins, carbohydrates, vitamins, fibers, minerals and very low fat. Due to its unique taste and aroma, the final blended meat products have enhanced sensory attributes

**8. Functional meat product with sesame:** Sesame (*Sesamum indicum* L.) belongs to the Pedaliaceae family, the seeds of which are one of the most common ingredients in many traditional meat products prepared by the natives of North Eastern region. These seeds are nutritionally rich with important vitamins and minerals such as niacin, thiamin, Ca, P, and Fe. These seeds can be blended with pork curries to prepare numerous products. Meat products blended with sesame seeds are

found to be enriched with nutraceutical compounds such as tocopherols and phenols. These compounds are well known for its antioxidant properties helping in reducing blood pressure, cholesterol, degeneration of blood vessels, and chronic diseases. Preparation of pork with sesame seeds is a part of the traditional cuisine of most of the tribes of Northeast India. The functional attributes of sesame seeds can be tapped and catered to a larger mass by industry production of such products through application of technologies like retorting. Through repeated experiments, the viability of the nutraceuticals, present in the seed, has been confirmed for the blended meat products as well.

**Conclusions**

Incorporation of nutraceutical ingredients to meat products will not only enhance the sensory attributes, functional and physiochemical properties of the final product, but will also result in increased shelf life. The functional enhancement of the popular meat products can be a potent initiative to reduce the risk of diseases associated to meat consumption. Extensive research and a profound knowledge on functional meat products can result in proper utilization of such beneficial ingredients and development of health-oriented meat products. It will create a dynamic opportunity the processors to tailor health benefiting meat products.

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