



A Review on Pea Peel used as a Biodegradable Food Waste

Kakali Bandyopadhyay¹ | Elina Sur² | Indranil Das² | Junaid Ahmed Ansari² | Neha Basfore² | Poulami Deb²

¹Professor and HOD, Department of Food Technology, Guru Nanak Institute of Technology, 157/F, Nilgunj Road, Sodepur, Panihati, Kolkata 70011, West Bengal, India

²Department of Food Technology, Guru Nanak Institute of Technology, 157/F, Nilgunj Road, Sodepur, Panihati, Kolkata 70011, West Bengal, India

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ABSTRACT

*The pea (*Pisum sativum* L.), a commonly grown legume crop, is full of vital nutrients and bioactive substances. The pea plant's edible portion is the seed, which is frequently eaten as a vegetable or processed into a variety of foods. The pea peel, which is typically thrown away during processing, contains a sizable amount of essential minerals and phytochemicals that may be good for human health. The purpose of this essay was to present a thorough analysis of the nutritional and medical advantages of pea peel.*

Throughout the review, the protein, fibre, vitamin, and mineral content of pea peel was highlighted along with other nutritional aspects. Furthermore abundant in pea peel are bioactive substances that have been demonstrated to have health benefits, including flavonoids, carotenoids, and phenolic acids.

Keywords: Legume crop, Bioactive, Phytochemicals.

1. INTRODUCTION

One of the most significant vegetable crops with a high protein content (18 – 30) is the pea (*Pisum sativum* L) [Klupsaite, D. & Gražina, J. Legume][1]. Both frost-tolerant and cold- climate settings are suitable for pea cultivation. There are two kinds of peas dried unheroic peas and fresh or mimetic green peas [Tassoni, A., et al][2]. Pea wastes produced in large amounts during artificial processing have a significant negative impact on the terrain and can release toxic effects [Tassoni, A., et al, Vilariño, M. V., Franco][2-3]. Since they've a direct effect on manufacturing viability,

unsustainable waste disposal may also indicate large profitable consequences [Malenica, D. & Bhat,][4]. . The pea peel wastes, which make up 30 – 40 of the total weight of the peas, are freely available in large amounts [Vilariño, M. V., Franco][3]. As a result, multitudinous strategies are demanded to transfigure these wastes into precious goods with high nutritive value. These styles correspond of employing pea peel wastes as best portion and their bioactive chemicals as a natural component in foods, cosmetics, and medicinal products. As a result, we can employ these wastes in operations for high nutrition value cosmetics, drugs, and food goods.

presently, both kiddies and grown-ups enjoy having snacks in between refections. utmost crackers are prepared with incentive and thin dough. It's made from stronger flour than that used to make eyefuls. New snack foods with health benefits are in high demands [Tharanathan, R. N. & Mahadevamma][5]. Pea peel can be used in place of beast protein because it's a good source of protein. This lowers the price of the food item and is profitable for insectivores. Pea peel is used as a flavouring with high nutritive value in dry haze. It's simple to prepare and may be stored at low temperatures. also, it has a harmonious flavour that lasts for about a time [Nguyen, T. M., Phoukham][6].

There are so many studies handling with antimicrobial screening of extracts plants have been regulated [Hadrach, F.; Cherif, S.; Gargouri, Y. T.; Sayari, Sakunpak, Zouari,][7,8,9]. Present investigation on free radicals demonstrate that essential role played by reach food in antioxidants to halt Cardiovascular disorder, Carcinoma, Neurodegenerative disorder and Inflammation problems of aging cutaneous cells [Sakunpak][8]. Antioxidants is a good source of oxidative stress prevention [Jacob, J. K.; Hakimuddin, F.; Paliyath, G.; Fisher, H][10]. Different types of fruits and vegetables are helpful to deacease the risk of chronic disorders [Bhupathiraja, S. N.; Tucker, K. L. , Gorinstein, S.; Caspsi][11,12]. Bioactive compound like aromatic acids, polyphenols, iridoids, terpenoids, sterols, flavonoids present in many leaves and peels that describes the pharmaceutical activity [Nguelefack-Mbungo, P. E] [13]. The usefullness of these compounds from peels and fruits are still unknown. Peas peel used as a folk medicine in Tanisia[Slim Cherif, Faculté des Sciences de Gafsa][14].

Peas protein ranges from 244-275g/kg and starch contents ranges from 440- 462g/kg on dry basis [Hood-Niefer et al., 2012][15]. After dehulling and utilise peas peel is a best source dietary fibre and natural antioxidants. This processed peel are in high demand in various countries. By the help of centrifugation chloroplast extract canisolated from pea vine halum[Torcello-Gómez et al., 2019][16]. Another methods like soaking , germination , pasteurisation, fermentation and advance techniques namely pulse electric field or ultrasonication have presented remarkable impact on nutritional quality improvementand technical combining with

functionalproperties of peas peel [Ma et al., 2018; Melchior et al., 2020][17].

➤ COMPOSITION

Table 1. Content of Major Constituents of Ground, Sieved, and Oven-dried Pea Peel waste.

Constituents	% composition
Holocellulose	61.35 ± 4.96
Lignin	22.12 ± 3.18
Ash	4.80 ± 1.76
Moisture	3.53 ± 0.67

Data are reported as mean ± standard deviation based on the repeated trails. [Mielenz 2001][18].

2.OTHER PROPERTIES

2.1 DIETARY FIBRE

Pea hulls are a great source of dietary fibre and contain more of it than actual peas do. This fibre can assist in controlling digestion and avoiding constipation. Also, they might lower cholesterol and lower the chance of developing heart disease. Pea hull extract has a higher fibre content and a stronger capacity to block alpha-glucosidase, an enzyme responsible for the digestion of carbohydrates, than other dietary fibres, according to a study published in the Journal of Food Science and Technology. [Hemalatha, S., et al.][19].

2.2 ANTIOXIDANTS

The antioxidants flavonoids and carotenoids, which are abundant in pea hulls and may help prevent cell damage and lower the risk of chronic disease. According to a study in the Journal of Agricultural and Food Chemistry, green tea extract was outperformed by pea hull extract in terms of antioxidant activity. Another study indicated that pea pod extract has strong antioxidant activity and significantly lowers oxidative stress in cells. It was published in the Journal of Functional Foods. [Zafra-Stone, S., et al.][20].

2.3ANTI-INFLAMMATORY PROPERTY

While persistent inflammation can cause a number of health issues, it is the body's normal response to damage or illness. Pea hulls include substances that have been demonstrated to have anti-inflammatory characteristics; these substances may be helpful in preventing chronic illnesses like cancer and arthritis. According to a study in

the Journal of Food Science and Technology, pea hull extract significantly lowers the production of inflammatory markers in cells and has anti-inflammatory properties. [Poojary, M. M., et al.][21].

2.4 VITAMINS AND MINERALS

Peas and their peel are loaded with vitamins and minerals and offer a host of health advantages [Gawalko et al., 2009; Robinson et al., 2019][22]. Following potassium, which makes up 1.04% of the dry weight of dehulled peas, are phosphorus, magnesium, and calcium, which are each 0.39%, 0.10%, and 0.08% of the dry weight of peas, respectively. Vitamin B is particularly abundant in potassium [Dahl et al., 2012; Millar et al., 2019][23]. The E group of vitamins is totally made up of and tocopherols, hence several extractions were carried out to isolate different types of vitamins and minerals [Boschin&Arnoldi, 2011][24]. Field or garden pea seeds had trace amounts of copper, nickel, selenium, folate, and boron as well as potassium (97-99mg/100g), calcium (9-11mg/100g), magnesium (5-7mg/100g), and salt (3-4mg/100g) [Mejri et al., 2019; Millar et al., 2019][25]. Selenium and folate are two of them that could be employed as health-promoting minerals because they can be used to counteract diseases caused by nutrient deficiencies [Han & Tyler, 2003][26].

According to reports, selenium and zinc are mixed in pea seeds to increase the bioavailability of the nutrients in food items [Poblaciones&Rengel, 2016, 2017; Rehman et al 2019; Robinson et al., 2019][27], phosphorus biofortification has been carried out to improve the soil microbiome's nutrient content in order to promote pea yield and counteract micronutrient deficiencies [Powers &Thavarajah, 2019][28].

3.HEALTH BENEFITS

3.1 THE FERMENTABILITY INTESTINAL MICROFLORA

The microfloras in the gut play a crucial role in the digestion of food, boosting defence mechanisms and other metabolic processes . Short-chain fatty acids are regarded as the main metabolite with neuroactive qualities, and dietary fibre is one of the primary sources of energy utilisation by bacteria accumulating in the production of various fermented results [Martens et al., 2017][29].In addition to dietary fibre, pea protein

regulates the metabolic process and the ability of intestinal bacteria to adhere to the cell lining. It also has a positive impact on the environment and promotes health [Ge et al., 2020][30].The starch structure is obviously impacted by the gut luminal environment by changing its morphology, which thus slows down the availability of glucose and ultimately lowers postprandial glucose (PPG) levels [Petropoulou et al., 2020][31]. When fermented, non-galactooligosaccharides from pea demonstrated a potential prebiotic function that reduced the gas production by colonic bacteria [Marin-Manzano et al., 2020][32].

3.2 CARDIOVASCULAR DISEASES

In recent years, cardiovascular disease (CVD) has become a leading cause of death in emerging nations. By raising blood pressure, hypertension causes an increase in cardiovascular disease [Ge et al., 2020][33]. Overweight has been linked to a higher incidence of coronary heart disease (72%), which is more prevalent among obese women. A significant risk factor for CHD is hypercholesterolemia, which can be avoided by adopting healthy lifestyle habits [Anderson & Major, 2002][34]. Lower rates of cardiovascular illnesses are connected with higher dietary fibre consumption [Slavin, 2013][35].Dietary fibre in particular has received attention for its role in lowering the risk of cardiovascular disease [Bazzano, 2008][36]. It was shown that people consume about 29g of dietary fibre on a daily average. When compared to people who took more than the average amount of DF, people who consumed less than 29 g per day had 38% higher hypercholesterolemia risks and 43% higher LDL cholesterol levels [Narayan et al., 2014][37]. Green peas are naturally rich in flavonols, carotenoids, vitamin C, and antioxidants that lower the risk of heart attack by reducing cardiometabolic risks and other heart-related disorders due to their capacity to prevent cell damage [Papandreou et al., 2019; Perez-Vizcaino & Duarte, 2010; Voutilainen et al., 2006][38].

3.3 CANCER PREVENTION

The population's propensity for the western diet, which is strong in fat, animal protein, and refined carbohydrates, significantly reduces their immune systems and increases their susceptibility to cancer-causing effects. Although eating is not thought to

be a cause of cancer, it can bring on other factors that are [Vohra et al., 2015][39]. Pea extracts have demonstrated pharmacological activity in addition to their anticancer properties [Bello et al., 2018; Mudryj et al., 2014; Rungruangmaitree&Jiraungkoorskul, 2017][40]. When consumed at certain levels, peas, which are typically a rich source of biologically active compounds, may have significant effects that reduce the risk of developing tumours [Mathers, 2002][41].

4. BENEFITS OF USING PEA PEEL AS A BIODEGRADABLE WASTE

Less food refuse is being disposed of in landfills: By using pea peel to create biogas, which can be used as a sustainable energy source, we can lessen the amount of food waste that ends up in landfills and reduce the amount of methane—a powerful greenhouse gas—that is released. 2019 [Lai et al.][42].

Pea peel can be used as a soil amendment, giving nutrients and enhancing soil structure, to improve the quality of the soil. This can result in better crop yield and greater soil fertility, which can reduce the need for synthetic fertilisers and have positive effects on the ecosystem by lowering water pollution and soil degradation. 2019 [Rashid et al.][43].

Production of bio-based products: Pea skin is a feedstock that can be used to create bio-based products like bioplastics and biochar. By doing so, carbon emissions can be decreased as well as the dependence on non-renewable resources.

2020 [Chen et al.][44].

5. CONCLUSION

The pea, which is practically grown everywhere for its edible seeds, is very nutritious, loaded with high levels of dietary fibre, antioxidants, numerous significant biomolecules, and has a low glycaemic index. It is also very helpful in treating diabetes, cardiovascular issues, some cancers, and many degenerative diseases. The current research offers nutritional data about peas and its underutilised byproducts, notably their pods, with a primary focus on their effects on health and other functional aspects. Pea and its waste are possibly acceptable for the food business due to their desirable functionality. The authors' overall goal was to present current research on peas and their by-products, which are thought to have tremendous potential in terms of

their various nutrients and biomolecules, which have a high reputation for supporting our various health-related diseases and for alleviating the latter on a global scale.

Another strategy for managing trash is waste utilisation. Given the significance of cellulases in numerous process industries, efficient and cost-effective manufacturing of these enzymes is crucial.

The use of inexpensive lignocellulosic waste, such as pea peel waste, in the manufacturing of cellulase would be a unique strategy that could enable cost-effective cellulase production. Whey from the dairy sector and native starch hydrolysate might both be consumed in the cellulolytic production process to reduce costs. Hence, using all waste material offers a method that is both economical and environmentally friendly, as well as being somewhat helpful in managing both solid and liquid waste as bioresources, using cellulase in combination with recombinant cultures or phenol-degrading microorganisms.

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Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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