

DEVELOPMENT OF BANANA BLOSSOM-BASED MEAT PRODUCT USING BROMELAIN ENZYME FROM PHULAE PINEAPPLE CORE WASTE FOR PROTEIN MODIFICATION

Somruthai Tunma^{1,*}, Natthiya Chaichana² and Patcharawarin Ruanto³

Received: November 30, 2024; Revised: April 11, 2025; Accepted: May 28, 2025

Abstract

Plant-based meat analogs are food products made from plant-derived ingredients that mimic the texture and nutritional profile of animal meat. This research aimed to develop a plant-based meat analog using banana blossom (*Musa ABB* cv. Kluai ‘Namwa’), Textured Vegetable Protein (TVP), and Lion’s mane mushroom as primary ingredients. Protein functionality was modified using proteolytic enzymes to enhance texture and digestibility. Bromelain from pineapple cores, a by-product of the fresh pineapple processing, and bromelain powder standard (BM), was used in the enzymatic modification. The enzymatic activity of bromelain powder and bromelain extract was 45.34 ± 7.14 , 13.83 ± 0.44 , and 13.63 ± 5.90 GDU/mg, respectively. In comparison to the controlled banana blossom-based meat without pineapple core extract, which had values of 3.38 g/100g protein, 0.15 mg GAE/g, and 0.16 mg Vitamin C/g, respectively, the banana blossom-based meat mixed with 4% of pineapple core extract had higher protein content (5.58 g/100g), total phenolic content (1.12 mg GAE/g), and antioxidant activity (0.84 mg Vitamin C/g). The banana blossom-based meat mixed with 4% pineapple core extract contained 16 types of amino acids and the 6 essential amino acids were found in higher concentration, including Leucine 729.63, Lysine 442.52, Threonine 440.00, Phenylalanine 425.65, Isoleucine 415.02, and Histidine 212.88 mg/100g. Processing involved blending, enzymatic pretreatment, molding, and steam-cooking at 100°C for 30 min, followed by stored in a freezer (cabinet) at -18°C for 30, 45, 60, 75, and 90 days. Sensory evaluation revealed that the products stored in the freezer for 30, 45, and 60 days received the highest overall scores for preference, including color, flavor, and texture. The safety findings based on the increase in total phenolic content and Vitamin C suggest that the enzymatically modified plant-based meat analog is safe and potentially beneficial for health-conscious consumers.

Keywords: Amino Profile; Bromelain; Enzymatic Modification; Plant-Based Meat

¹ Chemistry Program, Faculty of Education, Chiang Rai Rajabhat University, Chiang Rai, 57100, Thailand. E-mail: Somruthai.tun@crju.ac.th*

² Science Program, Faculty of Education, Chiang Rai Rajabhat University, Chiang Rai, 57100, Thailand. E-mail: natthiya.cha@crju.ac.th

³ Biology Program, Faculty of Education, Chiang Rai Rajabhat University, Chiang Rai, 57100, Thailand. E-mail: patcharawarin.rua@crju.ac.th

* Corresponding author

DOI: <https://doi.org/10.55766/sujst7673>

Introduction

Plant-based meat is a product that uses materials plants to create meat-like products in all their physical sensations, including taste, texture, smell, and appearance, in order to simulate meat eating. Plant-based meat is one of the future foods that is gaining increasing popularity, especially among groups emphasizing on occasional vegetarian consumption, known as flexitarians, as well as vegans and health-conscious consumers. Plant-based meat generally provides lower energy, total fat, and saturated fat compared to animal meat, while offering higher dietary fiber and helping prevent obesity, colon cancer, diabetes, and reducing cholesterol levels, especially lowering LDL-cholesterol (Curtain and Grafenauer, 2019). Banana blossoms are currently very popular abroad, especially among German vegans who consume it instead of meat due to its thick fibers low energy content. When compared to ripe bananas, banana blossoms contain 6 times fewer calories but 4 times more calcium and slightly more protein (Bhaskar *et al.*, 2012). Nutritionally, banana blossoms are rich in dietary fiber (approximately 16-20% by weight) and exhibit antioxidant activity 1.4-1.6 times greater than that of egg banana and fragrant banana blossoms. In addition, they are an excellent source of minerals such as potassium, calcium, magnesium, iron, zinc, and copper, while being low in calories and fat. Their fibrous structure makes them a promising candidate for mimicking the texture of meat. When humans consume protein from plant and animal sources, the protein is broken down by acids and enzymes into amino acids, which are then utilized to form various types of proteins needed by the body. Amino acids are classified into two categories: 1) Essential amino acids, which the body cannot synthesize on its own or cannot produce in sufficient quantities, so they must be obtained from food consumption, and 2) Non-essential amino acids, which the body can synthesize through various metabolic processes. Therefore, to obtain a complete range of essential amino acids, one must consume a diverse diet. Animal-based proteins or animal products provide complete proteins, meaning they contain all the essential amino acids, also known as 'complete proteins'. However, plant-based proteins and products differ in nutritional quality. Most plant-based proteins are incomplete proteins, lacking some essential amino acids. Solely consuming plant-based proteins may negatively impact muscle building and muscle mass, leading to sarcopenia (loss of muscle mass) in the elderly. Similarly, when developing plant-based meat recipes, it is important to consider this issue when

selecting plant-based ingredients or substitutes that can enhance the quality of essential amino acids in the food. In the production of plant-based meat, the functional properties of proteins are crucial.

This leads to the modification of the functional properties of plant proteins using various methods, such as physical, chemical, and enzymatic approaches, to induce changes in the protein structure. Modifying the functional properties of plant proteins using physical methods, such as hot water treatment, is not suitable for industrial-scale production when protein quantities are low. Meanwhile, chemical methods, such as using hydrochloric acid, often yield proteins of lower quality, which may have off-flavors or bitterness and can introduce contaminants like 3-MCPD (3-monochloropropane-1,2-diol), a carcinogenic substance resulting from protein hydrolysis (Rao *et al.*, 2021; Hewage and Olatunde 2022).

In plant-based meat production, it is necessary to simulate the spherical plant proteins into fibrous structures similar to those found in animal meat (McClements and Grossmann, 2021) to ensure that the product has a texture, taste, smell, and color comparable to animal meat. Currently, various methods (physical, chemical, and enzymatic) are used to modify the functional properties of plant proteins to alter their structure and resemble animal meat as closely as possible, particularly in terms of fiber-like tearing and texture, which are key characteristics of meat. Enzymatic modification of protein functional properties through low-degree hydrolysis results in various changes to protein characteristics, such as molecular structure, stability, elasticity, and interfacial properties. These changes affect the functional properties of the protein, including solubility, water-holding capacity, emulsifying properties, and foaming ability (Hajj *et al.*, 2024). This process generally relies on hydrolysis reactions under mild conditions, with commonly used enzymes including trypsin, papain, bromelain, and commercial enzymes. The hydrolysis process is controlled by factors such as pH, temperature, time, and degree of hydrolysis (DH) (Jugovic *et al.*, 2023) to achieve the desired peptide chain length in the protein product.

This research developed a plant-based food product using the main ingredient, banana blossom (*Musa* (ABB) 'Kluai Namwa'), Textured Vegetable Protein (TVP) and Lion's mane mushroom. Enzymes were used to modify the functional properties of plant proteins and induce changes in the protein structure. Banana blossom contains a high amount of dietary fiber, approximately

16-20% by weight, and its antioxidant activity is 1.4-1.6 times higher in comparison to egg banana and fragrant banana blossoms (Liyanage *et al.*, 2016; Thagunna *et al.*, 2023). Additionally, banana blossom is rich in minerals such as potassium, calcium, magnesium, iron, zinc, and copper, while being low in calories and fat. Its fibrous texture resembles meat. Textured vegetable protein is a dried food product made from defatted soy flour or low-fat soy flour. It contains up to 50% soy protein, which is highly nutritious since it provides all essential amino acids, with a particularly high level of lysine. Lion's mane mushroom (*Herinaceus*) is a rich source of proteins, carbohydrates, crude fiber, low fat and ash, and is considered a source of beneficial medicinal properties and nutritional functional foods (Bacha *et al.*, 2018).

We studied the enzymatic modification of plant-based protein functional properties by using bromelain from pineapple cores, a by-product of the fresh pineapple processing of local farmers and vendors in Chiang Rai. Bromelain is a glycoprotein compound that catalyzes the breakdown of proteins, peptides, amides, and amino acid esters into shorter chains. This also adds value to waste from the processing of pineapples.

Materials and Methods

Sample Preparation and Experimental Design

The technique used to produce this plant-based meat is the top-down strategy, which involves forming the product from plant protein and hydrocolloid mixtures using a mixer. The prototype recipe for banana blossom-based meat includes: 42.5% banana blossom, 25% Lion's Mane mushrooms, 25% textured vegetable protein, and 7.5% binder (2.5% Benecel™ MX +2.5% glucomannan +1.25% carrageenan +1.25% Konjac).

Two sample groups were used in this experiment: (1) Banana blossom-based meat analog (BBM), formulated with banana blossom (*Musa* (ABB) 'Kluai Namwa'), textured vegetable protein (TVP), and lion's mane mushroom (*Hericium erinaceus*); and (2) Pork (*Longissimus dorsi* muscle), used as the control sample. The banana blossom-based meat was molded into cube-shaped samples (2×2×2 cm, approximately 10 g each). All samples were prepared in triplicate (n = 3 per treatment group) for each analysis. A control group with no enzyme treatment was included for both pork and BBM samples.

Protein-digesting enzyme

The bromelain enzyme extract was obtained from Phulae Pineapple core, a by-product of

the fresh pineapple processing of local farmers and vendors in Chiang Rai. The core was mechanically blended by a fine blender and eventually centrifuged at 5,000 rpm for 15 min to separate the insoluble particles from the juice. The bromelain (2,400 GDU/g) pineapple extract powder protein-digesting enzyme was used as a bromelain standard.

The samples were banana blossom based-meat and pork. They were cut into small pieces and then weighed to 100 g to determine the protein-digesting enzyme. The treatment was conducted by covering cube-shaped meats using a protein-digesting enzyme with a concentration of 5, 10, and 15% from the total meat weight (w/w), respectively. The all of tenderizer-covered meats were incubated at room temperature (25-28 °C) for 60 min.

Bromelain Enzyme Activity Assay

The specific activity of the enzyme bromelain, measured by the gelatin digestion method, is expressed in Gelatin Digestion Units (GDU)/mg of bromelain enzyme and was conducted by the BIOSYNTHAI Biotechnology Co., Ltd.

Protein Analysis

The analysis of protein content in meat samples using an in-house method based on the AOAC (2012), 991.20 method was conducted by the laboratory of the Institute of Product Quality and Standardization, Maejo University. The analyte is referred to as "crude" protein because the method determines N, a component of all proteins. In addition, N from sources other than true protein is also determined. Additional digestion procedures must be used in order to include N from nitrate. The amount of protein in most materials is calculated by multiplying % N by 6.25, because most proteins contain 16% N.

Total Phenolic Content

The total phenolic content (TPC) was determined using the Folin-Ciocalteu's phenol reagent. The absorbance was measured using a microplate reader at 765 nm. Galic acid was used to establish the standard curve. The TPC was expressed as mg of gallic acid equivalent per g of the extract.

Antioxidant Activity

The antioxidant activity was performed by a DPPH radical scavenging activity assay. After incubation at room temperature for 15 min in darkness, the absorbance of each solution was determined at 517 nm. The free radical-scavenging activity was expressed as ascorbic acid equivalent.

Amino Profile

The amino acid analyzer is a device used to analyze the types and quantities of amino acids and their derivatives. It employs liquid chromatography techniques to separate substances using ion exchange methods and colorimetric detection of amino acid derivatives with ninhydrin. The amino acid profile was conducted using MEMBRAPURE, ARACUS at the Central Laboratory, Faculty of Agriculture, Chiang Mai University.

Results and Discussion

Plant-based Meat Tenderization

After the tenderizer-covered meats were incubated at room temperature for 60 min, as shown in Figure 1, the total protein content was shown in Table 1.

The use of bromelain powder to marinate pork and plant-based meat, which is primarily made from banana blossom and soybeans, was found to result in a higher protein content compared to using pineapple core extract. However, bromelain powder gave the food a bitter and astringent aftertaste, altering the flavor compared to the control group. Therefore, a new formula was developed to increase the protein content of banana blossom-based meat by using Phulae pineapple core extract at a ratio of 500 g of plant-based meat to 20 ml of pineapple juice (which equals 4% of pineapple core juice in the banana blossom-based meat).

Bromelain Enzyme Activity Assay

The enzymatic activity of bromelain in various bromelain samples, including standard bromelain and pineapple core extract, was analyzed by the gelatin digestion method, with standard bromelain showing the highest specific activity of 45.34 ± 7.14 GDU/mg, followed by pineapple core extract samples showing enzymatic activity values of 13.83 ± 0.44 and 13.63 ± 5.90 GDU/mg, respectively.

In this study, the bromelain enzyme activity significantly improved the protein digestibility of both banana blossom-based meat (BM) and pork samples. The enzyme activity increased proportionally with the bromelain concentration, with the highest digestibility observed at the 15% bromelain treatment. This result is consistent with the findings of Kresna and Nofiandi (2021); Hewage and Olatunde (2022), who reported that bromelain at higher concentrations enhanced protein hydrolysis in animal-based proteins. The increase in digestibility can be attributed to the proteolytic activity of bromelain, which breaks down protein structures, making them more accessible for absorption during digestion.

However, when comparing BM to pork, the digestibility of BM was lower across all bromelain concentrations. This is likely due to the inherent structural differences between plant proteins and animal proteins. As Xiao *et al.* (2019) suggested, plant-based proteins generally exhibit more complex structures, requiring more extensive treatment to achieve the same level of digestibility as animal proteins. This finding highlights the potential need for optimization of enzymatic treatment parameters in plant-based meat analogs to enhance their nutritional quality.

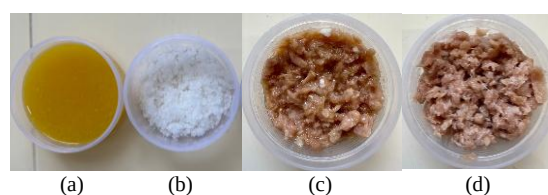


Figure 1. Bromelain enzyme (a) pineapple core extract, (b) bromelain powder and plant-based meat tenderized by pineapple core extract (c) and by bromelain powder (d)

Table 1. The total protein content of samples in g/100 g

Samples	Protein digesting enzyme		
	Control	BM	Pineapple core extract
1. plant-based meat	3.24 $\pm$ 1.0	7.27 $\pm$ 1.8	5.58 $\pm$ 2.1
2. pork ground	20.41 $\pm$ 2.0	32.31 $\pm$ 1.0	22.08 $\pm$ 1.6

Nutrient Composition, Total Phenolic Content, and Antioxidant Activity of Plant-Based Meat

The prototype banana blossom-based meat with pineapple core extract has a protein content of 5.58 g/100 g, a total phenolic content of 1.12 mg GAE/g, and antioxidant activity of 0.84 mg Vitamin C/g, which are higher than the controlled banana blossom-based meat without pineapple core extract, which has values of 3.38 g/100 g protein, 0.15 mg GAE/g, and 0.16 mg Vitamin C/g, respectively. The important nutritional components include ash 2.16, moisture 77.21, fat 8.23, carbohydrate 6.81, total sugar 1.22 g/100g, sodium 520.63 mg/100g, and total energy 123.63 mg/100g, with no cholesterol detected.

The protein content (crude protein, %) and amino acid profile (mg/100g) of banana blossom-based meat with 4% pineapple core extract showed the total protein of 15.96%, higher than the controlled banana blossom-based meat without pineapple core extract (13.65%), and contained 16 types of amino acids (not found: Hydroxylysine,



Figure 2. Shows the prototype banana blossom-based meat

Table 2. The protein content (crude protein, %) and amino acid profile by Dumas combustion and Amino analyzer

Analysis report	Banana blossom meat	
	Control	4% of Pineapple core extract
1. Crude protein (%)	13.65	15.96
2. Amino acid (mg/100g)		
Alanine	427.19	509.59
Arginine	653.34	783.94
Aspartic acid	976.95	1,143.00
L-Cystine	313.86	234.51
Glutamic acid	2,242.63	2,692.48
Glycine	344.50	401.81
Histidine	171.22	212.88
Hydroxylysine	5.45	Nd.
Hydroxyproline	1,745.34	2,109.88
Isoleucine	393.94	415.02
Leucine	619.68	729.63
Lysine	442.52	574.78
Methionine	Nd.	Nd.
Phenylalanine	373.21	425.65
Proline	1,272.19	1,527.20
Serine	505.56	618.72
Threonine	362.60	440.00
Tyrosine	255.80	280.75
Valine	Nd.	Nd.

** Note: Nd. = Not detected, LOD of Methionine = 2.24 mg/100g, LOD of Valine = 2.34 mg/100g

Methionine, and Valine), while the prototype banana blossom-based meat contained 6 essential amino acids, namely Leucine 729.63, Lysine 442.52, Threonine 440.00, Phenylalanine 425.65, Isoleucine 415.02, and Histidine 212.88 mg/100g, which are higher than those found in the controlled banana blossom-based meat, as shown in Table 2.

Nutrition Facts of Plant-Based Meat

A nutrition label is a food label that displays the nutritional information of the food within a rectangular box, as shown in Figure 2. It is beneficial for health-conscious individuals or elderly people with chronic diseases, as it helps them understand the types and amounts of nutrients they will receive from consuming that food. This allows them to choose foods that meet their

dietary needs appropriately. Additionally, it can be used for comparison to select the brand of food that provides the most benefits. The GDA (Guideline Daily Amounts) nutrition label is an additional symbol for nutritional information, supplementing the standard nutrition label. It displays the values for energy, fat, sugar, and sodium, and is often shown alongside a simplified nutrition label.

The high-utility banana blossom-based meat substitute from this research comes with a Thai (simplified) nutrition label, a GDA nutrition label, and the registration number 5720105960024, classified under ready-to-cook and ready-to-eat food products. It is categorized as a ready-to-cook food by the Food and Drug Administration (FDA). The product brand name is Banana Blossom Meat.

Table 3. Sensory evaluations scores of banana blossom-based meat product stored at different periods

Storage Time (days)	Appearance	Flavor	Texture	Overall Acceptability
30	8.2±0.3 ^a	8.3±0.2 ^a	8.1±0.3 ^a	8.3±0.2 ^a
45	8.1±0.4 ^a	8.2±0.3 ^a	8.0±0.4 ^a	8.2±0.3 ^a
60	8.0±0.4 ^a	8.1±0.3 ^a	8.0±0.3 ^a	8.1±0.3 ^a
75	7.2±0.5 ^b	7.0±0.4 ^b	7.1±0.4 ^b	7.0±0.5 ^b
90	6.5±0.6 ^c	6.3±0.5 ^c	6.2±0.5 ^c	6.4±0.5 ^c

Note: Data are presented as mean ± standard deviation (Mean±SD). Different superscript letters (a, b, c) within the same column indicate statistically significant differences ($p < 0.05$).

The sensory evaluation results of banana blossom-based meat products stored for different periods are summarized in Table 3. Samples stored for 30, 45, and 60 days received the highest scores for appearance, flavor, texture, and overall acceptability, with no significant differences observed among these storage periods ($p > 0.05$). In contrast, samples stored for 75 and 90 days showed significantly lower sensory scores ($p < 0.05$). Extended storage beyond 60 days resulted in darker coloration, firmer and tougher texture, and reduced juiciness, which negatively impacted consumer acceptance.

Bromelain belongs to the family of sulfhydryl proteolytic enzymes and is mainly extracted from the stems, core, and fruit of pineapple plants (*Ananas comosus*). Bromelain has a unique combination of proteolytic enzyme activities, making it suitable for efficient protein degradation and useful in a wide number of applications, including food processing, beverage production, pharmaceuticals, and cosmetics. Bromelain is a cysteine protease that targets the peptide bond inside the protein molecule where they have a cysteine amino acid. This hydrolysis breaks down the larger protein molecules by breaking the peptide bonds into smaller parts through the combination with water. Reducing the size of proteins through digestion delivers many functional and sensory benefits when applied to different applications.

The use of enzymes to break down plant cell walls, such as cellulase, pectinase, hemicellulase, and xylanase, helps increase the amount of extractable protein. This is because the structure of the cell wall is destroyed, allowing proteins that were trapped inside the cells to dissolve into the extract solution. Enzymatic protein digestion using proteases is an efficient method that can preserve the nutritional value of proteins and is safe for consumers. When digestion occurs, it produces free amino acids ranging from 2 to 30 units or many short-chain peptides, as well as groups of

carbohydrate compounds, phosphates, and nucleic acids, among others.

The results from this study demonstrate that bromelain can be an effective enzyme for improving the protein digestibility and sensory attributes of BM, making it a promising ingredient for developing high-quality plant-based meat alternatives. However, as Curtain and Grafenauer (2019) noted, achieving the perfect balance of texture, flavor, and nutritional quality remains a challenge in plant-based meat production. Future research should focus on optimizing enzyme concentrations and treatment times, as well as exploring other plant-based ingredients that can enhance the sensory profile of BM without compromising its nutritional benefits.

Further studies should also investigate the long-term stability of BM products and their consumer acceptance in various market segments. Additionally, integrating functional ingredients, such as prebiotics or omega-3 fatty acids, could further elevate the health benefits of plant-based meat analogs, catering to the growing demand for nutritious and sustainable food options.

Conclusions

The banana blossom-based meat product is modified by bromelain enzyme, which is extracted from pineapple core. The planted-based meat with 4% pineapple core extract showed the higher level of protein, total phenolic content, and antioxidant activity than the planted-based meat control. The modified planted-based meat contained 6 essential amino acids, namely Leucine 729.63, Lysine 442.52, Threonine 440.00, Phenylalanine 425.65, Isoleucine 415.02, and Histidine 212.88 mg/100g, which are higher in concentrations than those found in the controlled plant-based meat. Protein digestion with protease enzymes is an efficient method that preserves the nutritional value of the protein and is safe for consumers.

Acknowledgement

The authors gratefully acknowledge the financial support from the Agricultural Research Development Agency (Public Organization) and also acknowledge the Research and Development Institute, Chiang Rai Rajabhat University.

References

- Bacha, S.A.S., Ali, S. Li, S., Rehman, ur. H., Farooq, S., Safdar Ali Wahocho, A.M., and Aslam, S.M. (2018). Lion's mane mushroom; new addition to food and natural bounty for human wellness: A review. *IJB*. 13(4):396-402.
- Bhaskar, J.J., Mahadevamma, S., Chilkunda, N.D., and Salimath, P.V. (2012). Banana (*Musa* sp. var. elakki bale) flower and pseudostem: Dietary fiber and associated antioxidant capacity. *Journal of Agricultural and Food Chemistry*, 60(1):427-432. <https://doi.org/10.1021/jf204539v>
- Curtain, F. and Grafenauer, S. (2019). Plant-based meat substitutes in the flexitarian age: An audit of products on supermarket shelves. *Nutrients*, 11(11):2603. <https://doi.org/10.3390/nu11112603>
- Hajj, W.A., Salla, M., Krayem, M., Khaled, S., Hassan, H.F., and Khatib, S.E. (2024). Hydrolyzed collagen: Exploring its applications in the food and beverage industries and assessing its impact on human health - A comprehensive review. *Heliyon*. 10(16):e36433. <https://doi.org/10.1016/j.heliyon.2024.e36433>
- Hewage, A.H. and Olatunde, O. (2022). Novel extraction technologies for developing plant protein ingredients with improved functionality. *Trends in Food Science & Technology*, 129:492-511 <https://doi.org/10.1016/j.tifs.2022.10.016>
- Jugovic, Z.K., Culetu, A., Mijalkovic, J., Duta, D., Stefanovic, A., Sekuljica, N., Dordevic, V., and Antov, M. (2023). Impact of different enzymatic processes on antioxidant, nutritional and functional properties of soy protein hydrolysates incorporated into novel cookies foods. 12(1):24. <https://doi.org/10.3390/foods12010024>
- Liyanage, R., Gunasegaram, S., Visvanathan, R., Jayathilake, C., Weththasinghe, P., Jayawardana, B.C., and Vidanarachchi, J.K. (2016). Banana blossom (*Musa acuminata* Colla) incorporated experimental diets modulate serum cholesterol and serum glucose level in wistar rats fed with cholesterol. *Cholesterol*. 2016:9747412. <https://doi.org/10.1155/2016/9747412>
- McClements, D.J. and Grossmann, L. (2021). The science of plant-based foods: Constructing next generation meat, fish, milk, and egg analogs. *Comprehensive Reviews in Food Science and Food Safety*, 20(4):4049-4100. <https://doi.org/10.1111/1541-4337.12771>
- Rao, M.V., Sunil, C.K., Rawson, A., Chidanand, D.V., and Venkatachlapathy, N. (2021). Modifying the plant proteins techno-functionalities by novel physical processing technologies: A review. *Critical Reviews in Food Science and Nutrition*, 63(19):4070-4091. <https://doi.org/10.1080/10408398.2021.1997907>
- Thagunna, B., Kandel, K., and Lamichhane, B. (2023). Banana blossom: Nutritional value, health benefits and its utilization. *Reviews in Food and Agriculture (RFNA)*, 4(2):66-70. <https://doi.org/10.26480/rfna.02.2023.66.70>