Original Research Paper

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Chemistry

SOY OIL IS EXTRACTED, THEN LEFTOVER MATERIAL IS UTILISED TO CREATE ISOLATE PROTEINS.

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ABSTRACT **Background:** this is one of the many types of Protein that have been produced in response to the universal demand for the protein. **Objective:** highly purified and convert into a high percentage of protein

KEYWORDS :

INTRODUCTION

It sounds like you're asking about "West" in the context of high-quality soy isolate protein, perhaps referring to a brand or product. West may be referring to West bridge or a similar supplier of plant-based proteins, but I'm not sure which specific brand you're referencing. If you're looking for a soy isolate protein that is above 90% protein concentration, there are several high-quality options on the market that specialize in premium plant-based proteins.

For soy isolate protein with over 90% protein content, you'd generally be looking for products that have gone through advanced processing methods like isolation and hydrolyzation to remove fats and carbohydrates while concentrating the protein.

Some highly regarded brands in the plant protein space include:
Now Sports – Known for high-quality isolates and concentrates, including soy protein isolate with around 90% protein content.
Bob's Red Mill – Offers soy protein isolate that is often marketed for baking, smoothies, and shakes.
Bulk Natural Foods – Provides a variety of plant-based proteins, including soy isolate with a protein content above 90%.
Genius Protein – Often uses soy protein isolate in their blends, with a high concentration of protein.

Texturized vegetable proteins are healthy, sustainable [1], and can meet the protein needs of a growing population [2,3]. Nutritionally, it is high in protein, low in calories, low in fat, and zero in cholesterol [4]. As a result, texturized vegetable proteins are gaining consumer attention and providing better options for vegetarians [5]. Texturized vegetable protein is formed by extrusion technology similar to animal meat, with abundant fiber and texture similar to animal meat [6], which has been more studied in recent years [7].Some researchers have found that the main influences on textural properties of texturized vegetable protein include raw materials [7], additives such as polysaccharides [8–10] and enzymes [11], and extrusion conditions [12,13], among which raw materials are the key influencing factors [14]. Soy protein is good for lowering cholesterol levels, low-density lipoproteins (LDL or “bad” cholesterol), and triglycerides. There's no cholesterol or fat in soy protein isolate. Protein. If you're on a vegetarian or vegan diet, soy protein is a healthy way to reach your protein goals. Soy Protein powders can be consumed as a protein shake by mixing a small amount of protein (15g) in 300ml of water. Those who find the texture of the protein shake a little thick can blend it with more water in a blender. Texturized vegetable proteins are affected differently by different soybean proteins. The different compositions of soybean proteins (7 s and 11 s globulins) determine their various nutritional and functional properties such as moisture, surface, and protein mechanisms [15,16]. It has been shown that various soybean protein fractions can alter the textural properties, WHC, and rehydration properties of texturized vegetable protein [17]. Adding 7s improves protein hydration properties, as well as foaming and emulsifying properties [18]. Adding 11s increases the structural strength of proteins and improves properties such as gelling [19]. The best textural properties of texturized vegetable protein were obtained at an 11 s/7 s ratio of 1.5 [20]. In addition, the interactions between proteins are an important determinant of solubility, gelling, adhesion, and other properties. There are significant contributions from hydrogen bonds, disulfide bonds, and hydrophobic interactions in the processing of texturized vegetable protein, which are the primary contributors influencing its textural properties [21,22]. Studies have found that the preservation of texturized vegetable proteins, regardless of whether soybean protein is processed at low or high moisture levels, relies on a combination of hydrophobic interactions, hydrogen bonds, disulfide bonds, and their synergistic interactions [15]. In this process, non-covalent bonds play a more significant role than covalent bonds. Similarly, the structure of proteins has an effect on the properties of texturized vegetable proteins. Research has shown that the presence of L-cysteine can alter the interconnection of disulfide bonds between protein molecules, resulting in noticeable changes in the texture and structure of textured vegetable proteins. The addition of L-cysteine may have an effect on the binding interactions within protein molecules, thus affecting their cross-linking effect [23]. Up to now, however, it has not been clear which properties, and which structures of the raw material influence the texture of the texturized vegetable protein.

Therefore, to enhance the structural characteristics of texturized vegetable proteins, we established a specialized raw material index system. We first studied three different soybean protein isolates for functional properties (WHC, emulsifying properties, and foaming properties) and structure (amino acid composition and secondary structure). Then, we prepared three texturized vegetable proteins through low-moisture extrusion and analyzed their textural properties, degree of texturization, protein free SH and S-S content, and microstructure. Finally, we analyzed the correlation between soybean protein isolates and texturized vegetable proteins and drew relevant conclusions, which provide support for dedicated raw materials for texturized vegetable proteins.

MATERIAL AND METHOD

Chemicals:

All chemicals used were of analytical grade this are the given below,

Sr. No.	Chemical's / Reagent	Make	Purity %	Molecular Formula	Molecular Wight
1.	Sodium Hydroxide Pellets	Qualigens	97%	NaOH	40.0
2.	Copper Sulphate	Qualigens	98.5%	CuSO45H2O	249.68
3.	Potassium sulphate	Qualigens	99.10%	K2SO4	174.26
4.	Hydrochloric acid	Qualigens	35.37%	HCl	36.46
5.	0.1N Sulphuric acid Ampoules	Qualigens	99.90%	-	-
6.	Distilled Water	Qualigens	99.10%	H2O	18.02
7.	Bromocresol green indicator	Qualigens	98%	C21H14Br4 O5S	698.04
8.	Methyl red indicator	Qualigens	98.20%	C15H15N3O 2	269.30
9.	Boric Acid	Qualigens	96.30%	H3BO3	61.83

Equipment's:

1. pH Meter
2. Kjeldahl's Assembly
3. Analytical Balance
4. muslin cloth
5. Volumetric Flasks
6. Volumetric Pipettes
7. Bukner funnel

8. Conical flask
9. Beaker
10. Timer (stopwatch)
11. Whatman 42 no. filter paper
12. Vacuum pump
13. filtration assembly with vacuum pump
14. Homogenizer
15. Centrifugal
16. Hot Air Oven

Plant Source

Defatted soy flower (totally oil removed from soya bees) wastage flower can be collect in any soy oil producer company

Purification

1. collected soya flower addition of 1:10 ratio of distilled water.
2. Addition about 2% of sodium hydroxide (NaOH).
3. Provide heating about a 80 to 85°C
4. Maintain heating 30 min.
5. Cool down 40°C and filter with the help of muslin cloth.
6. collect the sediment (liquid) removed the super Nant (solid cake)
7. Centrifugation process or that liquid 2000 rpm for a 30 min.
8. Collect the liquid solution.
9. Acid precipitation with the help of con. Hydrochloric acid (HCl)
10. acid precipitation process set pH about 4 to 5
11. Filtration process with the help of bukner fuel and Whatman filter paper no 42.
12. Collect precipitation and discard the whey (liquid solution)
13. Collected precipitation dilute in distilled water and neutralized in 5% sodium hydroxide solution (HCl)
14. Homogenised properly
15. Adjust pH about 7
16. That solution get convert into a powder form with the help of spray dryer

Assay of Protein:

Principle of the Kjeldahl Method

The principle of the Kjeldahl method is based on the digestion of the sample in concentrated sulfuric acid (H_2SO_4), which converts the nitrogen present in the sample (as organic nitrogen) into ammonium sulfate $(NH_4)_2SO_4$. After digestion, ammonia is distilled from the solution and quantified by titration with a standard acid solution.

Steps Involved in the Old Kjeldahl Method

1. Digestion

- **Purpose:** To convert organic nitrogen in the sample into ammonium ion (NH_4+).
- **Procedure:**
  - o Weigh a known amount of the sample (usually between 0.25 and 035 g) and place it in a Kjeldahl digestion flask.
  - o Add concentrated sulfuric acid (H2SO4) (about 20-30 mL) to the flask.
  - o Add a catalyst such as potassium sulfate (K2SO4) and copper sulfate (CuSO4)) to speed up the reaction.
  - o Heat the flask gently. The sulfuric acid will break down the organic material, and nitrogen will be converted into ammonium sulfate.
  - o This digestion process can take 1 to 2 hours. The mixture turns clear, which indicates that the organic matter has been successfully digested.

2. Neutralization and Distillation

- **Purpose:** To convert the ammonium ion (NH4+) to ammonia gas (NH3) and distill it into a receiving solution.
- **Procedure:**
  - o After digestion is complete, cool the flask and dilute the solution with water.
  - o Add a strong base, usually sodium hydroxide (NaOH), to make the solution alkaline. The ammonia (NH_3) gas is liberated when ammonium sulfate reacts with the alkali:

(NH4)2SO4+2NaOH→2NH3+Na2SO4+2H2O(NH_4)_2SO_4 + 2 NaOH \→ 2 NH_3 + Na_2SO_4 + 2 H_2O(NH4)2SO4+2NaOH→ 2NH3+Na2SO4+2H2O

- The ammonia gas (NH_3) is distilled by heating the solution. The ammonia gas is passed into a receiving solution, typically a known concentration of boric acid (H_3BO_3) in water, which absorbs the ammonia.

3. Titration

- **Purpose:** To quantify the amount of ammonia (NH_3) captured in the receiving solution, which corresponds to the nitrogen content of the sample.
- **Procedure:**
  - o The ammonia solution (from step 2) is then titrated with a standard solution of a strong acid, typically hydrochloric acid (HCl) or sulfuric acid (H_2SO_4).
  - o A few drops of an appropriate pH indicator, such as methyl red or bromocresol green, are used to monitor the endpoint.
  - o The amount of acid required to neutralize the ammonia solution is directly related to the amount of nitrogen present in the sample.

4. Method of Protein Content Calculation

The nitrogen content is determined by the volume of acid used in the titration. The formula for calculating the nitrogen content is:

$$\text{Nitrogen Content (g)} = \frac{0.14\left[\dfrac{\text{(Volume of Acid X Normality of Acid)}}{0.1} - \text{Burette Reding}\right]}{\text{Sample weight (g)}}$$

Where:

- Equivalency factor: This factor depends on the type of acid used for titration. For HCl, it is typically 1, but it may vary depending on the acid and its concentration.
- Normality of acid: The normality of the titrant (HCl or other acid) is typically expressed in equivalents per liter.

Once the nitrogen content is determined, you can estimate the protein content by using the N × 6.25 factor, assuming that protein contains approximately 16% nitrogen. The conversion factor may vary depending on the type of protein being measured.

Result of Isolate Proteins:

- If 0.3 grams of sample were used, and the titration required 40 mL of 0.1 N HCl for neutralization, the nitrogen content can be calculated as:

$$\text{Nitrogen content} = \frac{0.14\left[\dfrac{(40 \times 0.1020\ N)}{0.1} - 8.9\ ml\right]}{0.3\ g} = 14.84\ \%.$$

To estimate the protein content:

Protein content=14.84%×6.25=92.76 % of protein sample

CONCLUSION

This study provides significant insights into the relationship between soy protein isolates and the textural properties of texturized vegetable protein (TVP), contributing to the growing body of research on plant-based meat analogs. Through the careful purification of defatted soy flower and the application of Kjeldahl's method for precise nitrogen analysis, we have successfully quantified the protein content, demonstrating that soy protein isolates can consistently achieve over 90% protein concentration.

Our findings confirm that the protein composition, particularly the balance between 7S and 11S globulins, plays a crucial role in determining the hydration, gelling, and emulsifying properties of TVP. These properties are essential for improving the texture and functional characteristics of plant-based protein products, making them viable alternatives to traditional animal-based meats. The interactions between soy proteins, influenced by factors such as pH, extrusion conditions, and the presence of additives like L-cysteine, were shown to significantly affect the textural integrity of TVP, offering important implications for both food science and the growing plant-based food industry.

Additionally, our study highlights the importance of efficient protein isolation techniques, which not only enhance the functional properties of soy proteins but also maximize protein yields, thus making plant-based protein more accessible for use in a variety of food products. This work underscores the potential of soy protein isolate as a sustainable, high-quality ingredient for developing healthy, protein-rich food products that can help meet the dietary needs of a growing global population, particularly among vegetarians, vegans, and those seeking to reduce their consumption of animal-derived foods.

In conclusion, the research not only advances our understanding of the molecular basis of soy protein functionality but also paves the way for the future optimization of soy-based meat alternatives. The Kjeldahl method, while classic, remains a fundamental tool for nitrogen and protein analysis, contributing to the development of more efficient and sustainable food production methods. Further studies are needed to explore additional protein isolates and their interaction with other plant-based ingredients to enhance the overall quality and consumer acceptance of texturized vegetable proteins.

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