ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 11, Issue, 01, pp.463-464, January, 2019

DOI: https://doi.org/10.24941/ijcr.34193.01.2019

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

PROTEIN SYNTHESIS FROM SOYABEAN (DOC)

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ARTICLE INFO

Article History:
Received 10th October, 2018
Received in revised form
20th November, 2018
Accepted 19th December, 2018
Published online 31st January, 2019

Key Words:

Protein synthesis; Soyabean; De-oiled cake; Alkali Hydrolysis; Acid Hydrolysis; Enzymes.

ABSTRACT

Nitrogen has been the most essential element that directly affects the growth of plants. It is present in the soil in insoluble form which cannot be used by the plants. The plants require soluble form of nitrogen in soil to grow and sustainability. One such important compound that provides the plant with required nitrogen is Amino Acid (protein). It can be extracted from different plant or animal matter. Soya bean is one such source of protein and due to its high protein yields, it can be used to extract protein by three different methods such as acid hydrolysis, alkali hydrolysis and with the help of enzymes. Protein can be used to regulate the Carbon-Nitrogen ratio of the soil. This C-N ratio if present in 24:1, is optimal for the soil microbes to convert nutrients like Nitrogen, Potassium and Zinc in usable form for the crops.

Citation: Harsh Chaudhari, Dr. Anita Kumari and Womesh Bhole. **2019.** "Protein synthesis from soyabean (DOC)", *International Journal of Current Research*, 11, (01), 463-464.

INTRODUCTION

Nitrogen uptake directly affects the plants by strengthening plant cells and increasing their disease resistance. The optimum 24:1 C-N ratio is essential fro healthy microbes to thrive in soil and spur release of nutrients like N,K and Zn. Out of 24 parts, 16 parts carbon is required for energy needs of the microbes and the remaining 8 parts are required for maintenance. Amino acid is a major source of nitrogen and it can be extracted from Soya bean (DOC) by the following methods. For this reason, soybeans is a good source of protein, among many others, for vegetarians or for people who want to reduce the amount of meat or other sources of protein they consume.The enzymatic hydrolysis process is a safe process to handle and high quality protein can be obtained by this process i.e. L-form amino acids.

MATERIALS AND METHODS

Protein synthesis by Acidic Hydrolysis

Vessel requirement: Acid proof or lead lined vessel A homogeneous paste of de-oiled soya bean cake in water is made. This mass is heated upto 60°C. A suitable mineral acid (Hydrochloric or Sulphuric acid) is added.

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The reaction mass is kept stationary upto 30 minutes at the same temperature. The temperature of this mass is then increased to 80°C and this mixture is allowed to sit for 1 hour. The mass is then neutralized by caustic potash lye. The batch can then be withdrawn through filter nooch where filtration occurs with the help of gravity. The solid cake is then sent to centrifuge and the liquid extracted is mixed with filtered liquid. This summed liquid makes the entirety of protein extract. The product is then made a homogeneous mixture and tested for nitrogen content. The protein content can be calculated by using the following relation:

Percentage Protein content = Nitrogen content * 6.25 *{conversion factor=6.25}*

The derived protein is in the DL-form.

Protein Synthesis by Alkali Hydrolysis

A homogeneous paste of de-oiled soya bean cake in water is made. This mass is heated upto 60°C. A suitable alkali (Sodium potash or NaOH) is added. The reaction mass is kept stationary upto 30 minutes at the same temperature. The temperature of this mass is then increased to 80°C and this mixture is allowed to sit for 1 hour. The mass is then neutralised by acetic acid. The batch can then be withdrawn through filter nooch where filtration occurs with the help of gravity.

Table 1. Comparison Between Acid Hydrolysis/Alkali Hydrolysis and Enzymatic Hydrolysis

Protein Synthesis by Acidic or Alkali Hydrolysis	Protein Synthesis by Enzymatic Hydrolysis
The obtained mixture of amino acids is in DL-form.	The obtained mixture of amino acids is in L-form.
The activity of DL-form is less than sufficient.	The activity of L-form is very strong.
The process is not smooth and clarity is substandard.	The process is substantially clean.
Desired amino acids, particularly Tryptophane cannot not extracted.	Predominantly L-Tryptophane is extracted which is beneficial for plants. This can be converted to Indole acetic acid.
The aroma obtained is undesirable.	Original aroma is retained.
These processes require specific reactors under set parameters.	This process allows flexible use of reactors.
Applications are limited to particular field. (Agri)	Universally applicable for eg. In Pharma, Agri, Animal Feed, Tissue Culture, etc.

Fig. 1. De-oiled Soyabean Cake

Fig. 2. Protein Extract

The solid cake is then sent to centrifuge and the liquid extracted is mixed with filtered liquid. This summed liquid makes the entirety of protein extract. The product is then made a homogeneous mixture and tested for nitrogen content. The protein content can be calculated by using the following relation:

Percentage Protein content = Nitrogen content * 6.25 *{conversion factor=6.25}*

The derived protein is in the DL-form.

Protein synthesis by use of Enzymes

At room temperature, usage of HDPE/ SS vessel for hydrolysis is recommended. A flow-able solution of de-oiled cake (soya) and water is made.

RESULTS AND DISCUSSION

This solution is then heated upto 40-45^{o}C. The heating system is then detached and pancretin 4NF is added and a paste is made. The reaction is allowed to proceed fro 2 hours under constant stirring. After 2 hours, the temperature is increased to 50-55^{o}C. Once this temperature is reached, a paste of papain as a catalyst is added and the reaction is allowed to proceed for 2 hours under constant stirring. The nitrogen content is checked by the Kjedalj method. Generally, 75-76% conversion is attained. The catalysts are deactivated by increasing the temperature to 75-80^{o}C.

Simultaneously, the whole reaction mass is made acidic by adjusting pH to 5.5 by glacial acetic acid. The mixture is allowed to sit for 30 minutes. The product is then filtered through filter nooch by the use of gravity. The solid cake is then sent to centrifuge and the liquid extracted is then mixed with the filtered liquid. This mixture makes the whole protein extract. The mixture is made homogeneous and tested for nitrogen content. The product can be stabilized by using 0.3% Sodium Benzoate, Sodium metabisulphate or formalin.

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