Analysis of Biochemical Composition of Hulled and Dehulled White Soybean

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ABSTRACT

Proximate properties of white soybean (with and without seed coat) such as protein, carbohydrate, crude fiber and oil content were determined. The values of protein, carbohydrate and oil content in white soybean with seed coat are 31.0g/100g, 32.85g/100g and 16.5 g/100g respectively. The amount of protein, carbohydrate and oil content in white soybean without seed coat are 30.44g/100g, 31.35g/100g and 16.0 g/100gm respectively. The percentage of crude fiber in white soybean with and without seed coat is 4.76% and 4.93%. The protein, carbohydrate, crude fiber and oil content were more in white soybean with seed coat compared to without seed coat. The crude fiber in white soybean was lowest with seed coat compared to without seed coat.

Keywords: White soybean, Biochemical parameters, Carbohydrate, Crude fiber, Oil content (Lipids).

1. INTRODUCTION

Soybean (Glycine max) belongs to the family leguminosae and sub family papillionnideae. Soybean is excellent source of the trace elements copper, zinc and manganese. (Ampofo,2009). It has been confirm that daily utilization of soybean between 30 g and 50 g replace with an equal amount animal-base protein generates the following outcome:

- 9.35 % reduction in total cholesterol
- 12.9 % reduction in LDL cholesterol (harmful cholesterol)
- 10.5 % reduction in triglycerides(Pamplona, 2005)

Currently, the USA, Brazil and China are the 'Big-3' in soybean production. The USA now has over 50 percent of total soybean area in the world. Today Soybean has familiar as the one of the leader in agricultural crops for many reasons. Soybeans were rich in food value for diabetes and heart diseases. Chinese infants using soymilk in place of cow's milk are practically free from

rickets. According to research data has shown that soybean has superior and nearly supreme protein content than additional crops. It has rich source of edible vegetable oil, vitamins and minerals. It contains 40.3% protein, 20 % oil and 91.9% total digestible nutrients. (Fukushima, 2000: Fabiyi 2007). *Sattu* is acquiring popularity among diabetics; combination of soybean with *sattu* will not only boost the value of protein but also provide benefits of health promoting phytochemicals at a reasonable price. (Mridula, et. al. 2007).

The specific objective of the study is to assess the biochemical parameters like protein, carbohydrate, and others from hulled and dehulled white soybean.

2. MATERIAL AND METHOD

Sampling: White soybean seeds were purchase from the local markets of Madhya Pradesh, India. Seed obtained were grinded to form powder was used for various experiments involved in biochemical analysis.

Nutritional evaluation: Components such as carbohydrate, protein, crude fiber and oil content affects the nutritional issue and are considered to be important. Hence, proximate analysis was carried out on the hulled and dehulled white soybean.

Estimation of Protein: The quantity of protein can be determined by colorimetric method introduced by Lowry et.al. (1951). The Lowry method combines the Biuret reaction with the reduction of the Folin-Ciocalteau phenol reagent (phosphomolybdic-phosphotungstic acid) by tyrosine and tryptophan residues in the protein. Proteins to be analyzed are diluted to an appropriate range (20-100 µg). K Na Tartarate –Na_2CO_3 solution is added after cooling and incubated at room temperature for 10 min. $CuSO_4$-K Na Tartarate-NaOH solution is added after cooling and incubated at room temperature for 10 min. freshly prepared Folin reagent is added, then the reaction mixture is mixed and incubated at 50^oC for 10 min. Absorbance is read at 650nm. A standard curve of BSA is carefully constructed for estimating protein concentration of the unknown. (Folin-Lowry Method).

Estimation of Carbohydrate with anthrone reagent : For the estimation of carbohydrate, 100mg sample were boiled for three hours with 5 mL of 2.5 N HCl and cool to room temperature. After neutralize with solid sodium carbonate (until effervescence ceases) and make up volume to 100ml and centrifuge. Collect the supernatant and take 0.2 ml aliquots for analysis. Prepare the standards by taking 0, 0.2, 0.4, 0.6, 0.8, 1 and 1.2 mL of the working standard.'0' serves as blank. Make up the volume to 2 mL in all the tubes including the sample tubes by adding distilled water.

Then add 4 mL of Anthrone reagent. Heat for eight minutes in a boiling water bath. Cool rapidly and read the green to dark green colour at 630 nm. Draw a standard graph by plotting concentration of the standard on the X-axis versus absorbance on the Y-axis. From the graph calculate the amount of carbohydrate present in the sample tube.(Hedge, J.E. and Hofreiter, B.T. 1962)

Estimation of Crude fiber by gravimetric method: Firstly grind the sample and take exactly 2 g of sample and transfer to a 9 cm hard filter paper. A filter funnel supported on a 60-degree cone. Remove three 25 ml of fraction of ether and the drying of sample with the help of vacuum. Transfer the sample which was extracted into the beaker and add 20ml of ceramic fibre suspension,200 ml of boiling 1.25% H_2SO_4, and 1 drop of very diluted antifoam. Now put the beaker and allow boiling for accurately 30 minutes. Take out the beaker from the boiling process and rinse it with 50-75 ml of boiling water. Remove the beaker and washing was done with the 25 ml of boiling 1.25% H_2SO_4, 50 ml of water, and 25 ml of alcohol. Take out mat and also residue part and move to ash dish. To determine value o f blank, run the blank on the ceramic fibre using the same quantity of fibre and same amounts of acid and alkali. (Holst. 1982).

%Crude fibre (dry basis) = {(Dry Residue Weight (g). Ignited Residue Weight (g). Blank Weight loss (g) X 100 x100}/Sample Weight (g) X Sample Moisture

Estimation of Oil Content using Soxhlet apparatus: Fat is extracted, semi continuously, with an organic solvent. Solvent is heated and volatized then is condensed above the sample. Solvent drips onto the sample and soaks it to extract the fat. At 15-20 min interval, the solvent is siphoned to the heating flask, to start the process again. Fat content is measured by weight loss of sample or weight of fat removed. In a round bottom flask, take 150ml of Hexane. In a thimble add 10g of ground seed sample. Overlay it with cotton .Heat the Soxhlet apparatus at 60 ^{0}C for 2 hours. The mixture which was obtained in the flask contains oil and further subjected to evaporation for refining of the product. Degumming of oil was done by adding 2% water at 70 ^{0}C to the extracted oil. The dissolved gum was separated by centrifugation. The resultant oil extracted is displayed in percentage of extraction.

3. RESULT AND DISCCUSION

Table 1 represents the results of biochemical composition of white soybean with and without seed coat.

The protein value in the white soybean with seed coat was 31.00g/100gm and slight decreased in the white soybean without seed (30.44g/100gm).

The increase in carbohydrate content means increase in calories. The carbohydrate content of white soybean with seed coat was found to 32.86 g /100 gm. while white soybean without seed coat was found to slight decreased by 31.35 g/100 gm. Carbohydrates provide heat and energy for all the body activity. Deficiency can cause the body to divert proteins and body fat to produce needed energy, thus leading depletion of body tissues (Gordon, 1999).

Crude Fiber content of white soybean seed with seed coat was lowest (4.76%) and highest in white soybean without seed coat (4.93%). Though crude fiber does not contribute nutrients to the body, it adds bulk to food thus facilitating bowel movements (peristalsis) and preventing many gastrointestinal diseases in man (Gordon, 1999).

The oil (fat) content of white soybean with seed coat was 16.5g/100gm.

Result Table-1 Showing biochemical composition of white (with and without seed coat)

Parameters	White soybean seeds with seed coat	White soybean seeds without seed coat
Protein(g/100gm)	31.00	30.44
Carbohydrate (g/100gm)	32.86	31.35
Crude fiber (%)	4.76	4.93
Oil content g/100gm	16.5	16.0

4. CONCLUSION

As shown in the above result table, dehulling of soybean affected the chemical composition, and nutritional quality of black soybean. However, dehulling caused smaller losses in protein and carbohydrate and huge in crude fiber. Therefore hulled soybean seed are recommended for improving nutritional quality. According to this study, hulled black soybean is a very good source of proteins, carbohydrates, fibers and other components that affect in cholesterol reduction and have anti carcinogenic effects(Messina and Barnes, 1991) The anti carcinogenic effect is indirect.

As the dietary fibers level decreases due to dehulling (without seed coat). The dietary fibers reduce the toxic effect of microbial waste product of large intestine. Thus it reduces risk for colon cancer. Dietary fiber helps to normalize blood lipids, thereby reducing the risk of cardiovascular disease (Nielsen Suzanne. S, 2003)

ISBN: 978-93-83083-79-4

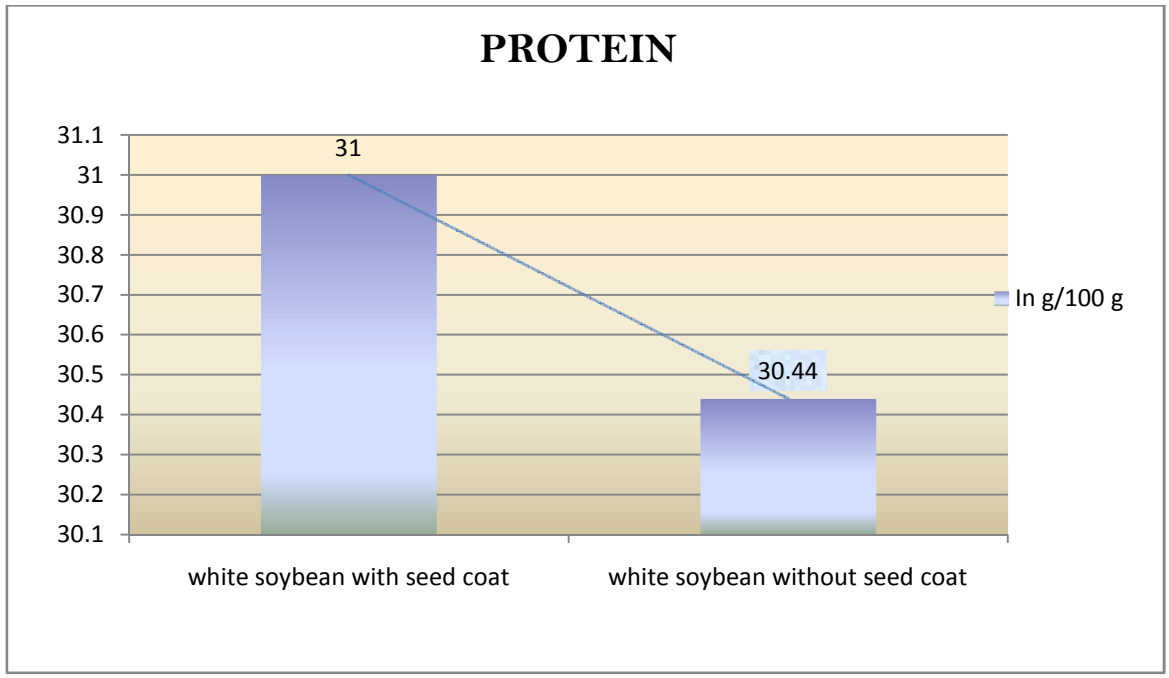

Figure -1: Showing the protein (g/100g) of white soybean (with and without seed coat)

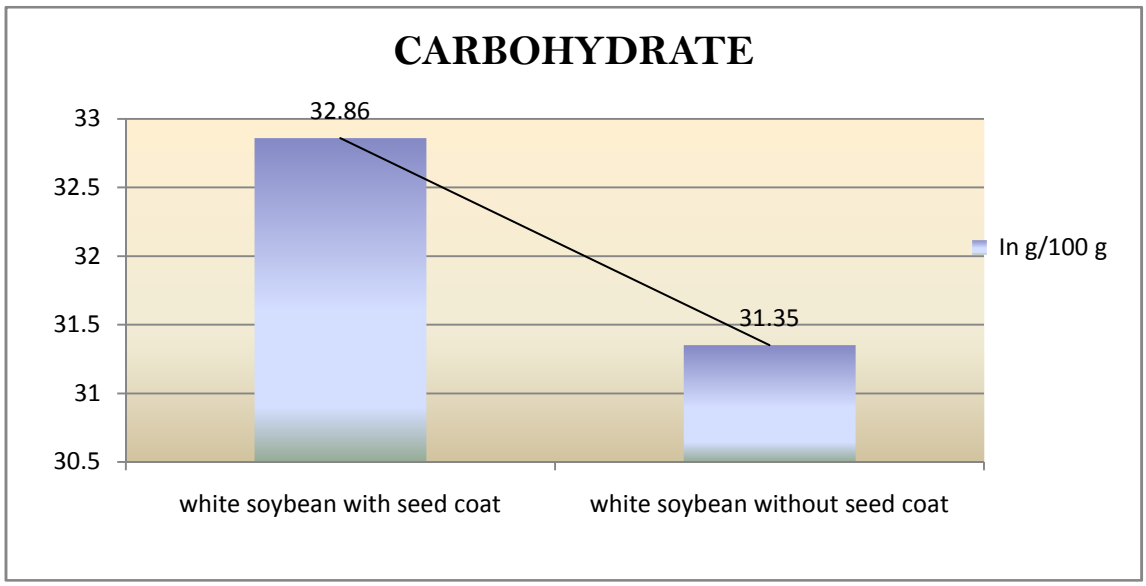

Figure 2: Showing the carbohydrate (g/100g) of white soybean (with and without seed coat)

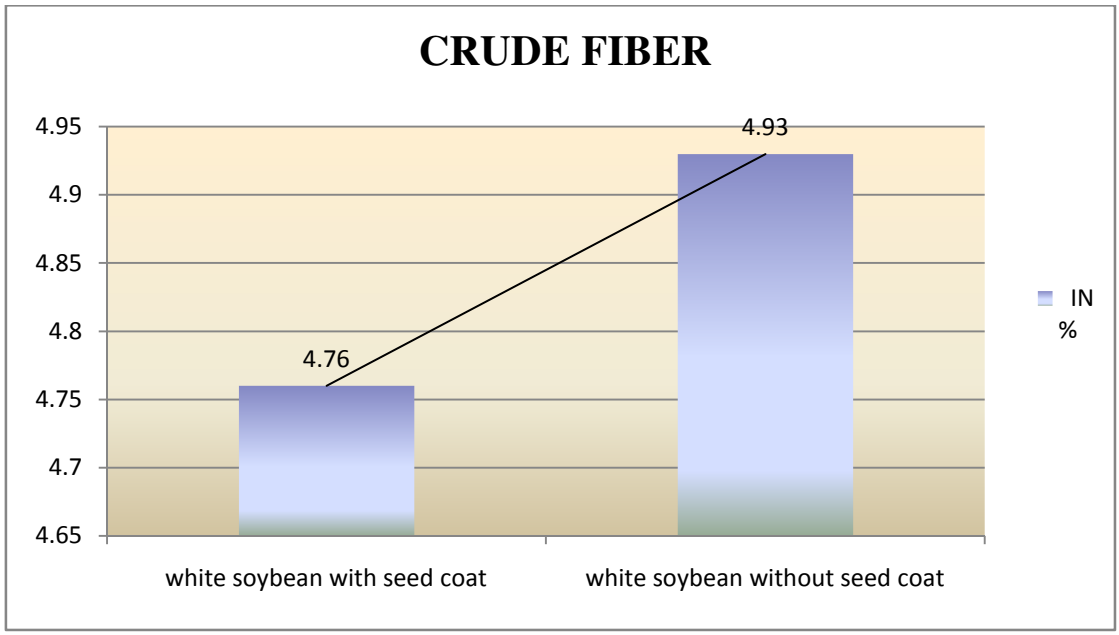

Figure 3: Showing the crude fiber (%) of white soybean (with and without seed coat)

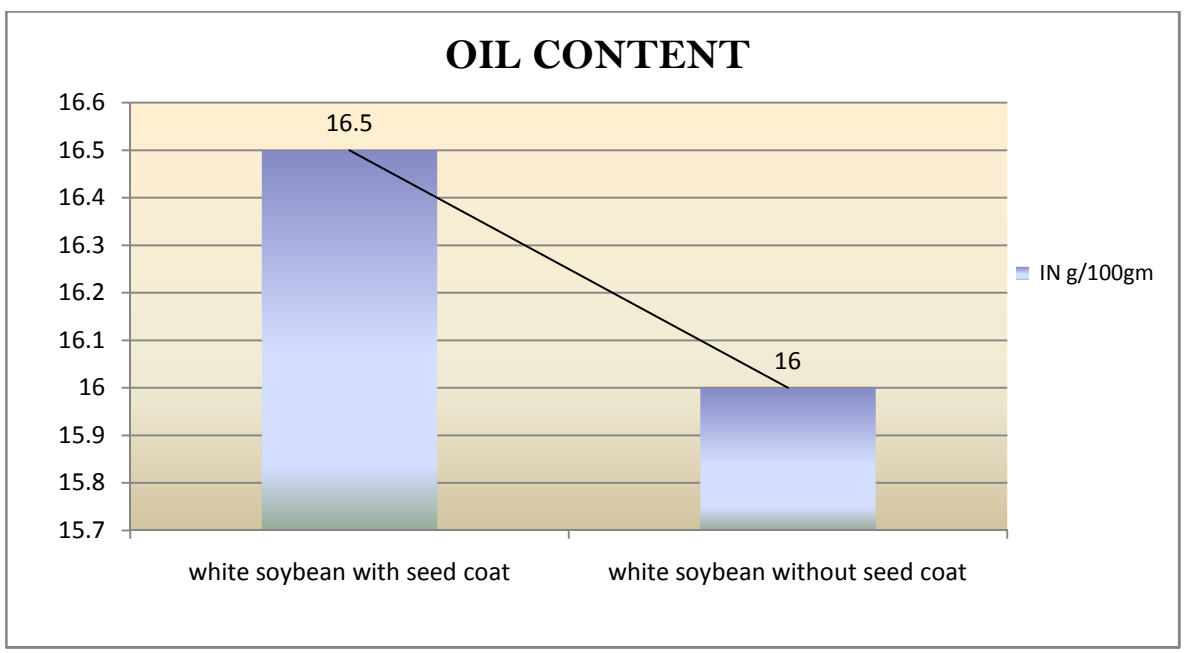

Figure 4: Showing the oil (fat)content (g/100g) of white soybean (with and without seed coat)

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