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Department of Nutrition and Food Engineering

Project Report

Analysis of physio chemical characteristics of Water caltrop, Bangladesh

Submitted by

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Department of Nutrition & Food Engineering
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Submitted to

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Date of Submission: 18th December, 2018

LETTER OF TRANSMITTAL

Date: 18th December 2018

Professor Dr. Md. Bellal Hossain

Head

Department of Nutrition & Food Engineering

Daffodil International University.

Subject: Submission of Project report

Dear Sir,

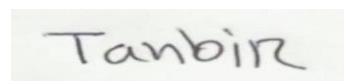
I would like to take this opportunity to thank you for the guidance and support you have provided me during the course of this report. Without your help, this report would have been impossible to complete. Daffodil International University has many more respective persons, for providing me all most supervision during my thesis in the organization.

To prepare the report I collected what I believe to be most relevant information to make my report as analytical and reliable as possible. I have concentrated my best effort to achieve the objectives of the report and hope that my endeavor will serve the purpose. The practical knowledge and experience gathered during report preparation will immeasurably help in my future professional life. I request you to excuse me for any mistake that may occur in the report despite of my best effort.

I would really appreciate it you enlighten me with your thoughts and views regarding the report. Also, if you wish to enquire about an aspect of my report, I would gladly answer your queries.

Thank you again for your support and patience.

Sincerely Yours



A.N.M. Tanbirur Rahman

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DECLARATION

I am pleased to certify that the project report on Study on **Analysis of physiochemical characteristics of Water caltrop, Bangladesh** conducted by **A.N.M. Tanbirur Rahman**, bearing respectively **ID No: 151-34-349** of the Department of Nutrition and Food Engineering has been approved for presentation and defense/viva-voice.

I am pleased to hereby certify that the data and finding presented in the report are the authentic work of A.N.M.Tanbirur Rahman. I strongly recommended the report presented A.N.M.Tanbirur Rahman, for further academic recommendations and defense/viva-voice. A.N.M.Tanbirur Rahman bears a strong moral character and a very pleasant personality. It has indeed a great pleasure working with him. I wish him all success in life.



Supervisor

Prof. Dr. Md. Bellal Hossain

Head

Department of Nutrition and Food Engineering

Faculty of Allied Health Science

Daffodil International University

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In the preparation of this report, I would like to acknowledge the encouragement and assistance given to me by a number of people. At first, I would like to express my gratitude to my creator the Almighty Allah for enabling me the strength and opportunity to complete the report in time successfully. I am grateful to each and every people who are involved with me in every phase of my life.

I am grateful to my parents without whom I cannot be here. Without the support of my parents, I could not be able to achieve my objectives and goals.

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Finally, I wish to express immense gratitude & humbly convey my heartfelt respect to the Managing Director.

Abstract

Water caltrop is an aquatic, annual, floating plant that grows in slow water. Water caltrop as known as water chestnuts. Bangladeshi name is paniphol or Singhara.that can be eaten raw or cook. in Bangladesh Several varieties are grown which *Trapa bispinosa* Roxb and *Trapa natans* L.two type of water caltrop born in Bangladesh that is red (Leaf, petiole, fruit) and green (Leaf, petiole, fruit). This water caltrop is born in any ware solo water local pond in Bangladesh. The physicochemical properties of water caltrop are they a good source of protein and starch. The proximate composition of water caltrop is ash 1.33, moisture 81.12, and Crude fiber 2.13% starch 8.7%, lipid 0.84%. In 100gm of water caltrop is vitamin-C 1.1 mg .protein 0.275 mg, β -Carotene 60 μ g. The shelf life of whole water caltrop at ambient, frozen, refrigerated, and aqueous conditions was studied. The water caltrop may play a crucial role in human nutrition.

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CHAPTER ONE

Introduction

1.1 Introduction:

Water caltrop is commonly known as singhara or paniphol in Bangladesh it is an annual aquatic dicotyledonous plant. two type of water caltrop grown in Bangladesh among which *Trapa natans* L. and *Trapa bispinosa* Roxb are important that Several varieties of water caltrop. *Trapa bispinosa* has two varieties, one is green (Leaf, petiole, and fruit) and the other is red (Leaf, petiole, and fruit). It grows well in a shallow freshwater basin in the tropical, sub-tropical and temperate zone of the world. It has been commercially cultivated in China, Pakistan, Srilanka India, Japan, and different parts of Southeast Asia. Recently, the cultivation of water chestnut is becoming more popular in Bangladesh due to its easy grow, good profit and to meet up the demand for more food production, low cost of production, This plant is extensively cultivated in freshwater tanks, ponds beels, and ditches. A balanced diet is important to maintain a sound health. A balanced diet should contain sufficient fruits and vegetables in order to supply minerals and, vitamins, deficiency of those cause specific diseases. Bangladesh is abounding with diverse fruits. Water caltrop is a seasonal fruit that grows well everywhere in Bangladesh For human consumption, water caltrop is eaten in many countries as raw, boiled or roasted and stem or leaves as vegetables or flavor or is added in other dishes. The fruit has also been used for medicinal purposes. They are also useful in burning sensation, intermittent fever fatigue, dyspepsia, inflammation, bronchitis, and debility. Flour made from the fruit is suitable for textile sizing and is a good substitute for cornstarch in ice cream manufacture. Fruits also provide starch, carbohydrates, proteins, fats as well as dietary fiber (fruit skin). Presently, it is well putative that dietary fiber looks to lower the risk of colon cancer. However, data available on the physicochemical parameters, enzyme and antimicrobial activities of water caltrop produced in Bangladesh are quite scanty. Water caltrop may add a lot to the nutrition of our Bangladeshi people by given that essential nutrients. Consequently, the details research works including biochemical and biological soundings are very important to release a good variety of water caltrop, which would be nutritionally rich as well as high yielding. Keeping all these in mind in this study, an effort was made to investigate in details of the water caltrop fruits using locally available two varieties (green and red). This study comprises the determination and comparison of physiochemical characteristics such as pH, moisture, ash, starch, protein etc.

1.2 Nutritional importance of water caltrop

- It Contains starch
- Good source of energy from water caltrop.
- It Contains moderate amounts of fiber
- Water caltrop has no gluten
- Water caltrop is a High amount of potassium
- Water caltrop is Low in fat
- Water caltrop is no Cholesterol
- Water caltrop is Low in sodium
- Water caltrop Rich in minerals, including calcium, iron, zinc, and phosphorus

1.3 Health Benefits of Water Caltrop

Water caltrop is widely used in Ayurvedic and Unani systems of medicine and is used to treat kidney, and spleen ailments stomach, liver. It is a bitter, diuretic, astringent and antiseptic plant.

Some of the reported health benefits are:

- It is a cooling food, perfect to counter summer heat.
- The juice relieves vomiting and can increase the appetite.
- A paste of the seed helps to treat fractured heels.
- The sour juice is used to control diarrhea and dysentery.
- Powdered water caltrop relieves a cough.
- The fruit cuts irritation and may act as an aphrodisiac.
- Applied regularly, water caltrop seed powder, mixed with lemon juice, it will help treat eczema.

1.4 Origin of the study:

Thesis or project report is a graduation requirement for all university students. Daffodil International University & Department of NFE provide thesis opportunity for students in the university laboratory.

Purpose of this study about physiochemical characteristics of Water caltrop are as follows:

1. To find out unique information about Water caltrop.
2. To learn about how to calculate ash, moisture, fat, starch.
3. To fulfill graduation requirements
4. To learn about apparatus related to this project
5. To learn how to use theoretical knowledge in practical
6. To become self-dependent.

1.5 Methodology

A systematic procedure is required for the preparation of the final report. The methodology starts from the selection of topic, data source, and interpreted results in a systematic manner and key points are to be found out. The overall process of the methodology is as follows:

Selection of the topic:

The selection of the topic for any research is very important. It depends on gained knowledge and on practical experience from the assigned organization.

Source of data:

Essential data can be collected from both primary and secondary source.

Primary Source of data:

- Primary data collected from the practical work

Secondary Source of data:

- From newspaper, journal, articles etc.
- Different websites related to dairy science.
- From manuals and files of the organization.

Tools Used:

Some arithmetic, graphical tools are used in this report for analyzing the data and to classify different types of data.

1.6 Limitations of the Study:

Everything has some limitations. So this study also has some limitations.

The main limitation was the time. Because of insufficient time, it was not enough to conduct the research properly. To make a perfect and clear research high-technology and types of machinery required which was not enough in the laboratory.

Technical support was not enough to conduct this research properly. Instruments and other necessary things were not enough for the present research.

CHAPTER TWO

Water caltrop Contacts



Figure: Raw Water caltrop

2.1 Water caltrop scientific classification:

Kingdom:	Plantae
Clade:	Angiosperms
Clade:	Eudicots
Clade:	Rosids
Order:	Myrtales
Family:	Lythraceae
Subfamily:	Trapoideae Voigt
Genus:	Trapa L.
Type species:	Trapa natans L.

Species

Trapa natans

Trapa bicornis

Trapa rossica

2.2 Biology

The water caltrop's flooded stem ranges 12 to 15 ft. (3.7 to 4.6 m) in length, attached into the mud by very fine roots. It has two types of leaves, finely divided, feather-like flooded leaves borne along the length of the stem, and undivided variable leaves borne in a rosette at the water's

Surface. The floating leaves have saw-tooth edges and are ovoid or three-sided in shape, 2–3 cm long, on inflated petioles 5–9 cm long, which provide added resistance for the leafy portion. Four-petalled white flowers form in early summer and are insect-pollinated the fruit is a nut with four 0.5-in (1-cm), barbed spines.

2.3 The proximate composition of water caltrop

- Water 48.2 g
- Ash 1.33
- Moisture 81.12
- Protein 3.4 g
- Fat 0.2 g
- Starch 8.7g
- Crude fiber 2.13g
- Vitamin-C 1.1 mg
- Carbohydrate 32.1g
- lipid 0.84 g
- Sugar 3.3g
- Energy 730 calories
- Dietary fiber 14.9g
- Calcium 17.6 g
- Zinc 0.4 g
- Iron 0.7 g
- Potassium 468 g
- Sodium 0.8g

2.4 Born water caltrop



Figure: Collect water caltrop

Water caltrop is commonly known as singhara or paniphol in Bangladesh it is an annual aquatic dicotyledonous plant. two type of water caltrop grown in Bangladesh among which *Trapa natans* L. and *Trapa bispinosa* Roxb are important that Several varieties of water caltrop. *Trapa bispinosa* has two varieties, one is green (Leaf, petiole, and fruit) and the other is red (Leaf, petiole, and fruit). It grows well in a shallow freshwater basin in the tropical, sub-tropical and temperate zone of the world. It has been commercially cultivated in China, Pakistan, Srilanka India, Japan, and different parts of Southeast Asia. Recently, the cultivation of water chestnut is becoming more popular in Bangladesh due to its easy grow, good profit and to meet up the demand for more food production, low cost of production, This plant is extensively cultivated in freshwater tanks, ponds bells, and ditches.

CHAPTER THREE

Water caltrop collection and Drying

3.1 Water caltrop collection

Water caltrop is commonly known as Singhara or Paniphol in Bangladesh. Two type of water caltrop grown in Bangladesh one is green (Leaf, petiole, and fruit) and the other is red (Leaf, petiole, and fruit). It grows well in a shallow freshwater basin in the tropical, sub-tropical and temperate zone of Bangladesh. In Bangladesh, any local market sells water caltrop.in Dhaka city winter season anywhere get water caltrop. In kawranbazar Dhaka water caltrop is 30-40 taka per kg.so I collect water caltrop in kawranbazar Dhaka.

3.2 Drying

1. After collect water caltrop then peels them.1kg of water caltrop 500gm of seeds.



Figure: Water caltrop without pulp

2. Then cut seed of water caltrop in 3-4 pieces for easily dry.



Figure: Water caltrop cutting 3-4 pieces

3. After that, it washes in cool water.
4. Then boil in 70 to 80°C temperature in 5-7 min.
5. Then put a 3-4 basket of water caltrop seeds.
6. Then dry for Multi-commodity solar tunnel dryer (MCSTD) process is sun drying techniques in drying products. The process is mainly dependent on the weather conditions and is very difficult during the rainy season. Moreover, the traditional technique generally yields products with a high microbial load. The exposure to wind and weather is a moderately slow process and results to a great loss through spoilage, lack of consistency in the final product and development of unwanted flavor.



Figure: Water caltrop with MCSTD Drying Method

7. After that 3-4 day water caltrop is dry. The 3-4 day long time need for drying cause of winter season.73gm of dry water caltrop for 500 gm. of water caltrop seeds.

8. After dry, it grinding for grinder machine.so water caltrop powder in 70gm.

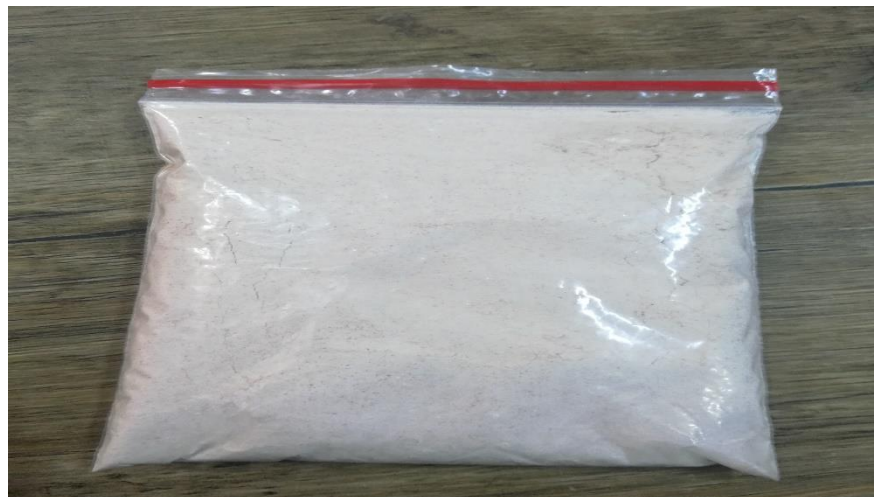


Figure: Water caltrop powder

CHAPTER FOUR

PROXIMATE ANALYSIS OF WATER CALTROP

4.1 pH Test:

Taken of water caltrop juice in a beaker. Then enter the pH meter in a beaker and stay some minutes. This time pH meter continues working. At the moment pH meter volume doesn't up and down. Then collected the original pH volume.

Result: pH 7.25 ± 0.29

4.2 Moisture Test:

Apparatus:

- Crucible lid
- Oven
- Measuring
- Desiccator

Procedure:

- First of all set 105°C temperature on the oven.
- Then weight crucible lid
- Then weight water caltrop.
- Then weight crucible lid + sample
- Then heat sample 105°C temperature on the oven in 1 hour
- After that sample cool in 30minute on desiccator
- Then again weight crucible lid + sample
- Then calculate it for a result.



Figure: Oven

Result:

Before heat,

Crucible lid weight = 23.383g

Crucible lid + sample weight = 28.383g

After heat,

Crucible lid + sample weight = 27.924g

So moisture content is

Before heat, (Crucible lid weight) - After heat, (Crucible lid + sample weight)

$$28.383\text{g} - 27.924\text{g} = 0.459\text{g}$$

So 5g water caltrop is .0459g moisture content

4.3 Ash Test:

Apparatus:

- Crucible lid
- Muffle furnace
- Measuring
- Desiccator

Procedure:

- First of all set 600°C temperature on the muffle furnace
- Then weight crucible lid
- Then weight water caltrop.
- Then weight crucible lid + sample
- Then heat sample 600°C temperature on the muffle furnace in 6 hours.
- After that sample cool in 1 hour on desiccator
- Then again weight crucible lid + sample
- Then calculate it for a result.



Figure: Muffle furnace

Result:

Before heat,

Crucible lid weight = 25.047g

Sample weight = 4.003

Crucible lid + sample weight = 29.050g

After heat,

Crucible lid + sample weight = 25.198g

So ASH content is

Before heat, Crucible lid weight - After heat,

Crucible lid + sample weight

$29.050\text{g} - 25.198\text{g} = 3.856\text{g}$

Then before sample weight - after sample weight $4.003 - 3.856\text{g} = 0.147\text{g}$

So 4.003g of water caltrop Ash is .0147g.

So water caltrop Ash is 1.44 %

4.4 Protein determination using kjeldahl apparatus

Materials required:

- H_2SO_4
- Digestion mixture (2g $\text{CuSO}_4+98 \text{K}_2\text{SO}_4$)
- 40% NaOH
- .1 N HCL
- Methyl red indicator
- .1 NaOH
- Distilled wate

Procedure:

Digestion:

- First of all take 0.4gm of water caltrop, H_2SO_4 10 ml, and digestion mixture
- Then it was put on the digestion flask
- After that, use two digestion flasks for this procedure average value can be taken
- Then heat slowly then increase heat and heat about 3-4 hours. but the heating problem that's why it was heated 15-18 hours.
- The endpoint will be no white smoke of H_2SO_4 and the solution will be crystal clear.
- Then Cool it for some time.



Figure: Digestion machine

Distillation:

- At first, taken volumetric flask then make it 100ml level using distilled water for Pour the solution.
- Then taken 10 ml from that conical flask to the distillation flask,
- Then taken 150 ml distilled water and 10ml of 40% NaOH to the distillation flask.
- Then taken 150 ml of distilled water and 10ml 0.1N HCl and 2 drops of methyl red (1%) in the trapping conical flask
- After that Use three distillation flasks for this procedure where one of them will be blank i.e. no sample.
- Only take 150ml distilled water with 10 ml 40% NaOH.
- Then Use three trapping solution in 3 trapping conical flasks remaining the same thing.
- Then set up the condenser and start it
- Start the distillation unit and run for 30 min.



Figure: Distillation machine

Titration:

- Fill the burette with 0.1N NaOH
- Then taken 25ml HCL on trapping flax
- Do the titration 3 times with 3 trapping solution
- The endpoint will be color changes from pink to light yellow

Calculation:

$$\frac{(B - S) \times 1.4 \times 10 \times 5.95 \times 0.1}{\text{Sample weight}}$$
$$\frac{(11-11) \times 1.4 \times 10 \times 5.95 \times 0.1}{0.4\text{gm}}$$
$$\frac{0}{0.4\text{gm}}$$
$$= 0.34$$

Result:

In internet source 100gm of water caltrop is 3.4gm of protein so that 0.4gm of water caltrop is 0 protein.

4.5 Fat test Soxhlet method**Equipment:**

- Analytical balance
- Soxhlet extractor, with glassware
- Vacuum Oven

Supplies:

- 3 Aluminum weighing pans, predried in 70°C vacuum oven for 24 h
- Beaker, 250 ml
- Cellulose extraction thimbles, predried in 70°C vacuum oven for 24 h
- Desiccator
- Glass boiling beads
- Glass wool, predried in 70°C vacuum oven for 24 h
- Graduated cylinder, 500 ml
- Mortar and pestle
- Plastic gloves
- Snack foods (need to be fairly dry and able to be ground with a mortar and pestle)
- Spatula
- Tape
- Tongs
- Weighing pan

Chemicals: N-Hexane

Procedure:

- At first weight of water caltrop and weight of thimble
- Then dry thimble for an oven for no moisture
- Then it was a place 5 gram of water caltrop in the thimble.
- Then reweight water caltrop and thimble
- Then it was Place samples in a Soxhlet extractor. And Put 210 ml N-Hexane ether in the flask, and extract for 6 h or longer. Samples in thimbles take placed in the beaker after extraction and before drying.
- Remove thimbles from the Soxhlet extractor using tongs, air dry overnight in a hood, then
- dry in a vacuum oven at 70°C, for 24 h. Cool dried samples in a desiccator then reweigh.
- Then Reweigh after drying, and calculate fat of the water caltrop.



Figure: Soxhlet method

Calculation of % fat:

% Fat =

$$\frac{(\text{Initial weight of sample+ thimble}) - (\text{Final weight of sample+ thimble}) \% 100}{(\text{Wight of weight sample +thimble})- \text{Weight of thimble}}$$

Then,

$$\frac{(5+4.095) - (4.985+4.095) \% 100}{(5+4.095)- 4.095}$$

Then,

$$\frac{1.5}{5} = 0.3 \%$$

So result is 100gm of water caltrop is 0.3 % of fat.

4.6 Starch test

Apparatus:

- Bikar
- Muslin cloth
- Water

Procedure:

- First of all, water was taken in bikar then water caltrop mixing with it.
- After that a muslin cloth put on another bikar then mixer water caltrop put upon on the muslin cloth, that time water 2-3 drops remove for cloth to bikar .
- After that take a time to storage starch in under the bikar .
- Then remove the water of the bikar.
- Then weight 250ml small bikar.
- Then it was dry to small bikar to oven.
- After dry that weight for bikar
- Then calculate it.

Calculation:

Raw water caltrop

Weight of bikar = 34.856

Weight Bikar + sample after heat = 37.529

$$\begin{aligned}(\text{Bikar} + \text{sample after heat}) - \text{Bikar} &= 37.529 - 34.856 \\ &= 2.673 \text{ g}\end{aligned}$$

20 gm. of raw water caltrop is 2.673g starch

Water caltrop powder

Weight of bikar = 34.980

Weight (Bikar + sample after heat) = 35.127

$$\begin{aligned}(\text{Bikar} + \text{sample after heat}) - \text{Bikar} &= 35.127 - 34.980 \\ &= 0.148\text{g}\end{aligned}$$

5 gm. of water caltrop powder is 0.148g starch.

4.7 Non Starch test

Apparatus:

- Bikar
- Muslin cloth
- Water

Procedure:

- First of all, water was taken in bikar then water caltrop mixing with it.
- After that a muslin cloth put on another bikar then mixer water caltrop put upon on the muslin cloth, that time water 2-3 drops remove for cloth to bikar.
- After that take a time to storage starch in under the bikar.
- Then outside of muslin cloth water caltrop put in the filter paper.
- Then it was dry to the oven.
- After dry that weight for filter paper
- Then calculate it.

Calculation:

Raw water caltrop

A weight of filter paper = 0.992g

Weight (filter paper + sample after dry) = 1.268g

$$\begin{aligned}(\text{Filter paper} + \text{sample after dry}) - \text{Filter paper} &= 1.268\text{g} - 0.992\text{g} \\ &= 0.346\text{g}\end{aligned}$$

20 gm. of raw water caltrop is 0.346g non starch.

Water caltrop powder

A weight of filter paper = 1.370g

Weight (filter paper + sample after dry) = 4.382g

$$\begin{aligned}(\text{Filter paper} + \text{sample after dry}) - \text{Filter paper} &= 4.382\text{g} - 1.370\text{g} \\ &= 3.012\text{g}\end{aligned}$$

5 gm. of water caltrop powder is 0.346g starch.

CHAPTER FIVE
Result and Discussion

5.1 pH Test:

Result: pH 7.25 ± 0.29

Discussion: Water caltrop pH rang 6.7 to 8.2 and an alkalinity of 12 to 128 mg/l of calcium carbonate.

5.2 Moisture Test:

Result:

Before heat,

Crucible lid weight = 23.383g

Crucible lid + sample weight = 28.383 %

After heat,

Crucible lid + sample weight = 27.924g

So moisture content is

Before heat, (Crucible lid weight) - After heat, (Crucible lid + sample weight)

$28.383g - 27.924g = 0.459g$

So 5g water caltrop is .0459g moisture content

Discussion: So 100g of water caltrop Powder moisture is .918g and raw water caltrop is 81.7 g some time the result not accurate cause of measurement problem or drying problem.

5.3 Ash Test:

Result:

Before heat,

Crucible lid weight = 25.047g

Sample weight = 4.003

Crucible lid + sample weight = 29.050g

After heat,

Crucible lid + sample weight = 25.198g

So ASH content is

Before heat, Crucible lid weight - After heat,

Crucible lid + sample weight

29.050g - 25.198g = 3.856g

Then before sample weight - after sample weight 4.003 - 3.856g = 0.147g

So 4.003g of water caltrop Ash is .0147g.

Discussion: So 100g of water caltrop powder is .367g ash content. Sometime no accurate result cause of measurement and drying problem .

5.4 Protein test

Calculation:

$$\frac{(B - S) \times 1.4 \times 10 \times 5.95 \times 0.1}{\text{Sample weight}}$$

Then,

$$\frac{(11-11) \times 1.4 \times 10 \times 5.95 \times 0.1}{0.4\text{gm}}$$

$$\frac{.136}{0.4\text{gm}} = 0.34$$

Result: 0.34

Discussion: In internet source 100gm of water caltrop is 3.4gm of protein so that 0.4gm of water caltrop is 0 protein. But some time heating problem and titration not accurate calculate that's why deferent result.

5.5 Fat test

Calculation of % fat:

% Fat =

$$\frac{(\text{Initial weight of sample+ thimble}) - (\text{Final weight of sample+ thimble}) \% 100}{(\text{Wight of weight sample +thimble})- \text{Weight of thimble}}$$

Then,

$$\frac{(5+4.095) - (4.985+4.095) \% 100}{(5+4.095)- 4.095}$$

Then,

$$\frac{1.5}{5} = 0.3 \%$$

So result is 100gm of water caltrop powder is 0.3 % of fat.

Discussion:

So the result is 100gm of water caltrop powder is 0.3g of fat. But internet source 100g water caltrop is 0.1g fat .the result some time deferent cause lack of heat and not well dry.

5.6 Starch test

Calculation:

Raw water caltrop

Weight of bikar = 34.856

Weight Bikar + sample after heat = 37.529

$$\begin{aligned} (\text{Bikar + sample after heat}) - \text{Bikar} &= 37.529- 34.856 \\ &= 2.673 \text{ g} \end{aligned}$$

20 gm. of raw water caltrop is 2.673g starch

Water caltrop powder

Weight of bikar = 34.980

Weight (Bikar + sample after heat) = 35.127

$$\begin{aligned}(\text{Bikar} + \text{sample after heat}) - \text{Bikar} &= 35.127 - 34.980 \\ &= 0.148\text{g}\end{aligned}$$

5 gm. of water caltrop powder is 0.148g starch.

Discussion: So 100g of water caltrop powder is 2.96g and raw water caltrop is 13.365g. But other research starch of water caltrop is 8.7g for 100g of water caltrop. Its depend on not well mixing and remove water it going to with water.

5.7 Non Starch test

Calculation:

Raw water caltrop

A weight of filter paper = 0.992g

Weight (filter paper + sample after dry) = 1.268g

$$\begin{aligned}(\text{Filter paper} + \text{sample after dry}) - \text{Filter paper} &= 1.268\text{g} - 0.992\text{g} \\ &= 0.346\text{g}\end{aligned}$$

20 gm. of raw water caltrop is 0.346g non starch.

Water caltrop powder

A weight of filter paper = 1.370g

Weight (filter paper + sample after dry) = 4.382g

$$\begin{aligned}(\text{Filter paper} + \text{sample after dry}) - \text{Filter paper} &= 4.382\text{g} - 1.370\text{g} \\ &= 3.012\text{g}\end{aligned}$$

5 gm. of water caltrop powder is 3.012g starch.

Discussion: So 100g of water caltrop powder is 60.24g and raw water caltrop is 1.73g. But another research starch of water caltrop different. It's depend on not well mixing and remove water it going to with water.

CHAPTER SIX

CONCLUSION

6.1 Conclusion:

Water caltrop is an aquatic, annual, floating plant that grows in slow water. Water caltrop as known as water chestnuts.in Bangladesh, winter season eat water caltrop so that if improve the production of water caltrop in business purpose so that a lot of people work for its production. The shelf life of whole water caltrop at ambient, frozen, refrigerated, and aqueous conditions was studied. The water caltrop may play a crucial role in human nutrition. And water caltrop is a lot of starch it eats to good for our health. And water caltrop is a low-cost price.

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